ICMPC15
ESCOM10
2018

Abstract Book


Graz


La Plata


Montréal


Sydney

How to cite this booklet:
Richard Parncutt and Sabrina Sattmann (Eds., 2018). ICMPC15/ESCOM10: *Abstract book (electronic).* Graz, Austria: Centre for Systematic Musicology, University of Graz.

15th International Conference on Music Perception and Cognition

10th triennial conference of the European Society for the Cognitive Sciences of Music

La Plata, Argentina
Montreal, Canada
Sydney, Australia
Graz, Austria

23-28 July 2018

Abstracts

Edited by Richard Parncutt and Sabrina Sattmann

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Welcome to ICMPC15/ESCOM10!

It is my pleasure to welcome all active and passiveparticipants at all four hubs and elsewhere to this pioneering, semi-virtual, multi-hub, global conference. We are part of a long and successful tradition of ICMPCs, beginning in 1989, every two years since 1992; also the ESCOM conference, every three years since 1994. The combined ICMPC/ESCOM has happened every six years since 1994. Ours is the first conference in our field to happen on different continents simultaneously with a 24-hour program.

The organizing committees at all hubs hope that conferences of this kind will become the norm, allowing us to achieve several goals simultaneously: increase global participation, lower financial barriers, increase cultural diversity, improve validity of research content, and work toward a better future for our discipline and for humanity by reducing emissions. In these ways, we can overcome historical and future injustices, and inspire colleagues in other disciplines.

Cultural diversity has been an ICMPC hallmark from the start. The first conference was in Japan rather than North America or Europe, encouraging equal participation by participants from three continents. This conference adds a fourth: South America. In future, I hope that Asian and African hubs can be added. ICMPC is also about disciplinary diversity: although we focus on sciences (psychology, neuroscience, computer science), we also promote interactions with humanities (history, ethnomusicology, music theory) and practically oriented disciplines (performance, composition, therapy, medicine, education).

On behalf of the ESCOM executive council and the conference organizing committees at all hubs: Enjoy the conference, learn new things, make new contacts, and have a great time, wherever you are. If you need help of any kind, don't hesitate to ask a member of your local organizing committee or student support team.

Richard Parncutt
University of Graz, Austria

Conference chair, ICMPC15/ESCOM10
ESCOM President

Welcome from the ICMPC15/ESCOM10 co-organizer

Welcome to the 15th International Conference on Music Perception and Cognition and the 10th triennial conference of the European Society for the Cognitive Sciences of Music in Graz, La Plata, Montreal, and Sydney! We are honoured to welcome 787 participants from 54 different countries from all around the globe - from Island to South Africa, from Chile to Taiwan, and all countries in between.

The impressive number of paper and poster sessions covers a wide range of subjects from movement, flow, and expression to health, violence, and beyond. This is complemented by workshops and demonstrations that offer practical applications and show upcoming trends. The symposia focus on diverse topics from visual imagery to hearing impairment.

Another highlight are the keynotes from four different hubs, entitled “Riddles of time: Rhythm and temporal structure in language and music” by Simone Falk, “Moved by music: The role of empathy and social cognition in music-induced emotions” by Jonna Vuoskoski, “The neuroscience of musical entrainment: insights from EEG frequency-tagging” by Sylvie Nozaradan, and “Variability, complexity and gender in musical cultures: Insights from experiments with epistemological waste” presented by Luiz Naveda.

For the first time a new platform for networking is introduced. Please take advantage of the possibility to connect with researchers around the globe. This way, you can continue the experience of the conference even when you are back home, watch the talks you have missed during the conference and discuss with other researchers through the platform.

I would like to express my sincere thanks to all the hub organizers and their teams and all the student assistants and volunteers for their extraordinary work, especially the student assistants Nils Meyer-Kahlen, Katharina Pollack, Magdalena Ramsey, Theresa Schallmoser, and Sandra Tanzmeister. I would also like to thank the reviewers of abstract submissions for their helpful suggestions and evaluations.

And I especially want to thank you – for taking part in this exciting new experience!

Sabrina Sattmann
University of Graz, Austria

Co-organizer, ICMPC15/ESCOM10

Welcome from the ICMPC Executive Committee

I would like to warmly welcome all participants to the 15th International Conference on Music Perception and Cognition. I would also like to acknowledge members of the Executive Committee of the ICMPC, with special thanks to former Chair Steve Demorest. The committee worked intensively with Richard and the local ESCOM committee over a period of many months to refine, finalise and support this innovative multi-hub model. Thanks to Richard's vision, this novel conference structure is certain to raise awareness of climate change and our individual responsibility for the future of the planet.

Australian researchers are making significant contributions to the field of music perception and cognition, yet the travel required to attend conferences held on other continents is both expensive and physically demanding, especially for students and early career researchers. We are delighted that some of our most promising young researchers in the field now have the ability to present their work at the local Australian hub of the ICMPC, and we look forward to productive interactions with researchers from around the world.

William Forde Thompson
Macquarie University, Sydney, Australia

President of the Australian Music Psychology Society
Chair of the ICMPC Executive Committee

Welcome from the La Plata Hub

On behalf of the organizing committee of La Plata Hub, it is my pleasure to welcome you all to this exciting global conference.

We are extremely happy to be part of the event, and thank Richard Parncutt and his terrific team for inviting us to join with Sydney, Montreal and Graz in such an innovative project. We are also grateful to La Plata University for its full support.

We have been working hard discussing ideas, schedules, technical details, and socio-cultural topics as diverse as the diversity of our own academic and socio-cultural environments. This is precisely the strength of this project, what makes the joint organization of ICMPC15/ESCOM10 so exciting.

We welcome international researchers from all over the world, in particular our Latin American partners from Brazil, Mexico, and Colombia, who chose La Plata as the venue to present their research. During the live and virtual sessions of the conference, including the “global foyer”, we will learn about many contrasting research projects and meet many international colleagues.

For some of our young researchers, this is the first time that they will be able to take part in an international event, thanks to the innovative concept of streaming communications between hubs. We welcome the keynote presenter for the La Plata Hub, Dr. Luiz Naveda from the State University of Mina Gerais, Belo Horizonte, Brazil, who will present his research on dance, music, gender, and culture.

I thank my co-organizers Joaquin Blas Perez and Alejandro Pereira Ghiena, my colleague Favio Shifres for his wise advice, and the members of the organizing committee Matías Tanco, María Marchiano, Sebastián Castro (our genious technician), Mónica Valles, Demián Alimenti Bel, Camila Beltramone, Juan Pissinis, Mariano Guzmán, and Sofía Uzal for the happy time we shared in our lab preparing this conference.

You can contact any of us during the week of the event to ask for help of any kind.

Enjoy the conference!

Isabel Cecilia Martínez
National University of La Plata, Argentina

La Plata Hub Chair
Director of the Laboratory for the Study of Musical Experience (LEEM-FBA-UNLP)

Welcome from the Sydney hub

The Sydney hub of ICMPC is proud to be part of this world first in conferencing, an international music psychology conference across four locations around the globe, glued together by digital technologies. I echo the welcomes from the other hubs, and thank them all for their support of the project, and above all the herculean effort of the Graz team, led by Nils Meyer-Kahlen, Sabrina Sattmann, and the visionary, project-brain-parent Richard Parncutt. In addition to a fascinating local and international program, we are thrilled to welcome the keynote presenter for the Sydney Hub, Dr. Sylvie Nozaradan from Western Sydney University who is sharing her latest, innovative research on the brain and synchronization.

With pleasure we welcome participants from around Australia, countries that are part of the Asia-Pacific Society for the Cognitive Sciences of Music (APSCOM) and beyond. We also have opportunity for spontaneous contact with the hundreds of other delegates through our 'global foyer', an idea developed at the Global Arts and Psychology Seminar in 2017, where during the world synchronized coffee breaks, you will be able to 'digitally bump into' someone at another hub and start up or continue a conversation.

The Sydney hub has been blessed with volunteers, staff and a local committee who are committed to making the new-format conference work. We also thank the UNSW Arts and Social Science Faculty (A&SS) and School of the Arts and Media (SAM);; the Graz hub; ESCOM; and the Australian Music Psychology Society (AMPS): UNSW International, Marketing and Communications; Technical Resources Centre, A&SS; Creative Practice Lab in SAM; and UNSW Hospitality.
Over 18 months of preparation and investment; but still no doubt a few thrills and spills to come, and in that spirit, the Sydney hub organizing committee looks forward to working with you all to make this a memorable conference, and warmly welcomes all delegates around the world.

Emery Schubert
University of New South Wales, Australia

Sydney Hub chair, ICMPC15/ESCOM10

Welcome from the Montreal hub

Welcome to ICMPC15/ESCOM10 in Montreal. Welcome to Concordia University's downtown Sir George Williams campus. Welcome to this innovative conference spanning four continents!

Montreal, the music research city, boasts: the MNI (Montreal Neurological institute); CIRMMT (Centre for Research in Music, Media, and Technology); CRBLM (Centre for Research on Brain, Language and Music); and BRAMS (The International Laboratory for Brain, Music, and Sound.

Concordia University has always been a school where unusual combinations are put together. An open-minded place of creative ferment, with high standards of excellence, a robust research tradition, and living connections to the city and its peoples, Concordia is one of the most daringly innovative of Canadian universities. Concordia's Faculty of Fine Arts is top-rated in Canada, with many research units internally, and vibrant external research links both national and international.

Concordia's department of Psychology is an excellent training and research unit. It is home to the Penhune lab for music research, and an Integrated Neuroscience Program with the MNI.

Concordia's department of Music has undergraduate programs in music, electroacoustic studies (ea), and jazz. Non-elitist, the department offers composition training for all students, and emphasizes contemporary music. Faculty members pursue a wide range of interests in their research and research/creation. Graduates of Concordia's department of music go on to professional careers in sound art; high-level technical and recording production; as well as composition, performance, and teaching, across classical, pop, jazz, and more.

Concordia is delighted to welcome you here in Montreal. We wish you an excellent working conference, and hope that you enjoy your leisure time in the city's many fine festivals, restaurants, and cultural attractions.

Christine Beckett & Eldad Tsabary
Concordia University, Montreal

Montreal hub co-chairs, ICMPC15/ESCOM10

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AWARDS

ESCOM Early Career Researcher Award

ESCOM congratulates the following research students on their excellent proceedings papers:

1. Lindsay Reymore, Ohio State University, USA
2. Nayana Di Guiseppe Germano, UNESP, San Paulo Brazil
3. Yong Jeon (YJ) Cheong, Ohio State University, USA

SEMPRE Travel awards

The organizers of ICMPC15/ESCOM10 thank SEMPRE, the Society for Education, Music, and Psychology Research in Great Britain, for their exceptionally generous contribution toward the travel expenses of the following 78 active student participants:

Tanushree Agrawal
Emma Allingham
Firat Altun
Anderson Alves
Anjni Amin
Manuel Anglada-Tort
David Baker
Margarida Baltazar
Jotthi Bansal
Aimee Battcock
Maria Benitez
Mary Black
Blanka Bogunovic
Leonardo Bonetti
Erica Burdzy
Andrew Chang
Alvaro Chang
Yong Jeon Cheong
Susanna Cohen
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Konrad Swierczek
Bohdan Syroyid
Liila Taruffi
Michelle Ulor
Ulrika Varankaite
Olivia Xin Wen
Mauro Windholz
Shoya Yamaguchi
Danny Zhou

KEYNOTES

KMM: Riddles of time: Rhythm and temporal structure in language and music

Simone Falk
Université Sorbonne Nouvelle Paris-3, France

Time: Tuesday, 24/Jul/2018: 16:00 - 17:00 · *Location:* Montreal_1
Session Chair: Eldad Tsabary

Music and language both display unique temporal signatures which are exploited to create the building blocks of musical and speech sounds, convey meaning and foster interaction in human communication. After reviewing current concepts of rhythm and timing in both domains, I will focus on temporal structure in hybrid registers of “musilanguage” such as infant-directed speech and singing. Here, some results will be presented that highlight the relation between musical durations and the temporal structure of syllables and words. Furthermore, similarities and differences in form and function of rhythm between music and language will be discussed by considering rhythmic predictions. Rhythmic predictions in music emerge through recurrences of prominent events over time and have been shown to facilitate sound processing and to enhance attending to predicted points in time. The nature of rhythmic predictions in speech, whose prominences are less repetitive and isochronous than in music, is less clear. However, recent evidence indicates that predictions from musical rhythms can benefit language and speech processing and production in healthy and speech-impaired children and adult populations. These findings shed light on the general processes and limitations underlying rhythmic predictions during speech and music processing. They also reveal directions for future research on rhythmic predictions and predictive timing in language and speech production and their role in acquisition.

KGG: Moved by music: The role of empathy and social cognition in music-induced emotions

Jonna Vuoskoski
University of Oslo, Norway

Time: Wednesday, 25/Jul/2018: 9:30 - 10:30 · *Location:* Graz_1
Session Chair: Richard Parncutt

Music is imbued with the signs of human emotional expression and agency at multiple levels. Although it is likely that music capitalizes on multiple different psychological mechanisms in the induction of emotional experiences, one compelling account suggests that we respond to music as we would to the observed experiences of another person — with empathy. Furthermore, musical engagement (music-making, listening and dancing) involves and fosters a number of processes that are associated with empathy, such as embodied resonance, entrainment, and social bonding. One example of such a process is the feeling of ‘being moved’ – a powerful, rewarding experience often accompanied by chills, tears, and a sense of connection. I will argue that the experience of ‘being moved’ is an inherently social emotion with prosocial motivations and functions. I will present findings from my recent empirical work, investigating the psychophysiological correlates of empathy, and continuous ratings of ‘being moved’ in the context of music listening.

KSS: The neuroscience of musical entrainment: insights from EEG frequency-tagging

Sylvie Nozaradan
MARCS Institute, Western Sydney University

Time: Wednesday, 25/Jul/2018: 23:00 - 23:59 · *Location:* Sydney
Session Chair: Kim Burwell

Entrainment to music is a culturally widespread activity with increasingly recognized pro-social and therapeutic effects. Music powerfully compels us to move to the musical rhythm, showcasing the remarkable ability of humans to perceive and produce rhythmic inputs. There is a wave of current research exploring the neural bases of this rhythmic entrainment in both human and non-human animals, in evolutionary terms and in development. One way to investigate these neural dynamics is frequency-tagging, an approach recently developed to capture the neural processing of musical rhythm with surface or intracerebral electroencephalography (EEG). Recent experiments conducted in healthy and brain-damaged adults, in infants and in non-human animals while exposed to rhythm will be presented. Results show that, although the auditory system presents a remarkable ability to synchronize to the rhythmic input, the neural network responding to rhythm transforms the rhythmic input by amplifying specific frequencies. This selective shaping is correlated to the perception and individual ability to move in time with musical rhythms. These different results may lead to a new understanding of the neural bases of rhythmic entrainment.

KPP: Variability, complexity and gender in musical cultures: Insights from experiments with epistemological waste

Luiz Naveda
State University of Minas Gerais, Brazil

Time: Friday, 27/Jul/2018: 15:00 - 16:00 · *Location:* La Plata
Session Chair: Isabel Cecilia Martinez

The coexistence of dance and music in societies strongly supports the hypothesis that the body and music share underlying dependencies immersed in the complex of social and cultural constructs. Afro-Brazilian musical cultures tacitly attach cultural and social patterns on the dancing bodies as a strategy to resist cultural epistemicide and communicate values, social roles, gender or religion among peers. How do we represent the musical knowledge lost in the complexity of cultural context?

Recent post-colonial literature suggests that a significant part of the knowledge is lost in the process of discarding “epistemological waste”: the process of discarding uncertainty encoded as variability and complexity of real contexts. We look at three experiments that cope with uncertainty as a method to understand musical knowledge in the “wild”. First, we discuss representations of Afro-Brazilian dance and music as maps of relationships across variables, rather than fitting variables in traditional representations of certainty. Then, the comparison between maps of relationships across Afro-Brazilian and Argentinian cultures helps to reveal how music and dance cultures can be distinguished. Finally, we look at common constructs, such as the communication and perception of gender, as a form to understand how social roles are encoded and represented in music and dance patterns.

T1G: Short Talks 1 - Music Analysis

Time: Tuesday, 24/Jul/2018: 8:30 - 9:30 · *Location:* Graz_1

Session Chair: Kelly Jakubowski

Melodic segmentation based on temporal information

Zuzana Cenkerova[1], Martín Hartmann[2], Petri Toiviainen[2]

[1]Slovak Academy of Sciences, Slovak Republic; [2]University of Jyväskylä, Finland; zuzana.cenkerova@savba.sk

Background

As a music information retrieval task, melodic segmentation usually operates at phrase level. Existing algorithms use either rules deriving from Gestalt theory or probabilistic characteristics of the corpus to predict phrase boundaries. We introduce a model based on the assumption that inter-onset-intervals (IOI) within music phrases tend to get longer as the phrase progresses, and longest towards the phrase end. The model we propose, ΔIOI, partitions a melody at the points of minimal second-order differences between successive notes. It is parsimonious, general, and parameter-free.

Aims

Our aim is to test the performance of the ΔIOI model against other Gestalt-based approaches: LBDM (Cambouropoulos, 2001) and Grouper (Temperley, 2001). We also investigate the role of pauses and meter in melodic segmentation.

Method

All models were tested on the Essen corpus of folk songs. The following approaches were included in the comparison: (1) ΔIOI, as described above; (2) LBDM, as defined by Cambouropoulos (2001), with parameters optimized for the Essen corpus; (3) Grouper, as defined by Temperley (2001); (4) Pause, which assumes that any note following a pause is the start of a new phrase; (5) Meter Finder, which predicts phrase boundaries at regular intervals depending on the song's estimated meter (double or triple); the classification proposed by Toiviainen and Eerola (2005) was used as the basis for meter prediction. Finally, we performed logistic regression to devise a meta-classifier with all the models analysed.

Results

Comparison of mean F-scores shows that the approach based on minimal IOI differences (F = .58) does not on its own reach the performance of LBDM (F = .65) and Grouper (F = .74). Its lower predictive power is partially compensated by its simplicity and versatility. Pauses are a strong segmentation criterion in the songs of the Essen corpus (F = .60). This approach also reaches the highest precision rate at .98. Metrical symmetry is another relevant predictor. Dividing songs into segments of equal length, the performance of Meter Finder (F = .64) is similar to LBDM. Combining the three temporal predictors, IOI differences, pauses, and meter, as a disjunction of models (1), (4), and (5), results in an improved F-measure (.68), and the highest recall rate at .81. The Compound ensemble classifier generated the best mean F-score (F = .75), and performed significantly better than each of the other models.

Conclusions

In melodic segmentation based on temporal information alone, different elements of timing - IOI differences, the presence of rests, and metrical symmetry, converge to an optimal task solution. At present, our findings are limited to European ethnomusicological material.

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Toiviainen, P., & Eerola, P. (2005). Autocorrelation in meter induction: The role of accent structure. J. Acoust. Soc. Am., 119(2), 1164–1170.

Analysis of the Constructive Functions of Notated and Acoustic Silences in Béla Bartók's Fifth String Quartet, First Movement, Allegro

Bohdan Syroyid

University of Leuven, Belgium; bohdan.syroyid@kuleuven.be

Background

Most analyses of Bartók's Fifth String Quartet concentrate primarily on the thematic and harmonic relationships of various themes that are part of a palindromic sonata form (see Bates, 1986; Klefstad, 2000). However, this piece has a striking and characteristic silence usage that is worthy of a deeper examination. For this, both score and audio recordings will be examined revisiting some of the silence theories of Braman (1956), Dougherty (1979), Gaudibert (1995), Margulis (2007) and Yin Lo (2015).

Aims

The main goal is to explore the underlying musical processes that surround notated and acoustic silences in the first movement of Bartok's Fifth String Quartet. Notated silences are limited to rests that appear simultaneously in all four parts. Acoustic silences are examined through the visualization of the waveform of two recordings and the identification of regions with low amplitude.

Main Contribution

The dramatic opening silences of Bartók's Fifth String Quartet present an intermittent monophonic texture, developed in a contrapuntal manner in the first theme. These four bars are viewed by Klefstad (2000) as a framework theme that reappears eight times in the movement (accounting for 66 out of 80 notated silences). The repetition of this theme suggests a retrodictive silence situation. In these framing themes, silence is in motion and it actively contributes to various forms of rhythmic manipulations, namely: symmetry (non-retrogradable rhythms), transformation, inversion, fragmentation, and expansion. In contrast, 11 notated silences appear in the development and the coda and seem to be associated with the disintegration of theme C. In addition, only 3 notated silences stand alone and perform a normative structural function, delineating sectional edges and releasing the accumulated tension. A similar function can be found in the silences situated at the outer edges of the framing themes. The comparative analysis shows a strong correlation between acoustic and notated silences. However, the softer passages of both themes C are only manifested as acoustic and dynamic silences.

Implications

This study reveals that Bartók's silence usage has dynamic, rhythmic and structural implications. Currently, there are scarce analytical studies based on musical silence, and none were found on Bartók. It is hoped to progressively reverse this trend shedding some more light on the importance of musical silence as a constructive element of music.

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Harmony and Form in Brazilian Choro: A Corpus Study

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Background

Digital musicology and computational music analysis have gained momentum in recent years largely due to the increased creation of symbolic corpora. While covering diverse genres, encodings, formats, and methodologies, most datasets concentrate on melody and/or harmony to infer or describe idiosyncrasies of a certain style, genre, or composer, sometimes also considering aspects of formal structure.

Aims

The current project contributes to this trend and aims at complementing data-driven approaches by analyzing a genre beyond the canon of both classical and popular music research. We seek to gain insight into the structural features of harmony and form in this particular genre, enabling us to relate them to other corpora. Furthermore, we provide visualizations of the form of each piece in this dataset.

Methods

We transcribed chord symbols and the formal structure of the 296 songs from the Choro Songbooks (Chediak, Sève, & Souza, 2009, 2011a, 2011b). Choro comprises three meanings: (1) it is a social musical event, (2) it is a musical genre including various sub-genres, and (3) it is a manner of performing, a musical style. The transcriptions are based on de Clercq & Temperley (2011), and include information about root and bass notes, chord types, added notes, key and meter (global and local), and metadata such as genre, year of composition, and composer. We transposed all chord symbols relative to the global key of the piece and converted the transcriptions into the hierarchical JSON format for statistical analysis and visualization. Subsequently, we applied natural language processing techniques to find patterns on the piece, part, and phrase levels, and interpreted them as expressing important features of the genre.

Results

Our findings show that (1) frequency vs. rank of chord symbols reveals an underlying Zipf distribution, typically occurring in musical and linguistic corpora. (2) Moreover, prototypical harmonic sequences, such as subdominant-dominant-tonic patterns, make up a large portion of the whole dataset, albeit there are differences in sub-genres and styles. (3) The formal structure is mostly limited to ternary and Rondo forms, and (4) key and modulation patterns vary between sub-genres. (5) These features can partially be related to diachronic changes within the genre.

Conclusions

The analyses of our dataset support theoretical assertions about harmony and form in Choro (Almada, 2006). We deduce that these regularities are informative about stylistic particularities, both for human listeners and algorithms. Thus, our findings can serve as a basis for subsequent music information retrieval applications such as prediction of genre or composer within the style in question, as well as allow for cross-stylistic comparisons.

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T2G: Short Talks 2 - Computing

Time: Tuesday, 24/Jul/2018: 8:30 - 9:30 · *Location:* Graz_2

Session Chair: Annemarie Seither-Preisler

The importance of song context and song order in automated music playlist generation

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Background

On-line music streaming services let users browse catalogs of tens of millions of songs. The development of so-called "recommender systems" (i.e., data-driven techniques designed to provide users with useful suggestions) has been crucial to facilitate the navigation of such large music collections. A common task of music recommender systems is the so-called "automated music playlist generation", where songs are automatically recommended one after the other producing a listening experience similar to traditional radio broadcasting. Understanding the musical taste of users and common playlist compilation rules is crucial to predict better music recommendations.

In order to predict the next song, some playlist generation models consider the current and previous songs in the playlist (i.e., the song context) and possibly the order of the songs in the playlist. This was justified by the findings of Cunningham et al. (2006), who according to interviews with playlist-compilation practitioners, identified the choice of songs and the song order as important aspects of the playlist curation process. However, previous works in automated music playlist generation did not explicitly analyze the impact of exploiting the song context and the song order on the quality of next-song recommendations.

Aims

We aim to investigate, in the context of music recommender systems, whether considering the song context and the song order has an impact on predicting better next-song recommendations.

Methods

We compare three playlist models: a popularity-based model, a song-based collaborative filtering model and a Recurrent-Neural-Network-based model (RNN). We consider, as a reference, a fourth model that predicts next songs at random. The considered playlist models are of increasing complexity and, by design, are able to exploit the song context and the song order to different extents. We let the playlist models extract patterns from two datasets of hand-curated music playlists. Then, we assess the quality of the next-song recommendations yielded by each playlist model following the standard evaluation methodology described by Bonnin and Jannach (2014). By relating the performance of each playlist model to its modeling capabilities, we can reason about the importance of exploiting the song context and the song order for the prediction of next-song recommendations.

Results

Our experiments indicate that the song context has a positive impact on the quality of next-song recommendations. However, as observed in previous works, the bias towards very popular songs masks the importance of considering the song context. Our experiments also indicate that current playlist models can not effectively exploit the song order to predict better next-song recommendations.

Conclusions

We found empirical indications that considering a longer song context has a positive impact on next-song recommendations, while the song order does not seem to benefit the recommendations. Further investigation on order-aware models is required.

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Computational model of pitch detection, perceptive foundations, and application to Norwegian fiddle music

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Background

Automated detection of pitch in polyphonic music remains a difficult challenge (Benetos et al. 2013). Robust solutions can be found for simple cases such as monodies. Implementation of perceptive/cognitive models have been so far less successful than engineering methods, and in particular machine learning models. One reference model (Klapuri 2006) preselects pitch candidates based on harmonic summation and searches for multiple pitches through cancellation.

Aims

The aim was to conceive a model for pitch detection in polyphonic music able to transcribe in details traditional Norwegian music played on Hardanger fiddle, where more than two strings are played at the same time. The new model should be applicable to other types of music as well. Perceptive and cognitive models should guide the improvement of the state of the art.

Main Contribution

The model is neither based on a machine-learning training on a given set of samples, nor explicitly relying on stylistic rules. Instead, the methodology consists in conceiving a set of rules as simple and general as possible while offering satisfying results for the chosen corpus of music. We follow some general principles of the model by (Klapuri 2006) while introducing new heuristics. We present a new method for harmonic summation that penalises harmonic series that are sparse, in particular when odd partials are absent, as it would indicate that the actual harmonic series is a multiple of the given pitch candidate. Besides, a multiple of a fundamental can be selected as pitch in addition to the fundamental itself if its attack phase is sufficiently distinctive. For that purpose, we introduce a concept of pitch percept that persists over the whole extent of the note, and that serves as a reference for the detection of higher pitches at harmonic intervals.

Results

The proposed method enables to obtain transcriptions of relatively good quality, with a low ratio of false positives and false negatives. The construction of the model is under refinement. We are applying this method to the analysis of recordings of Norwegian folk music, containing a large part of Hardinger fiddle pieces and a cappella singing.

Implications

Automated transcription is of high interest for musicology and music information retrieval. This enables for instance to build large corpora of scores for music analysis and opens news perspectives for computational musicology. By attempting to design computer models based on general rules as simple as possible rather than on machine learning, while resulting in a behaviour in terms of pitch detection that comes closer to human capabilities, we hypothesise that the underlying mechanisms thus modelled might suggest general computational capabilities that could be found in cognitive models as well. In the same time, an improvement of the model based on expertise in music perception and cognition is desired.

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T11G: Short Talks 11 - Cognition

Time: Tuesday, 24/Jul/2018: 8:30 - 9:30 · *Location:* Graz_3

Session Chair: Reinhard Kopiez

Entropy and acceptability: information dynamics and music acceptance

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Background

Shannon's (1948) Information Theory, developed to determine the optimal encoding of messages for radio transmission, has also been adopted as an analytical tool in music cognition. Early research in this area was mostly measured the entropy of musical styles (Febbres & Jaffe, 2015; Margulis & Beatty, 2008), rather than that of individual musical elements (melody, rhythm, harmony). However, detailed modelling of these elements (Conklin & Witten, 1995; Pearce, 2005) shows that complex combinations of them influence the entropy of music.

Aims

We examine the relationship between acceptance of music, the entropy of its harmony and the regularity of its harmonic flow, and how these characteristics, combined with recognisability, affect the listeners' responses to music.

Method

Mihelač (2017) and Mihelač & Povh (2017) evaluated four criteria on a Likert scale, 1–5, over 160 pieces, with N=21 evaluators: difficulty of listening to the piece; pleasantness; recognition; and repeatability (the evaluator's readiness to listen to the whole piece, not only to a part). In the current work, the same data was evaluated twice by twenty new evaluators (aged 15–16, ten with and ten without musical knowledge) and extended with an analysis of harmonic flow.

Results

Our results support the findings of the previous research: the effect of musical style on listening difficulty is significant. Listening difficulty significantly decreases on the second hearing of a piece, while pleasantness, recognition and repeatability significantly increase, with one exception: participants without musical knowledge showed no significant difference in mean repeatability. Our results suggest that subliminal irregularities in the harmonic flow affect the listeners' acceptance of music.

Conclusions

Our results support Madison and Schiölde (2017): repeated listening can increase participants' liking of music regardless of complexity (entropy). Further, our findings suggest consideration of irregularities in harmonic flow when measuring acceptability of music.

Uncertainty modulates musical prediction error: Converging behavioral and neurophysiological evidence

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Background

Auditory predictions are fundamental for music perception, as established by studies manipulating the confirmation or violation of musical expectations. A related but less researched issue is the uncertainty of those expectations, a phenomenon closely related to precision in the predictive coding theory. Uncertainty has been proposed to modulate prediction error so that, in less predictable contexts, expectation violations are weaker and less salient (Ross & Hansen, 2016). While there is some evidence for this effect in the auditory domain, very little is known about whether and how it operates in music listening. This is important because the interplay between prediction and uncertainty is considered fundamental for the aesthetic and emotional experience of music.

Aims

We aimed to determine whether and how uncertainty modulates musical prediction error. To accomplish this, we obtained behavioral and magnetic (MEG) brain responses to deviants in musical contexts with different degrees of uncertainty, as estimated by IDyOM, a model of melodic expectations that combines both short-term and long-term statistical learning (Pearce & Wiggins, 2012). We hypothesized weaker prediction error as contextual uncertainty increases.

Methods

In the MEG experiment, we tested a group of non-musicians using a novel mismatch negativity (MMNm) paradigm with non-repetitive complex melodies. We compared it with a more predictable paradigm that used a simple and repetitive pitch pattern known as Alberti bass (Vuust et al. 2016). The MMNm is a prediction error signal that arises when an auditory regularity is violated. We introduced violations in pitch, intensity, timbre and slide. We predicted smaller MMNm amplitudes in the melodies than in the Alberti bass. In the behavioral experiment, we presented to another group of non-musicians sequences with five degrees of complexity. We introduced pitch deviants in half of the sequences and asked the participants to decide, after each trial, if there was a mistuning or not, and indicate their certainty. We predicted lower d' and confidence scores as the complexity of the sequences increased.

Results

We found smaller MMNm amplitudes in the melodies than in the Alberti bass for pitch and slide but not for timbre or intensity deviants. This indicates that uncertainty indeed down-weighted prediction error, but only for pitch-related features, suggesting a degree of independence in the predictability of different features. Moreover, the behavioral data showed a decrease in d' and confidence scores with increasing contextual uncertainty.

Conclusion

We provide converging evidence supporting the idea that uncertainty modulates prediction error in music listening. Our new experimental designs can be used to explore how other variables such as musical expertise mediate this effect.

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Shared representations and processes in the perception of transformed auditory and visual patterns: Evidence from priming experiments

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Background

In music, inverse and retrograde transformations of melody have long been used as a compositional device. When explicitly instructed, listeners can recognise such transformations in short melodies (Dowling, 1972) and evidence suggests they are processed implicitly (Balch, 1981). The ability to perceive relations between transformations of melodic structure draws comparison with visual grouping (Aksentijevic, Elliott, & Barber, 2001). Furthermore, brain-imaging evidence suggests there may be shared neural resources for the mental transformation of auditory and visual patterns (Foster, Halpern, & Zatorre, 2013).

Aims

Four experiments investigated the perception of transformed auditory and visual pattern structure, and explored the role of supramodal cognitive processes.

Method

In all experiments a priming stimulus was followed by an equivalent target. We hypothesised that the perception of a structural relationship between prime and target would generate expectancies thus facilitating performance in a perceptual task embedded in the target. In Experiment 1, participants listened to a prime melody followed by a target melody. Their task was to judge the pitch height of the final tone of the target melody, relative to the preceding tone (i.e. was it 'higher' or 'lower'?). Priming melodies were either structurally related to the target under a transformation (inverse, retrograde), or unrelated. Stimuli were 6-note melodies composed from a 5-tone equal temperament scale. Experiment 2 replaced auditory stimuli with structurally analogous visuo-spatial sequences, and participants judged the relative vertical height of a terminal line segment. In Experiments 3 and 4, stimuli were presented cross-modally (Experiment 3 = visual prime/auditory target, Experiment 4 = auditory prime/visual target). Response time (RT) and error rate data were analysed.

Results

At present, data have been analysed for Experiments 1 and 3 producing similar results. One-way ANOVAs revealed significant effects of target type (inverse, retrograde, unrelated), indicating that the structural relationship between prime and target influenced performance. Pairwise comparisons revealed significantly faster and more accurate responses for retrograde compared to unrelated targets, but there were no significant differences between inverse and unrelated targets. Data are currently being analysed for Experiments 2 and 4.

Conclusions

The results thus far demonstrate an implicit facilitation effect for retrograde transformations, indicating that structural relationships facilitate target analysis even when the stimuli are presented in different modalities. One interpretation of the findings is that the perception of structural transformations involves shared supramodal cognitive processes. The results of the remaining two experiments should shed more light on this interesting phenomenon.

References

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T4G: Short Talks 4 - Singing

Time: Tuesday, 24/Jul/2018: 8:30 - 9:30 · *Location:* Graz_4
Session Chair: Freya Bailes

Singing Accuracy in the General Population: A Database Study

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Background

Singing ability is fundamental to developing musicianship and to the developing view of oneself as a musical being. Lack of singing ability has been associated with self-perceptions of unmusicality that can negatively impact future participation in music. Several studies have explored singing accuracy in the general population. Findings suggest that between 50% and 85% of the general population display accurate singing performance (Loui, et al., 2015). However, these studies typically rely on relatively small samples and a variety of measurement and scoring procedures.

Aims

The purpose of this study was to analyze a large sample of volunteers from the general population all of whom were tested with an identical online measure of singing accuracy. The research questions were: a) How accurate are people when asked to match a pitch under a variety of conditions? b) Does accuracy differ by age or training? c) Are some tasks easier than others to perform? and d) Do people's self-perceptions of musicality correlate with their singing accuracy score?

Results

Data collection is ongoing, but the results presented here represent an initial sample of 426 people (ages 6-96) screened for errors in recording or incomplete entries. Mean accuracy for the entire sample was 79%, but the data were negatively skewed so the median value of 90% is a more accurate representation. There was significant difference in accuracy by training ($F(1,421)=78.16$, $p<.001$) with trained participants ($N=257$) averaging 87% correct while untrained averaged 66%. There was a significant difference by age ($F(3,422)=22.43$, $p<.001$) with those over 20 performing significantly better than younger singers. The pattern matching task was significantly more difficult than the two single pitch tasks ($F(2,420)=37.62$, $p<.001$) and self-perceptions of musicality were significantly correlated with singing accuracy ($rs(424)=.42$, $p<.001$). Results were similar for the familiar song with almost half the sample ($n=195$) scoring 7 out of 7 in accuracy, but differing significantly by age and training.

Discussion

Half of our sample sang above 90% accuracy which is our cutoff for deeming a person an "accurate" singer. However, when those who report no training ($N=166$) are analyzed separately the median accuracy drops to 76% of pitches with only 31% scoring at 90% accuracy or above. Data suggest that our initial volunteer sample skewed toward people with more musical training than might be typical in the general population which may account for our age effect since our older participants also had more training. It appears that self-perceptions of musicality are based in part on singing accuracy performance, though with many underestimating their performance. We will provide a much more detailed breakdown of the data, and how it compares to earlier smaller sample studies about the general state of singing in the general population as well as the important relationships between singing accuracy, musical training and self-perceptions of musicality.

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Brawlers, Bawlers, and Bastards: Vocal timbre as a marker of recurring archetypal characters in the music of Tom Waits

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Background

Probably the most immediately remarkable aspect of Waits' music is his vocal quality, both in its recognizability and its variety (Montandon 2005). Also significant are intersections between Waits' music, his life, and theatrical elements (Hoskyns 2009), clearly reflected in several albums of music composed for the stage. Unlike much of rock music, which claims some form of implicit autobiography as the voice of the singer/songwriter, Waits' songs are (often overtly) inhabited by fictional personas (see BaileyShea 2014) who speak in distinct voices, figuratively and literally.

Aims

In this paper, I explore the hypothesis that Waits' songs can be categorized by vocal timbre into a relatively small number of subsets, and that these groups of songs represent recurring archetypal characters in Waits' output. I further hypothesize that the songs within these groups are marked by a high degree of intertextuality. Waits' music presents a useful case study for empirically examining singers who use distinct vocal timbre in popular music more broadly.

Method

71 participants each categorized 40 randomly-selected Waits songs by vocal timbre out of 146 vocal tracks beginning with the album Swordfishtrombones. Participants were given 5-second excerpts beginning from the voice's first entrance in each song and told to sort songs into as many as eight categories, classifying songs exclusively by vocal timbre and not instrumentation or lyrical content. Once sorted, participants provided descriptive labels, and then hierarchically sorted each group until there was only one left. Finally, texts for each song were analyzed for emotional and topic categories using NRC and LIWC2015.

Results

Using cluster analysis, participant grouping data is consistent with the existence of a small number of groups based on the vocal timbre he employs in his songs. Seven groups is the most robust solution for song clustering. Participant descriptions of vocal timbres by song clusters are also consistent with distinctions between groups, with distinctive timbral characteristics associate with each cluster. However, the automated inter-textual analysis performed through sentiment analysis in LIWC2015 and the NRC emotion lexicon produced decidedly negative results. Either distinct character archetypes are not reflected in the texts of the lyrics, or they are not detectable using the crude tool of automated sentiment analysis.

Conclusions

Generally, the results of this study are consistent with the existence of sub-clusters within Waits' songs based on vocal timbre. However, the negative results from the content analysis of lyrics and the relatively large numbers of songs in each cluster leave open the question of specific recurring personas or character archetypes for further investigation.

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Behavioral and neuro-physical effects of singing and accompaniment on the perception and cognition of song

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Background

The processing of song lyrics is thought to be affected by the music. On the one hand music might lead to arousal and attention and thus support language processing, but on the other hand, violations of musical expectancies can hamper language processing (Kunert, 2017; Gordon et al., 2010). Thus far, these effects are usually tested with short stimuli, seldom with complete songs. Furthermore, the role of sung melody and musical accompaniment have not been properly disentangled.

Aims

The current experiment tests the hypothesis that singing, especially accompanied singing, supports attention and appreciation for song lyrics and that an accompaniment can alleviate the distracting effects of violations of musical expectancies.

Method

24 right-handed adults (Average age 24,4; SD = 4.8; average Gold MSI Musical training score: 22,0; SD = 11.9) listened to four songs, each in one of four versions: spoken, a cappella, vocalized (sung a cappella on 'lala'), and complete (sung with accompaniment). The stimuli were quasi randomized such that each participant heard each song and each condition just once. During listening EEG measures were taken, and after each track participants completed a questionnaire, including Likert scale ratings on emotion, arousal, aesthetic valence, concentration and comprehension, and a cued recall task. ERP-targets reported here were out-of-key notes of which there were at least 28 in each melody

Results

Regression analysis on the questionnaire data showed that the complete version received the highest ratings for Positive affect, Strikingness of textual features, and Voice quality, and the lowest ratings for Seriousness. However, cued recall was highest in the condition a cappella. These results indicate that singing mainly affects text perception, while an accompaniment affects emotion, arousal, attention and aesthetic valence more clearly. A preliminary analysis of the EEG-results for in-key notes (iks) versus out-of-key notes (ooks) revealed that ooks were processed differently in each condition. The condition cappella shows a larger ERAN for ooks, and a slightly larger N400; the condition vocalized a smaller N400 and a larger P600 for ooks; and the condition complete a slightly larger N400 and P600 for ooks.

Conclusions

Both singing and accompaniment affect the appreciation and the cognition of song and song lyrics. Singing supports lyric cognition, while accompaniment affects emotion, attention and aesthetic valence. The EEG results indicate that ooks indeed affect the meaning of the lyrics, with slightly larger N400s in the conditions a cappella and complete, but not in the condition vocalized. However, in spite of a smaller ERAN, the results for the condition complete do not point unambiguously towards enhanced processing fluency.

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T5G: Short Talks 5 - Ethnomusicology

Time: Tuesday, 24/Jul/2018: 10:00 - 11:00 · *Location:* Graz_1

Session Chair: Niels Chr. Hansen

The Effect of Temperament Systems on Emotional Induction and Learning

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Background

There is a multitude of research on emotional effects of musical parameters such as melody, harmony, rhythm, dynamics, or timbre (Gabrielsson & Lindström, 2010; Juslin & Timmers, 2010). However, although forming the foundation of music's pitch relationships, there are very few studies that test the effect of temperament systems on music emotion and how this changes through exposure.

Aims

The aim of this study is first to test the effect of temperament systems on emotion induction through unfamiliar Turkish Makam music and to see how induced emotions are changing for a specific Makam after taking familiar or unfamiliar temperament-based ear training classes. We compared the unfamiliar Original Temperament (OT, with pitches unequally divided into 24 intervals) with familiar western Equal Temperament (ET, with pitches equally divided into 12 intervals).

Method

In the pre-experiment, 19 participants listened to 10 excerpts of 5 different Makams in ET and OT in random order and rated emotional responses retrospectively using the GEMS-25 questionnaire (which was subsequently scored as second order factors). Participants were then randomly assigned into one of two different one-hour long ear training classes (either in OT or ET) that focused on the theoretical features of the Hicaz Makam. In the post-experiment, all participants rated the emotional responses to the same Makam excerpts that were presented in the pre-experiment and completed a Makam recognition task.

Results

In the pre-experiment, participants rated Vitality significantly higher in ET compared to OT. Two Makams were found to be significantly the most vital Makams in both temperament systems. However, experimental factors temperament and Makam type showed a significant interaction: The effect of the temperament system on Vitality was different for different Makams. There was no significant direct influence of the temperament and Makam type on Uneasiness. However, there was a significant interaction between temperament and Makam type. Only for the Huseyni Makam, the OT induced higher uneasiness. There was no significant influence of temperament and Makam type on Sublimity.

Recognition rates of the Hicaz Makam generally significantly increased from pre-experiment to post-experiment. This increase did not depend on the different temperament systems used in the courses or in stimulus presentation. Uneasiness was significantly reduced after the course independently of the temperament system employed in the course and the stimulus. Generally, there was not a significant difference in Vitality and Sublimity comparing pre- and post-measurements.

Conclusions

These findings demonstrate that the unfamiliar tuning system lead to less vital and more uneasy experiences. This effect did not change after exposure to the training course. However, there was a general decrease in uneasiness independent of temperament. This indicates that ear training courses decrease negative emotional responses to unfamiliar musical syntaxes independent of their temperament systems.

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Testing a Computational Model of Music Enculturation: Evidence from a Free Sorting Task

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Background

Music, like language, differs across cultures; by the first year of life children learn which patterns are meaningful within both domains. The process of statistical learning that drives linguistic development may also underlie musical enculturation. Learned patterns of typicality and exceptionality in such parameters as melody, harmony, rhythm, and meter may mediate cross-cultural music interactions (Demorest, Morrison, Nguyen, & Bodnar, 2016). Recent advances allow these patterns to be analyzed and modeled computationally (Pearce, Mülllensiefen, & Wiggins, 2010). Applying this analysis to musical corpora from different cultures offers potential insights into difficulties encountered when listeners interact with culturally unfamiliar music.

Aims

We posited that ability to process culturally unfamiliar music is mediated by the degree to which that music differs in statistical patterns of pitch and rhythm from music of one's own culture, a construct we have labeled cultural distance. We tested this construct using the hypothesis that listeners would organize a set of culturally familiar and unfamiliar novel melodies in a way that reflects cross-cultural music distinctiveness.

Method

Stimuli consisted of two matched sets of 20 music excerpts, 10 from a corpus of Western chorale melodies and 10 from a corpus of Turkish makamlar. We selected excerpts for within-culture distinctiveness using IDyOM (Pearce et al. 2010) to calculate strength of classification (SoC) data for combined parameters of pitch and inter-onset interval. SoC scores reflected information content of each excerpt within the probabilistic model for its own corpus exclusive of the contrasting corpus model. SoC scores reflected the degree to which an excerpt was representative of its corresponding music type and different from the contrasting type. Using an online interface, adult North American participants (N=67) freely placed icons representing each excerpt along a horizontal axis marked with a center point. Participants then listened to a sequence of 40 excerpts and indicated whether each was among the 20 items in the preceding task.

Results

Participants showed a strong tendency to segregate melodic excerpts by music type with 71.8% of Western excerpts and 68.2% of Turkish excerpts placed to one side of the horizontal axis midpoint ($p < .001$). Placement position along the axis demonstrated moderate correlation with SoC scores for both Turkish ($r = .36$) and Western ($r = .26$) excerpts. Similar to previous findings, participants demonstrated better memory for culturally familiar excerpts.

Conclusions

When given the opportunity to freely organize novel melodies from culturally familiar and unfamiliar traditions, Western-encultured listeners appeared to employ strategies reflecting statistical properties of pitch and rhythm consistent with Western music. Findings suggest that the construct of cultural distance may be a useful lens through which to interpret and potentially predict outcomes reflecting cross-cultural music processing.

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Aspects of timing in Lithuanian traditional singing

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Background

Various aspects of (micro)timing were studied for different musical styles including traditional music (cf. Bengtsson et al 1969, Ledang 1967). Sets of time performance rules were developed (cf. Friberg et al 2006) based on analysis and synthesis of performances visualized by "tempo curves" (cf. Clarke 2004). The performance rules obtain different expressions for different styles, thus they work as specific stylistic "markers". nPVI (normalized Pairwise Variability Index) is an additional technique to eliminate the factor of local tempo changes and to study small-scale timing phenomena (Grabe & Low 2002).

There are a number of ethnomusicological studies on timing in Lithuanian traditional music, yet they stop short of discussing patterns of rhythm categories and do not consider microtime deviations (cf. Čiurlionytė 1969).

Aims

The study aims at revealing basic manifestations of time performance rules in Lithuanian traditional singing.

Methods

Forty song recordings and forty fragments of recorded spoken performances (10 songs and 10 fragments from each of 4 Lithuanian main ethnographic regions; NE, SE, SW, and NW) are examined. The previously proposed set of performance rules (phrase arch, duration contrast, double duration, inégales, etc.) is tested with the musical utterances. The general levels of temporal unevenness ("general rubato indices") and the temporal unevenness provided by the nPVI technique ("nPVI rubato indices") are evaluated for each utterance. A technique for evaluation of the local tempo changeability (extracted from collation of the two indices) is proposed.

Results

The vocal dialects corresponding to the ethnographic regions differ noticeably in timing expressed in terms of the values for the performance rules and the three parameters (the two indices plus the local tempo changeability). For instance, inégales gets different values >1 for all dialects except for SE (<1). NW is remarkable for large values of the "nPVI rubato index" and local tempo changeability. A positive correlation between the "nPVI rubato indices" in spoken and vocal dialects is found, showing the impact of linguistic rhythm onto musical rhythm. The results show that the different parameters of rhythm interpretation can serve as more or less reliable markers of a musical dialect.

Conclusions

The techniques for studying the performance rules and other aspects of timing could be applied more widely in ethnomusicological research as they reveal significant stylistic qualities. The proposed technique for evaluation of local tempo changeability could be applied in studies of a broad range of musics.

T6G: Short Talks 6 - Emotion Computing

Time: Tuesday, 24/Jul/2018: 10:00 - 11:00 · *Location:* Graz_2

Session Chair: Jochen Steffens

Challenges and opportunities of predicting musical emotions with perceptual and automatized features

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Background

The description of music in psychological research contexts is a complex task with many possible perspectives, e.g. on timbral, musical, and emotional content. The reliability of subjective ratings for this task can sometimes be low, since they depend on the individual backgrounds of the raters. Furthermore, the collection of subjective ratings is often costly and time consuming. The progress in automatized feature extraction, developed in the Music Information Retrieval (MIR) community, promises to provide objective measures, which are not only replicable but also cheap and fast. The question is thus, if and to what extent, subjective assessments of musical attributes can be substituted by algorithmic methods.

Aims

We tested the usability of acoustical features for modeling perceived emotional content.

Method

Twenty sound engineers rated 60 musical excerpts (43-61 sec. duration) from a broad range of styles and emotional expression. All participants rated all excerpts on a set of musical (e.g., consonant-dissonant), cross-modal (e.g., cold-warm), spectral (e.g., mean pitch high_low), and emotional items (e.g., happy). Additionally, we extracted 86 acoustic features from the sound files using the MIRtoolbox (Lartillot & Toiviainen, 2007).

Results

Subjective ratings turned out to be seldom normally, often even multi-modally distributed, which poses a measurement problem. The spectral and cross-modal items produced the least multi-modal distributions, emotional variables the most. In addition, inter-rater agreement was generally rather low (Krippendorff's α about .25 to .30). Second, acoustic and their corresponding perceptual features were often only moderately correlated ($|r| = .30$ to .40). However, some key features for emotion perception (e.g., loudness, tonality) were highly correlated ($|r| > .60$). Third, we applied and compared five different methods of feature selection to be used as predictors of the emotional content. Interestingly, the actual set of features to predict emotion perception seemed to be rather arbitrary, which indicates that acoustic features did not considerably improve the null models–mostly due to the large variation in subject ratings. Fourth, using linear mixed effect models, we showed that tempo, tonality, and loudness were the most important acoustic as well as perceptual predictors, which aligns with the literature. However, only tempo manually annotated by an expert entered the model. Notably, the automatically extracted tempo did not correlate with annotated tempo. Fifth, comparing model fits for acoustic and perceived features resulted mostly in better fits for the perceptual feature predictors.

Conclusions

Our results indicate that the application of automatized feature extraction has to be handled with care, since it seems that only very basic characteristics of music can be reliably estimated and only on the level of means. Interdisciplinary exchange between informatics, acoustics, musicology and psychology is desirable for further developments evaluation of the available tools.

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Emotional Outcomes of Personal Music Listening: Experience Sampling with the MuPsych App

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Background

Personal music listening on mobile phones has grown rapidly over the last decade and is now a central component of everyday music listening. This portable and flexible style of listening allows for the immediate selection of music to fulfil emotional needs, presenting it as a powerful resource for emotion regulation. Whether this regulation is beneficial for the listener is of fundamental concern, as deficits in emotion regulation—and the use of maladaptive strategies—are closely tied to the development of many forms of psychopathology, including mood and personality disorders. The experience sampling method (ESM: Csikszentmihalyi & LeFevre, 1989) is ideal for investigating this issue, as it assesses current subjective experience during natural everyday music episodes.

Aims

The current study aimed to develop a comprehensive model of personal music listening on mobile phones, detailing how various emotional outcomes are produced through an interaction of music, context, and individual variables. In doing so, it aimed to improve and expand upon the first model of personal music listening, developed by Randall & Rickard (2017).

Method

All data were collected though the MuPsych app: a mobile ESM designed for the real-time and ecologically-valid measurement of personal music listening (Randall & Rickard, 2013). The study utilized a restructured MuPsych platform, updated to reflect the latest advances in music research, and collecting a range of relevant variables not included in the initial model, such as temporal changes in discrete emotional states. Furthermore, it was updated to reflect the range of modern listening behaviours, allowing experience sampling from any music player on the mobile device of the participant.

Results

Multilevel structural equation modelling was utilised to determine the predictors of emotional outcomes on both experience and listener levels. Results revealed various ways in which the broad set of individual, context and music variables interacted to produce changes in the valence, arousal, and intensity of discrete emotional states. Initial mood of the listener and certain emotional reasons for listening were shown to have the greatest impact on emotional outcome, while several clear patterns were revealed in the use of regulation strategies and underlying mechanisms. As with the original model, context variables were shown to play a crucial role, which emphasises the importance of considering these variables in all music and emotion research.

Conclusions

This improved model has provided an unprecedented understanding of how personal music listening influences emotional states, and how this relates to longer-term emotional health and well-being. This research lays the foundation for future applications in personalised music regulation strategies, and playlist curation for music streaming services.

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Extracting majorness as a perceptual property of music

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Background

With Western popular music, the term "mode" is mostly used dichotomously to refer to major and minor keys (here, we omit the nuances such as harmonic minor, blues scales, etc.). Labeling a musical segment as "major" or "minor" can be subjective, ambiguous, or even impossible (especially when modulations and/or key signature changes are present inside the segment), also, the tonal hierarchy requires time to establish itself (Parncutt, 1989). In music information retrieval context, the category of mode can sometimes be treated probabilistically, resulting in a continuous property (Saari, 2011) and (Friberg, 2011).

Aims

For the tasks of music emotion recognition, genre recognition and music recommendation it is helpful to be able to define the category of mode for any section of a musical piece continuously, as a perceived amount of major mode inside that section as a whole. We will call this property majorness, similarly to (Parncutt, 1989) and MIRToolbox. The current music analysis tools that permit to extract it (e.g., MIRToolbox, QM Vamp Plugin), employ pitch profile based statistics, and produce a result that is far from perceptual estimation (Friberg, 2011). In this study we test whether this property can be uniformly understood by musicians in an intuitive way, and can be modeled from data and applied to music emotion recognition.

Methods

On a crowd-sourcing platform we hired 80 musicians to compare pairwise 100 musical excerpts of 15 seconds on majorness. From the comparisons we obtain a ranking of pieces from the most certainly minor ones, through the ambiguous ones, to the most certainly major ones. From an ordered by majorness set of 100 excerpts we sample 10 examples and use them as a rating scale and ask the same musicians to rate 5000 excerpts on perceived majorness by rating them using the scale. We collect 5 annotations per excerpt.

Results

The consistency of the annotations without any unreliable rater filtering is 0.69 Cronbach's alpha and 0.33 Krippendorff's alpha. On these data we train a convolutional neural network on mel-spectrograms and predict majorness (r=0.48 on the testset). The extracted feature is helpful for predicting valence, as shown on Soundtracks dataset and other datasets annotated with emotion.

Conclusions

Even without being given a formal definition of the category of majorness, musicians can intuitively understand this property, and agree on it when annotating music. We automatically extract this property from sound and show that it can be applied to music emotion recognition.

Acknowledgements

This work is supported by the European Research Council (ERC) under the EUs Horizon 2020 Framework Programme (ERC Grant Agreement number 670035, project "Con Espressione").

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T7G: Short Talks 7 - Performance

Time: Tuesday, 24/Jul/2018: 10:00 - 11:00 · *Location:* Graz_3

Session Chair: Rebecca Schaefer

Analysis of Chunk Forming Factors in a Piano Performance Learning System Using Grounded Theory Approach

Manami Ishigaki, Yoshinari Takegawa, Keiji Hirata, Atsuko Tominaga

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Background

In music, chunks work as one type of short-term memory and can form a hierarchical structure (Snyder, 2001). A listener can more easily understand music with well-formed hierarchical chunks as a piece of long-term memory. We are interested in chunk formation in piano performance, which is related to four cognitive factors: visual information, auditory information, body motion, and knowledge application. We suppose chunk formation is influenced by these cognitive factors. However, the relationships between chunk formation and the cognitive factors are not clarified, because of the difficulty of observing chunk formation in the mind from the outside, and that of its verbalization.

Aims

The goal of the research is to explore the formation mechanism and types of chunks occurring in piano practice and to identify the features for distinguishing chunk type from the others.

Method

To analyze chunk formation factors in piano playing, we conducted the following experiment.

The subjects were 25 university students. 13 subjects were experienced in formal piano training over 3 years. The other 12 subjects were beginners who have never had formal piano training.

First, the subjects practice the opening 8 bars of 3rd movement of Piano Sonata No. 11 "Turkish March" by W. A. Mozart as a set piece for 20 minutes. Next, in the finalizer test, a subject is instructed to perform the set piece from the beginning to the end. If a subject can perform the set piece with no mistake (keying error) within 5 minutes, the experiment is finished. After every finalizer test, a subject is asked to directly draw on a score to indicate the places of chunks, following his/her current recognition and images in mind. At the same time, a subject is interviewed to explain why he/she draws those chunks.

Results

We have collected 2852 chunks on scores. The average experimental periods of beginners and experts were 4.2 and 2.2 days, respectively. By the method conforming to GTA (Strauss, 1987), chunks were able to distinguish three types: score chunk caused by musical notations on a score, performance chunk caused by finger and hand motions during performance, and knowledge application chunk such as chord and phrase. Furthermore, score, performance, and knowledge application chunks are segmented into 14, 7, and 5 subcategories, respectively. We also ascertained that the chunk forming factors of beginners are significantly different from those of experts by two-way ANOVA ($p<.10$).

Conclusions

The goal of this research is to identify the discrimination conditions for chunks in piano performance. We were able to classify chunks into three types: score, performance, and knowledge application.

As for future work, we will compare chunk size etc., with previous chunks and analyze whether these aspects influenced the three types of chunk.

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An emotional McGurk effect on motion and audio for piano performance: In the case of positive impression piece

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Background

The McGurk effect was firstly reported as an audiovisual fusion on speech perception. Authors reported an alternative version of the effect, an emotional McGurk effect on piano performance's motion and audio. This phenomenon is occurred when people watch a piano performance with combined distinct emotions. For example, when people watch the piano performance of the combined "anger" motion with "sadness" audio, the people perceive "fear", that is neither angry nor sadness. From the result, authors confirmed the existence of the audiovisual fusion when watching musical performance. The phenomenon is, however, confirmed when using the piano piece "For Elise" only, which is desired to be confirmed on other pieces.

Aims

An emotional McGurk effect using the piano piece of the positive impression is here discussed in terms of possibility of existence.

Methods

Audio of piano performances expressed each of several emotions were recorded with audio and MIDI signals. The body with his/her hand motions of the piano performances were also recorded using an optical motion capture system. Employed music is "Prelude in C major from The Well-Tempered Clavier Book 1" by Bach as a positive piano piece. One pianist was asked to express each of the 6 emotions (anger, sadness, tenderness, happiness and fear in "the two-dimensional emotion-space" by Juslin and neutral). Authors conduct following three experiments to rate emotion for :(1) recorded, (2) stretched and (3) combined stimuli. For (1), the recorded motions and audio are presented each by each to subjects who were asked to rate emotion, and if expresses and rated emotions are homogeneous, the stimuli are employed to the experiment (2). The experiment (2) is designed to generate audio-visual stimuli by combining motion and audio on distinct emotion (sad motion with angry audio, for example). Since the timing of the motion and audio is not synchronized, a time-stretching processing is employed to synchronize between the motion and audio. The time-stretched stimuli's emotion are then rated by subjects. The stimuli rated as same in terms of emotion are then employed on the experiment (3). On experiment (3), motion and audio rated as distinct emotion are combined and used as experimental stimuli, that are presented to subjects who are asked to rate perceived emotion.

Results

The authors confirmed the existence of the emotional McGurk effect on the piano piece of the positive impression when combining motion and audio with distinct emotion. Specifically, when combining the motion of "neutral" and audio of "tenderness", it was perceived as "sadness". Therefore, the authors found a different result from the previous study that uses negative piano piece.

Conclusions

This study confirms an example pattern of the emotional McGurk effect using the piano piece of the positive impression. Future works of it is to increase the piano players and to investigate another pattern of the emotional McGurk effect.

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The sound of leadership: Effective public speaking draws on ethological signals associated with authority

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In this paper we present the results of a study of leader speech based upon the respondent ratings of good leadership within a pairwise comparison tournament of short audio excerpts of TED talks. While we find significant agreement among respondents with respect to which clips were better than others, we do not find unequivocal support for our hypotheses that mid-level auditory cues consistent with ethological assumptions provide significant influence over and above cultural factors such as regional accent, gender, and ethnicity. Three possibilities for these results are briefly considered and explored, including the influence of semantic content, low-level auditory information, or the artifactual influence of data aggregation across participants.

T8G: Short Talks 8 - Singing

Time: Tuesday, 24/Jul/2018: 10:00 - 11:00 · *Location:* Graz_4
Session Chair: Diana Omigie

Evaluating features, feelings and preferences in singing voices in popular music

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Background

The voice is a substantial medium in everyday life and transports linguistic information, feelings, emotions and personality traits. Vocal features have mainly been described on the basis of clinical (phoniatrics, speech therapy) or pedagogical applications, or phonetics, including physiological and acoustical parameters. These parameters are typically evaluated and described by voice experts using the vocabulary specific to their field and limited to speech or classical singing.

Aims

This study aims at evaluating a tool for the descriptions of voices for non-experts and investigating relations between vocal features, preferences and evoked feelings by voices.

Method

With a combined methods approach, the current study aimed at identifying the terms used by non-experts to describe voices as well as the vocal features associated with preference and evoked feelings. Developed from an interview study (N=20), a group testing session (N=48) and an online survey (N=216, including speech and singing experts and non-experts), a set of nine items was created for the evaluation of singing voices in popular music styles. The features were a combination of expert terms and non-expert descriptions, derived from speech science and vocal technique: four items on vocal color/timbre, including habitual pitch, items on articulatory specificities, melodic contour, speaking/singing mode and overall expression.

Results

Specifically, in the online survey, six well-known songs were presented for evaluation on the basis of these nine features and seven feelings evoked by the singer/song. The participants' agreement on the features was dependent on the singer, i.e. how recognizable the features were as well as how steady the features were used (variability). The discrimination between singers was examined with a multiple discriminant analysis, which revealed that 63% of the cross-validated cases were correctly classified. A rough and pressed vocal sound explained 75% of the variance, i.e. contributed strongly to the classification of voices.

Regression analyses revealed that a preferred voice has a low, soft, pressure-less, dark/muffled sound. In the given context, a voice is preferred when the performer sings (rather than speaks) and articulates rather precisely. Actual disliked voices, i.e. not just less preferred voices, on the other hand, reveal a rough, pressed, thin vocal and twangy/nasal sound.

The relationship between vocal features and evoked feelings is dependent on the feelings evoked by the song itself. Based on the six songs/singers investigated, a soft, pressure-less and dark/muffled voice evoked relaxing feelings, a rough voice (in combination with an overall positive expression of the music) evokes energizing feelings and a soft voice also evokes sad feelings.

Conclusions

The resulting features represent a set of items for the description of singing voices in popular music styles that can be used by various people, not just voice experts. Furthermore, the study shows for the first time relations between vocal features, preference and feelings evoked by singers of popular music styles.

Music Aptitude: A Meta-analysis

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Background

Music aptitude has been defined as the potential for music achievement (Gordon, 2001). Measures of music aptitude have been used as dependent variables within research extensively. Correlational investigations have been conducted between music aptitude and various other measures (e.g., Norton, 1980; Strait, Hornickel, & Kraus, 2011; Zdzinski, 1992). Research also exists regarding the development of aptitude tests and internal validity (e.g., Gordon, 1984; Karma, 2007). Given the breadth of research on the topic, theoretical arguments persist.

Aims

The need for a statistical synthesis of music aptitude research is three-fold: (a) for the purpose of informing future music aptitude research, (b) disseminating informed results and conclusions, and (c) adding evidence to theoretical discussions.

The purpose of the meta-analysis is to support/refute ideology regarding aptitude. Hypotheses included: (1) what is the overall effect size (ES) regarding analyses of variance; (2) what is the overall ES of aptitude measure outcomes regarding correlational data; and (3) what are the statistical effects of moderator variables: condition, age, gender, measurement instrument, aptitude components, publication source/year, population, and research design?

Method

The meta-analytic process included: creating exclusion/inclusion criteria, literature search, coding articles, calculating study ES's, calculating an overall effect size, and moderator variable analyses. The meta-analysis utilized a conditional inference model with fixed-effects procedures.

Results

A preliminary literature search yielded 120 studies. Cohen's d was chosen due to its prominent use in recent meta-analyses (e.g., Svec, 2018). Equations (Card, 2012) were used to calculate ES's from reported data where applicable: means, standard deviations, F/t-tests, and correlation coefficients. Subsequent analyses will yield an overall ES and for each individual study. Both overall ES analysis and moderator variable analysis will be calculated using Field and Gillet's (2010) SPSS syntax.

Conclusions

Conclusions will address implications for teaching, research pedagogy, research practice, and will discuss theoretical components of music aptitude and the use of aptitude testing.

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L12G: Long Talks 12 - Movement

Time: Tuesday, 24/Jul/2018: 13:30 - 14:30 · *Location:* Graz_1

Session Chair: Jan Stupacher

Music-supported motor learning: Behavioral learning and cue dependence

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Background

The use of cued movement rehabilitation paradigms is currently receiving much research interest. Recent findings showed neural changes after a music-cued motor learning paradigm as compared to learning without music, unexpectedly in the absence of motor performance differences (Moore et al., 2017).

Aims

Focusing on behavioral increases after music-cued motor learning, we investigated short-term button press sequence acquisition, comparing cueing conditions with varying levels of support for the movement. By including four different types of cue, namely no cue (silence), a metronome cue, a musical cue providing a rhythmic backing but no explicit temporal cue for the presses, and a full melodic cue, where the movement was represented in the melodic contour, the effect of the cue on learning could be assessed, with implications for clinical use.

Methods

Sixty-five non-musicians (33 female, mean age 22.3 years, sd=4.6) were divided into four groups which each trained a repeating button press sequence with one type of cue. A visual display was used showing circles descending along four vertical lines representing the different fingers. First, participants performed six repetitions of the motor exercise, and then learning retention, cue dependence and transfer to a different sequence were tested a day later. Cue dependence trials lacked either the visual or the auditory cues, and transfer was tested for the original cueing condition using a novel sequence. Accuracy was implemented as the number of correctly performed sequences, and timing regularity was assessed using the coefficient of variation (sd of inter-press intervals corrected for tempo). Accuracy and timing were analysed for the training using a two-way (time*group) ANOVA, while cue dependence and transfer trials were compared between groups with a one-way ANOVA.

Results

In terms of learning, no accuracy differences between the cueing groups were found, and timing variability was significantly lower for the melodic and metronome cueing groups as compared to the rhythmic backing or silence groups (all post-hoc comparison p values <.015). This timing pattern persisted for the visual cue dependence and transfer trials (all p values <0.04), without any accuracy differences between groups for these trials. However, in the auditory cue dependence trials the melodic cueing group performed less accurately than the metronome or silence groups (p=.021 and .004, respectively), and the only timing difference was a lower variability for the metronome group as compared to the rhythmic backing group (p=.004), indicating a relative rise in timing variability for the melodic cueing group in this trial.

Conclusions

Previous findings of no differences in learning accuracy between cueing conditions were replicated, although timing variability is notably lower for the groups learning with cues that explicitly contain the time-points of the desired movement. However, learning a new movement with melodically supportive stimuli appears to lead to cue reliance in both timing and accuracy, which has clear implications for the selection of optimal cues in clinical settings.

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The effect of hand shape familiarity on guitarists' perceptions of sonic congruence: An analysis using Linear Mixed Effects Models

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Background

Musical performance depends on the anticipation of the perceptual consequences of motor behaviour and this auditory-motor coupling is stronger for well-rehearsed actions (Lahav, Saltzman, & Schlaug, 2007). Altered auditory feedback has been used to investigate auditory-motor coupling (Maidhof, Vavatzanidis, Prinz, Rieger, & Koelsch, 2010), but previous studies have predominantly used MIDI piano in experimental tasks.

Aims

To investigate how the familiarity of hand shape affects judgements of sonic congruence in an altered auditory feedback paradigm using MIDI guitar.

Method

21 experienced guitarists without absolute pitch who normally play right handed participated (18 male, age = 26.75 years, SD = 9.18 years). Each participant played chords in response to tablature diagrams created with the Encore music software program. These were presented on a Toshiba laptop via a custom MAX patch, which also recorded response data. The patch delivered auditory feedback via Bose noise cancelling headphones as chords were played on a guitar fitted with a Fishman MIDI guitar pickup. Participants responded via a Fishman FC-1 foot controller. The experiment consisted of four blocks of sixty-four trials each. Stimuli were randomly ordered. Each of eight distinct four-note chords were presented requiring either a familiar or unfamiliar hand shape. In half of the trials at random, the auditory feedback was altered by changing the pitch of one of the notes. Participants then judged whether the feedback was altered or not, responding as quickly and accurately as possible by pressing one of two buttons on the footswitch. There were thus two factors with two levels each: familiarity (familiar vs. unfamiliar hand positions) and congruence (congruent vs. incongruent auditory feedback). In a subsequent session, participants ranked the familiarity of the stimuli by means of a questionnaire. We constructed a linear mixed effects model to predict reaction times with the fixed-effect predictor variables "congruence" and "familiarity" as well as a congruence*familiarity interaction term, and the random effects of participant and chord number. We also included a fixed effect of occurrence number since participants may have got better with later repetitions of particular stimuli.

Results

Congruence lowered reaction times by 51.49ms ± 12.30ms, $t(3081.60) = 4.19$, $p < .001$. Each unit of the normalized familiarity rating lowered reaction times by 35.06ms ± 8.52ms, $t(3086.20) = -4.12$, $p < .001$. Each additional occurrence lowered reaction times by 11.32ms ± 1.34ms, $t(3076.50) = -8.45$, $p < .001$. The interaction between congruence and familiarity was not significant. A mixed effects logistic regression used to predict accuracy returned similar findings.

Conclusions

Participants' judgement of sonic congruence tended to be faster when the chord shape was familiar and when feedback was congruent. A follow up study is underway to further isolate the effect of hand shape.

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L1G: Long Talks 1 - Consciousness

Time: Tuesday, 24/Jul/2018: 13:30 - 14:30 · *Location:* Graz_2

Session Chair: Andrea Schiavio

Time-Consciousness as Link between Empirical and Formal Research in Music

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Background

At the turn of the 20th century, not music but philosophy as a discipline stood on the brink. The newest science – psychology – redefined questions of meaning by taking account of empirical evidence in the brain, challenging the long tradition of philosophical idealism. Were ideas reducible to material causes? But how, then, would we be capable of communicating anything like knowledge? In response, Edmund Husserl's Logische Untersuchungen took up concerns of epistemology (i.e. the possibility of knowledge as such), proposing a new science of science – a Wissenschaftslehre – that would investigate the relations between the natural laws of empirical psychology and the ideal laws of logic: this new science he termed, "phenomenology."

How remarkable that after the turn of the 21st century, we in music find ourselves in a similar situation, insofar as neuroscience promises an empirical account of musical meaning in opposition to the tradition of music analysis. How, then, might phenomenology provide a framework that could accommodate or – better – link these two approaches?

Aims

My aim is to investigate, through an account of time-consciousness, a correlation between the formal idea and natural act with respect to the perception of music.

Main Contribution

According to Husserl's analysis of the intentionality of consciousness, our experience takes place neither exclusively on the side of objects (i.e. reducible to natural acts of cognition) nor exclusively on the side of subjects (i.e. restricted to an inner, ideal realm that cannot access the world); rather, objects and subjects are constituted as non-independent parts of a whole that is the experience of consciousness itself. Drawing upon the third logical investigation of the Logische Untersuchungen – on mereology, or the study of parts and wholes – I examine what Husserl terms the "logical laws" of non-independent parts, thinking them through in terms of time-consciousness by focusing on Husserl's phenomenological explorations of the musical melody (in Zur Phänomenologie des inneren Zeitbewusstseins). Developing Husserl's themes, I make two claims: 1) that musical meaning unfolds thanks to the capacity of retention, specifically, and 2) that the relation of the parts of time to retention operate according to objective laws of logic.

Implications

Phenomenological analysis illuminates the relationship between what is most subjective (i.e. inner time-consciousness) and what is most objective (the "laws" of mereology). In this way, phenomenology is relevant to contemporary concerns in music, showing that it is not necessary to oppose empiricism and formalism; rather, we can illuminate the relation between the cognitive act and formal meaning in terms of time and logic, thus providing a clarification of their common epistemological ground.

References

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L2G: Long Talks 2 - Feedback and Regulation

Time: Tuesday, 24/Jul/2018: 13:30 - 14:30 · *Location:* Graz_3

Session Chair: Jonna K. Vuoskoski

Is it me or the music? An experimental study on the contribution of regulatory strategies and music to stress reduction

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Background

Affect regulation strategies (i.e. specific actions towards an affective goal) have been consistently identified as a determinant factor for the success of self-regulation. In the context of music use, regulatory strategies exhibit strong bonds with musical mechanisms (i.e. music's features that underlie affective change; Juslin & Västfjäll, 2008; Van Goethem, 2010). The associations between strategies and mechanisms underlying engagement in music have been recently described (Baltazar & Saarikallio, 2017), but their impact (combined and individual) on a given affective goal has not been yet explored experimentally. Given previous research on the strategic use of music and on the outcomes of different music, we hypothesized that both elements are relevant for the outcomes of musical self-regulation.

Aims

We aimed at experimentally exploring the affective impact of self-chosen strategies and self-chosen music on the goal of reducing acute stress.

Method

Thirty-four participants took part in the experiment. Firstly, they named songs that are personally effective for stress reduction and others that hinder this goal (efficient music-EM vs. inefficient music-IM). Additionally, they selected the most and the least efficient regulation strategy for reducing stress from a given list (efficient strategy-ES vs. inefficient strategy-IS). The experiment followed a within-subject factorial design. Each condition started with the induction of acute stress using a task of monetary decisions coupled with administration of heat-based pain (Q-Sense, Medoc). Then, the participants were instructed to reduce their stress levels by listening to music and using a certain strategy. Music and strategy varied across conditions, which resulted from the possible combinations of ES/IS – EM/IM. Affect self-regulation was measured by self-report scales (tension, valence, arousal), physiological activation (skin conductance levels-SCL), and one cognitive task (risk taking in a monetary decision task).

Results

Self-reports showed a strong effect of both strategy and music on stress reduction, with ES leading to lower tension compared to IS, and EM leading to lower tension, arousal¸ and negative valence than IM. The physiological and cognitive measures captured an effect solely for music. EM, in comparison to IM, was followed by lower SCL and riskier choices in decision-making related to gain. This decision-making pattern is considered more stereotypical and, thus, denotes lower levels of stress.

Conclusions

Our results suggest that listening to music to decrease stress levels involves at least two choices: music and strategy. When both are adequate, the individual experiences the maximum reduction of stress and changing any of the components (music or strategy) impacts the regulation's success. The considerably negative consequences of listening to the "wrong music" and applying the "wrong strategy" for a given goal calls for an increased attention to emotional skills underlying music use.

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The Effect of Feedback on Singing Accuracy

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Background

Studies have found that up to 17% of the general population self-identify as "tone deaf" despite having normal perceptual ability. Interviews with adults who think they are tone-deaf reveal feelings of inadequacy and unmusicality that most believe are insurmountable. While many children develop the ability to sing accurately without special instruction, teachers are not always well-equipped to help those who struggle, especially in classroom settings.

Aims

Researchers have hypothesized that poor-pitch singing is the result of a weakness in the auditory/motor loop. One possible means of helping inaccurate singers is to provide feedback during imitation to augment their perceptual acuity. Previous studies have found benefits from both visual and enhanced auditory feedback (Wilson, et al., 2008; Wise & Sloboda, 2008) but the two have not been compared directly as an instructional strategy. The purpose of this study was to compare improvements in singing accuracy after a brief practice period utilizing different kinds of feedback.

Method

Participants (N=80) scored below 80 percent on a standard online measure of singing accuracy that involves matching both isolated pitches and patterns, despite exhibiting healthy pitch discrimination thresholds of less than 100 cents. After completing the pretest measure, participants were randomly assigned to one of the three 20-minute training conditions that involved vocal imitation of an auditory target: 1) Visual feedback training in which participants could both hear and view real-time visual feedback showing the relationship between their sung pitch and the target, 2) Auditory feedback training which was identical to the first condition with the exclusion of visual feedback, 3) Control training which involved imitation of speech from a foreign language instruction recording. After training, participants were measured the same way as during pretest.

Results

There was a modest but statistically significant improvement from pretest to posttest when averaging across all conditions. However, when breaking down this effect by condition the effect of training was only significant for participants who received visual feedback training.

Discussion

These results suggest that even a 20-minute practice session can improve singing accuracy when one's own auditory feedback is augmented by visual feedback that presents on-line knowledge of results. Visual feedback may facilitate accuracy by substituting for inaccurate auditory-motor associations. The fact that training, even over a very short time-span, can have significant effects on singing testifies to the importance of practice and the hypothesis that singing is a learned skill that can benefit from experience and may not simply reflect an inherited talent (Demorest, Nichols, & Pfordresher, 2017).

References

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W1G: Workshop 1

Time: Tuesday, 24/Jul/2018: 14:30 - 15:30 · *Location:* Graz_1

"It's making singers think what they need to know in order to make that sound!" (Director Ken). Imagery, Cognition and Vocal Responses in Choral Rehearsals

Mary Teresa Black

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Background

This workshop is based on doctoral research into the functions of imagery in choral rehearsals. Drawing on research by Jansson (Jansson, 2014) and Price and Byo (Price & Byo, 2002) amongst others, the workshop will demonstrate how directors' verbalisations of imagery can influence vocal responses.

The workshop will provide a brief introduction to the nature of imagery, as demonstrated by Lakoff and Johnson (Lakoff & Johnson, 1980) and Ortony (Ortony, 1975) for example, and will demonstrate cognitive understanding of images encountered in the research. The vocal techniques and physiology underlying the images will be explained, demonstrating the vocal effects of the images.

Aims

The main aim for the research was to ascertain the contexts and efficacy of imagery in choral rehearsals, specifically in determining its ability to be understood by singers and in establishing the role of imagery in choral directors' pedagogy.

The workshop will allow participants and observers to judge for themselves the efficacy of imagery, albeit in a contrived situation.

Audience activities

The audience will be provided with examples of imagery from the research, together with the intended (original) vocal responses. They will be invited to sing as a choir, using short pieces of choral music and to apply the imagery examples whilst singing short sections of the piece. They will judge whether their understanding of the section is influenced by the imagery and whether the resulting vocal responses were affected.

Implications for practice

Smith and Sataloff define choral pedagogy as the bridge between choral conducting and choral singing (Smith & Sataloff, 2006, p. viii). The research and workshop demonstrate that choral directors achieve changes in vocal effects through the use of imagery. Imagery therefore creates that bridge so singers and directors can be more effective during rehearsals. Directors who constantly search for the most appropriate ways of communicating their requirements can be assured that imagery is a valid and effective rehearsal strategy, which they might utilise more effectively and consciously.

Value for this conference

Cognition, Perception and Performance are the topic areas at the heart of this workshop. These will be shown through demonstrations of how singers understood the imagery and what they perceived to be the appropriate vocal responses. During regular rehearsals there are no opportunities for singers to demonstrate their cognition of the imagery or for scholars to examine the vocal responses. This workshop enables insight into this under-researched context.

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D1G: Demonstration 1

Time: Tuesday, 24/Jul/2018: 14:30 - 15:30 · *Location:* Graz_2

Enactive Cognition in Music Theory: Conduction in the Classroom

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This demonstration presents a novel approach to music theory (MT) pedagogy that (1) deepens working knowledge by integrating emerging research in enactive cognition, and (2) accounts for recent criticisms faced by MT instruction in an undergraduate setting. While some call for MT study to be absorbed by related courses, others defend that it requires increased specialization. In a recent survey of undergraduates (Gutierrez, 2017), music students overwhelmingly identified three areas of weakness in their MT experience: diversity, creativity, and integration. The enactive account of cognition proposes that embodied action facilitates deeper learning more effectively than paradigms that presuppose a dualist separation of mind from body (Nunez, 2000). Conduction, a sign/gesture system created by jazz musician Butch Morris to all real-time composing with an ensemble, can be considered an enactive approach to composing music and interacting with music structure. Conduction was used in MT classes to determine if an enactive approach facilitates a deeper understand of target material, including diatonic triads, sevenths chords, augmented sixth chords, and bitonality. Using this system students experimented with abstract theoretical concepts in real-time in an exploratory domain, creatively exercised critical listening skills, reinforced working and episodic memory of specific structures, and deepened their working knowledge of theory concepts through embodied action. In initial testing students report a deeper learning of these concepts than with conventional approaches, and also reported improved integration, creativity, and diversity in their classroom experience. In this demonstration participants will experience first-hand how to integrate enactive cognition with undergraduate MT courses through Conduction.

D2G: Demonstration 2

Time: Tuesday, 24/Jul/2018: 14:30 - 15:30 · *Location:* Graz_3

The Music Mat for encouraging collaborative and embodied music teaching

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Background

The development of music technology has given for music educators new tools to reach their pedagogical goals (Burnard, 2007). Computers, tablets and smartphones are actively used, and the number of software in the market is increasing rapidly. While this has brought along many positive consequences, some problems have become apparent, too. To a great extent the ways in which children create music are directed by the physical characteristics of computers and tablets. Sound is created by using the keyboard of a computer or by touching the screen of a tablet. New technology is particularly well suited for individual work, but it does not encourage a collaborative approach. Thus, when new technology is applied to music education it may move music lessons in directions that will not support collaborative music learning and embodiment.

Aims

The purpose of the workshop is to introduce a new pedagogical tool, the Music Mat, that is based on high technology while avoiding the pedagogical limitations related to the present use of music technology. The Music Mat is based on a philosophy that emphasizes the role of embodiment (Leman, 2008) in understanding abstract concepts. Moreover, the architecture of the Music Mat encourages children to collaborative problem solving (Bruffee, 1993). The workshop aims at giving a concrete example of how embodiment and collaborative learning can be applied into music education by embedding capacitance-based sensors on surfaces like mats.

Practical implications

The mat as a midi controller can be of benefit for music educators in helping pupils to understand in a concrete and embodied way the key concepts in music theory. Other topics, too, such as improvisation, instrumentation and composing can be taught with this pedagogical tool. The mat can also be used for integrating music into other school subjects, for example into sports, geography, mathematics, languages and art (music painting).

Specific value of the workshop for the conference

The Music Mat is an example of the way in which recent research in music cognition can be applied into music education. From a technological point of view, the workshop illustrates how major challenges related to capacitance-based sensors have been solved and used in an environment like a mat. The workshop shows in a concrete way how the instability of capacitance-based sensors can be stabilized while highlighting the main benefits of this technology in pedagogical use.

The mat has been tested in several Finnish schools on the primary, secondary and higher secondary levels as well as at the university level. In addition to music classes the mat has been tested by dancers and by special educators. The key findings of the experiments and observations of these tests will be reported in the conference.

References

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T1M: Short Talks 1 - Language

Time: Tuesday, 24/Jul/2018: 14:30 - 15:30 · *Location:* Montreal_1

Session Chair: Janet Eileen Bourne

Readers use duration and intensity variation to signal hierarchical metric structure in child-directed poetic speech

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Background

Exposure to child-directed poetic speech is argued to support literacy acquisition in young children, but the cognitive mechanisms are unclear. The current study explored how the consistent metrical and rhyming structure of child-directed poetic speech influence prosody in productions of a representative text: The Cat in the Hat by Dr. Seuss. We assessed whether hierarchical models of meter influence word duration and intensity over and above other linguistic factors. One model instantiated a five-level metric hierarchy based on metric grouping [2]; a second model instantiated a three-level metric hierarchy based on a 6/8 musical meter [3].

Aims

The current study was designed to investigate how readers signal metric structure in child-directed poetic speech by assessing whether duration and intensity vary systematically across hierarchical metric levels.

Methods

Seventeen female speakers read the book aloud. Recordings were force-aligned with the text and three acoustic features were extracted from each monosyllabic word (n=25433 after exclusion of outliers, page-final words, disfluencies, and repetitions): inter-word interval (word duration plus following silence), word duration, and peak intensity. We used linear mixed-effects regression to find the best-fitting model of these features as a function of linguistic control factors: segment number, lexical frequency, word class (open vs. closed), syntactic structure, repetition, and font emphasis (e.g., NOT in (1)). We then tested whether a model parameter corresponding to metric grid height improved model fit.

Results

Position in the metric hierarchy explained durational and intensity variance beyond that observed for the control factors; complementary patterns of duration and intensity variation signaled both models of metric structure. Models of metric grouping demonstrate that speakers signal increases in the five-level hierarchy with concurrent durational lengthening and intensity reduction. Models of musical meter demonstrate that speakers use complementary variation in duration and intensity to signal a 6/8 structure which, as in music, is comprised of a three-level structure: the primary accent (beat 1) was signaled by the highest intensity and shortest duration; the secondary accent (beat 4) was less intense, but longer, than the primary accent; the unaccented beats (2,3,5,6), were the least intense, and the longest.

Conclusions

The finding that speakers use duration and intensity variation to signal hierarchical metric structure is consistent with findings from music production [3,4], demonstrating overlap between hierarchical timing processes in speech and music production. These data support a model of how poetic books improve literacy outcomes for listeners: readers' prosodic realization of the metric hierarchy cues listeners to direct their attention to the rhyme target, facilitating phonological processing and memory. Moreover, the consistent metric structure of poetic speech may serve to train attentional mechanisms in ways that support efficient speech segmentation and phonological learning. Current work is using ERPs to assess attentional allocation during listening.

References

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Shared Neural Resources of Rhythm and Grammar: An ALE Meta-Analysis

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Background

Emerging evidence suggests connections between music and language processes [1]. Although a growing body of neuroimaging studies have independently highlighted similar foci along the speech-motor network in rhythm and syntax, there is no quantitative analysis determining the degree of overlap between both processes.

Aims

The present study attempted to identify shared brain regions involved in rhythm and syntax processing by performing a quantitative meta-analysis using activation likelihood estimate (ALE) [2].

Methods

We performed a literature search using PubMed and Neurosynth to identify experiments reporting activation coordinates of fMRI or PET data collected with whole-brain imaging. We found twenty experiments for each of the syntax and rhythm analyses: Rhythm experiments involved processing isochronous beats, metric, and non-metric rhythms. Syntax experiments included comparisons of object-relative versus subject-relative sentences, sentences versus word lists, and Jabberwocky sentences. Activation coordinates from these rhythm and syntax experiments were separately analyzed using GingerALE (http://brainmap.org/ale/). The overlapping maps were obtained at cluster-level $P < 0.05$ family-wise error (FWE) correction combined with voxel-level threshold $P < 0.001$, and 1000 permutations [3]. As an exploratory analysis, the same maps were thresholded at uncorrected $P < 0.005$ with a minimum cluster size threshold of 300mm3.

Results

Both rhythm and syntax ALE analyses yielded significant clusters throughout the brain. In rhythm, significant clusters emerged in the posterior supplementary motor area (SMA), bilateral putamen, bilateral inferior frontal gyri (IFG), bilateral superior temporal gyri (STG), bilateral precentral gyri (PG), bilateral inferior parietal lobules, and cerebellum. In syntax, significant clusters were found in the anterior SMA, left middle frontal gyrus, left IFG, left PG, and left medial temporal gyrus (MTG). Intersection of the two ALE maps revealed some adjacent and overlapping clusters within the left IFG and left insula. In the exploratory analysis, additional overlap was seen in the left putamen, pre-SMA, and right insula, suggesting the functional role of cortical and subcortical rhythm systems for syntax processes [4].

Conclusions

To our knowledge, this is the first meta-analysis reporting shared regions between rhythm and syntax processes in the whole brain. The present data lend more support to the notion that music and language recruit common neural circuitries by identifying overlapping and neighboring foci within the same anatomical areas along the sensory motor network.

References

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Behavioral studies on the role of melodic contours in linguistic processing in Chinese musicians and non-musicians

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Background

The role of melodic contour has been an appealing topic in understanding the relationship between musical and linguistic information processing. Our previous work (Will&Poss, 2008; Will et al., submitted) provide evidence that tonal information may facilitate vocal responses, and vocal/non-vocal contour information may elicit different influence on linguistic processing. That tonal information may have an influence on lexical processing can also been seen in many musical speech surrogates. In practical applications, musical speech surrogates map speech onto instruments or whistling by maintaining either pitch information or formant contour (Sebeok&Umiker-Sebeok, 1976), suggesting that tonal information may help listeners decode messages. However, it is unclear how contour information affects linguistic processing.

Aims

In this study, we aim to explore whether and how melodic contours affect linguistic processing, and what the role of musical training and experience in the process might be.

Method

We conducted two experiments. All musician participants were native Chinese speakers, with at least 5 years of formal musical training and ongoing active musical engagement at the time of participation. The first experiment was a lexical decision task. 20 musicians and 20 non-musicians were instructed to classify the auditory target syllables as either words or non-words as quickly and accurately as possible.

The second experiment involved a syllable repetition task. 14 musicians and 14 non-musicians were instructed to repeat the syllables they heard as quickly and accurately as possible.

A priming paradigm was applied in both experiments. Melodic contour primes were either instrumental or vocal, corresponding to the four Chinese lexical tones but without segmental information. A control prime was a white noise with the same duration and amplitude envelop as the pitched primes. Target syllables included words, non-words and pseudo-words, and were equally distributed in four tones.

Every syllable appeared with control prime, but half of the syllables appeared with vocal, the other half with instrumental primes. Target syllables with vocal and instrumental primes were counterbalanced across subjects.

Results

We applied mixed effect model for data analysis. In both experiments, musicians responded faster than non-musicians. The analysis demonstrates that melodic contour primes facilitate certain types of linguistic processing. The effects on linguistic processing appear to be both lexical and extra-lexical. Vocal contours produced faster responses than instrumental contours and unpitched white noise.

Conclusions

Our experiments suggest a rather complex relationship between musical and linguistic information processing. In tone-language speakers melodic contour information was found to have lexical as well as extra-lexical effects on syllable processing. The effect size increases with musical training. The different effects of vocal and instrumental melodic contours could be due to specific cognitive adaptations.

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T2M: Short Talks 2 - Musical Skill

Time: Tuesday, 24/Jul/2018: 14:30 - 15:30 · *Location:* Montreal_2

Session Chair: Gary S. Karpinski

Diagnostic assessment of aural skills based on cognitive principles: Placement testing and curricular ramifications

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Background

This paper examines the use of cognitive principles as a basis for designing and implementing a diagnostic placement examination in aural skills for entering students at the University of Massachusetts at Amherst.

Traditional methods of assessing and evaluating the aural skills of incoming college music students have proven to be ineffective predictors of success in traditional aural skills curricula. These methods — interval and chord-quality identification, error detection, dictation, and sight singing — are at best snapshots of students' achievements in these specific activities. Future achievement in aural training hinges not so much on students' proficiency in such complex behaviors but on much more basic aural abilities and skills.

Aims

An aural examination was devised based on research in musical intelligence, learning sequence, pitch discrimination, musical memory, and tonal perception. This examination tests such fundamental skills as pulse inference, pitch matching, short-term rhythm and pitch memory, extractive memory, and tonic inference. During the test, students sing and clap their responses to test items. The results are interpreted and used to place students in either of two curricular tracks in aural skills.

Main Contribution & Implication

This paper presents the cognitive principles underlying the designs of the various test items and explores the interpretations of various responses to each item. The pedagogical designs for the two curricular tracks are examined, with an eye toward how specific goals and methods of this curriculum are dependent on the perceptual and cognitive skills measured by the examination. The paper also explores how best to develop the skills of those individuals exhibiting specific deficiencies on the examination. The paper goes on to investigate correlations between diagnostic examination scores and actual achievement during the academic year. Student achievement in the years before and after implementation of the two-track curriculum is also compared.

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Musical Training Modulates Tempo Adaptation Around Spontaneous Rates

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Background

Musicians spontaneously produce familiar sequences at consistent rates across time, tasks, and effectors (Zamm, Pfordresher, & Palmer, 2015). These rates, called Spontaneous Production Rates (SPRs), may reflect the natural frequency of an underlying oscillation at which coordination is optimized and toward which individuals may be pulled (Strogatz & Stewart, 1993). Previous research has shown that individuals with similar SPRs synchronize more accurately with one another than individuals with different SPRs during duet piano performance (Loehr & Palmer, 2011; Zamm, Wellman, & Palmer, 2016). Musical training may influence how strongly individuals are pulled toward their SPRs. Previous work suggests that musical training enhances the flexibility with which individuals synchronize at non-SPR rates (Scheurich, Zamm, & Palmer, 2018). Little is known about whether SPRs constrain tempo adaptation in real time, and how musical training modulates adaptation to changing rates away from one's SPR.

Aims

We first investigated whether SPRs constrain tempo adaptation during synchronization. Second, we investigated how musical training modulates tempo adaptation at a variety of rates.

Methods

Sixteen musicians and 16 nonmusicians performed a novel musical tapping task in which they tapped every beat of a familiar melody at a comfortable and steady rate (the SPR) on a force-sensitive resistor of an Arduino while hearing the corresponding melody tones. Participants then synchronized their tapping of the same melody with a metronome that unexpectedly sped up or slowed down around their SPRs. Relative phase of taps to metronome clicks was measured after each perturbation.

Results

First, musicians synchronized more accurately than nonmusicians at all tempi. Second, musicians adapted faster overall to both speeding and slowing tempo perturbations than nonmusicians. Third, musicians (not nonmusicians) adapted faster to perturbations that returned to the baseline tempo than to perturbations that moved away from it. Damped harmonic oscillator model fits confirmed that musicians adapted more quickly and returned to baseline synchronization more often than nonmusicians.

Conclusions

This study demonstrates that tempo adaptation is enhanced overall for musically trained individuals compared with individuals without musical training. In addition, musicians show a stronger attraction toward, rather than away from, baseline tempi, whereas nonmusicians do not. Future research may investigate musical training as a continuum to further examine possible effects of spontaneous production rates on tempo adaptation.

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The effect of the environment on singing skills in 2- and 3-year-olds

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Background

Recent studies on singing have enhanced the understanding of processes involved in singing skills, challenging conventional beliefs regarding singing proficiency in the population from kindergartners to adults. Unfortunately, the number of empirical studies conducted with very young children has been negligible. Presumably because of the challenges this age group poses for systematic study, resulting in low response rates. Recent studies using home recordings and applying age appropriate methods for evaluating singing proficiency in toddlers have found that singing skills may be more advanced in early childhood than previously suggested in the literature. However, it remains unclear how much singing proficiency in early childhood depends on biological and cognitive development and how much depends on the input of the environment in terms of training and modeling of singing behavior.

Aims

The purpose of the study was to evaluate the effect of a singing intervention in terms of direct training of singing in an age appropriate manner with 2- and 3-year-old children.

Methods

Two types of training were offered to two groups of 3-year-olds in public preschools within the same neighborhood (N = 44). The experimental group received signing lessons with an early childhood expert while the control group received musical rhythm and movement training with no singing activities. Singing tests, using age appropriate protocols, were conducted before and after the training period. The singing data was analyzed using mixed methods of automatic pitch analysis and expert judges.

Results

Results suggest that 6 weeks of singing intervention affects 3-year-olds' performances on tests measuring singing proficiency. The singing intervention resulted in larger singing ranges and higher pitch accuracy, although the overall performance of the treatment group was not significantly different from the control group. A significant effect of gender was found, with males scoring lower than the females. However, the males made larger improvements from pre-test to post-test than the females.

Conclusions

Singing proficiency is affected by gender, already at age 3. However, training at this early age has an effect on singing proficiency. When evaluating and reporting musical development it is important to account for the effects of training and exposure to musical tasks. Further studies are needed with a larger number of subjects and longer periods of intervention.

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T2P: Short Talks 2 - Emotion

Time: Tuesday, 24/Jul/2018: 14:30 - 15:30 · *Location:* La Plata

Session Chair: Fernando Bravo

Music, Rituals and Worlds of Sense. A Political Approach to Musical Emotions

Oscar Hernández-Salgar, Luis Gabriel Mesa, Luis Fernando Valencia, Juan Daniel Gómez, Diego Gómez, María Camila Mendoza, Laura Molina, Julio Guevara

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Background

This research project is the result of a long time concern with the relation between music and power, understood as an action on the actions of others (Foucault 1988). More specifically, we wanted to explore the role of music as a means for the orientation of action in combination with other modes, according to the concept of world of sense. This is understood as an instance of experience in which different verbal and non-verbal languages reinforce similar contents, thus generating an immersive experience that can help to naturalize and guide behaviors by privileging certain courses of action while making others more difficult (Hernandez 2016).

Aims

The main goal was to test this concept in the context of three real religious rituals: A Catholic mass, a Pentecostal cult and a Muslim prayer. We wanted to check if the reinforcement of similar content was directly related to a raise in the intensity of emotional experience. As an additional inquiry we looked for evidence that showed if the intensity of emotional experience during the ritual was somehow related to an increased compliance with the behaviors expected by the church.

Methods

The study used a combination of quantitative and qualitative methods that aimed to collect information about 1) the intended effect of rituals on the subjects, 2) the emotional expression of the signifying material in each ritual (music, colors, general movement, architecture, verbal discourse), 3) the emotional response of the subjects according to Russell's circumplex model of affect (1980). For the first part we did interviews and analysis of written documents. For the second part we did participant observation and semiotic analysis. For the third part we analyzed the body movement and measured the brain activity of nine subjects (three for each ritual) with a portable Emotiv Epoc EEG device that gave us information about valence and arousal dimensions.

Results

Both the qualitative analysis and the measurement of emotional responses show that multimodal reinforcement in each ritual is correlated to arousal, but not so much to valence, except for some specific moments of the ritual that must be analyzed by looking at the syntactic properties of music. Additionally, the study suggests that the participants of the ritual in which we observed the strongest multimodal reinforcement and the highest emotional intensity are also the ones that more willingly follow the rules and procedures of the church.

Conclusions

Emotional responses in religious rituals seem to depend more on the expectations and internal dispositions of participants, than on external stimuli. However, the use of music emotionally reinforced by different modes, has an impact on arousal, which can be used to coordinate bodily responses, generate catharsis and facilitate certain courses of action.

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A constructionist theory of emotional contagion with music

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Background

Emotional contagion with music is the experience of perceiving that a piece of music expresses an emotion, and experiencing the same emotion aroused in ourselves. According to the BRECVEMA theory, this phenomenon arises from activation of mechanisms of internal mimicry of so-called “basic emotions” (Juslin & Västfjäll, 2008). Additionally, Juslin and colleagues have proposed the existence of a shared acoustic code for emotional expression in music and speech, organized around 5 basic emotions (Juslin & Laukka, 2003). Although the BRECVEMA theory posits that emotional responses to music are caused by factors in the listener, the music and the situation, it does not specify how these factors interact, producing experiences where perceiving that a piece of music expresses a basic emotion, does not lead to the induction of the same emotion.

Aim

To propose a constructionist theory of emotional contagion with music.

Main Contribution

Although there is a shared code for the perception of emotions in music and speech, this code is organized around variations of activation and valence, not around basic emotions (Cespedes-Guevara and Eerola, 2018). This makes the “mirroring of basic emotions” theory of contagion implausible.

Musical emotional contagion occurs when of bottom-up and top down processes interact. The bottom-up processes consist of perceptual mechanisms that appraise the stimulus producing fluctuations of arousal and valence in the listener (this effect has been studied in the visual domain, e.g. Lebrecht, Bar, and Barrett, 2012). These changes in the underlying affective tone of the listener (called core affect) are non-specific, and do not constitute discrete emotional experiences. Perception and induction of discrete emotions only happen when top-down processes relate the changes in core affect to semantic and episodic memories, and to information from the present situation, making the affective experience conscious, discrete, situated, and object-directed. This “conceptual act” (Barrett 2006) produces a variety of emotional experiences that go beyond 5 basic emotions.

Implication

This theory explains how factors in the music, the listener, and the situation interact producing a variety of emotional experiences, where contagion is one a possibility among many. Adopting this theory implies that explaining how personal, situational, and cultural factors interact in musical emotions involves using ambiguous musical stimuli, open-ended response formats, qualitative data, manipulations of contextual information, and priming of cultural knowledge.

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THE EFFECT OF MUSICAL TRAINING ON AFFECTIVE MEMORY IN 4/5 YEAR OLD CHILDREN

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Background

Musical training at early age has multiple beneficial effects on cognitive development. It stimulates synaptic plasticity, observed through anatomical, functional and behavioural differences between musicians and non-musicians (Justel & Diaz Abrahan, 2012). Musical training can be either receptive or active- i.e. where the child perceives music and its elements or when he produces music besides perceiving it. Although there is considerable research involving musical training, differences between both kinds of trainings has not been further investigated.

One of the cognitive functions that are influenced by the musical training is memory. Previous research shows that memory for emotional items is better than for neutral ones and also that music can modulate memory for emotional items better than for neutral ones (Cordon et al., 2013). There are investigations that evaluate these issues in adults. However, the influence of emotional vs neutral items in pre-schoolers' memory remains poorly understood.

Aims

The goal of this study was to evaluate the effect of receptive and active musical training for a period of 4 or 10 weeks, on emotional and neutral visual memory of 4- and 5-year-old children.

Methods

One hundred and eighty 4- and 5-year-old (91, 4) children were musically trained during either 4 or 10 weeks. Before and after the training period they were tested on recognition and free recall of 24 emotional (positive and negative valences) and neutral images (from IAPS protocol). Both tests (free recall and recognition) were run immediately after facing the images and a week late.

Results

Results indicate that children evaluate the emotional pictures as more activating than neutral ones. They remember more emotional images than neutral pictures, being negative images the most remembered pictures [$F(2,330)=21.26$, $p<0.0001$]. Of greater relevance, results also indicated that children actively trained obtain better scores than children in receptive training [$F(1,165)=7.25$, $p<0.008$]. On the other hand, the children of 5 years showed a greater memory than the children of 4 years of age [$F(1,165)=11.86$, $p<0.001$]. Finally, the 10-week intervention was more effective than the 4-week one [$F(1,165)=8.37$, $p<0.004$].

Conclusions

The results indicate that musical training can modulate emotional memory. Specifically, these results supporting that musical training has a positive effect on the memory of pre-schoolers, are socially, clinically and educationally relevant. Thus, a child who participates in structured musical activities including both vocal and instrumental performance and composition can take some advantages for memory. These findings, besides being interpreted as a benefit to children, also can be seen as an opportunity to reflect upon appropriate practices in the teaching of music in preschool contexts. In addition, further hypotheses could be studied concerning children with developmental disorders and adults with neurological diseases.

References

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D1P: Demonstration 1

Time: Tuesday, 24/Jul/2018: 20:30 - 21:00 · *Location:* La Plata

Participatory Embodiment of the Musical Metric in Argentinian Tango

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Background

Tango is a dance system of dynamic movement in which two bodies embrace each other while walking and moving in different directions as they hear the music. Recent studies (Laguna, 2018) have 'quantitative' analysed the rhythmic structure of the tango step according to the biomechanical analysis of the gait cycle, and have demonstrated that there is a strong relation between the movement of the couple and the tango music around the hierarchical periodicity of the musical metric and its strong-weak relation.

Although, during the learning of tango, a part is reserved for the individual practice of the movements, the construction of meaning of the dance emerges from a 'kinesthetic' (Sheets-Johnstone, 2012) and haptic experience of the interaction and socialization of the couple while dancing. From an enactive perspective, the search for coordination and the creation of meaning would be given by the ability to regulate, as a dynamic unit, the internal and relational states of the interactions with the environment (Di Paolo, 2016).

Aims

The purpose of the demonstration is to show why the participatory creation of meaning that occurs with the interacting couple cannot be understood from the sums of the partners's individual steps.

Main content

The demonstration is performed by a couple of professional dancers from Argentina who exhibit in real-time the 'qualitative' analysis of the participatory construction that occurs in the interaction.

The analysis is based on a methodology that articulates the kinesthetic perception of movements with the categories of biomechanical analysis and metric structure.

Implications for practice

The methodological application has an impact on the tango practice, since the analysis reveals strategies that improve the way of observing, understanding, and verbalizing the 'musical' (Malloch & Trevarthen, 2008) and 'intentional' (Stern, 2010) details in the heartfelt construction of the dancing with the music. Ontological issues such as the link between street walking and tango walking –referred to by the milongueros since the 40s– can be evaluated more solidly when analysing the processes of transformation from the street-step to the individual tango-step, and towards the tango-step of the couple. Likewise, both the kinesthetic identification of the strong-weak relationship and the metric hierarchy in-the-step of tango allow for a more vertical understanding of rhythm versus the usual horizontal understanding and the 'counting' conception of dance movements. This knowledge, when embodied, turns the (propositional and non-propositional) communication between dancers and musicians richer and more adjusted.

Specific value of demonstration for conference

To show how the strong-weak periodicity of the music and the subtle details of the expressiveness are represented in the body of the dancer. The presented conclusions reinforce all the pedagogical conceptions that sustain the focus and the development of the rhythm in the physical-corporal movement and contribute to a more multi-modal and interactive learning of the dance and of the listening of tango.

References

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S4M: Symposium 4 - Rhythm, Meter, and Beat (RMB) processing- empirical and modeling approaches

Time: Tuesday, 24/Jul/2018: 20:30 - 22:30 · *Location:* Montreal_1

Session Chair: Yune S. Lee

Outline

This symposium session is focused on rhythm, meter, and, beat processes, ranging from empirical findings to modeling. Corbeil and colleagues revealed that children who showed slower rhythm tapping were worse at auditory, not visual working memory tests. Kato and colleagues showed that beat synchronization ability in schizophrenic patients predicted severity of the brain disease and their language disturbances. Visi et al. found that bimanual tapping provided more stable synchronization as rhythmic structures become more fine-grained. Lastly, Kim and Large demonstrated that an oscillator network model was able to capture metrical structure in a mechanism similar to human perception.

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6. Authors and titles of all presentations in the symposium including the first talk by the chair, with titles corresponding to accepted talks.

Spontaneous rhythm tapping predicts auditory working memory ability in children

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Background

A spontaneous rhythm tapping test has been widely used to better understand differences in time segment propensity between individuals.1 The inter-tapping interval metric provides insight into a differentiated size of the temporal window in which sensory information is registered. Accordingly, we hypothesized that more information could be stored in a larger temporal window, which might adversely affect working memory capacity due to the difficulty of selecting a target among competing information also contained in that temporal window.

Aims

Here, we attempted to test the aforementioned hypothesis by relating participants' working memory performance to their spontaneous rhythm tapping tendency.

Method

Eighty-five typically-developing, American English-speaking children aged 7-17 years (mean age 11.37 yrs; 11 males, 48 females) were recruited through the Language Pod at the Center of Science and Industry (COSI) in downtown Columbus, OH. Participants first completed computerized visual working memory (VWM) and auditory working memory (AWM) tasks, for which they determined whether a probe stimulus was previously shown as a member of a group of auditory or visual stimuli. All stimuli were designed to be arbitrary and unnamable, such that they would likely not map onto real-world

representations when perceived. Participants then engaged in drumming tasks to assess two rhythm skills: spontaneous beat generation and rhythm synchronization. For spontaneous beat generation, they tapped a virtual drum pad at a constant pace of their choice for 24 seconds. For rhythm synchronization, they tapped along the drum pad to three different tempos (60, 120, and 180 BPM) for 24 seconds each.

Results

A logistic regression analysis within the linear mixed effect (LME) framework was performed to identify significant predictors of AWM and VWM separately. The following variables were incorporated into the LME model: beat synchronization scores (averaged across three tempos at aforementioned rates), mean inter-tapping interval (from the spontaneous beat generation activity), variance of the interval, age, sex, level of parental education, hours of music training period, and number of languages spoken. The analysis revealed that age (z=3.68; P=0.0002), mean inter-tapping interval (z= -2.25; P = .02), and variance of the interval (z=2.38; P=0.02) reliably predicted AWM performance. By contrast, none of those measures except age (z=2.85; p=0.004) predicted VWM performance, indicating a domain-specific relationship between the tendency of time segmentation and auditory working memory performance.

Conclusions

Our data indicate that auditory working memory ability is associated with the size of the temporal window as indexed by mean inter-tapping interval. Specifically, a large-sized temporal window may be detrimental in keeping track of target auditory information, compared to a short temporal window in which relatively fewer pieces of competing information are registered in the working memory system. Lastly, our data support the notion that different rhythm skills involve different types of cognitive processes.2

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Beat Synchronization Predicts Language Disturbance in Patients with Schizophrenia

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Background

Schizophrenia is a chronically debilitating mental illness characterized by positive symptoms (delusions and hallucinations), negative symptoms (amotivation and diminished expression), and cognitive impairment. There is robust evidence that patients with schizophrenia have language disturbances such as verbal communication impairment (Kuperberg, 2010). Recent studies have shown that the ability to synchronize movements to musical beat relates to neural encoding of speech and language metrics as phonological awareness (Tierney, 2013) and vocabulary (Woodruff, 2014). Thus, we hypothesized that the degree of the ability of beat synchronization would be associated with the language disturbance in patients with schizophrenia.

Aims

The aim of this study was to investigate the relationships between the ability to synchronize with musical beat and severity of clinical symptoms in patients with schizophrenia.

Method

Forty-five patients with schizophrenia (18 male, 27 female) participated in this study. We used the Positive and Negative Syndrome Scale (PANSS) for clinical symptoms and the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS) for cognitive impairment. To assess the beat synchronization ability, we used the Music Tapping Test in the Harvard Beat Assessment Test (H-BAT) (Fujii, 2013). Three musical genres (rock, pop orchestral, and jazz style songs) were played at three different tempi (100, 120, and 140 beat per minute) with repeated twice for each. The patients were required to tap to the quarter-note beats with the index finger. The degree of the beat synchronization ability was indexed

using entropy of relative phase distribution (Fujii, 2013). The beat synchronization measure was subjected to 3 (genres) × 3 (tempi) two-way repeated-measures analysis of variance (ANOVA).

Results

The two-way ANOVA showed no significant interaction between genres and tempi ($F_{4, 176} = 1.48$, $p = .21$). The main effect of tempi was significant, showing that the patients had difficulty in synchronizing to the beat of songs with faster tempo ($F_{2, 88} = 13.82$, $p < .001$). The main effect of genres was also significant, showing that the patients had difficulty in synchronizing to the beat of jazz style songs ($F_{2, 88} = 21.25$, $p < .001$). There was a significant correlation between the beat synchronization measure and cognitive outcome as measured by the RBANS language score after controlling for severity of extrapyramidal impairment measured with the Simpson-Angus Scale (SAS) and Chlorpromazine dose equivalent dose ($r = 0.351$, $p = 0.021$).

Conclusions

We found that patients with schizophrenia had difficulty in synchronizing to the beat of jazz music with faster tempo. The decreased ability of the beat synchronization was associated with the severity of language disturbances in patients with schizophrenia. The link between the beat synchronization ability and the language disturbances may support our hypothesis suggesting that there may be a shared neurobiological mechanisms underlying these dysfunctions in patients with schizophrenia. The results will be further discussed with magnetic resonance imaging data.

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Modeling phase dynamics, relaxation and multistability in meter perception

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Background

Meter is structural regularity in which musical rhythm is organized into a hierarchy of periodicities of different rates. Human listeners naturally hear meter in music and can synchronize bodily movement to one or more metrical levels present in music. The extraction of meter from audio signals has been a central problem in music information retrieval with many applications. Existing methods for meter analysis commonly consist of two steps. First, salient periodicities are detected from audio using signal processing techniques such as autocorrelation and comb filtering. Then, meter is estimated from the pattern of periodicities using statistical models or machine learning techniques. However, human metrical perception is more subtle and complex than extraction of a notated meter. Existing methods differ in the degree to which they capture subtleties such as phase dynamics, relaxation time and multistabilty, which are characteristic of human rhythm perception.

Aims

Here we present methods of meter analysis using an oscillator network model. First, we study the periodicity analysis by the model and compare it to other standard methods as to how well each method captures the characteristics of human rhythmic behavior. Second, we develop and compare different methods of estimating metrical structure from the oscillator network output.

Method

We use a gradient frequency neural network (GrFNN) driven by onset signals, which is a network of oscillators tuned to a range of distinct frequencies. The amplitude and phase of individual oscillators indicate the salience and phase of periodicities in the audio signal. We use the model to capture the phase dynamics, variability, relaxation time, and multistability observed in human finger-tapping data for rhythms of varying complexity (Large, Herrera & Velasco, 2015). We also compare the GrFNN model with other methods of periodicity analysis. To estimate metrical structure from the oscillator network output, we test three methods: peak picking, template matching and pattern formation. The first two are

based on oscillator amplitudes while the third depends on the pattern of synchronization among oscillators, thus taking both amplitude and phase into account. The performance of each method is evaluated with a music database with meter annotation.

Results

(1) Both the GrFNN model and other methods well matched the human responses to simple rhythms, but the former performed better for complex rhythms by capturing the bistability of tapping phase for highly syncopated rhythms. (2) The overall performance was comparable for the three estimation methods, but they had different types of error: the selection of non-metrical frequencies for peak picking, and duple-triple confusion for template matching and pattern formation. We discuss possible improvements for each method.

Conclusions

We observe that the oscillator network model provides a psychologically realistic model that captures the complexities of human rhythm perception. Moreover, meter can be successfully estimated from an oscillator network that takes into account flexible forms of perception.

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Using Unimanual and Bimanual Tapping to Explore Sychronisation with Musical Rhythmic Layers

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Background

Tapping to a rhythm commonly occurs when listening to music, and the tapping paradigm has frequently been used to study sensorimotor synchronisation. However, even though bimanual tasks have been extensively studied in various branches of psychology and bimanual synchronisation is central to playing many musical instruments, bimanual tapping to music has been the subject of only a limited number of studies.

Aims

We present two experiments where two modes of finger tapping (unimanual and alternate bimanual) are employed to explore how participants synchronise to the different rhythmic layers of a set of musical patterns and metronomic cues. Experiment 1 was designed to study how people perform at different rates and find out if the tapping modality has an effect on the performance. In experiment 2 we aimed at finding out if the tapping modality and the morphology of rhythmic patterns have an effect on the perception of the internal beat (i.e. the pulse) of musical rhythms played at the same tempo.

Method

Exp. 1: In order to find reliable synchronisation rates for each tapping mode, participants were asked to tap 1:1 to an isochronous click track played at 16 different rates, from very slow (33 BPM) to very fast (715 BPM). Exp. 2: Participants were asked to tap at their preferred rate to a set of musical patterns consisting of 4 instruments (bass drum, snare drum, hi-hat, bass) assigned to 4 rhythmic subdivisions (whole note, half note, quarter note, eighth note). All the possible combinations between instruments and subdivisions were presented, resulting in 24 musical stimuli for each tapping mode, all played at 120 BPM in 4/4 time. Participants performed the tasks by tapping on a low-latency touch pad.

Results

Experiment 1 showed that the best performances for both tapping modes were found between 83 and 150 bpm, where more than 95% of taps were considered successful and absolute mean asynchronies were below 50 ms. At fast tempi (366-715 BPM), alternate bimanual tapping mode yielded tapping sequences with significantly lower coefficient of variation of asynchronies

($p = .002$) and with a higher percentage of successful taps ($p < .001$). Experiment 2 showed that the mean inter-tap interval (ITI) of the tapping sequences in bimanual mode was significantly lower ($p = .014$), thus suggesting that tapping in bimanual mode induced synchronisations with faster rhythmic subdivisions of musical patterns playing at the same tempo. A correlation between a distance measure between the rhythmic patterns and the variability of preferred synchronisation layer showed that participants tapped more consistently with patterns similar to popular rhythms (both modes $p < .05$).

Conclusions

Results suggest that patterns closer to highly-codified rhythms are likely to induce the same synchronisation rate more often. The analysis of the mean ITI shows that tapping modality has a significant effect on internal beat perception, as participants preferred to synchronise to smaller rhythmic subdivisions when tapping bimanually. This, together with the results of the first task, indicates that the bimanual mode affords more stable and spontaneous synchronisation with finer-grained rhythmic layers.

L2P: Long Talks 2 - Meaning

Time: Tuesday, 24/Jul/2018: 21:00 - 22:00 · *Location:* La Plata

Session Chair: Julian Cespedes-Guevara

Constructing the conceptual meaning in music: Imaginative dimensions and linguistic descriptions

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Background

The theoretical-methodological contribution of the so-called embodied cognitive sciences became absorbed by musicological research in the 1990s (Brower, 2000; Cox, 1999; Godøy & Leman, 2010; Hodges, 2016; Larson, 1998; Saslaw, 1996; Zbikowski, 1995, 1998). The early years of investigation on musical meaning under this approach unequivocally demonstrated its remarkable potential for application to the domain of musical semantics. I have been discussing in previous studies, that when we experience the musical stream, we appropriate it in three concurrent dimensions of imaginative production: (a) categorizing its distinctive sonic traces in the form of "movements," from the variability of the sound state of the flow; (b) producing formal images profoundly stylistic, resulting from habituation and hence from the recognition of invariance, recurrence, and contrast of patterns; and (c) establishing a communicative exchange between the imaginative aspects of mind and the object of listening, which implies orientation responses, tensions, expectations, and intentions.

Aims

I discuss in this paper the validity of the hypothesis that the linguistic descriptions of our musical understanding are configured by the attentional focus of the descriptor, which sometimes emphasizes one or another of the imaginative dimensions mentioned above. I argue the events perceived as novelty and rupture on the musical stream stasis, determine the production of perceptual hierarchies of the listeners and regulate their formation of the meaning.

Main Contribution

We only have objective access to the production of the musical understanding in its linguistic level, admittedly more restricted than the cognitive level in which the meaning is not yet a concept. The confrontation between indicators of orientation responses and linguistic descriptions can offer the most relevant clues as to how we construct the conceptual understanding of music.

Implications

The development of a strictly enactivist model of investigation of the modes of conceptualization of the musical understanding can offer unprecedented access to the path that goes from the concept towards the meanings that are not yet concepts.

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Neural Systems underlying Music's Affective Impact in Film

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Background

Music elicits distinct connotations, which are the outcome of associations made between its structural characteristics and different objects, concepts or states belonging to the extra-musical world. This connotative dimension of musical information has been frequently employed in film sound to influence the emotional comprehension of visual narratives. Film theorists have long acknowledged the affective function that music performs in film, and during the past two decades several empirical studies have shown that music does in fact exert a significant influence upon the perception and interpretation of visual information. However, to date, the precise neural underpinnings implicated during this processes remain unexamined.

Aims

The present paper describes a pilot audiovisual fMRI paradigm, which was designed to explore the neuro-cognitive systems underlying the spontaneous retrieval of music-evoked associations within the movie-viewing experience.

Methods

The experiment requires participants to emotionally interpret ambiguous visual information biased by musical cues. Situations that entail perceptual uncertainty rely on prior beliefs (i.e. contextual memory) to inform our perception; consequently, they facilitate the use of methods that can illuminate the ways in which associations elicited by the music may influence the interpretation of the visual discourse. The task is constructed in the form of an audiovisual film clip with two possible background music conditions. Participants are instructed to attend to the mental states (emotions) of a character on-screen. In order to investigate brain regions in individual subjects that are selectively engaged during the ascription of mental states based on the manipulation of musical structures, two control conditions are included: i) visual-only: film clip with no soundtrack; ii) non-ToM: the audiovisual film clip is tested with an instruction to describe the "physical" appearance of the character (control for multimodal sensory processing, working memory and attentional demands of the task, without cueing subjects to attend specifically to mental states).

Results

fMRI results from exploratory power analyses revealed increased activation of rostral medial prefrontal cortices (mPFC) and bilateral engagement of the middle cingulate gyrus (MCC) during the encoding of musical structures that elicited negative valence mental state inferences.

Conclusions

Both the mPFC and the MCC respond consistently to empathy for pain felt by the self or by the knowledge that a significant other is in pain (Singer et al., 2004), which shows that their response is not only elicited during reflection upon one's own feelings but also during inferences about the internal emotional states of others. Our neuroimaging data indicates that the encoding musical structural features used to infer other's mental states during film viewing could rely on similar neural substrates, reflecting potential modulatory effects of music on self-projection processes (Buckner & Carroll, 2007) that are used to inform and conceive the mental states of others.

References

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S7M: Symposium 7 - Shared Musical Experience as Shaping and Shaped by Interpersonal Dynamics

Time: Tuesday, 24/Jul/2018: 21:00 - 22:30 · *Location:* Montreal_2

Session Chair: Auriel Lassyn Washburn

Background

Music is an inherently social activity whether it is the result of a group of people engaging together or one or multiple people performing for an audience. Previous research on music and social connection has demonstrated that shared experiences of rhythmic timing and affective states as facilitated by music begin in infancy (Phillips-Silver & Keller, 2012) and can engender prosocial behavior outside of musical contexts across human lifespans (Cirelli, Einarson & Trainor, 2014; Hove & Risen, 2009). Recent studies have also begun to examine musical interaction with the aim of better understanding human interaction in general (e.g., D'Ausilio et al., 2015).

Aims

This symposium includes work investigating the relationships between musical constraints such as performer roles, and metric structure on the coordination of performers and audience members as well as the effects of social-personality traits and prior shared experiences on musical actions and perceptions.

Contributors

Washburn, A., Román, I., Huberth, M., Gang, N., Dauer, T., Reid, W., Nanou, C., Wright, M., & Fujioka, T. The effects of musical role asymmetries in piano duet performance on neural alpha-band oscillation and behavioral synchronization.

Chang, A., Livingstone, S. R., Kragness, H. E., Bosnyak, D. J., & Trainor, L. J. Coupled body sway reflects coordination, leadership, and emotional expression in joint music performance.

Wen, O. X., & Zayas, V. Shared experiences change perception of groove and promote social affiliation

Main Contribution

Among the studies included in this symposium, interaction and coordination between individuals are measured using electroencephalography (EEG), keyboard key press timing, postural sway, and affiliation ratings. These measures reflect relations between musical performers and listeners, as well as individuals interacting outside of a musical context who have shared musical experience. As such, the findings presented in the current symposium serve to extend our knowledge of the dynamic interaction between shared musical experience and the relational and collective behaviors of socially-situated individuals.

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The Effects of Musical Role Asymmetries in Piano Duet Performance on Neural Alpha-band Oscillation and Behavioral Synchronization

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Background

Social coordination is shaped by between-agent asymmetries, including co-actors' respective perceptual-motor abilities and task goals (Richardson et al., 2016). Neural correlates of such asymmetries have been identified (Konvalinka et al., 2014). Here decreased frontal alpha-band (8-13 Hz) power, observed during attention to a co-actor (Vanderwert et al., 2013), was differentially associated with distinct joint-task roles. Music ensemble performance contains many such co-performer asymmetries, affecting coordination across timescales (Wing et al., 2014).

Aims

This study empirically investigates effects of three levels of asymmetry in piano duet performance: 1) performer animacy (human-to-human vs. human-to-non-adaptive computer), 2) musical role (starting vs. joining) and 3) musical task (similar vs. different parts). We examine how these asymmetries interact to influence behavioral timing and neural oscillations during unison performance.

Method

Pianists were paired and alternatingly played six-note phrases twice before playing in unison in the fifth phrase which was identical across all duets. The melodic patterns of the alternating parts within a duet were either similar or different.

Each pianist acted as starter and joiner for one 'similar' and one 'different' duet and played the remaining two duets with a non-adaptive computer partner. Electroencephalography was recorded simultaneously from both players, and a group of six frontal-midline electrodes were analyzed for phrase five. Starter and joiner alpha-power were assessed separately as the starting performer played the first three notes of this phrase alone. Fifteen pianists' data are retained.

Results

Reduced note-onset asynchrony between performers was observed for human compared to computer partners for both starters, $F(1, 14) = 29.76$, $p < .001$, and joiners, $F(1, 14) = 6.61$, $p = .02$. A significant interaction between the effects of duet similarity and partner on alpha-power occurred in starters, $F(1, 14) = 7.96$, $p = .014$, with expected alpha desynchronization not observed in the 'similar' condition during interaction with a computer partner.

Conclusions

Reduced temporal synchrony with a computer partner likely resulted from the lack of computer partner timing adaptability. Despite the fact that the unison phrase was identical across conditions, similarity between co-performers' musical parts leading to the unison affected alpha-band power decreases during unison related to attentiveness to one's co-performer. Specifically, for the similar condition, less engagement with a joining computer co-performer was found. Thus, the relative independence of ensemble performers is particularly influenced by musical similarities between parts, which further interacts with timing related factors in the ensemble structure.

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Coupled body sway reflects coordination, leadership, and emotional expression in joint music performance

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Background

Joint action and interpersonal coordination are essential for daily life, but the mechanisms are not well understood. The main obstacles for investigating interpersonal coordination include (1) the trade-off between ecological validity and experimental control, (2) the lack of dependent measurements that quantify the time course of interpersonal dynamics, and (3) difficulty dissociating directionality. The current study aimed to overcome these obstacles by proposing that (1) a music ensemble is an appropriate model for balancing ecological validity and experimental control, (2) body sway can be used to quantify interpersonal coordination, and (3) Granger causality analysis can reveal the magnitude and directionality of interpersonal coordination.

Aims

We conducted two experiments to investigate whether body sway reflects different aspects of joint music performance. In Experiment 1 (Chang et al., 2017), we investigated whether the total body sway coupling within an ensemble reflected the quality of interpersonal coordination, and whether the coupling revealed a leader-follower relationship. These two aspects of interpersonal communication are essential for many forms of joint action. In Experiment 2, we investigated whether body sway coupling also reflected joint emotional expression, a quality that is essential for joint action in aesthetic tasks such as music playing and dancing.

Methods

In both experiments, body sway was tracked using motion capture, with markers placed on performers' headbands. Movement time series were analyzed with Granger causality to quantify the magnitude and direction of interpersonal coupling. Two string quartets participated in Experiment 1, and one piano, violin and cello trio in Experiment 2. In Experiment 1, we confidentially assigned different performers to be the leader in different trials, and investigated whether coupling direction and magnitude were modulated according to leadership. In Experiment 2, the performers played each of 12 music pieces with or without musical expression, and we examined whether these factors modulated the coupling magnitude. In both experiments, the performers rated their own performances after each trial.

Results

The results of Experiment 1 confirmed that total coupling magnitude was positively associated with self-rated performance goodness ($p = 0.015$). Coupling magnitude of leader-to-follower was also higher than follower-to-leader or follower-to-follower (p-values < 0.001). These effects were replicated with a second quartet. In Experiment 2, coupling magnitude was higher when pieces were played with rather than without expression ($p = 0.004$). This coupling magnitude was positively associated with self-rated emotional intensity ($p = 0.004$).

Conclusions

These two studies demonstrate that body sway instantaneously reflects aspects of interpersonal coordination, including coordination quality, leadership, and emotional expression. Methodologically, we show that a music ensemble can be a useful model for investigating interpersonal coordination, and that Granger causality analysis can reveal the magnitude and direction of interpersonal dynamics. These findings extend our understanding of joint music performance, and these methodological advances can be widely applied to investigate other forms of social interaction.

References

Chang, A., Livingstone, S.R., Bosnyak, D.J., & Trainor, L.J. (2017). Body sway reflects leadership in joint music performance. Proceedings of the National Academy of Sciences of the United States of America, 114(21), E4134-E4141.

Shared experiences change perception of groove and promote social affiliation

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Background

Although music listening often takes place in social settings, most work assesses music perception of individuals alone. How might music perception, such as groove (Janata et al., 2012), be affected by shared experiences? We considered two opposing positions. Listening to music in the presence of another could lead to an amplification effect, where the perceptions of low vs. high groove music are more pronounced than alone (Boothby et al., 2014). However, based on work where music was rated as happier after listening alone compared to with a partner (Zhang et al., 2017), solitary listening could lead to amplification. Findings of the present work will shed light on the social context required for a music listening experience to be considered a shared experience.

Aims

The study explores how listening to music in different social contexts affect music perception and social affiliation.

Method

Participants rated grooviness, enjoyment, and familiarity after listening to each instrumental excerpt from Janata et al. through headphones. The Alone condition (N = 71) is the control condition. In the Pair-NoShare condition (N = 72), participants listened to different music in the presence of a partner (someone not known to the participant), which resembles scenarios such as listening to music in the library and in silent disco. In the Pair-Share condition (N = 73), participants listened to the same music in the presence of a partner, which to some extent resembles scenarios such as music festivals and concerts.

Results

We found a diverging effect on groove ratings depending on the social context. Compared to Alone, Pair-NoShare enhanced groove ratings, where listeners rated high-groove music (categorized based on Janata et al.'s perceptual ratings) groovier and low-groove music less groovy. In contrast, Pair-Share dampened groove ratings, where listeners rated high-groove music less groovy and low-groove music groovier. Although nonsignificant, the pattern of results for enjoyment ratings were in the same direction as groove ratings. Social contexts also yielded psychological benefits. Compared to before music listening, Pair-NoShare improved listeners' mood and Pair-Share improved social affiliation with not only the partner but also people in general.

Conclusions

Listeners coped with social contexts differently depending on whether or not the music was shared. Without sharing music, perceptual sensitivity towards the music and mood were both enhanced. When sharing music, perceptual sensitivity towards the music was dampened as a trade-off for stronger social affiliation. The awareness of a stranger's presence might have facilitated listeners to stay on task while filtering out the social context. However, the realization that music is shared with a stranger might have shifted listeners' focus to better incorporate the social context.

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L1M: Long Talks 1 - Singing and Development

Time: Tuesday, 24/Jul/2018: 23:00 - 23:59 · *Location:* Montreal_1

Session Chair: Andrea R. Halpern

The Role of Singing Accuracy and Imagery Self-Report in Auditory Imagery Tasks

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Background

Auditory imagery underlies many musical tasks, including good pitch imitation, and can be measured by self-report and in objective tasks. Pfordresher and Halpern (2013) showed that poor pitch imitators reported lower auditory imagery vividness on a self-report scale. A subsequent study (Greenspon, Pfordresher & Halpern, 2017) found that the poor pitch imitators showed degraded ability to form auditory images of novel short tunes that they were then told to manipulate. This perceptual-motor mapping was further explored in two studies.

Aims

One study extended the auditory imagery task to familiar melodies. As the task was difficult with novel tunes, we asked if having a prior memory representation would increase performance, particularly in poor imitators. A second study used EMG recorded from the face and neck to see if better pitch imitators differed from poor imitators in activation of the motor system when imagining tunes, given that (sub)cortical motor system activation is sometimes seen in the brain during imagery tasks.

Methods

Familiar/Unfamiliar Tune experiment: participants compared two melodies (Familiar or matched Unfamiliar melodies) in a same/different (one changed note) task: the target was either repeated or was presented in reverse order, transposed, or shifted serially. Pitch imitation accuracy, imagery vividness and control, and forward and backward digit span were predictors.

EMG experiment: we measured laryngeal and orofacial muscle activity during preparation for singing and also a control task of visual imagery. In the auditory task, participants listened to a four-note melody, imagined the melody, and then sang it aloud. In the visual task, participants studied an array of objects, imagined the array, and then were probed about a single object's location.

Results

In the Familiar/Unfamiliar Tune experiment, using familiar tunes did improve performance. Singing accuracy and pitch discrimination predicted performance in all conditions. Only self-reported vividness and control of imagery predicted performance for repetitions of familiar tunes. Only STM (digits forward) predicted recognition of unfamiliar tunes in all conditions.

In the EMG study, when controlling for baseline activity, subtle motor activity near the larynx and lip was larger in auditory compared to visual imagery. Worse pitch imitators showed larger laryngeal responses than better pitch imitators. Imagery vividness, assessed on each trial, correlated positively with both imagery tasks.

Conclusions

These experiments extend our understanding of perceptual-motor mapping in auditory imagery. The first experiment suggests a dissociation. Whereas imagery formation may be the critical stage in representing familiar tunes, unfamiliar tunes may need to draw on the "computing power" of STM as is needed in imagery manipulation. The second study links auditory imagery to supportive motor behavior, as the increased activity in poorer pitch imitators implies an attempt at compensation. Auditory imagery is clearly not one entity but has many components, which selectively support musically relevant behaviors.

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Characteristics of Infant-directed singing and speech in early development

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Background

There has been an abundance of research in the last 30 years exploring the special vocal communication primarily directed to infant listeners. However, infant–directed (ID) speech has received more research attention than ID–singing, although singing to infants is a universal caregiving practice around the world.

Aims

To reach a better understanding of the role and structure of these two different ID inputs, we discuss how the acoustics and infants' perception of ID singing and speech converge or differ.

Method & Results

In the first part of our talk, we present examples from two corpora of naturalistic ID singing and speech (German, French, Russian; Falk, 2009), and a more controlled lab corpus (German; Falk & Kello, 2017). Using a head-turn preference procedure, we examine infants' ability to perceive and categorize naturalistic ID singing and speech in a native and foreign language. Sixty-six 6- to 9-month-old infants from English-speaking households listened to native Russian-speaking and native English-speaking mothers speaking or singing to their 6-months-old infants. We found that infants listened significantly longer to the sung stimuli compared to the spoken stimuli, in particular to stimuli presented in their non-native language (i.e., Russian). This finding shows that infants discriminate between both sets of stimuli and are highly attracted to properties of ID singing (Tsang, Falk, & Hessel, 2017).

In the second part of our talk, we discuss which acoustic properties could influence infant preferences for ID speech vs. singing as well as adult- vs. ID speech and singing. Recent research illustrates the difficulties in capturing the characteristic form and function of ID registers that arise from substantial variability in the acoustic structure (e.g., Martin et al., 2015). We present a novel method ("temporal event clustering", Abney, Paxton, Dale & Kello, 2014; Falk & Kello, 2017) that very efficiently characterizes differences between adult-directed and ID speech and singing taking temporal variability as a point of departure. The method, which is fully automized, allows to determine the degree of nested clustering of temporal events in speech. "Events" are derived from peaks in the amplitude envelope, and peak clustering and the nesting of these clusters are determined at varying timescales. Analyses on ID and AD story reading and playsong singing of 15 German-speaking mothers with their infants showed that ID speech and song display significantly more temporal clustering and hierarchical nesting compared to AD speech and song. We discuss how this feature could foster infants' perceptual processing and preference of ID stimuli.

Conclusions

Overall, we argue that ID singing complements ID speech as a critically important stimulus for infants' perception and learning in the first year of life. In the future, ID–singing should be investigated with its unique features and functions compared to ID speech and AD registers.

L2M: Long Talks 2 - Rhythm

Time: Tuesday, 24/Jul/2018: 23:00 - 23:59 · *Location:* Montreal_2

Session Chair: Justin London

Where is the beat in that note? Effects of attack, frequency, and duration on the p-centers of musical and quasi-musical sounds

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Background and Aims

The perceptual center of a sound (P-center) is the specific moment at which it is perceived to occur (Morton, Marcus & Frankish 1976). While well-studied in speech (Villing 2010), musical P-centers have received less attention, though Wright (2008) found they are not congruent with a sound onsets. Here we report on two experiments aimed at investigating the effect of rise time, frequency range and sustained versus decaying amplitude on the P-centers of musical and quasi-musical sounds.

Methods

Stimuli in Exp1 were eight samples of acoustical and electronic instruments which contrasted short vs. long attack, high vs. low center frequency, and sustained vs. rapidly decaying duration; in Exp2 analogous stimuli were created using bandpass filtered white noise. All stimuli were looped and presented at an ISI of 600ms. In both experiments in one block of trials participants aligned a clicktrack to the stimuli; in another block they tapped along with clave sticks. There were 20 participants in Exp1 and 24 in Exp2.

Results

In Exp. 1 Mean click alignment varied from 1 to 23ms after stimulus onset (StDev 7-28ms) and mean tap alignment varied from -4 to +17ms after onset (StDev 13-18ms). RM ANOVAs for both conditions showed main effects of Attack, Frequency, and Duration. Attack had a greater effect in click trials, and Duration had a greater effect in tap trials. In Exp. 2 Mean click alignment varied from 5 to 34ms after onset (StDev 15-21ms) and mean tap alignment varied from 0 to 26ms after onset (StDev 17-20ms). RM ANOVAs for both conditions showed main effects of Attack and Duration, but not of Frequency.

Main findings

- - P-Centers occur later with slower Attacks and longer Durations.

- - Frequency affected P-Center location only in Exp1, and only with longer Durations.

- - Mean P-Center variability is a useful dependent measure, but not in Tapping trials.

- - Tapping trials tend to locate P-Centers earlier than Click trials, especially with shorter Durations.

Conclusions

The location and width (i.e., variability) of musical P-centers are dependent on both stimulus factors (Attack, Duration, and Frequency) and experimental task (tapping vs. click alignment). Both experiments support the thesis that P-centers are flexible “bins” rather than points in time (Danielsen et al., 2015), and together show the need for multiple response methods in studying sensorimotor perception and action.

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Examining the Effects of Rhythmic Variability and Metric Structure on Tempo Agreement in Bach's Solo Violin Music

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Background

Previous research studied the relationship between rhythmic variability and tempo agreement in Bach's Well-Tempered Clavier (Schutz, Herbert-Lee, & Siminoski, 2016). Results indicate that pieces with low rhythmic variability are performed in a wide range of tempi, while the tempi of pieces with greater rhythmic variability is more similar across performers. Rhythmic structure may therefore have a significant impact on overall tempo choice.

Aims

The present study aims to test that hypothesis with another large set of Bach's pieces, the six sonatas and partitas for unaccompanied violin. These pieces are amongst the most important in the violin repertoire and have been recorded by dozens of violinists on both period and modern instruments. Amongst the 32 individual movements are Baroque dances, variation forms, fugues, and moto perpetuo pieces.

Method

Performances of 40 expert violinists were taken from commercial recordings, spanning 1934-2017. The tempo of each movement was calculated by dividing its total duration by the number of measures, with that IOI used to determine the nominal tempo of various metric levels. In order to compare tempo agreement between movements, tempo variability within each movement is expressed as the coefficient of variation. Rhythmic variability was calculated using the normalized Pairwise Variability Index (nPVI).

Results

Results do not completely replicate those of the Well-Tempered Clavier study, with many of the isochronous violin movements being performed in a narrow tempo range and pieces with the highest nPVI exhibiting lower tempo agreement. In response to this result, measurements of rhythmic variability were combined with an analysis of metric structure. Results suggest that tempo variability is affected by the number of present metric levels, the ratio between those periodicities, and the number of pulses that lie within a perceivable beat range (London, 2012). Tempo choices are constrained when metric structure allows for only one likely perceived beat, thus resulting in stronger tempo agreement between performers. Conversely, the highest tempo variability occurs in pieces with more than one possible beat, suggesting that multiple perceptual options allows for multiple "right" performed tempi. In addition, a wider range of tempo choices occurs in movements with multiple triple metric levels and in slow tempo pieces where the appropriately paced tactus corresponds with the notated beat division or subdivision and thus serves a more ornamental role relative to the overall melodic and harmonic structure.

Conclusions

The results of this study support the hypothesis that tempo choices are influenced by the structural characteristics of a piece, with both rhythmic variability and metric organization explaining tempo variability across multiple performances of the same piece. Further research will investigate the relationship between rhythmic variability (nPVI), metric structure, and timing variability (rubato).

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L1S: Long Talks 1 - Movement and Perception

Time: Tuesday, 24/Jul/2018: 23:00 - 23:59 · *Location:* Sydney

Session Chair: Emery Schubert

Expressive body movements of professional flautists preparing and performing solo flute repertoire

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Background

There is much debate amongst flute teachers and performers regarding body movement in flute performance. Some body movement is necessary to produce sounds physically on the flute (particularly with extended techniques), and some body movement relates to communicating the expressivity of the music, while other aspects communicate individual differences and relate to aspects such a personality, individual movement style, etc. Opinions differ regarding the extent of which body movement is incorporated in flute performance, and how consciously it is generated. Although these issues are often informally discussed in performance contexts, no systematic research has examined which body movements in solo flute performance are considered expressive, and whether similarities occur between flute players. Moreover, no prior research has examined the development of body movements from first learning a piece, to its final performance.

Aims

This research aimed to (1) identify commonly used expressive body movements generated by flautists in performance, and (2) compare flautists' body movements between sight-reading and mastery of a solo flute piece.

Methods

Thirty advanced flautists were given the same musical stimuli, with either standard notation or extended techniques, to sight-read, practise, and perform five times, with one rendition selected as the final 'performance take'. Following their performance, participants re-watched their final 'performance take' to carry out a self-critique. Laban Effort Action analysis was applied to the video data: (1) to produce a corpus of commonly used expressive body movements, and (2) to track changes in body movements from the initial sight-read through to the final 'performance take'. In conjunction to the objective Effort Action, qualitative data collected from the self-critique sessions were subjected to content analysis coding to provide further individualised examinations of each performer's body movements.

Results

Ongoing analyses reveal a small repertoire of commonly used expressive body movements amongst flute players, and that differences in body movements exist between flautists performing repertoire with standard notation or extended techniques. Findings also indicate some expressive body movements are generated at the sight-reading stage of preparing a new piece and are then continued and expanded upon through the practising and final performance stages.

Conclusions

Research regarding expressive body movement in performance has the potential to contribute new knowledge in both practical and academic contexts. Flute teachers and performers can benefit from a greater self-awareness of body movements in performance; thus, helping younger students to understand musical phrasing through physical bodily experience, and enabling better communication between performer and audience. Future research will build upon this study by investigating perception of expressive body movements in solo flute performance.

Effect of Short-Term Motor Training on Rhythm Imagery Accuracy

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Background

Mental imagery of rhythm has been relatively unexplored, partly due to the difficulty of maintaining tempo in silence. Maintaining tempo of isochronous beats, in both silence and white noise, is easier when finger tapping than when relying on imagery alone (Manning & Schutz, 2015).

Aims

In a series of experiments, our aim was to firstly develop a new paradigm to induce rhythm imagery, and secondly to test if short term motor training could improve rhythm imagery performance.

Methods

We developed a Rhythm Imagery Task (RIT) to measure rhythm imagery accuracy during silence. The RIT presents a rhythmic piano pattern, including a bass drum on the downbeat (0.625 Hz). A continuation period then follows, where the bass drum maintains tempo, and participants imagine the piano pattern between downbeats. A piano probe is then played, and participants must judge whether the probe is accurately timed within the pattern. A motor version of the task was also designed, where participants were required to tap out the piano rhythm during the continuation period.

Experiment 1: Musicians (N=26) and Non-Musicians (N=26) completed the RIT (n=80 trials) and a pitch imagery task (Gelding, Thompson, & Johnson, 2015).

Experiment 2: A separate group of Musicians (N=26) and Non-Musicians (N=26) first performed the motor version of the rhythm task (n=40 trials), then completed the RIT (n=40 trials).

Experiment 3: A new group of participants (N=39) with a range of musical sophistication, first completed 40 trials of the RIT, followed by 40 trials of the motor condition, followed by another 40 trials of the RIT. To investigate whether improvement occurs due to auditory feedback in tapping, half of the participants tapped in white noise whilst the other half tapped in silence. All imagery took place in silence, with the bass drum maintaining downbeat tempo.

Results

Experiment 1: Performance on the rhythm and pitch imagery tasks were significantly but moderately correlated, suggesting rhythm and pitch imagery are at least partially dissociable.

Experiment 2: Participants who experienced the motor practice performed significantly better at the RIT than those who did not (experiment 1). Performance accuracy was significantly correlated with the Goldsmith Musical Sophistication Index (GOLD-MSI). Musicians did not perform significantly better than non-musicians.

Experiment 3: Accuracy in the motor condition was significantly better than in the imagery conditions, for both the silence and white noise groups. Imagery accuracy after motor training was also significantly better than before.

Conclusions

Taken together, these studies show that successful performance on the RIT requires precise timing of musical imagery. Short-term motor training improved rhythm imagery accuracy, regardless of whether the tapping was completed in silence or white noise. These findings support the interpretation that the brain's motor systems are needed for accurate imagery of rhythm.

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L1P: Long Talks 1 - Development

Time: Tuesday, 24/Jul/2018: 23:00 - 23:59 · *Location:* La Plata

Session Chair: Nadia Justel

Infant Soundscapes: Differences in the Music Environments of Infants from the United States and Tanzania

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Background

There is extensive research on infants' language environment showing the profound and long-lasting effects that the quantity and quality of exposure to speech has on the development of their language skills (e.g., Hurtado et al, 2008). Research on infants' musical environment is not as plentiful and is based almost exclusively on parental questionnaires and interviews (e.g., Barrett, 2009).

Previous findings using daylong recordings of infants and their families show that caregivers overestimate the duration and frequency of musical episodes (name deleted, 2016, in press, in press). The discrepancy between reported and actual exposure to music highlights the extent to which caregivers consider music and singing as memorable and valuable experiences during the first years of life. It is important to note, however, that most research on infants' home music environment has been conducted with infants and families representative of Western cultures. Because diverse social and cultural contexts have not been adequately represented and assessed, it is unclear whether infants of different backgrounds share similar musical experiences.

Aims

Our project aims to extend our understanding of music in early childhood by describing the similarities and differences in the home musical experiences of infants from the United States and Tanzania using parental self-reports as well as behavioral data gathered from the perspective of the infants in their homes.

Methods

Infants (n=12 American, n=20 Tanzanian) wore a portable recording device during an entire day that captured all sounds produced near them as well as their own vocal production continuously for up to 16 hours. The sound files were analyzed with specialized software and through repeated listening to identify relevant language and music indicators.

Results

The analysis of home music environments suggests that there is considerable variation in the characteristics of the music interactions in which infants participate, even across families of similar SES and cultural background. Overall, the initial results suggest that cross-cultural differences in caregiving behavior may provide infants with different types of musical experiences. For example, American mothers reported singing frequently to their infants, yet, behavioral data showed that they did so for very short periods of time. Tanzanian mothers, on the other hand, rarely reported singing to the infants but the behavioral data showed that indeed they did so. American infants were immersed in digital sounds produced by toys and electronic devices, something that was more rear in Tanzanian homes. But Tanzanian infants were exposed to a larger variety of sounds produced by people around then and immersed in more social interactions with other children than were American infants. Such experiences are likely to shape the way in which the infants learn music and become active participants in their own musical culture.

Functional Connectivity Changes Induced by Musical Training during Development.

Lucero Pacheco[3], Nadia González[2], Roberto Velasco-Segura[4], Pablo Padilla[1]

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Background

Musical training has been shown to roughly but consistently improve some cognitive abilities, such as: reading, vocabulary, sequencing verbal information and memory (Forgeard, et.al. 2008;Piro and Ortiz, 2009; Schellenberg, 2011). These findings suggest a sensitive period effect when training begins before age 7. A sensitive period is “a time during development when experience has a differential effect on behavior and the brain” (Penhune, 2011).

Aims

This work focuses on the functional connectivity changes induced by musical training during development.

Methods

In prticular, we used rsMRI to study differences of two groups of people, one with musical training, and a control group with no musical training. A total of 80 healthy subjects, 37 children (23/14) ages 8-12 yrs and 43 adolescents (28/15) ages 13-18 were considered for this study. Functional brain connectivity is studied through path length, clustering coefficient and global efficiency. Additionally, cognitive ability measures were obtained through the age appropriate scales WAIS, WISC and Woodcock-Muñoz.

Results

We found that the main differences between the functional networks occur before age 12. The formation of a phonological network was observed and found to have a higher efficiency index in musicians (0.3175) than in non-musicians (0.2447). It was also found that two networks that literature has reported to be involved in reading and language acquisition, and a language processing network are more efficient in musicians, with an efficiency index of 0.3134 in musicians and 0.2325 in non-musicians. There were no significant changes in the formation of modules or the network parameters in adolescents.

Conclusions

The cognitive results found are consistent with these findings. There were statistically significant results in the scores of reading speed (94/108 p=0.31) and the verbal comprehension index (104/119 p=0.004).

These results suggest that music could reinforce language acquisition, but during adolescence there are other environment factors that should be considered.

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L3M: Long Talks 3 - Emotion and Improvisation

Time: Wednesday, 25/Jul/2018: 0:00 - 1:00 · *Location:* Montreal_1

Session Chair: Manuel Alejandro Ordás

Fate knocking at the door: Frontal responses to tragic and joyful musical themes in classical sonata form

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Background

It is generally recognized that major-mode music tends to express the emotional states with positive valence, whereas minor-mode music tends to express emotional states with negative valence. Part of the joy of appreciating music is to experience various emotions, including positive and negative emotions. A recent psychological model for the paradox of art and negative emotions emphasized two groups of processing components: cognitive-appraisal-driven distancing, and embracing the powers of negative emotions (Menninghaus et al., 2017). However, the neural processes underlying our appreciation of musical pieces conveying negative emotions are poorly understood.

Aims

The aim of the present study was to delineate the neural mechanisms underlying anticipation and receipt of musical themes of joyful character (in major-mode keys) and themes of tragic character (in minor-mode keys).

Methods

All the stimuli were excerpts from the first-movement sonata form, which used tension-resolution patterns for theme recurrence. The theme recurrence at the beginning of the recapitulation coincides with the release of tonal/harmonic tension (Tsai & Chen, 2015; Webster, 2001). In the other words, the passage before the theme recurrence often evokes listener's anticipation via heightening the musical tension. We defined the bar immediately before the theme recurrence as "Theme-Anticipation", and the end of the first phrase of theme recurrence as "Theme-Receipt". Functional magnetic resonance imaging data of 17 participants were analyzed.

Results

We found that anticipation to tragic and joyful themes was commonly associated with increased activity in the superior temporal pole and lateral orbitofrontal cortex compared to the control (random atonal music). The inferior orbitofrontal cortex, rostral prefrontal cortex, and inferior frontal gyrus showed increased activation for anticipation to joyful themes compared to tragic themes. This result may suggest the effect of musical emotion valence on preparatory attention and reward processing. Moreover, activity in the right inferior frontal gyrus and right rostral dorsal premotor cortex was greater for the receipt of tragic themes compared to joyful themes. These two regions may contribute to cognitive reframing of negative affect in appreciation of tragic music.

Conclusions

These results have significant implications for musical tension and the specific aesthetic role of negative emotions. In line with the distancing-embracing model for the paradox of art and negative emotions (Menninghaus et al., 2017), anticipation to tragic musical themes may be associated with taking a detached perspective, whereas the receipt of tragic musical themes were likely to evoke negative emotions in listeners, and they would use reappraisal-based emotion regulation strategies to cope with this musical event.

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Shared musical and movement features in free jazz improvisation

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Background

When individuals coordinate their behavior, they need to both anticipate actions and respond to each other in meaningful ways. Jazz musicians often encounter situations in jam sessions in which they interact with other musicians for the first time. Comparable to interactions in social situations such as dyads in sports or turn-taking in conversations, free jazz improvisation is highly spontaneous with a limited set of musical rules and corresponding mental representations (Berliner, 1994; Hadley et al., 2015). The current study investigated call and response patterns in jazz improvisations by analysing movement and musical characteristics in duos, and by contrasting different emotional expressions in these improvisations.

Aims

If jazz musicians "tune into" each other's play (cf. Seddon, 2005), then this should be manifest in their shared actions. Thus it was assumed that there is some correspondence in the bodily actions between musicians in call and response situations, and that they can decode each other's expressive intentions. Second, it was hypothesized that these shared performance parameters differ for conditions with contrasting emotional expressions.

Method

Twelve jazz musicians were invited as duos of an e-guitar and a saxophone. Balanced across duos, one musician was asked to play a series of improvisations expressing the emotions happy, sad or neutral. The second musician responded to each improvisation without knowing the emotional intention of the first musician. Call and response roles were then exchanged. While musicians improvised or listened to their duo partner, they were both recorded with an optical motion capture system.

Results

There were significant correlations between call and response musicians in movement variability and cumulative distance of the head motion, indicating that musicians mirrored movement features of their duo partners even when listening. Furthermore, happy and sad emotional expressions led to significant differences both in movement parameters and musical features including mean intensity, mode, and, albeit to a lesser extent, tempo. Retrospective verbal decoding of the call musicians' emotional intentions was correct in 76.5% of all cases.

Conclusions

Independently of explicit decoding success and even for the first encounters, musicians tuned into each other's performances by means of their body movements and musical characteristics in the improvisations. In the words of Berliner (1994, p. 348), musicians interacted in a "collective conversation" including "give and take". It can be argued that some of the fascination with free jazz stems from witnessing the interplay of these processes in a live situation.

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L2Mcont'd: Long Talks 2 - Rhythm cont'd

Time: Wednesday, 25/Jul/2018: 0:00 - 1:00 · *Location:* Montreal_2

Session Chair: Justin London

Relation between melodic characteristics and tempo determination

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Background

Research on tempo has concentrated on the concepts of preferred tempo (i.e., spontaneous tapping rate), tempo memory (tempo memory/imagery for familiar songs, or group memory for tempo), and tempo identification/discrimination (the ability to identify or discriminate different tempos). However, there has been very little research on tempo determination, or the process of actively determining an appropriate tempo for an unfamiliar musical excerpt. This study investigates what melodic characteristics provide contextual cues for appropriate tempo in an unfamiliar melody.

Boltz (1998) determined that in a tempo discrimination task, melodies containing multiple contour changes and more/larger pitch skips were judged to be slower than reference melodies. Her results indicate that melodic characteristics have an important effect on the perceived tempo of a melody, and suggest that these characteristics might play a similar role in a determination task.

Aims and Methods

The current study extends Boltz's findings to an innovative experimental design where subjects are presented with a repeating melodic stimulus and are able to manipulate the tempo in real time via a spin wheel controller. Their task was to determine what they believe to be an appropriate tempo for each stimulus. The musical characteristics of each stimulus (including contour changes, skips and leaps, and the overall average interval size) are systematically varied to determine which characteristics influence the tempo determined by the subjects.

Results

We have conducted two experiments investigating the role that these and other melodic characteristics have on tempo determination. Results indicate that contour change is the most important characteristic for tempo determination; the significant correlation with tempo ($r=0.57$, $p<0.01$) indicates a preference for slower tempos with increased contour changes. Other characteristics were also determined to have an effect, including a more sophisticated measurement of interval size.

The most recent experiment collects continuous response data for each subject, allowing us to make finer predictions about which specific events most influence tempo determination. Analysis of the continuous tempo data revealed that participants used a range of strategies to determine the tempo for each melody. Participants tended to arrive at a final selected tempo more quickly when there was more melodic change in a melody.

Conclusions

These studies demonstrate that melodic characteristics alone can influence tempo determination. The continuous response task allows us to refine those measurements and to determine more specifically how subjects are reacting in real time to a variety of melodic characteristics.

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Backbeat placement affects tempo judgment

Bryn Hughes

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Background

Tactus is considered by many to correspond with listeners' perceptions of tempo (Drake et al 2000). Nevertheless, equating tactus rate to tempo may ignore other musical parameters that impact our sense of "musical speed" (Epstein 1995). Is it possible that style-specific parameters might have such an impact? Listeners are keenly aware of stylistic traits that define musical genres (Gjerdingen and Perrot 2008), and genre has been shown to impact listeners' expectations of harmony (Hughes 2011), tempo, and meter (McKinney and Moelants 2006). The backbeat, an emphasis on non-hierarchical beats two and four in a simple quadruple meter, is ubiquitous in popular music. Moreover, the backbeat serves as a rhythmic cue that listeners and performers anecdotally claim provides them with metrical orientation (Attas 2014). If genre-specific musical traits, such as backbeat, can impact metrical hierarchy, they may also influence tempo perception.

Aims

The present study investigates the impact of backbeat on participants' accuracy in a tempo comparison task. It was predicted that changing the backbeat placement between two excerpts would lower participants' accuracy in judging the tempo change between those two excerpts.

Methods

For each trial, participants (N=21) listened to pairs of excerpts and were asked whether the second excerpt was slower, the same tempo, or faster than the first. Each excerpt pair consisted of the same song, with two manipulations: tempo (120 or 132 BPM), and backbeat (normal, with emphasized beats 2 and 4; or "half-time," with emphasized beat 3). Four different songs were used for replication; the full-factorial design yielded a total of 64 trials. Participants were asked not to tap, or otherwise engage physically with the music.

Results

As predicted, participants' accuracy in judging tempi significantly worsened when the backbeat placement in the second excerpt changed from normal to "half-time," or vice versa.

Conclusions

The results show that backbeat influences our perception of tempo, suggesting that theories of tempo and meter perception in rock music should consider the location of the backbeat, a stylistic trait of vital importance to rock musicians' metrical orientation (Attas 2014).

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L1Scont'd: Long Talks 1 - Movement and Perception cont'd

Time: Wednesday, 25/Jul/2018: 0:00 - 1:00 · *Location:* Sydney

Session Chair: Emery Schubert

The effect of music on word learning among young adults

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Background

Some studies have shown that music – either background music or song—may facilitate cognitive performance and memory, presumably due to music increasing learners' arousal and mood levels and/or enriching the learning context, which facilitates learning and recall (e.g., Bottiroli et al., 2014; Thiessen & Saffran, 2009). However, other studies have shown no music advantage—or sometimes a disadvantage—leading some to propose that music may distract learners (e.g., Racette & Peretz, 2007; Salame & Baddeley, 1989). The equivocal findings are presumed to be due to methodological differences across different studies; indeed, few have compared the different learning conditions in a controlled manner.

Aims

This research addresses the contradictory findings by comparing learning of novel word-object pairings by speech-only, speech-with-background-music, and song-only within the same learner and with comparable learning conditions (e.g., matched on intensity, duration, familiarity with the melody, etc.).

Methods

Twenty-two young adults learned pairings of disyllabic pseudowords and novel objects. Each pseudoword occurred in a carrier phrase ("This is a __"), which is presented in one of four learning conditions: spoken, spoken with background music (bg), sung in-key (sung-in) and sung out-of-key (sung-out). Simple melodies, matched in duration and intensity to the spoken condition, were created for the music conditions: in the bg condition, each spoken sentence was accompanied by a soft sine-tone melody in which the duration of each tone is matched to each syllable; in the sung conditions, the pitch of each spoken word of the carrier phrase was manipulated such that it would be 'sung' to tones implying a major key (e.g., "This is a.." sung to E-G-C). The pitch of the pseudowords were also manipulated in the same way, resulting in sung syllables that would either be in-key or out-of-key relative to implied key of the carrier phrase (e.g., relative to E-G-C carrier, in-key pseudoword: "rin-ba" sung to D-C vs. out-of-key pseudoword: "lu-gash" sung to G#-F#). Participants saw 24 unique word-object pairings (6 word-object pairs x 4 conditions) twice with no two same pairings presented consecutively. Learning was examined using an identification task, in which all pseudowords were spoken, immediately after learning and after a short delay.

Results

Mixed effects logistic regressions were fitted to determine whether learning conditions predicted accuracy at test. The final model consisted of Condition and Test Phase as fixed effects with no interaction and random effects of by-subjects and by-items intercepts. Two main effects were observed: performance was generally better during immediate than delayed test (β= -0.333, z= -2.383, p= .017) and that accuracy at test differed among learning conditions. Specifically, with spoken as the reference condition, bg yielded significantly worse performance (β= -0.521, z= 2.040, p= .041) whereas no difference was observed between spoken and sung-in (β= 0.305, z= 1.129, p= .259) and between spoken and sung-out (β= -0.036, z= -0.139, p= .889).

Conclusions

Speech in the presence of background music hinders word learning relative to speech in quiet. There is no song advantage over speech in word learning among young adults.

Absolute pitch and sound-colour synaesthesia provide for unique learning opportunities

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Background

Research into the multimodal experience of music is steadily gaining momentum, and has recently culminated in questions as to whether the acquisition of cross modal associations leading to synaesthesia-like experiences, in a population of non-synesthetes, is possible (Meier & Rothen, 2015; Rothen & Meier, 2014). While training paradigms have been implemented using coloured graphemes (Bor et al., 2014), this has not previously been attempted with sound induced forms of cross modal associations.

Aims

Using a statistical learning paradigm to train tone-colour associations, this study investigated whether absolute pitch (AP) possessors had an advantage in acquiring these associations compared to normal controls. This study aimed to test whether AP possessors have an advantage in both the acquisition of tone-colour associations and in statistical learning more generally.

Method

This research was based on data collected through an absolute pitch test, as well as a statistical learning paradigm implemented as a tool for learning tone-color associations. Fixed tone-color pairs were initially presented to participants in brief three-element sequences, with participants subsequently asked to distinguish between presented vs. not presented sequences. AP possessing graduate music students were compared to a group of relative pitch (RP) possessing music students, as well as a non-musician control group.

Results

The results showed a benefit in statistical learning for both AP and RP possessors. In contrast, AP possessors outperformed both groups in the incidental learning of tone-colour associations. Furthermore, AP possessors with tone-colour synaesthesia exhibited an additional advantage in statistical learning.

Conclusions

These results indicate that musical expertise can boost cross-modal integration, and offers a general advantage in statistical learning. This effect is enhanced by tone-colour synaesthesia. Furthermore, AP provides advantages in learning tone-colour associations. The potential application of these results includes the prevention of age-related loss of AP in musicians, and statistical learning as a tool for training pitch memory. This research expands our understanding of how new learning can shape the perceptual experience of sound, even in adulthood.

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T2S: Short Talks 2 - Performance and Timbre

Time: Wednesday, 25/Jul/2018: 1:30 - 2:30 · *Location:* Sydney

Session Chair: Peter Keller

Contribution of Visual and Auditory Information in Pianists' Performance of Their Repertoire: Observation with Positional and Moving Error Analyses.

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Background

We previously examined piano performances with/without visual/auditory information and more/less haptic information (Ohsawa, Sawai, & Tsuzaki, 2017). With error analyses of the performances, we observed that the visual information was particularly important for accurate performance in the arpeggio tasks, while auditory and haptic information seemed to work supplementally, especially in error correction. In this case, we presented the task sequence to the pianists at the beginning of the experiment. If their processes in acquiring external information were certainly robust and sophisticated such as in a performance of their repertoires, the roles of information in each modality might be different. Thus, we examine the data on their repertoire performances which they played in the former part of the same experiment.

Aim

The present study aimed to test how and when the online acquisition of the visual and auditory information contributes to the performance of trained pianists' repertoire.

Method

Thirteen students majoring piano performance at a university participated in our experiment. We asked them to choose an excerpt from their repertoire which they regarded as a part with leaps in the main melody and requiring more advanced skill than the other parts of a musical piece, while they were able to perform accurately with confidence. Each pianist played the excerpt in four conditions: "with-sound-with-vision," "no-sound-with-vision," "with-sound-no-vision," and "no-sound-no-vision." We shielded visual information from the hands and keyboard with goggles with masking tape. Also, under the "no-sound" condition, we set the volume control of the electric piano to its "minimum" and the participant took off the headphone. We recorded the performance data as MIDI data, and dynamic programming identified their correspondence. We set two types of performance errors: the positional errors (PE: what we call "mistake" usually) and the moving errors (ME: distance error from the former note). We counted the errors with these criteria, then standardized them as "PE/ME rate" by dividing with the number of notes to be played.

Results

The participants made significant errors in no-vision conditions while they had little mistakes in with-vision condition; this result was same as with the simple experimental tasks in our previous result, however, the individual difference was more substantial. Additionally, the PE rates were clearly larger than the ME only in no-sound-no-vision condition.

Conclusion

We observed that the visual information has an essential role also in the repertoire performances. However, some pianists made not so many errors as in arpeggio tasks. This may indicate that the other information such as somatosensory information contributed more in the repertoire performances than in the experimental arpeggio tasks. The auditory information seemed to help error correction in this case as well as the result in the previous research (Ohsawa et al., 2017).

Reference

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Perception thresholds for timbral change in gap-free sounds

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Background

Tonal stimuli are traditionally described by the rather obvious dimensions of pitch and loudness, and some more ambiguous ones, such as brightness, roughness, fullness, intensity, density, which are generally grouped under the broad term of timbre. Most research so far has tried to approach timbre by focussing on the perceptual and/or the acoustical properties of sounds(1)(2). Whilst obviously linked, few studies have looked at timbre from a musician's/composer's perspective, or used an approach that could make more sense in a musical setup. In a musical/compositional context timbre is usually controlled by (seemingly arbitrary) parameters of sound-effects and -manipulation.

Aims

The study examines how timbre-changes that are based on these parameters, physical properties of instrument behaviour or common practices of sound production, affect the perception of tonal events and how they, if at all, relate to each other. It tries to approach timbre, based on methods/tools that are available to practitioners of music. We are using the manipulation parameters inside a self-built, additive synthesizer as the primary timbre descriptors by themselves.

Methods

Assuming that, for a change in sound to be noticed, an acoustic event has to have taken place, the experiment looks at how much each of the chosen timbre manipulators has to be changed for a subject to notice a new event in a staircase procedure with gap-free sound stimuli. This is implemented via a staircase procedure, in which the participants (n=22) listen to a short sound and indicate, if they noticed a change in timbre.

In a second experiment, similar in setup, the influence of transition time between different timbres is explored.

A third experiment investigates participants' judgement of the utility of different timbre dimensions in a musical context. The participant adjusts the parameters for the synthesizer whilst it is playing a musical loop with accompanying drums that suggest different genre conventions.

Results

The perception thresholds appear to be strongly dependent on the starting value of any chosen timbre-parameter. Additionally pilot studies so far have revealed perception asymmetries in the direction of stimulus change, as well as a notable sensitivity to phase position of partials (in particular in the stimuli with inharmonic partials) which contradicts the common idea of the ears' phase-deafness. The results also show some timbre detection thresholds are affected more strongly by gradual transformation than others.

Conclusions

Overall, the results advance our understanding of sound perception and pave the way for future work designed to test listeners' ability to detect rhythmic sequences of timbral only stimuli (meaning no change in F1 or perceived loudness), as well as work on developing full musical pieces based on such manipulations or similar.

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Voices within voices: developing a new analytical technique for vocal timbre through examining the interplay of emotional vocal timbres and lyrics

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Background

Vocal timbre is a highly salient musical feature that, arguably, contributes significantly to our emotional experience of a song. Despite this, analytical techniques for vocal timbre remain in their infancy. This paper proposes that one way in which vocal timbre may be analysed is through considering how emotion expressed in vocal timbre impacts emotional perception of lyrics.

Aims

This research proposes that a new analytical technique for vocal timbre may be developed by considering if/how emotion expressed through vocal timbre impacts emotional perception of sung words. The underlying hypothesis of this approach (that emotion expressed through vocal timbre impacts emotional perception of words) is experimentally tested.

Main Contribution

Two main contributions are offered. First, results of an experiment conducted to test the hypothesis stated in the Aims will be presented. These results suggest that vocal timbre may act as a strong prime in musical contexts, impacting emotional perception of lyrics in a similar way across listeners.

These results support the second contribution of this research – the development of a new technique for analyzing vocal timbre in terms of its emotional content. This technique (building on previous work such as Heidemann (2016), Smalley (1986, 1994, 1997), and van Leeuwen (1999)) aims to provide a set of tools for analyzing vocal timbre in terms of its emotional cues. The technique will be demonstrated through a short analysis of Gotye's "Somebody that I used to know".

Implications

This research is among the first of its kind to use a priming paradigm to experimentally test the impact of vocal timbre on emotional perception of words. That the present research found that vocal timbre can act as a strong prime, impacting emotional perception of words in an intersubjective way, suggests that this may be a fruitful avenue for further investigation. This approach can now be developed to further examine the relationship between vocal timbre, emotion, and lyrics.

This research also offers a new set of tools designed to allow the analyser to analyse vocal timbre in terms of its emotional content. Given the general lack of techniques available for analyzing vocal timbre today, this is an important contribution which has implications for musical analysis, and the discussion of emotion in music more generally.

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L5G: Long Talks 5 - Development

Time: Wednesday, 25/Jul/2018: 6:30 - 8:00 · *Location:* Graz_1
Session Chair: Reinhard Kopiez

Development of Musical Abilities: Literature Review and Analysis of Cohort Study Data

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Background

Musical abilities mark the foundation for all musical behaviour that has emerged among humans, yet there exists a scarcity of knowledge about how it develops in the course of a lifetime (Hannon & Trainor, 2007). Most importantly there is a lack of longitudinal studies that assess the developmental trajectory of musical abilities during childhood and adolescence along with important covariates. While past decades have seen a large number of studies investigating the potential benefits of musical training and abilities on the development of skills in other domains (i.e. so-called 'transfer effects', see e.g. Sala & Gobet, 2017; Williams, Barrett, Welch, Abad, & Broughton, 2015), much less research has been devoted to the more general question of how musical abilities themselves develop over time and in response to musical training.

Aims

To address these shortcomings, we gathered existing information from a range of sources that employ longitudinal measures of musical abilities and used them to examine developmental trends and influencing factors.

Method

In order to gather information from existing data and publications, two approaches were combined: Study I comprises a systematic literature review and quantitative comparison (n=3,236) on publications assessing musical abilities longitudinally. In study II we used structural equation modelling to model the development of musical abilities during childhood and adolescence based on data from the Millennium Cohort Study (n=18,980).

Results

Our findings show that a) musical abilities remain relatively stable across childhood and adolescence, except for those who receive musical training, where musical abilities further increase and b) that the degree of active musical engagement in adolescence is predicted by parent-initiated musical activities in infancy and most strongly by musical ability in childhood as assessed by teacher judgements. Formal musical training was a positive predictor for the development of musical abilities through childhood and adulthood: If musical training was received, musical skills developed, whereas if not training was received, the skills remain relatively constant over time. Further, we observed the steepest gains in musical abilities during childhood (10 to 12 years of age), while no clear trends emerged during adolescence.

Conclusions

Our results suggest that general musical abilities are already far developed in early childhood and remain at a constant level until adulthood. Musical training has shown to effectively improve musical abilities, whereas passive "musical enculturation" (Trehub, 2003) seems to be either already complete in childhood or does not effectively contribute to an improvement of musical abilities. However, data from existing longitudinal studies is scarce, particularly data covering the adolescent period. In addition, most existing longitudinal studies show severe methodological limitations which makes the generalization of results difficult. In conclusion, the current data available in the published literature only allow for a limited empirical description of how musical of listening skills and competences develop during childhood and adolescence and more quantitative data from longitudinal studies (the LongGold project, Müllensiefen et al., 2015; or Habibi et al., 2016) is required to this end.

Musical listening mode predicts talent for imitating tonal languages

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Background

The sounds of voiced speech and of many musical instruments are composed of a series of harmonics that are multiples of a low fundamental frequency (F0). Perceptually, such sounds may be classified along two major dimensions: (a) the fundamental pitch, which corresponds to F0 and reflects the temporal periodicity of the sound and (b) the spectrum, which may be perceived holistically as a specific timbre or analytically in terms of prominent frequency components. F0 sensations enable the tracking of melodic contours in music and prosodic contours in speech and do not depend on the physical presence of F0. We have previously shown that the salience of F0 perception varies considerably among subjects. It is positively correlated to the degree of musical expertise (Seither-Preisler et al. 2007; Piber et al., 2015), phonological awareness, and literacy skills (Serrallach et al., 2016).

Aim

In contrast to non-tonal languages (e.g. English, German), tonal languages (e.g. Mandarin, Cantonese, Thai, Vietnamese) convey word meaning also by stable, upward, or downward F0-contours. A salient perception of this attribute should therefore be more advantageous for the acquisition of tonal than of non-tonal foreign languages. In order to test this hypothesis, we administered active speech imitation tasks for (a) the tonal language Mandarin (Chinese) and (b) the non-tonal language Farsi (Persian) and compared performance to a psychoacoustic test measuring the subjective salience of missing F0 contours.

Methods

Participants were 70 German native speakers (32 males, age: 34.1 ± 14.0 y; 38 females; age: 35.0 ± 14.2 y). They were instructed to listen to the language material three times (4 sentences; 2 with 9 and 2 with 11 syllables) and then to repeat it. Recordings of the repetitions were rated by 4-5 native speakers and evaluated on a scale between 0 and 10. Mean scores were considered as indicators of the talent to learn tonal and non-tonal languages, respectively.

Subjective pitch perception was tested with a short version of the Auditory Ambiguity Test (Seither-Preisler et al., 2007). In addition, the musical aptitude test AMMA (Gordon, 1989), consisting of a tonal and a rhythmic part, was administered and the number of instruments played and languages spoken were considered.

Results

Regression analyses showed that F0 perception had a significant influence only on the talent to imitate tonal, but not non-tonal languages. Moreover, the number of instruments played was positively correlated to F0 perception and all measures of language and music talent.

Conclusions

The results signify a close interdependence between the perception of the missing F0, musicality, and the talent for learning tonal languages. This suggests that musically based training programs for westerners might support the acquisition of Asian tonal languages.

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Developing Auditory-Motor Timing Skills to Support Literacy Skills in Dyslexic Children

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Background

Previous studies indicate that musical activities can be an effective tool for supporting dyslexic children (Flaugnacco et al., 2015; Habib et al., 2016; Overy, 2003), but it is not yet clear what kinds of musical activities are most effective. Dyslexic children can experience difficulties with auditory-motor rhythm skills (Overy et al., 2003; Wolff, 2002) as well as with phonological and literacy skills, suggesting that musical activities focused on developing auditory-motor timing skills may be an important direction for intervention work. We compared the effects on phonological and literacy outcomes of a specialist musical activities programme (MAP) designed for dyslexic children and focused on developing auditory-motor timing skills through a series of musical games (Overy, 2008) and a carefully matched control music listening programme (MLP). Hypothesis: After 15 weeks, children allocated to the MAP will make significantly greater progress than children allocated to the control MLP group in auditory-motor rhythm skills, phonological segmentation and literacy skills.

Aim

To compare the relative effects of experimental and control music interventions on phonological and literacy skills in dyslexic children.

Method

Children aged 7 to 11 years with a diagnosis of dyslexia from two primary schools in Edinburgh were randomly assigned to participate in either the MAP or the control MLP. The children participated in their respective interventions for 3 × 20 min per week for 15 weeks. Musical, phonological and literacy skills were assessed before and after the interventions.

Results

ANOVA results showed that the MAP group ($n = 15$) made significantly greater progress in standard scores of spelling ($p < .05$) and word reading efficiency ($p < .05$) than the MLP group ($n = 13$), with a strong trend for the same effect in single word reading ($p = .06$). The MAP group also made significant improvements in phonological segmentation ($p < .01$) and rhythm copying skills ($p < .01$), but these improvements were not significantly greater than the MLP group's progress. Improvements in rhythm copying predicted improvements in phonological segmentation, which in turn predicted improvements in spelling.

Conclusions

This study compared for the first time the effects of two different kinds of music intervention for dyslexic children. We found that musical activities focused on developing auditory-motor timing skills were more effective than musical activities focused on developing listening skills at supporting literacy skills in dyslexic children. These results support our novel hypothesis that musical activities focused on developing auditory-motor timing skills are particularly beneficial for supporting dyslexic children's literacy skills, and are consistent with evidence that adult dyslexic musicians have less impaired reading profiles than dyslexic non-musicians (Weiss et al., 2014; Zuk et al., 2017).

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L6G: Long Talks 6 - Everyday Life

Time: Wednesday, 25/Jul/2018: 6:30 - 8:00 · *Location:* Graz_2

Session Chair: José L. Besada

Patterns of situational cues and characteristics contributing to music listening in daily life: Towards a taxonomy of music listening situations

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Background

Individual responses to music are results of an interaction between music, person, and the listening situation (Hargreaves, North, & Tarrant, 2006). While factors associated with the music and the listener have brought about reams of research efforts (e.g., Greenberg et al., 2016), the number of studies investigating the role of the listening situation is surprisingly small. This might be due to a lack of consensually agreed-upon definitions and taxonomies of situations in general (Rauthmann, 2015) as well as the high costs associated with investigating and measuring music listening behavior in everyday situations.

Aims

This paper presents data from two studies investigating music listening in daily life with the aim of developing a taxonomy of music listening situations.

Methods

In a first online study, 587 participants (mean age: 25.4 years, 58% female) reported three typical music listening situations in free response format. In a second study using the Experience Sampling Method (ESM), 119 participants (mean age: 24.4 years, 55% female) reported on 3564 music listening situations over the course of ten days. For each situation, various situational variables (e.g., activity, presence of other people), functions of music listening, and perceived characteristics of the music were assessed.

Results

A qualitative analysis of the first study suggested that descriptions of the music listening situations were predominantly based on current activity (e.g., “while studying”), location (e.g., “in the gym”), the person’s emotional state (e.g., “when I’m sad”), and/or the function of music listening (“to relax me”). The analysis of the reported activities led to a taxonomy of 11 categories which were then used in the second study. Results of a two-step cluster analysis of the ESM data showed that a six-cluster solution to classify music listening situations achieved the best model fit. This classification includes pure music listening, music listening as social-interactional background, music during sports and party, music listening for supporting work, music listening during household activities, and music during transport. A multilevel regression analysis further indicated that cluster membership significantly predicts characteristics of the music people listen to in a specific situation (e.g., tempo).

Conclusions

We found that numerous situational variables can be combined to more abstract and condensed situational clusters. These clusters illustrate the similarity and repeated patterns of music listening behavior across different individuals and can be used to predict characteristics of the music listened to. Our studies therefore contribute to a better understanding of music listening situations and their complex interplay with person- and music-related factors.

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Reconceptualising the Functions of Listening in Everyday Life: A Domain-Based Aggregate Thematic Framework and Comparative ESM Study

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Background

Music is drawn into action by human beings throughout their daily lives as a matter of course, whether through conscious action, habitual routine, or as a suggested/mandated behaviour. Merriam (1964) suggested the "functions of music" pertains to the underlying driver for music listening. Numerous researchers have contributed potential functions to the field of research from myriad disciplinary perspectives (music sociology, sports sciences, music psychology, music in everyday life etc.). Yet, there exists no agreed taxonomy of suggested functions.

Aims

Firstly, to develop an exhaustive domain-based framework of the functions of music listening drawn from existing literature, and secondly, to confirm the validity of the proposed framework through comparison with real-world Experience Sampling Methodology (ESM) study data. The final aim would interrogate the ESM data for evidence of functions not previously identified.

Methods

An aggregate qualitative thematic analysis was performed on 41 publications (10 containing multiple datasets) from varying disciplinary perspectives. From the 58 datasets, 602 functions were identified and thematically coded and grouped by domain of action. The resulting analysis was termed the Aggregate Thematic Functions (ATF) Framework.

Following this, 76 individuals (mean age: 28, SD: 7.91) participated in a 7-day experience sampling methodology study. The study gathered 575 logs examining drivers for listening. The functions identified within the ESM logs were thematically coded and compared with the ATF Framework.

Results

The ATF Framework identified 45 functions. Functions were sorted into 5 domains (Cognitive: 9 functions, Emotional: 3 functions, Physiological: 9 functions, Social Group: 9 and Social Individual: 5 functions). 1 sub-domain concerning emotional regulation within the Emotional domain was identified, and 1 larger Meta-Domain (5 functions) was proposed for functions occurring in simultaneous domains of action.

Comparatively, the ESM study identified 49 functions, only 37 of which were identified in the ATF Framework. There was noticeable disparity between the Social domains (Individual and Group) in the ATF and ESM data. The remaining domains and functions approached similitude or matched.

However, 12 functions were identified that have little or no evidence in the literature informing the ATF Framework. These functions concern deeper sub-groupings of functions within the Meta-Domain: "Musicking Behaviours" (divided into 5 sub-functions) and "Atmosphere Creation and Maintenance" (divided into 3 sub-functions). 5 additional functions in the Cognitive domain were identified. 1 additional function was identified within the Emotional domain. Finally, two further functions of uncertain domain specificity were identified: "Habitual Listening" and "Matching & Fit".

Conclusions

The work presents a prototype domain-based taxonomy of the functions of music working from an aggregate dataset. However, the study found a lack of parity between the literature and the real-world listening of participants. The study found 12 functions not proposed within the functions literature. Further study of these functions is required to approach an exhaustive taxonomy of the functions of music.

References

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Situational influences on music selection behavior in daily life: An experience sampling study

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Background

Recent research has aimed at quantifying the relation of person-related and situational influences on people's music-listening behavior in daily life (e.g., Greb, Schlotz, & Steffens, 2017, Randall & Rickard, 2017). While these studies highlight the predominance of situational influences on music-listening behavior, the majority of research has been focusing on between-person differences of music listening. Furthermore, the role of functions of music listening in the process of music selection is not clear yet.

Aims

First, we wanted to estimate the amount of person-related and situational influences on music-selection behavior in daily life. Second, we intended to disentangle some of the complex processes among the listener, situation, and functions of music listening involved in music selection.

Method

One hundred nineteen participants (55% females, mean age = 24.4 years, SD = 4.4) reported 3564 music listening situations (mean number of situations per person = 30, SD = 22, compliance rate = 83.7%) in an experience sampling study using smartphones. Before starting the ambulatory assessment, participants reported on person-related variables such as musical taste or musical sophistication. During the 10 days lasting assessment (Friday–Sunday), participants were randomly prompted 14 times a day answering the question if they are listening to music right now. In case they listened to music, they reported on questions regarding the situation (e.g., presence of others), the functions of music listening, and characteristics of the music (excitement, tempo, joyfulness, melody, rhythm, complexity, aggressiveness, and intensity). In addition, participants were able to start the questionnaire at any time and report listening to music by pressing a button in the application.

Hierarchical linear models (intercept-only) were used to calculate the variance components of between and within-person variance. We used statistical learning procedures (percentile-Lasso) on general linear mixed models and multilevel structural equation modeling to determine the most important predictors and analyze mediation processes between person, situation, functions of listening, and music selection.

Results

The intraclass correlation coefficients showed that on average 16% of the variance of the musical characteristic was attributable to between-person differences and 84% was due to within-person differences between different situations. Functions of music listening were found to act as a mediator between characteristics of the situation and music-selection behavior.

Conclusions

Our results indicate that, on the level of musical characteristics, music-selection behavior is almost entirely determined by situational factors, while person-related factors are only of marginal importance. Furthermore, our results indicate that listening functions should be integrated into models that aim to explain music selection in daily life. These findings suggest a shift in music-listening research from focusing on individual differences to situational influences, including potential interaction effects between person-related and situational variables.

References

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L7G: Long Talks 7 - Language

Time: Wednesday, 25/Jul/2018: 6:30 - 8:00 · *Location:* Graz_3

Session Chair: Joshua Albrecht

Vowel Perception in Congenital Amusia

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Background

Congenital amusia is a disorder that negatively influences pitch and rhythm perception (e.g. Peretz et al. 2002) and is not caused by a hearing deficiency, brain damage or intellectual impairment. While congenital amusia had long been reported to affect only the musical domain (Ayotte et al. 2002; Peretz et al. 2002), several studies have shown that amusics also have impaired perception of intonation (e.g. Patel et al. 2008) and linguistic tones (e.g. Tillmann et al. 2011), both mainly relying on pitch cues.

Aims

In the present study we aimed to show that congenital amusia also has an influence on linguistically relevant cues other than pitch by looking at the perception of the German front high vowels /ɛ/, /ɛ:/, /e/ and /e:/. These vowels are differentiated by length as well as formant frequency and we assessed amusics' behavioral and electrophysiological responses, more specifically the Mismatch negativity (MMN), which is a component evoked by unconscious change detection in the auditory signal.

Method

We tested 11 congenital amusics diagnosed with of the Montreal Battery of Evaluation of Amusia (Peretz et al. 2003) and 11 controls matched for age, gender, education and musical training. All participants were right handed, had normal hearing and had German as their native language.

Our stimuli were four isolated synthetic vowels, /ɛ/, /ɛ:/, /e/ and /e:/, created by Klatt synthesis in Praat (Boersma & Weenink 2016), varying in either duration or spectral properties, based on the properties of natural German vowels.

For the behavioral study, we employed an ABX task and the stimuli were presented with an inter-stimulus interval (ISI) of either 0.2 s or 1.2 s.

For the EEG study, the stimuli were presented in a multi-deviant oddball paradigm in 4 blocks. In each block, one vowel was the standard and occurred 85% of the time, while the other three vowels served as deviants, each occurring 5% of the time. This resulted in 16 event-related potentials (ERPs) per participant: 4 standards and 12 deviants.

Results

Behavioral results: We calculated a linear mixed model with subject as random effect. We found main effects of group $t(20) = 2.26$, $p = 0.035$, ISI $t(2436) = 5.73$, $p = 0.000$ and cue $t(2436) = 4.60$, $p = 0.000$. Amusics performed worse than controls, the short ISI was overall harder and duration was overall harder than formant cues.

We used a linear mixed model for the MMN data as well. We found significant main effects for group $t(323.7) = -2.45$, $p = 0.024$ with amusics ($M = -2.68$) overall having a smaller MMN than controls ($M = -3.37$). In addition we found a main effect for cue $t(2351.8) = -6.05$, $p = 0.000$.

Conclusions

Our study shows that congenital amusia does not only affect pitch perception in language but also vowel perception, therefore having more far reaching consequences for speech perception than previously assumed. Not only was the behavior of amusics shown to be affected, we also showed differences in the MMN, reflecting differences in early auditory change detection.

Different processing mechanism of ambiguity in music and language: an empirical approach

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Ambiguity is a ubiquitous phenomenon in both music and language. In the past several decades, scholars have acquired much understanding of it by examining its subtype called “garden-path ambiguity” in language. This type of ambiguity brings about several interesting questions in music: How can we define the garden-path ambiguity in music? Can we observe the garden-path effect in music? Does the human parsing mechanism (or the human parser) retain all the plausible interpretations in its initial processing (parallel model), or does it keep only the best-so-far interpretation at a time (serial model) when coping with such ambiguity? Though roughly touched upon by Meyer (1956), Bernstein (1976), Jackendoff (1991) and Temperley (2001), these questions have never been systematically theorized and empirically investigated. This paper first proposes a theoretical framework for what constitutes the garden-path ambiguity in music. Then it reports two experiments addressing the question about the parsing mechanism. In Experiment 1, a type of garden-path musical stimuli called “chimeric melodies” were presented auditorily to the participants. Results indicate that the processing of such garden-path stimuli does not cost significantly more time relative to the unambiguous controls. In Experiment 2, another similar type of chimeric melodies were presented but this time only visually in scores. In this experiment, the eye-fixation duration at the disambiguation region was significantly longer than other parts of the stimuli. Taken together, while the garden-path effect is verified in music, the processing model is dependent on the presentation modality. When presented auditorily (Experiment 1), the processing model of the garden-path ambiguity in music is best explained by a parallel model, whereas when presented visually (Experiment 2), it is best explained by a serial model. Further neuro-scientific research such as EEG study is suggested for more modality-neutral comparison and more real-time information.

Out-of-key notes and on-beat silences as prosodic cues in sung sentences

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Background

Recent findings indicate that the processing of music can affect the processing of language. For example, in line with Patel’s Shared Syntactic Integration Resource Hypothesis (SSIRH) (Patel, 2003) the processing of violations of musical-syntactic expectancies (VMSEs), such as out-of-key notes, interacts with the processing of linguistic syntax (Kunert, 2017). However, the SSIRH implicates that VMSEs do not affect semantics. Nevertheless, unexpected pitches often are interpreted as meaningful in connection to the lyrics (Burns, 2000, among others), and several studies show that out-of-key notes can evoke specific qualia (Arthur, 2018). Possibly, VSMEs are interpreted as prosodic cues. In a comparable way, an on-beat silence (a so-called loud-rest (London, 1993)) might also be interpreted as a prosodical cue, just as a pause for effect in speech would do.

Aims

In an online listen experiment the hypothesis was tested that out-of-key notes and on-beat silences, can affect the meaning of sung sentences.

Method

Thirty participants (average age: 41,7, SD = 18,9) listened to thirty sung sentences, sixteen targets and fourteen fillers. Ten of the sentences were sung fluently and in key. In another ten, two specific words were delayed digitally, creating on-beat silences. In the last ten sentences, the pitches of the same to words were changed by one semitone, making them out-of-key, without harming the melodic contour. Each sentence was preceded by a short piano cadence establishing the key. After each sentence, the participants read three interpretations of it, one of them literal, two of them ‘colored’ (i.e. ironic, emotional or metaphoric). They rated to what extent they thought these interpretations were plausible. The fillers were unambiguous sentences with highly implausible alternative interpretations.

Results

Although the singer’s tone of voice was as neutral as in the fluent-in-key condition, the results show that out-of-key notes make literal interpretations of target sentences less plausible, while supporting colored interpretations. They did not affect the plausibility ratings for fillers. Loud-rests did not show a significant effect, probably due to the fact that the loud rests often sounded artificial.

Conclusions

Out-of-key notes, well aligned with ambiguous words, can affect the interpretation of sung sentences. These results shed a new light on the debate concerning the interaction between VMSEs and language.

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L8G: Long Talks 8 - Memory

Time: Wednesday, 25/Jul/2018: 6:30 - 8:00 · *Location:* Graz_4

Session Chair: Renee Timmers

Music-evoked autobiographical memories in a representative UK sample

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Background

Music is often cited as a potent cue for bringing back memories of events from one's life. Lab studies of these music-evoked autobiographical memories (MEAMs, e.g. Janata et al., 2007) have confirmed that music can be used to cue vivid and emotional memories from across the lifespan. However, a more thorough understanding is needed of the frequency, features, and emotional content of MEAMs in everyday life. Research is also needed that investigates features of MEAMs across a wide age range of participants—which has relevance for the development of musical interventions for cueing memories in people with dementia—and using representative, non-student samples who are not selected on the basis of a pre-existing interest in music.

Aims

We investigated the features, frequency, and emotional responses to MEAMs in a representative sample of UK participants.

Method

An online survey was completed by 150 participants. These participants were selected via quota sampling to be representative of the UK adult population in terms of age, gender, and household income. The survey included questions about the frequency of MEAMs, titles and performers of three pieces of music that frequently/recently evoked autobiographical memories (including familiarity and liking ratings for this music), descriptions and age of the memories evoked, emotional responses to the music and corresponding memories, involuntary nature of the memory retrieval, and situational factors surrounding the onset of MEAMs. Participants also provided information about their musical backgrounds by completing the Musical Training and Active Engagement subscales of the Goldsmiths Musical Sophistication Index.

Results

On average, music was reported to trigger more positive than negative memories, and this pattern was consistent across 5 age categories of participants. The most highly rated categories of emotions evoked by MEAMs were: happiness/elation, nostalgia/longing, and love/tenderness. Pearson correlations between emotional responses to the music and emotional responses to the corresponding MEAM ranged from 0.62 to 0.86, depending on the emotion category. Some age differences in felt emotions were also found; for instance, MEAMs triggered significantly greater nostalgia in older than younger adults ($F(4,132) = 3.50$, $p = .009$). The median age at which a memory that was evoked by music was originally formed was 20 years. Overall, music-evoked memories tended to be more spontaneously than deliberately recalled, with a mean rating of the involuntary nature of recall of 5.85 and median rating of 7 (on a 7-point scale, with 7 as 'completely spontaneous'). The involuntary nature of MEAMs also increased significantly with age ($p = .02$).

Conclusions

These results indicate several stable features of MEAMs across the lifespan, as well as some changes that occur in relation to their features and emotional content. These findings also suggest certain previous results on MEAMs (e.g. their generally positive content and emotional responses) found in student samples are generalizable to the wider population. These results open new questions for further experimental research in relation to the experience of MEAMs across the lifespan.

References

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How reliable is memory for music? Exploring false memories in music listening

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Background

The study of false memory has had a profound impact on our understanding of how and what we remember. The work of Elizabeth F. Loftus has been particularly groundbreaking, including what she dubbed “the misinformation effect”. That is, how the information to which a witness is exposed after an event (whether consistent or misleading) is then integrated into the witness’s memory of the event (e.g., Loftus, Miller & Burns, 1978). The misinformation effect has been demonstrated extensively within visual tasks and featured in a wealth of psychological research. Surprisingly, however, it remains unclear to what extent memories of music may prove exceptional or congruent within the broader realm of false memory.

Aims

This study aims to investigate whether false memories can be induced within music listening tasks through the misinformation paradigm. In an exploratory manner, we also examined potential individual difference factors related to misinformation susceptibility.

Method

A total of 151 participants took part in the experiment. The experimental paradigm consisted of three phases: (i) participants listened to an initial unfamiliar track, which was missing an instrument (piano vs. drums). After a filler task, (ii) they read a descriptive text, which could either suggest the presence of the missing instrument (misinformation group) or not (control group). Following another filler task, (iii) participants performed a music recognition task in which they had to choose which audio clip was in the initial track. The core paradigm was repeated two times using different music excerpts as well as missing instruments (piano vs. drums).

Results

The percentage of times that participants selected the wrong music clip (i.e., a clip containing an instrument that was never actually experienced) was 36% when the descriptive text contained incorrect information and 25% when it did not ($p = .02$, $r = .22$). A random forest analysis revealed that participants with high levels of the personality trait of Openness were significantly less affected by the misinformation effect. None of the other individual difference factors were significantly associated with misinformation susceptibility.

Conclusions

These findings support previous research that post-event information has a significant effect on the reliability of memory, suggesting that false memories can be induced in music listening tasks. Participants used verbal information that was never actually experienced to reconstruct a memory of a piece of music, suggesting the integration of verbal information into long-term memory for music. The misinformation effect occurred regardless of participants’ levels of musical training. However, high levels of openness decreased significantly misinformation susceptibility. Demonstrating the existence of false memories in music listening has implications for any area in which musical memory is involved, including aesthetics, music education, performance evaluation, preferences for music, marketing, and advertising. We conclude that memory for music can be fallible and the extent to which humans can memorize and remember music reliably should be, at least, questioned and further investigated.

References

Loftus, E. F., Miller, D. G., & Burns, H. J. (1978). Semantic integration of verbal information into a visual memory. Journal of experimental psychology: Human learning and memory, 4(1), 19.

L2S: Long Talks 2 - Musical Structure

Time: Wednesday, 25/Jul/2018: 6:30 - 8:00 · *Location:* Sydney

Session Chair: Jon Prince

Goodness-of-fit and stability ratings in common and exotic scales

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Background

Since 1979, probe tone experiments have procured insight into the cognition of tonality in music. Participants are first played context setting stimuli, after which a probe tone is sounded and participants are asked to rate how well it “fits” the context. The context is normally composed in order to establish a tonal centre and ratings are assumed to describe the resulting stability profiles (Krumhansl, 1990). Data from these experiments has been modelled by the statistical prevalence of notes in a tonal music corpus but more accurately by the spectral pitch similarity of the probe to the notes in the context (Milne, Laney, & Sharp, 2015).

Aims

In order to explore the hypothesis that the stability profiles might emerge intrinsically from the notes of the context stimulus, two experiments were devised wherein the notes of the context – diatonic, harmonic minor and melodic minor ascending scales for Experiment 1; and harmonic major (major with flattened sixth), double harmonic (major with flattened second and flattened sixth), pentatonic, hexatonic, octatonic and blues scales for Experiment 2 – are uniformly, randomly distributed. Furthermore, Krumhansl’s assumption that her goodness-of-fit ratings account for tonal stability is tested by the collection of independent ratings for stability and goodness-of-fit.

Methods

Thirty-two musicians and thirty-two non-musicians were recruited for each of the experiments. Within each group, half the participants rated goodness-of-fit and the other half rated stability. For each participant, each of the twelve equally tempered pitch classes was probed twice for each context scale in addition, for the 7-note scales, to common triads. Ratings of fit and of stability used a Likert scale (values 1–7 in order of increasing goodness-of-fit or stability). Unlike previous studies, the order of notes in the context was randomised; each note in the context played three times in a trial.

Results

For the first experiment goodness-of-fit ratings were found to differ insignificantly from stability ratings apart from in a few specific cases, including the leading-tone and leading-tone triad. Models of the data based on spectral pitch similarity outperform models considering statistical prevalences of notes in appropriate corpora, with an r2 value of 0.844 across the 3 scales for probe tones and 0.727 for triads. Data collection for the second experiment is ongoing.

Conclusions

Though ratings of stability correspond largely to ratings of goodness-of-fit, the lower stability than fit of the leading-tone and leading-tone triad suggests that stability may encompass higher order effects such as expectation in the cognition of tonality. Either tonality indeed emerges intrinsically or learnt stability profiles are robust enough to be triggered by such a stimulus design. The experiment provides a modus operandi for further work testing novel microtonal scales to explore possible bottom-up explanations for tonality.

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Real-time continuous Timbre Perception and Production

Roger T. Dean[1], Kirk Olsen[1,2], Felix Dobrowohl[1], An Yu Yvonne Leung[1,3]

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Background

Much data on timbre perception has been based on similarity judgements of pairs of discrete short sounds. But the sonic experience of most of us is rather different. For example, environmental sounds (wind, rain, sea etc) are often continuous. Correspondingly, many genres of music (noise, glitch, ambient, drum and bass) include continuous sounds which transform very slowly, with few discrete sounds.

Aims

We wish to understand better how a listener, potentially naive to the musical usages of continuous sound sculpting, nevertheless construes musical events within such a timbral flux. We suggest, as do many, that without delineation of events, most musical contrasts and expectations could not be operative. We present three approaches to this issue. First we define listener continuous responses to environmental and musical sound sequences of significant duration, and provide Cox Hazard analyses which relate their perception of 'phrases' in the sound to acoustic input features. In the second, we investigate how a listener may form such perception mechanisms using a timbre ordering experiment, and in the third we briefly contrast deep learning approaches to timbre sequence generation with the two prior approaches.

Methods

Non-musicians are exposed to continuous sound pieces, environmental, familiar note-based music, and some sound-based music. They first undertake a 'stop-start' playthrough, indicating wherever a phrase ends with a key press. Then they hear the piece again, and on each key-press playback stops, and they give their reason for indicating a phrase end. We also undertake experiments with short stimuli, and forced ordering of stimuli, seeking to illuminate the flexibility of perceived timbral relationships when faced with unfamiliar yet distinct sonic stimuli. Finally, we illustrate how a deep learning neural net behaves in similar circumstances: when forced to generate appropriate continuation sound, though in a symbolic, note-based system.

Results

Sound-based and note-based music generate continuous timbral phrase perceptions driven by acoustic intensity and spectral parameters, but in very different ways. Data on the ordering experiment are intended to illuminate how those drivers might be formed, and we hypothesise that they may be biased in different directions according to the musical circumstances, in spite of the prior evolutionary influences, as a result of ongoing statistical learning. A deep learning net can only learn statistical relationships, and may allow an informative comparison.

Conclusions

The behaviour of timbral perception in continuous music may be significantly different from that revealed by paired dissimilarity measures, such that both the discrete and the continuous stimuli have much to tell us as listeners or composers about how to perceive and create music.

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The Structure of Chord Progressions Influences Listeners' Enjoyment and Absorptive States in EDM

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Background

From tribal cultures to western electronic dance music (EDM) contexts, trance music helps listeners achieve altered listening states. The relationship between harmonic structure and enjoyment of EDM has previously been investigated (Agres et al., 2017), however, the influence of chord progressions on absorptive states (AS) has remained unexplored. Also, although there is intuitively a connection between enjoyment and the sense of being absorbed in the music, this topic has not been formally addressed. The current work makes use of an empirical listening task with EDM experts to fill these gaps in the literature.

Aims

We created a set of uplifting trance (UT) excerpts to investigate whether chord structure impacts enjoyment and AS during trance music listening. In addition, we examine the relationship between self-reported enjoyment and AS.

Method

We conducted an online listening study with 19 expert listeners (mean age=33.4 yrs, std=10.5 yrs) who had a minimum of one year of experience DJing, composing, or producing trance music. On every trial, listeners heard a 2-min UT excerpt (including breakdown, buildup, and anthem), which were expanded versions of the three most liked and disliked stimuli from Agres et al. (2017). Each of these chord progressions varied in terms of repetitiveness and complexity. After each stimulus, participants rated their enjoyment on a Likert scale, and indicated the degree to which they "felt absorbed in the music," specifically, the extent to which they felt able to lose themselves in the music, such as achieving a trance-like state of mind.

Results

The results from the experiment show meaningful relationships between harmonic structure and AS, as well as subjective enjoyment and AS. A mixed effects analysis with enjoyment ratings as the dependent variable and chord sequence as the independent variable yielded a significant effect of chord progression ($F=3.48$, $p<.01$), supporting the hypothesis that harmonic structure influences enjoyment of UT excerpts. Also, the chord progressions that were most enjoyed in this listening study correspond to the most enjoyed (moderately complex) sequences from Agres et al. (2017). A second mixed effects analysis with AS as the dependent variable and chord sequence as the independent variable produced a significant effect of chord progression on AS ($F=2.73$, $p<.05$), providing evidence that harmonic structure influences AS. Because chord progressions were found to influence both AS and enjoyment, we conducted a mediation analysis. Results confirmed that the effect of chord structure on AS was not significantly mediated by enjoyment (ACME: $p=0.56$). Finally, a significant linear correlation ($\rho=0.60$, $p<0.001$) was found between enjoyment and AS.

Conclusions

Our findings indicate that the structure of chord progressions influences both listeners' enjoyment of music and their sense of being absorbed in the music. Moderately complex chord progressions are generally enjoyed more than extremely repetitive progressions or progressions that violate stylistic expectations. Finally, UT excerpts that are most enjoyed are those which tend to elicit absorptive states in listeners.

References

Agres, K., Herremans, D., Bigo, L., & Conklin, D. (2017). Harmonic structure predicts the enjoyment of uplifting trance music. Frontiers in psychology, 7:1999.

T6S: Short Talks 6 - Dementia

Time: Wednesday, 25/Jul/2018: 8:30 - 9:30 · *Location:* Sydney

Session Chair: Kat R Agres

Musicians with dementia: insights into preserved abilities

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Background

There is accumulating evidence that memory for music can persist in people with dementia, but the implications of these findings for musicians is not fully understood. Some forms of musical memory can remain relatively preserved in individuals with Alzheimer's Dementia (AD), including the ability to play a musical instrument (1-3), and there are cases of people with behavioural variant fronto-temporal dementia (Bv-FTD) learning to play a musical instrument post dementia onset (4). The mechanisms underlying this preserved ability are not well understood, but it has been suggested that spared implicit memory function plays a role (1, 2, 5). Understanding such mechanisms may assist in the development of music-based treatments for musicians with dementia, which may also help them recapture a sense of self (6).

Aims

Our aim was to explore music compared with non-music cognitive functions, including implicit memory, in musicians with dementia.

Methods

Three musicians with dementia were recruited from residential aged care facilities and a research register for people with Bv-FTD. Case 1 is a 77 year old ex-piano teacher who plays piano daily, and Case 2 is a 91 year old ex pipe band member who plays chanter, both with severe AD. Case 3 is a 78 year old amateur singer with Bv-FTD who taught himself the ukelele post dementia onset. Each person was seen over several sessions and completed assessments of music and non-music cognitive skills using standardised measures (including the Addenbrooke's Cognitive Examination, selective subtests of the Montreal Battery for the Evaluation of Amusia). Implicit memory was assessed with the Gollin's Picture Completion task. All sessions were filmed.

Results

All three cases exhibited impaired non-music cognitive skills, with the exception of their implicit memory function, which was relatively spared. Their music cognition skills, including recognition of familiar music, melody and rhythm perception were relatively preserved, and all three were able to play duets. Case 1 who was seen on three occasions over one year showed a decline in non-music cognition but stable music skills from Time 1 to 2, but evidence of a decline in music skills and relatively stable non-music cognition from Time 2-3.

Conclusions

This case series provides further evidence that musical skills remain relatively preserved compared with non-music cognitive skills in musicians with dementia. Our findings are consistent with the proposal that spared implicit memory may underpin this preserved ability. Furthermore, we provide the first formal documentation of spared ability to play duets in musicians with dementia. Their engagement in music making appears to reaffirm their sense of self, particularly the 'interpersonal self'.

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4. Cho H. et al. (2015). Neurocase, 21, 767-772.

5. Baird, A., & Samson, S. (2009). Neuropsych Rev, 19, 85–101.

6. Baird A & Thompson W. (in press). The impact of music on the self in dementia. J Alz Dis.

Personalized Playlists for People with Dementia: The Influence of Mental Health and Musical Features

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Background

Personalized music playlists are increasingly being utilised in health-care to reduce the severity of the behavioural and psychological symptoms of dementia (Garrido et al 2017). There is significant evidence that such interventions hold superior results to situations in which pre-recorded music is played in group situations without accounting for individual music tastes and preferences. However, results from previous studies are mixed (Martin et al. 2016; Kwak et al. 2016; Garland et al. 2007). There is therefore a need to further understand how the features of the music interact with individual symptoms to influence the affective responses of people with dementia to the music they are played.

Aims

The aims of this study are to investigate how the features of the music and the mental health of the individual influence the affective response of people with dementia to personalized playlists.

Method

A factorial experiment (2x2x3) was conducted to investigate the influence of tempo (fast, slow), mode (major, minor) and lyrics (none, negative, positive) on people with varying levels of depression, anxiety, apathy and cognitive decline. Ninety-nine people with dementia were randomly assigned to 3 experimental conditions, listening to 3 playlists based on personal preferences. Galvanic skin response, activation of facial action units were measured, and behavioural observation were measured continuously. Self-report measures of enjoyment were also taken.

Results

Arousal (GSR) increased compared to baseline when listening to music in fast tempos. Greater increases in arousal when listening to fast tempos was associated with low self-report enjoyment of music listening. Activation of the depressor anguli oris (lip corner depressor) indicating sadness was greater compared to baseline when listening to music in minor keys than when listening to music in major keys. People with high depression levels and low anxiety demonstrated increased levels of sadness after listening to music. People with more severe levels of cognitive decline demonstrated lower behavioural evidence of enjoyment and pleasure.

Conclusion

The effect of individual musical features and the psychological symptoms of individuals need to be taken into account in addition to personal taste when using music with people with dementia.

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The Music, Mind and Movement (MMM) Program for People with Dementia

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Background

Music is a powerful stimulus that can have a range of beneficial effects on people with certain neurological disorders that commonly affect the ageing population, such as dementia. Thompson and Schlaug (2015) proposed that seven attributes of music may contribute to its impact on neurological impairment. Specifically, music is social, emotional, engaging, physical, personal, persuasive and synchronising. The social nature of music assists with problems of isolation, providing a social scaffold for cognitive and emotional function; its emotional nature can assist with arousal and retrieval of memories; music is engaging and patients are more motivated to take part in treatment. Music elicits physical movements such as foot tapping and clapping, assisting with oxygenation and blood flow. It is personal and helps to reinforce a sense of identity; it is persuasive, so gives patients hope; and it affords synchronisation of bodily movements in a precise manner, helping with motor problems. Many of these attributes are also at the core of other therapeutic practices. Using music, they occur in a single convenient treatment program.

Aims

This study aimed to test this model of therapeutic treatment by devising the Music Mind and Movement (MMM) program, which incorporated activities that target each of the seven attributes. It used both recorded and live music.

Methods

The MMM program involved seven 45-minute weekly group sessions, and individual 15-minute “booster” sessions mid-week. Twenty PWD (mild/moderate) participated. Group 1 (n=10) completed the MMM program first and Group 2 (n=10), acting as a wait list control (standard care) for the first 7 weeks, completed the MMM program second. Assessments of cognition (Addenbrooke’s Cognitive Examination, ACE), mood, identity, and fine motor skills were conducted at baseline, Time 1 (7 weeks) and Time 2 (post treatment for Group 2). Selected assessments were obtained at the end of sessions 2, 4, and 6 to measure the effect of the specific attributes targeted in those sessions.

Measurements: Measurements were taken at baseline and immediately post program and include assessments of cognition (Addenbrooke’s Cognitive Evaluation-III, expressive language and autobiographical fluency tasks), mood (Geriatric Depression Scale- short form), Self-Identity (“I AM” task) and fine motor skills (9 Peg Hole task).

Results

During the MMM intervention there were 5 drop outs from illness, 1 death and 2 drop outs from disinterest. Final analysis was conducted on 12 participants in the MMM and 10 control participants. T-tests revealed a significant decrease in total ACE scores in the control group after receiving standard care ($p=0.038$). After the MMM intervention, there was a marginally significant increase in total ACE scores ($p=0.059$). Significant differences were present in the ACE sub-scores of attention ($p = 0.004$) and verbal fluency ($p = 0.04$). There were no significant differences for measures of mood, self-identity and fine motor skills.

Conclusion

Our preliminary findings suggest that the MMM program may improve cognition in PWD, particularly in the areas of verbal fluency and attention.

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P1G: Posters 1

Time: Wednesday, 25/Jul/2018: 8:30 - 9:30 · *Location:* Graz Poster Room

Absolute Memory for Pitch as a Hypothetical Cognitive Component for Tonic Retention

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Background

In tonal music practice, a composer is able to increase and decrease harmonic tension locally by choosing a particular sequence of chords. Concurrently, harmonic tension may also be globally increased by changing which chord exerts the Tonic function (a process called modulation), and when original Tonic chord reassumes the Tonic function, it generates a large-scale tonal closure effect. If these principles are true, a listener should be able to recognize both the local Tonic and the main Tonic simultaneously after any modulatory passage. Many experiments were designed to provide empirical evidences regarding this theoretical proposition. Research reports are divergent, some corroborating the existence of this cognitive ability (Lerdahl & Krumhasl, 2007), some questioning it (Cook, 1987; Bigand & Parncutt, 1999; Marvin & Brinkman, 1999; Farbood, 2016).

Aims

Based on a literature review on tonic retention, Absolute Pitch and Relative Pitch, we argument in favor of the hypothesis that main tonic retention over modulatory passages in tonal music is only possible for subjects capable of retaining in memory some form of absolute pitch information (an ability called by cognitive literature absolute memory for pitch), and that this ability is employed conjointly with relative memory for pitch, which provides a local hierarchical representation mapping for pitches.

Main contribution

We provide a theoretical background in favor our testable hypothesis, which explains how listeners are able to recognize the same pitch in distinct musical segments with different tonal centers (i.e., regardless of tonal hierarchies). Explaining tonic retention ability is problematic if a listener could rely exclusively on relative pitch information, as the overlapping of two harmonic mappings, one for the local Tonic and another for the main Tonic, would cause the same pitch to possess two distinct tonal hierarchies.

Implications

Empirical research on the abilities to encode and retrieve relative and absolute pitch information still needs quantification in terms of mean value and probability distribution. Future researches should focus on testing subjects using basic musical elements, such as isolated pitches, music intervals and chords, and it should also try to chart which factors are able to enhance or reduce performance (e.g., age, gender, timbre, register, response time) and to what extent. This information could provide an important background for more advanced experiments in musical contexts, such as those necessary to evaluate our hypothesis. We conclude with a set of objective questions that should guide future researches in scrutinizing our proposed hypothesis.

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Psychometric Features to Assess Absolute Pitch: Looking for Construct Validity Evidences Regarding Isolated Pitch Tasks in Undergraduate Brazilian Music Students

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Background

A bibliographical review of absolute pitch (AP) displayed that its main characteristic lies in the ability of identifying tones using verbal labels without any type of external reference. However, among its different definitions, we also found several non-consensual criteria describing such latent phenomenon, which leads to different and non-directly comparable models: e.g., AP as a trait (continuous measure) versus AP as a categorical phenomenon (categorized in groups). For the study of any latent psychological measurement, it is essential to identify a set of observable indicators. Such criteria must have content validity based on evidence from empirical observation and theoretical foundation. Subsequently, it is fundamental to test the conceptual model (formed by tasks based on underlying latent entities) fit to real data. Under a dimensional approach, besides the goodness of fit, it is possible to evaluate tasks parameters such as discrimination, difficulty, and probability of guessing.

Aims

To provide evidences regarding psychometric features (i.e., model goodness of fit and item parameters) for a set containing ten isolated pitch dichotomous tasks (correct versus incorrect).

Method

A set of ten isolated notes recorded from real instruments was played once, with a 15-second pause in between them. The subjects were instructed to mark their answers in a piano-keyboard drawn on a paper. Only exact pitch responses were considered as correct. A total of 783 Brazilian undergraduate music students (regardless if self-described as AP-possessors or not) from 7 universities attended the test. The data were analyzed based on two approaches: dimensional factor analysis, also known as item response theory (IRT) and categorical latent class analysis (LCA) (Asparouhov & Muthén, 2016; Marcoulides & Schumacker, 2001).

Results

IRT results evidence a good adjustment in assessing the ability to label isolated pitches without reference (RMSEA=0.033, 90% CI=0.020-0.045, CFI=0.973, TLI=0.965, WRMR=1.129). For LCA, the result of two latent classes showed the best class solution (entropy 0.914). Comparing the Bayesian Information Criterion (BIC), Aika Information Criterion (AIC) and Sample-size Adjusted Bayesian Information Criterion (SSABIC) for dimensional solution (BIC=7082.150, SSABIC=7018.640, AIC=6988.887) with those for categorical solution (BIC=7105.199, SSABIC=7038.513, AIC=7007,273), we have evidence that dimensional solution fits better due to its lower values.

Conclusions

Comparing the dimensional solution with the categorical one, we have evidence that dimensional solution fits better. This result suggests that the frequent assumption that there is a clear distinction between AP-possessors and non-AP-possessors under the task of labeling isolated pitches might not be entirely correct. Our results also showed empirically that the prevailing procedure adopted on AP research where it is credited the same score to the correct recognition for all pitches (i.e., ordinary summing of correct answers) might not be reliable due to considerable differences in items' difficulty and discrimination.

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Long term effects of auditory localization improvement – a pilot study

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Background

Localization is indispensible to determine the direction and location of a sound event. Localization training often requires an individual's own head-related transfer functions (HRTFs) measured for accuracy and effectiveness, which is expensive and tenuous. However, previous reports (e.g., Wendzel et al., 1993) of a successful training utilizing directional cues in generalized HRTFs inspired this pilot study using generalized HRTFs provided by Microsoft HoloLens, a head-mounted augmented reality (AR) device.

Aims

Our goals were to examine 1) individual's localization improvement; 2) the improvement patterns over time; and 3) long term training effects using generalized HRTFs in AR.

Method

Five students with normal hearing participated in an individualized and self-paced training twice a week for four weeks. Four tests were conducted: 1) before the training began; 2) after two weeks of training; 3) after four weeks of training; and 4) ten weeks after the last day of training.

Each test consisted of six modules. Three modules had the target sound only, and the other three had the target and one distractor. Sounds for target and distractor were always the same mono signals: The target was a female singing improvisation, whereas the distractor a piano accompaniment. These were placed at random positions in the space, on the horizontal plane only in Modules 1–4, and with vertical displacements up to 45 degrees angle in Modules 5–6. The task was to indicate the estimated location of the hidden target, then the actual and estimated locations of the sound sources were visually displayed. Localization score was calculated and reported based on the distance between the two locations. This score as well as the two locations of the target were recorded in files.

Results

A two-way repeated measures analysis of variance (ANOVA) was performed on the average performance as dependent variable (DV). Test (1–4) and Module (1–6) were the independent variables (IVs). Both IVs showed significant main effects, $F(3, 12) = 6.65$, $p < .01$, $\eta 2p = 0.62$ for Test, and $F(5, 20) = 16.53$, $p < .001$, $\eta 2p = 0.81$ for Module. The interaction was insignificant, $F(15, 60) = 0.61$, $p = .86$, $\eta 2p = 0.13$.

The average localization performance improved the most between Tests 1 and 2, from about 0.88 to 0.94 on average for the horizontal-only modules. The subsequent performances stayed around 0.94, even with a 10-week break between the last two tests. Test 1 performance was already quite high, which gives little room for improvement, so the average score of 0.94 may reflect ceiling effects.

Conclusions

In summary, we see localization improvement using generalized HRTFs after initial two weeks, which seems to remain stable. This improvement appears to last long after the training ended. However, we should be careful not to over-interpret significance given a very limited number of participants. We are currently conducting a similar experiment with more participants, which we hope will clear some questions that this pilot study failed to answer.

Identifying the Perceptual Dimensions of Musical Instrument Timbre

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Background

Different musical instruments do not simply exhibit different musical timbres; they also evoke different phenomenological experiences, or "musical instrument qualia." Informal descriptions of instrument sounds seem to employ stereotypical characterizations, such as "airy" for a flute or "heavy" for a tuba. Previous research has sought to identify dimensions of timbre through listener judgments of paired comparisons (Grey 1977, Kendall et al. 1999). Investigations into the semantic dimensions of timbre demonstrate that a number of descriptive terms map consistently onto particular acoustic correlates of timbre (e.g. Zacharkakis, Pastiadis, & Reiss, 2014). In a quantitative corpus analysis of texts on orchestration and

instrumentation, Zachary Wallmark (2017) found descriptive terms for instrument timbre could be sorted into relatively few distinct categories.

Aims

We aim to develop a model of the perceptual dimensions of musical instrument timbre, that is, dimensions of musical instrument qualia. We use this model to construct perceptual profiles for a variety of instruments.

Method

In the first study, interviews were conducted with 23 professional musicians who were asked to describe 20 different musical instrument sounds. These responses were parsed for content analysis and were pile sorted, yielding an initial list of categories of musical instrument qualia. This list of dimensions is refined by asking musicians to judge how well-suited the dimensions are for characterizing musical instrument sounds. To test the reliability and usefulness of the dimensions, participants are asked to rate musical instrument sounds on these refined dimensions. Principal components analysis suggests ways in which categories with significant overlapping variance can be collapsed, producing a final version of the model. In the last stage of the study, participants rate instruments' sounds according to each of the dimensions in the refined model; these results generate perceptual profiles for the musical instruments.

Results

460 interview responses from 23 musicians produced 2,487 unique component ideas, 502 of which occurred multiple times. The researchers independently performed pile sorts of these 502 ideas, producing 59 and 70 categories; through mutual discussion and review, these were reconciled to 77 categories. Results for the remaining stages of the study are forthcoming.

Conclusion

In this paper, we derive a model of the dimensions of musical instrument qualia. This model is then used to generate perceptual profiles for musical instrument sounds. The profiles will reveal common ways in which instrument sounds are perceived and characterized and will serve as a resource for future studies of timbre and orchestration.

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Is vocal mimicry needed for octave equivalence?

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Background

Octave equivalence, or treating a doubling in frequency as belonging to the same pitch class, is very common, if not universal, across human cultures. Octave equivalence makes a lot of sense when we consider ourselves in a biological light: The first harmonic of any vocalization is always an octave, and male and female voices are roughly an octave apart. When humans with different vocal ranges (males and females or children) sing together, they have to approximate the vocal signal of the other person, and the best way to do that is to use octave equivalence. One way to try and understand the origin of octave equivalence in our species is to see whether other species might have it, and if so, what else they share in common with humans. Previously, I asked whether a songbird species (black-capped chickadee) that also learns their vocalizations like humans do, would also show octave equivalence. However, though we used a highly similar methodology for both humans and the songbird species, we did not find octave equivalence in this species. One piece of evidence for octave equivalence in a non-human species comes from dolphins, where one dolphin octave transposed a

sound it was supposed to mimic because it was too far outside of its normal vocal range. Because humans imitate each other in different vocal ranges, is vocal mimicry potentially the key to understanding octave equivalence?

Aims

To address whether octave equivalence occurs in species with vocal mimicry abilities.

Methods

Using a highly similar methodology as previous work with humans and a songbird species, we tested whether budgerigars perceive octave equivalence. Budgerigars are a parrot species that can mimic sounds including human speech.

Results

We found that budgerigars categorize pitch in a very different way to humans despite their vocal mimicking abilities. Interestingly, though they did not appear to use octave equivalence, they responded in a way that is very similar to the previously tested songbird species.

Conclusions

Birds appear not to have octave equivalence, unlike humans, regardless of whether or not they can mimic sounds outside their vocal range. This, along with other recent work that suggests that birds may not separate pitch and timbre the way we do, suggests that octave equivalence may only be one way to successfully mimic sounds. Further work looking at the acoustic correlates of successful mimicry across species and searching for other species where members have different vocal ranges like humans could shed further light on this topic.

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Towards the physical correlates of musical timbre(s)

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Background

Since Helmholtz (1875), timbre is traditionally understood as an identifying as well as discriminating characteristic of musical instruments. As a consequence, researchers treated musical instruments as virtually zero-dimensional by reducing them to one single tone. Thus, the aforementioned timbre dimensions and their physical correlates, were in reality ascertained by means of single sounds and not musical instruments.

Aims

Studies with more than one tone per instruments suggest a shift in the correlation of perceptual timbre dimensions and physical sound properties (Marozeau et al., 2003, Handel & Erickson, 2004). Hence, the question is: What are the physical correlates of the perceptual timbre dimensions, once pitch and dynamics (i.e. a more realistic representation of instruments) are taken into account?

Method

To investigate this, five orchestral instruments (bassoon, cello, clarinet, flute, trombone) with three different pitch- and dynamic levels each were tested. In a hearing task, the subjective dissimilarities of the stimuli were obtained. By means of multidimensional scaling a low-dimensional configuration, which translates the dissimilarities into spatial distances, was calculated. Using music information retrieval, several sound features were extracted. By calculating the correlations between the ranks of the sounds for each feature and along every spatial dimension, the most suitable physical features to explain the perceptual dimensions were identified.

Results

When tested via several tones, instruments widely strew across the perceptual space and are rather heterogeneous tonal entities than singular objects as assumed by the standard definition. Concerning the physical correlates: Pitch is a very dominant factor that supplants every other correlate, no matter what. In accordance to the established dimensions, the harmonic spectrum was found as salient factor and the attack time of the sounds also contributes to timbre. Though not statistically significant in our evaluation, noise components nonetheless seem to contribute to the timbral discrimination of single tones. Factors that reliably discriminate/identify musical instruments as a whole could not be found.

Conclusions

The established dimensions apply reasonably well to single tones but fail on the more complex level of musical instruments. Using several tones per instrument yields a better resolution but spatial (and thus perceived timbral) similarity doesn't mean tones stem from the same instrument. Sounds from different instruments with e.g. similar pitch resemble one another more than sounds from the same instrument but with dissimilar pitch. Obviously, musical instruments cannot be approriately investigated on the basis of single tones. To clarify the ambiguous meaning of the word "timbre", a set of terms, that apply to the different levels, is proposed.

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PERCEPTUAL DIFFERENCES AND PREFERENCES BETWEEN BINAURAL AND STEREO MIXES OF MUSIC

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Background

Binaural technology allows the creation of a virtual auditory space, which, when presented over earphones, produces sound that appears to originate from different positions in space. Among other applications, this technology can be used to create three-dimensional (3D) music, with instruments virtually located all around the listener, not only on a stereo left/right axis. Adding a new dimension expands the creative possibilities to music makers and has the potential to offer a novel experience for listeners. Binaural technology has been broadly studied, yet research on the perceptual aspect is minimal, especially as regards musical content

Aims

The present study investigated affective differences between a binaural and a stereo music listening experience, especially focusing on preferences between the two mixing methods. In addition, it aimed to compare the preference between binaural music mixed with individualized Head Related Transfer Functions (HRTF) and generic HRTF. The initial hypothesis was that the preference between mixing conditions will differ. Based on the results from previous studies (Fontan, Farina & Grenier, 2007), the direction on this preference was unknown.

Method

The experiment consisted of a comparison between three different mixing technologies for five excerpts of song from different genres, based on Nicol et al's (2014) recommendation to assess the quality of experience for 3D audio. Preference for each mix was directly rated by participants. Each excerpt was presented to participants in a stereo mix, a generic binaural mix (based on KEMAR HRTF (Gardner & Martin, 1995)) and also in an individualized binaural mix (based on HRTF (Iwaya, 2006) pre-selected to fit each participant).

Results

The outcomes of this study reveal a significant preference for 3D music, especially when the binaural mix is created with individualized HRTF. These results add more understanding to the perception on of 3D audio, and lead to further investigations on the use of binaural technology for musical and entertainment purpose.

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Decoding the sound of 'hardness' and 'darkness' as perceptual dimensions of music

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Background

In a previous investigation the concept of 'hardness' in music was examined in terms of its acoustic correlates and suitability as a descriptor for music (Czedik-Eysenberg et al., 2017). Certain kinds of music are sometimes described as 'dark' in a metaphorical sense, especially in genres like gothic or doom metal. According to musical adjective classifications 'dark' is part of the same cluster as 'gloomy'/'sad'/'depressing' (Hevner, 1936), which was later adopted in computational musical affect detection (e.g. (Li & Oghihara, 2003)). This would suggest the relevance of sound attributes that correspond with the expression of sadness, e.g. lower pitch, small pitch movement and 'dark' timbre (Huron, 2008). In timbre research 'brightness' is often considered one of the central perceptual axes (e.g. (Grey, 1975); (Siddiq et al., 2014)), which raises the question if 'darkness' in music is also reflected as the inverse of this timbral 'brightness' concept.

Aims

Based on computationally obtainable signal features, the creation of models for the perceptual concepts of 'hardness' and 'darkness' in music is aimed for. Furthermore it shall be explored if there are interactions between the two factors and to which extent it is possible to classify musical genres based on these dimensions.

Method

Based on last.fm listener statistics, 150 pieces of music were selected from 10 different subgenres of metal, techno, gothic and pop music. In an online listening test, 40 participants were asked to rate the refrain of each example in terms of 'hardness' and 'darkness'. These ratings served as a ground truth for examining the two concepts using a machine learning approach: Taking into account 230 features describing spectral distribution, temporal and dynamic properties, relevant dimensions were investigated and combined into models. Predictors were trained using five-fold cross-validation.

Results

The characterizing attributes of 'hardness' include high tempo and sound density, less focus on clear melodic lines than noise-like sounds and especially the occurrence of strong percussive components. While a suspected negative correlation with timbral 'brightness' cannot be confirmed, 'darkness' appears to be associated with a high spectral complexity and harmonic traits like major or minor mode.

Although a considerable linear relation ($r=0.65$, $p<0.01$) is present between the two dimensions within the studied dataset, the concepts prove to be useful criteria for distinguishing music examples from different genres.

Conclusions

'Hardness' and 'darkness' constitute perceptually relevant dimensions for a high-level description of music. By decoding the sound characteristics associated with these concepts, they can be used for analyzing and indexing music collections and e.g. in a decision tree for automatic genre prediction.

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Variable critical bands

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Background

Critical bands were first discovered in the 1930s by Fletcher and Munson during their research on equal loudness contours and have been a research subject since [Fle33]. This technique of human hearing is connected to the perception of loudness as well as other effects. Zwicker measured the width of critical bands [Zwi57] and derived the so-called bark-scale from this. This scale consists of 24 bands at fixed center frequencies, although Zwicker states that a critical band can appear at any center frequency in the human hearing range [Zwi67]. Glasberg and Moore researched auditory filters and (assuming critical bands are related to auditory filters) came to the ERB-scale[Gla90]; similar to the bark scale but consisting of narrower bands.

According to Spreng the brain searches for dips in the frequency response, in order to be able to separate evoked areas [Kei75]. Researchers agree that critical bands (as well as auditory filters) can appear at any center frequency and yet fixed scales (bark or ERB) are used.

Aims

Dynamic behaviour of critical bands shall be explored. Width and center frequency for different input signals are of interest. From this an enhanced loudness approximation can be derived. Other fields of application could be audio compression or hearing aids.

Methods

First simulations in Matlab on the behavior of critical bands have been carried out. An algorithm was designed employing a wavelet analysis to produce a time-frequency representation and a peak-finding algorithm identified dips in the magnitude frequency-response. It is important for the wavelet transform to have a higher resolution than auditory filters.

Results

Theoretical research on the subject using Matlab simulations of adaptive critical bands indicate a different behavior in loudness perception. Differences seem to appear in the specific loudness as well as the simultaneous masking (one critical band masking the next).

Conclusions

So far it is too early for final conclusions, but simulations lead to expect different loudness perception. In 2018 psycho-acoustical experiments to acquire empirical data on center frequency and width of critical bands will follow.

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Control of Headphone and Loudspeaker Characteristics in Online Experiments

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Background

In online experiments using acoustic stimuli, it is usually unknown which headphones or loudspeakers participants use. However, the sound transducing equipment could have an influence on the participants' responses. In a previous online study (Kopiez, Wolf, Platz, & Mons, 2016), participants had to distinguish between real orchestra sounds and sample-based orchestra sounds. Participants with much experience in sound evaluation were more likely to give the correct answer than less experienced subjects. The resulting question is whether this result was solely due to differences in listening expertise. It cannot be ruled out that the more experienced participants also used higher quality audio equipment. Not every test subject received signals with identical characteristics. Due to the modification in acoustic stimulus by different sound transducers and listening situations the test prerequisites vary. Consequently, a confounding variable which is currently hard to control by objective procedures must be assumed in this context.

Aims

To preclude the limited reliability of self-reports in the future, a simple and easy to implement procedure should be created to indirectly determine the playback characteristics of sound transducers used in online experiments. Additionally, the variety of transducers used in online studies should be obtained.

Method

The listening tasks were designed to determine headphone and loudspeaker characteristics and the listening situation based on listener response behavior. Features such as sound volume, headphone vs. loudspeaker playback, mono vs. stereo playback and cutoff frequency should be determined with an online survey. In total, 181 complete data sets could be used for the data analysis. 87 of the participants were female and 94 male. The average age was 34 years (SD = 12.4).

Results

The evaluation of the listening tasks showed that an objective procedure for the control of listening conditions and quality of audio equipment used in online surveys can already be created with eight subtasks. This procedure serves as a first try for a Headphone and Loudspeaker Test (HALT). A t-test for unequal variances showed a significant difference with a medium effect on the HALT score under the conditions of high expertise ($M = 10.27$, $SD = 1.01$) and low expertise ($M = 8.92$, $SD = 2.85$); $t(22.63) = -3.62$, $p = .0015$, $d = 0.49$. The calculation of a one-way ANOVA showed a significant difference between the transducer types (headphones, loudspeaker boxes, integrated loudspeakers) with regard to the HALT score; $F(1,179) = 17.5$, $p < .001$. There was a medium effect of $\eta 2 = .089$.

Conclusions

A simple and speedy test procedure may be helpful in reducing the confounding influence of transducers in online experiments. With modularly organized subtasks, the procedure can be adapted to the respective question with little additional effort on the part of either the examiner or the subject. In a next step, the stimuli are to be further improved and tested under controlled laboratory conditions.

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The Influx of Different Language Rhythms and Cultures into Musical Rhythms because of the Occupation by Other Countries

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Background

Rhythm is one of the most important elements not only for music, but also for language. Language rhythm is categorized into three types: stress-timed language, syllable-timed language, and mora-timed language (Ladefoged & Johnson 2010). Grabe & Low (2002) have used the Pairwise Variability Index (PVI) to categorize three linguistic speech rhythms, and Patel & Daniele (2003) adapted it into musical rhythm measurement and found that language rhythms influenced musical rhythms through composers' native language in their culture. Jekiel (2014) compared the nPVI of British English and that of Polish (mixed-type language) with the nPVI of pieces composed by British composers and that of pieces composed by Polish composers in the 19th century; the main problem was that the historical background in Poland was not considered; Poland was occupied by other countries, and the rhythms of languages in those countries are different from Polish rhythm.

In the same manner, Japan has complex history: Japan was occupied by the United States after World War II (WWII), and Western cultures and languages inflexed into Japan during the occupation. Hence, it is presumed that not only language rhythm, but also history and musical history impact musical rhythm.

Aims

The aim of this study was to test if the complex background of Japanese history influences Japanese musical rhythms.

Methods

One thousand fifty-nine phrases from 224 pieces composed by 102 native Japanese speakers who were born after 1800 were calculated the musical nPVI values and analyzed depending on eight periods based on history in Japan and four periods based on musical history in Japan.

Results

The results indicate that musical rhythms significantly changed after the occupation by the United States after the Pacific War. In the same manner, musical rhythms differ from period to period based on the musical history in Japan. Japanese musical history influenced changes in Japanese musical nPVI values.

Conclusions

Japan a unique country whose culture has significantly changed many times over the last 200 years: "Galapagosization" by locked countries, the importing of new cultures from other countries by the open country, the merging of Japanese culture and others, the importing of American culture as a result of the occupation by the United States, and the restoration of sovereignty. Complex historical and cultural impacts from other countries whose languages have different rhythms from Japanese language rhythm are strongly related to musical rhythms.

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Do Dotted Rhythms Increase Performance Precision: Why Marches Have Dotted Rhythms

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Background

Among the most impressive human behaviors are closely synchronized actions involving large groups of people, as seen in marches, military displays, and certain types of dance and synchronized swimming. Given that coordinated movement promotes cooperation amongst the partakers (Valdesolo, Ouyang & DeSteno, 2010) and increases the extent to which observers attribute rapport and entitativity to the group (Lakens & Stel, 2011), there are good evolutionary reasons to aspire to such behaviors on an individual as well as on a group level. Interestingly, contexts entailing synchronized movement are very often accompanied by music. This raises the question about which temporal cues or features in the music facilitate precise movement coordination. Through a musical corpus analysis, this project proposes and formally tests the conjecture that dotted rhythms appear more often in marches than in other comparable types of music because such rhythms facilitate mental subdivision of the meter and thereby aid in synchronizing to a beat.

Aims

A corpus study tested the hypothesis that musical marches show a tendency for the second of the two notes preceding sounded downbeats to be shorter than the first of the pair, leading to “cretic rhythms” (i.e., long-short-long), such as in “dotted rhythms”. Moreover, the durational ratio of these two notes is expected to be greater in slower compared to faster movements.

Methods

For the corpus study, 200 marches were randomly sampled from a list produced from a keyword search for “march” in the database of the International Music Score Library Project (IMSLP). A matched sample of control pieces written by the same composer and employing the same instrumental genre and metric type was similarly compiled. The first four sounded downbeats beginning a measure and preceded by two notes were examined. Tempo was coded based on an ordered list of common tempo terms (cf. Hansen & Huron, 2018).

Results

Although marches contained more cretic rhythms ($M = 0.985$, $SE = 0.086$) than non-marches ($M = 0.790$, $SE = 0.085$) on average, this difference was not statistically significant, $t(199) = 1.61$, $p = .109$. Marches were also not more likely than non-marches to begin with a pickup gesture, $\chi2(1) = 0.047$, $p = .829$. Moreover, there was no non-parametric correlation between tempo and the median ratio of cretic rhythms in marches, $\rho(63) = .007$, $p = .954$.

Conclusions

The present results are inconsistent with the theory that dotted rhythms encourage subjective beat subdivision which, in turn, increases the likelihood of accurate beat synchronization. Cultural factors seem more likely than perceptual-motor-social ones to explain the musical topic of dotted rhythms in military-themed Western music.

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Aesthetic preferences and perceptual discrimination of microrhythmic variations in music: A comparative study across three cultures

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Background

Live musical performances reliably contain rhythmic variations that deviate from the theoretical rhythmic structure of the music, in terms of both horizontal (i.e. subdivision structure of the beat and meter) and vertical (i.e. asynchronies between co-performers) relationships of musical events. The degree to which such microrhythmic variations are perceptually salient has been examined primarily for Western musical styles, while investigations of the degree to which such variations affect aesthetic appraisal of performances have produced somewhat conflicting findings (e.g. Senn et al., 2016).

Aims

We compared behavioural ratings from participants from three countries to three style of music to test the effects of cultural familiarity and musical expertise on aesthetic judgements of microrhythmic variations.

Method

We compared participants in three countries (UK, Mali, and Uruguay) in their behavioural responses to music from each of the represented locations (jazz music representative of one music style present within the UK, jembe drumming music from Mali, and candombe drumming music from Uruguay). We also compared responses from performing musicians to non-musician university students in each country. Stimuli were short musical excerpts that were reconstructed from actual (prototypical) performances from each style, in which two types of manipulations were introduced: 1) changes in the metric subdivision structure of the music (5 levels of manipulation, which essentially vary the magnitude/pattern of 'swing') and 2) changes in the microtiming deviations from the metric subdivision structure in each ensemble part (8 levels of manipulation, which introduce different degrees of asynchronies between co-performers).

Participants (N=180, 60 per country) were asked to give preference (liking) ratings for the stimuli (including both versions based on the original performance timings and versions with manipulated timing parameters). Two additional (control) tasks included a same/different discrimination task that tested participants' ability to detect the timing deviations introduced by each of the two manipulations, and a task in which they were asked to tap along to the beat of the original (un-manipulated) versions of the stimuli. All participants were exposed to the stimuli from all three cultures in all three tasks.

Results

Results indicate several effects of both cultural familiarity and expertise. For instance, whilst both candombe musicians and Uruguayan non-musicians preferred the subdivision structure from the original performed version of the candombe music, only Malian jembe musicians preferred the original subdivision structure of jembe music, whilst Malian non-musicians showed preferences closer to those of Western listeners. Results for the jazz musicians suggest a wider range of subdivision structure preferences than the other groups. A general preference for minimal asynchrony between ensemble parts was found across styles and groups.

Conclusions

This work reveals both cross-cultural similarities (asynchrony preferences) and differences (subdivision structure preferences). Results also indicate differences in preferences within sub-cultural groups from the same country (musicians/non-musician university students). Challenges and perspectives on cross-cultural research will be discussed.

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The Effect of a Rhythmic Pulse on the Heart Rate: A Validation of the Rhythmical "Entrainment" and "Synchronization" Hypothesis

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Background

The heartrate (HR) is an important psychophysiological parameter which can be used as an indicator of emotional reactions to music. Especially the tempo of a musical pulse seems to significantly influence the HR. Two different phenomena have been discussed in previous studies: 1. The adaption of the HR to the frequency of the stimulus (so-called "entrainment"). 2. The phase synchronization between the onset of the stimulus and the R-waves of the ECG (so-called "synchronization" (von Holst, 1936)).

Concerning the "entrainment" effect, Saperston (1993) reported successful manipulations of the HR -- however, only when the frequency of the stimulus was coupled to the actual HR of a listener in real-time. In contrast, discontinuous and random changes in tempo did not influence HR (Van Dyck et al., 2017).

To the best of our knowledge, up until now the "synchronization" effect of tempo changes of the trigger pulse on the HR has not been investigated.

Aims

We investigated whether "entrainment" and "synchronization" effects on a rhythmic pulse can be observed under the condition of tempo changes coupled to the actual HR in real-time.

The following hypotheses were tested: 1. By multiplying the average mean of the HR with a coefficient $x > 1$ and using this numeric value for the real-time tempo change of the stimulus (rhythmic pulse), the average HR would significantly increase ("entrainment"). 2. By presenting an isochronous rhythmic pulse in a similar tempo to the actual averaged HR, the phases of the R-waves in the ECG would be linked to the onset of the stimulus ("synchronization").

Method

The hypotheses were tested in a repeated measures design using a real-time feedback loop based on a researcher-developed MATLAB script. The stimulus frequency was continuously adapted in relation to the moving average HR. Data analysis was based on circular and Bayesian statistics.

Participants (N = 23) were music students at the Hanover University of Music, Drama and Media.

Conclusions

In testing the "entrainment" hypothesis, the Bayesian repeated measures ANOVA (software JASP V. 0.8.2.3) revealed an overall Bayes-Factor of BF(10)= 0.417 (BF(01)= 2.4), meaning that there was no support for the alternative hypothesis and weak evidence for the null hypothesis. In testing the "synchronization" hypothesis, the individual analysis with circular statistics showed no consistent tendencies of synchronization across all subjects.

Discussion

No assumed effects were found for either of the hypotheses, which is in line with the assumptions by Koelsch and Jäncke (2015). The positive finding of Saperston (1993) could also not be replicated. May be the tempo of a rhythmic pulse alone does not cause "entrainment" or "synchronization" effects, but additional parameters such as emotional involvement might lead to an increased HR.

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Complexity in musical rhythms: beat content, liking and urge to move

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Background

Within predictive processing theories, it is hypothesized that zero error is the end goal of the brain. However, both theory and empirical data indicate that some optimal amount of prediction error is preferred in music (e.g. Witek et al., 2014), especially when it comes to rhythmic prediction error, generally implemented through rhythmic complexity. Although previous work shows that rhythmic complexity can lead to more liking or urge to move, different types of complexity were used, sometimes producing disparate results.

Aims

Here, we distinguish and evaluate two kinds of rhythmic complexity that are both beat-based, namely repeating syncopated patterns that only deviate from a standard metrical structure (or metrical complexity, MC), and randomized sequenced note durations, producing an unpredictable but still beat-based pattern (random complexity, RC). As control conditions, metrically predictable, simple rhythms (MS) and non-beat-based patterns (NB) were used. For each pattern type, the beat clarity, preference and urge to move were assessed.

Methods

Although data collection is still ongoing, 22 participants (17 female, mean age 19.6, sd = 1.9 years) have currently taken part. In a single session, participants first tapped to the four different rhythm types and rated the clarity of the beat in each pattern, listening to 5 MS patterns, and 10 different examples of MC, RC and NB patterns. Next, participants rated their preference and urge to move for 10 MP patterns, 20 examples of MC and RC patterns, and 10 NB patterns in a blockwise, counterbalanced design. All ratings were made using sliders yielding a score between 0 and 100. As a measure of musical engagement, the Goldsmith Musical Sophistication Index was also administered. Each rating measure is compared between rhythmic categories using a repeated-measures ANOVA with post-hoc comparisons. Analyses of the tapping responses and inclusion of musical background measures are underway.

Results

In terms of preference, MS and MC patterns were rated equally ($p=0.62$), and both significantly more pleasant than RC or NB patterns (all p values <0.01). Ratings of the urge to move and beat clarity showed identical response patterns in which all rhythm types were significantly different (all p values <0.000), in which the MS scored highest, then MC, RC and ending with NB patterns.

Conclusions

Different types of complexity in beat-based rhythms, namely syncopation or random note durations, were found to lead to significantly different responses in all investigated measures, namely preference, urge to move and beat clarity, with higher scores for the syncopated rhythms than the random durations. The control condition of non-beat-based rhythms scored significantly lower than all other patterns on all measures, while metrically simple rhythms were liked as much as syncopated rhythms but elicited more urge to move than both complex rhythm types. These results are among the first to directly compare different types of rhythmic complexity on these subjective measures, and promise to refine our understanding of the interaction of musical rhythms with pleasure and movement.

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Associations between musical and linguistic abilities in first-grade children: The short-term effects of a movement-based elementary school music educational program

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Background

Studies have shown that active engagement in musical activities advances speech perception and language-related skills (Miendlarzewska & Trost, 2014). Although several programs have been developed to examine the link between music instruction and linguistic abilities in 6-7-year-old children, only a few studies investigated the possible short-term benefits of classroom music education. Moreover, the effects of musical activities employing gross and fine motor movements have been rarely examined and need further investigation.

Aims

The purpose of the present study was to investigate the short-term transfer effects of a music education program using movement activities on the development of musical and linguistic abilities in first-grade children and to explore the links between music perception, entrainment, and language-related abilities in two classes with different curricula.

Method

Fifty-eight first-grade students were tested in the fall and the spring term in the school year of 2016/17. We compared two groups from the same elementary school participating in a new music education program. “Active Music Learning” is based on creative vocal-movement games and aims to support the understanding of musical concepts through directed movement activities, providing a kinaesthetic and visual experience of music. Music lessons were held by trained music educators four times a week in the music class and twice a week in the class with the mathematics curriculum.

Three tests from the Hungarian version of Dyslexia Differential Diagnosis Maastricht (3DM-H; Tóth, Csépe, Vaessen, & Blomert, 2014) were used to measure linguistic abilities: reading, phonological awareness and rapid automatized naming tests were administered. Music perception was assessed with an online test (Asztalos & Csapó, 2016) measuring pitch, melody, rhythm, tempo, and harmony discrimination as well as visual connection skills. We tested rhythmic entrainment by measuring the synchronization of tapping to isochronous tone sequences.

Results

Results showed significant pre- to posttest enhancement of reading, phonological awareness, rapid naming, rhythmic entrainment, and musical auditory abilities in both classes, but no significant difference was found between the classes at the end of the school year in any measures abilities. Correlation analyses revealed strong significant relationships between reading, phonological awareness and musical abilities only in the music class, but the strength of these associations was not significantly different from the non-significant relationships found in the mathematics class.

Conclusions

We conclude that attendance at elementary school might lead to improvements in linguistic and musical abilities in first-graders and that short-term music instruction in elementary school environment could not support the appearance of transfer effects considerably. We further investigate the long-term effects of “Active Music Learning” in the same classes.

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Lexical decision task in music for words differentiated on affective dimensions

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Background

Affective responses may facilitate cognitive reactions congruent to the emotional states (Bower, 1981), what could be observed in the lexical decision task (LDT). We assume that the facilitation effect occurs with regard to musical stimuli differentiated on arousal and valence dimensions.

Aims

We wanted to verify whether reaction time in LDT for affective words (AW) is shorter while the decision is made during listening to affectively congruent and longer with affectively incongruent music.

Method

We used 4 music pieces representing the affective quarters of valence and arousal dimensions. The music preceded and was still being played while 64 AW (in Polish; Imbir et al., 2016) and 64 pseudo-words (Imbir, 2015) were appearing in randomized order on the computer screen. Participants were asked to make LDT with the same lexical material and different music piece for each part of the experiment. 99 women and 60 men took part in the study (Mage=22.9; Min=17; Max=47). We obtained 126 responses for the first part (FP) and 115 for the second part (SP). Analyses were conducted separately for words from affective quarters (high arousal/high valence, etc.) and from affective halves (high/low valence, etc.) in each part.

Results

In the FP of the experiment participants from the high arousal music group responded faster to presented words than from the low arousal music groups (p-values were between .028 and .09, effect sizes between .15 and .20). In the SP participants from the negative valenced music groups reacted faster to negative words than from the positive valenced music groups (p=.010, r=.24). Participants from the positive valenced music groups reacted faster to positive words than from the negative valenced music groups (p=.010, r=.24).

Conclusions

The valence of music pieces in the SP led subjects to congruent affective state what might have activated the associations with that affect (Bower, 1981) and enabled the faster recognition of words affectively congruent with music.

The differences among results obtained in two parts of the experiment may be a result of different level of cognitive load. In the FP the LDT stimuli were unknown, so subjects had to concentrate on the experimental material. Execution of a demanding task and simultaneous attention to the stimuli from the auditory channel could lead the subjects' cognitive system to the decision of processing only one channel of information. In the SP, when the words were known to participants, subjects might have shifted a part of their attention to affective value of music. The results from the FP may indicate that music does not have the power to induce affective state as long as it is not in the center of the subjects' attention.

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Rhythmic processing of music and language: A review and implications

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Background

Musical rhythm is a highly predictable and periodic stimulus that allows for entrainment and phase locking of internal neural oscillators. Although less regular than music, language also contains predictable rhythmic information and some metrical structure. Dynamic Attending Theory (DAT; Jones, 1976; Large & Jones, 1999) proposes that internal neural oscillators entrain to external rhythmic events at multiple hierarchical levels, and that this process allows for prediction of upcoming events through directed attention and phase locking. Numerous studies have revealed cross-domain transfer effects and connections between rhythmic processing in music and language in both normal and impaired populations, suggesting that this link between the domains can be exploited for rehabilitation and training. The strong periodicity within music makes it a useful tool to entrain neural oscillations and enhance speech processing.

Aims

In this review, we draw together a number of research domains indicating connections between neural processing of music and speech rhythms. By reviewing literature on neural oscillations to auditory stimuli, cross-domain transfer, and effects of rhythmic priming and rhythmic training on speech processing in normal and impaired (e.g., dyslexic, specific language impairment (SLI), hearing impaired) populations, we aim to connect these research domains and discuss implications for the field.

Main Contribution

This review combines behavioural, neuroscientific, and clinical research investigating connections between music and language in relation to rhythm, and places this research within the dynamic attending framework. Prominent theories of shared neural mechanisms for rhythmic processing in music and language will be contrasted and discussed, focusing on elements common to all theories. Experimentally, we will focus specifically on recent work investigating rhythmic priming between music and speech as a model for exploring shared underlying neural processes between the two domains. With the culmination of knowledge gained through this review and the comparison of prominent theories in the field, suggestions for future research and the efficacy of rhythmic training for speech processing will be outlined. The main contribution of this review is therefore to provide a critical appraisal of the research thus far, to compare current theories of shared rhythmic processing in music and language, and to outline implications and future directions for research.

Implications

The current review suggests that musical rhythmic stimulation and musical rhythmic training can enhance language processing in normal and impaired populations. A greater understanding of the underlying neural processes involved in this connection can therefore advance our understanding of normal as well as impaired rhythmic processing, and also inform treatment options for linguistic impairments in various patient populations.

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MUSIC LISTENING AND VISUAL INTERPRETATIONS: MUSIC AS SOUNDTRACK PROVOKING LISTENERS' IMAGINARY FILM

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Background

Music listening is not a simple acoustic experience, it is usually accompanied by extramusical associations that make the musical piece meaningful. Although the evoked visual and/or emotional experiences may seem to be personal, the influence of cultural background is quite significant (Almén, 2014; Levitin, 2006) as the musical signs that listeners find meaningful "depend on learned cultural codes" (Monelle, 2000). This paper illustrates an empirical case study which

focuses on “music listening as a creative process” (Wiggins, 2002) and listeners’ interpretations, and is based on an interdisciplinary approach mainly involving musical semiotics and music psychology.

Aims

The main aim of the study is to investigate how instrumental music can act as a narrator telling a story and what kind of stories are perceived by listeners’ minds. Are they individual, different, emotional, visual, dynamic, more personal or culture-related?

Method

The empirical study involved active listening to three musical excerpts and qualitative semi-structured interviewing where each subject separately was asked open-ended questions regarding their extramusical associations after each listening. The musical pieces selected for this study represented different musical genres: mainstream pop music, Lithuanian sung poetry and contemporary instrumental music. The last one was chosen as the main musical target for the analysis because it contains no verbal text, and thus the mind of the subjects is not attached to or limited by lyrics. Each experimental session was recorded and the audiovisual material was used for analysis of listeners’ verbal and non-verbal responses.

Results

24 subjects (Lithuanians aged between 21-30) participated in the study. None (0%) of the participants were familiar with the instrumental excerpt, thus the mere exposure effect (familiarity factor) could be avoided. However, all subjects (100%) had extramusical associations related to the instrumental piece. 66.66% of the subjects described their images as nature landscapes (fields/meadows, mountains, forests, rivers, sky). The dominating colors “seen” in this musical piece were green (54.1%) and blue (45.8%). General mood perceived by most of the subjects was “elevated”, “majestic” (~45.8%).

Conclusions

Individual extramusical associations - visual and/or emotional interpretations - as product of music listening tend to reveal interesting associations that most of which creatively become dynamic stories, narratives. Although often music is understood as a reflection of inner “Self” (Girdzijauskas, 2012), the evoked associations tend to come from listeners’ socio-cultural, especially audiovisual, experience as this study revealed some general tendencies in perceiving the same meaning.

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Effective soundtrack? Influence of background music on the emotional and cognitive processing of documentaries

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Background

The soundtrack has become an increasingly essential part of documentary film. In contrast to music in fictional films, which is regarded as inconceivable element and whose effects have been studied empirically for quite some time now, the usage of background music in documentaries is often rated negatively by experts or recipients – e.g., perceived as “coloring reality” (Have, 2010, p. 51). Is this negative attitude justified? What does music in documentaries affect?

Music in fictional films can – especially if it is selected congruent to the film plot – induce specific strong emotions (e.g., Strobin, Hunt, Spencer, & Hunt, 2015). Fitting film music guides viewers to remember more content-related information (Boltz, 2004). TV news with matching background music is generally evaluated more positively than the ones with incongruent or without music (Brosius, 1990). Positive effects of music in non-fiction even occur regarding the credibility – e.g., of radio spokespersons (Martín-Santana, Reinares-Lara, & Muela-Molina, 2015).

Aims

This study investigates the effects of music in documentaries regarding the viewers' emotions and information processing as well as the documentary's perceived credibility and evaluation.

Methods

This study's media stimulus was a 7-minute documentary excerpt about Chernobyl today. Its central theme is the necessity to build a new protective sarcophagus for the old buildings to prevent a re-contamination with nuclear radiation (mood: discomfort and anxiety). A congruent (fearful) and incongruent (angry) music was edited as background. In a between-subject design, 92 participants of a laboratory experiment (70% female, age M=21, SD=2.02) were randomly assigned to either a control group without music or one of the two film conditions.

Results

Participants perceived the congruent condition of music and documentary as significantly more fitting than the incongruent one (manipulation-check). The results regarding the participants' emotions (H1) were in alignment with the assumption that congruent music would induce significantly stronger specific emotions than incongruent or no music. Matching music in a documentary influences the information processing positively (H2: $F(2,89)=14.47$, $p<.001$, $\eta^2=.245$) and leads to a better evaluation of the documentary in a whole (H3: $F(2,89)=11.18$, $p<.001$, $\eta^2=.201$). As long as the congruent music is used, it does not negatively affect the perceived credibility (H4: $F(2,89)=17.81$, $p<.001$, $\eta^2 =.286$).

Conclusions

This study shows that carefully selected music's positive effects outweigh the documentary audience's potential feeling of being manipulated – congruent music even leads to a particularly strong perceived credibility of the documentary.

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Blindsided By Music: A Driving Simulator Study Employing Eye Tracking With Music Background

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Background

Drivers monitor traffic and road, and respond to environmental cues, all while steering, accelerating, and braking. Background music competes for attentional resources, and hampers the primary task of driving (Brodsky & Slor, 2013). In-car music affects mental workload and hazard perception, and increases reaction time to peripheral target detection (Huges, Rudin-Brown, & Young, 2013). While previous studies indicate a relationship between allocation of attention and driving performance mediated by driver experience (Lee, 2007), and point to distraction as more pronounced among younger drivers who are less efficient in processing visual material, there is little hard evidence to substantiate such a causality concerning in-car music.

Aims

Eye movements are efficient for measuring driver allocation of attentional resources when engaged in multiple tasks (Young, Mitsopoulos-Rubens, Rudin-Brown, & Lenné, 2012). The current study aimed to examine saccades (rapid ballistic eye movements) and fixations while driving with music.

Method

36 undergraduates participated as drivers; 10 held an Australian Provisional I license (<2 years), 16 a Provisional II license (2-3 years), and 10 a Full license (>3 years). The study employed a high-fidelity fixed-base STISIM driving simulator. Music

stimuli were two songs: ‘Bye, Bye, Bye’ (N-Sync) and ‘I’m Real’ (J. Lo featuring Ja Rule). There were six trips: two with original vocals, two with instrumental covers, and two without music.

Results

Results revealed no significant differences between vocal and instrumental covers, and no effects of music for total number of saccades, total number of fixations, or mean fixation duration. Then, license type was added as a between-subjects factor. No significant main effects or interactions were found for saccades or fixations, but a significant interaction surfaced between whether or not music was present and the level of driving experience; individuals with a Provisional I license exhibited a higher mean fixation duration when driving with music.

Conclusions

Novice drivers tended to make longer fixations when driving with music. As differences between vocal versus instrumental version did not result in extended fixation durations, and presuming that longer fixation duration is indicative of a narrowing of attention, the findings suggest that music is particularly distracting for young novice drivers. The extent to which in-vehicle music listening contributes to collisions is unknown, and as such, cannot be clearly conveyed. Nonetheless, young novice drivers should think more carefully before engaging with music as a secondary task while driving.

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Characteristics of eye movements and working memory at sight-reading of the musical text by pianists

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Background

Sight reading of the musical text involves a multi-level complex of physiological and mental processes. Physiological level includes visio-motor patterns - eye movements when reading musical signs and playing music on the piano keyboard. These processes include sensory register, the components of attention to ensure the selection and recognition of visual stimuli, recognition of sign patterns, executive control and working memory specific for music analysis, as well as high level executive mechanisms, providing fine eye-hand coordination. Thus the eye movement parameters represent the physiological basis which provides the possibility of an objective quantitative study of cognitive functions in the execution of such complex skill as sight reading.

Aims

Aim of the topic is to study the eye movement parameters in pianists at sight reading of a two-line musical text without any restriction to the pianist’s head and body movement.

Method

The research involved 16 students of Tchaikovsky Moscow State Conservatory who specialize in piano performance (age of 19-23, 7 women). The musicians were asked to sight-read facing pages of a music-sheet of three classical musical pieces of various complexity. Experiment on the recording of eye movements was carried out with use of hardware and software which allows to register eye movements without any restriction to the pianist’s movement. This allows a maximum approximation of the experimental conditions to natural. Also we tested capacity of working memory (WM).

Results

Data on eye position while sight reading of a musical piece allow to study an eye-hand span interval (EHS) between the gaze direction on a music-sheet and the performed music at a particular moment. In our experiment the EHS parameter

varies significantly both in relation to each musician and among the musicians from -3 to 14 symbols. While sight reading the easiest musical piece the EHS is at its maximum and on average constitutes 4-5 symbols, for the most difficult musical piece – 2-3 symbols.

The pianists performed shorter visual fixations divided by saccades of low amplitudes when performing more complicated pieces. Less experienced pianists had longer visual fixations when reading a musical piece. The proportion of reverse saccades was 6-7%. The value of EHS in more experienced pianists is lower, and the number of reverse saccades is larger, which is connected with the visual strategy of text reading.

The average WM capacity was 3-4 symbols. The average value of EHS when reading a two-line notation text was 4-8 symbols, which exceeds the WM capacity. We revealed a direct correlation between EHS values and WM parameters.

Conclusions

The number of saccades and fixations for each piece depends on the information saturation and complexity of the musical piece. The ratio of horizontal and vertical saccades depends on the complexity of musical pieces. EHS reflects the complexity of a musical piece for pianists of approximately one and the same level of proficiency. Larger values of EHS in comparison with WM capacity mean that patterns loaded to WM consist of more than one musical symbol.

Supported by RFH/RFBR (project №16-06-01082).

Does visual working memory predict musical discrimination abilities in children?

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Background

Measuring melodic and rhythmic abilities are often used as a proxy for general musicality. However, melodic and rhythmic tests often rely on working memory, and the degree to which the test scores relate to the underlying constructs of melodic and rhythmic discrimination ability is difficult to determine (Harrison et al, 2017). Furthermore, it has been shown that musicians perform better than non-musicians on verbal memory tasks, although there is less evidence that musical training improves visual working memory capacity (Talamini et al, 2017).

Aims

This study investigates the relationships between musical listening abilities, musical training and visual working memory across children of different ages by determining the strength of the association between these different abilities.

Methods

20,111 children from 330 Danish schools (age range: 5-20 years) participated in the study. We administered the miniMET - a new musical aptitude test for children assessing melodic and rhythmic discrimination (Sørensen & Petersen et al., in preparation). We used a forward visual digit span test to assess working memory ability, and to measure musical engagement, we used the Concurrent Musical Activity questionnaire (Müllensiefen et al, 2015).

Relationships between variables were analysed using structural equation modelling (SEM).

Results

Preliminary analyses show that the best fitting model (N = 19876, CFI = 0.826, SRMR = 0.056) includes years of musical training and working memory capacity as significant predictors for performance on the melodic and rhythmic subtests of the miniMET. In turn, age and concurrent musical activity are significant predictors of working memory capacity in this model.

Conclusions

Our preliminary results show that greater working memory capacity increases performance on both musical tasks and that musical training (as well as age) has a positive effect on working memory capacity.

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Analysing the Effects of Music Videos on Listening Experiences

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Background

There has been limited research to date dedicated to the analysis of music videos (MVs) and their effect on listeners, especially in respect to emotional outcomes from listening. Studies show that visual information contributes to how the emotional quality of a piece of music is perceived and remembered, even when the video is no longer present (Boltz, Ebendorf & Field, 2009). Music serves an important psychological function during youth (Laiho, 2004), and is often used as a tool regulating affect (Saarikallio & Erkkilä, 2007). Music psychology research can benefit from a better understanding of how information from MVs affects emotional and perceptual outcomes during music listening, particularly in youth audiences. This is especially true given the increased accessibility of this type of media, the effects of which have not been explored in respect to modern listening devices and the new listening contexts they enable.

Aims

The study aimed to provide new insights into individuals' experiences with MVs. It examined the extent to which the visual component of MVs affected emotional outcomes and perception of the music's meaning in future listening episodes

Method

The study featured a mixed methods design to explore this under-investigated phenomenon. Psychological scales measuring individual variables such as personality and healthy listening habits were used. Participants were instructed to watch a preferred MV before completing the open-ended questionnaire, which gathered self-report data on their experience. Data were collected from n = 36 participants, however only 30 of the 36 were also included for qualitative analysis.

Results

Content analysis revealed MVs had the ability to influence emotional and perceptual outcomes, both during MV watching and in subsequent listening episodes without the video. Survey data revealed possible relationships between these psychological outcomes and individual variables such as personality and healthy music use. It was concluded that MVs had a significant effect in influencing future emotional outcomes and understanding of the music's meaning. Furthermore, the majority of participants reported images or scenes from the MV being recalled as mental imagery in subsequent listens.

Conclusions

The study's exploration of outcomes from MV watching succeeded in providing novel insights about subjects' experiences with this media. MVs are becoming an increasingly relevant form of media among youth audiences, and more research needs to be conducted in order to better understand their role and function as a form of musical engagement.

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Visualising Sound: A Cross-Cultural Study in Crossmodal Correspondences

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Background

"Crossmodal correspondences" as a term has been commonly used in order to describe interactions across the senses. Linguistic and semantic crossmodal correspondences, as distinguished by Spence (2011), may depend on cultural traits and therefore lead to cross-cultural differences when people are asked to make audio-visual couplings. However, according to the prototype theory of categorization, proposed by Rosch (1977), people use prototypes in order to cognitively process objects found in the external world. Natural prototypes are common to all cultures, such as categories of colours and shapes. Moreover numerous studies have shown that cognitive and perceptual processing of music is common between cultures, and these commonalities are thought to be universal.

Aims

Previous studies on crossmodal correspondences have shown that sound characteristics, especially pitch and loudness, correlate to visual properties. The aim of this work is to unveil firstly whether correspondences between auditory stimuli and visual patterns are culture dependent and secondly how people make such judgments when asked to do so.

Methods

An experiment was conducted in which persons of German, Chinese, and South American origin participated (47 males, 56 females, mean age=26,7). A monitor and two loudspeakers on a table were placed in front of the participants. The task was to choose for each sound (stimuli of noise, sine and square wave tones) (1) a visual pattern that matched the sound the most (9 graphic achromatic patterns), and (2) an adjective that best described the sound (hard, soft, smooth, unsmooth, rough). Furthermore they were asked to justify their selection (sound-to-pattern). All participants were asked to fill out a questionnaire.

Results

The data collected was divided into three groups (depending on origin). A three-way log linear analysis was conducted which indicated that the highest-order interaction (culture*sound*texture) was not significant. However, separate x2-tests were performed for all cultural groups which unveiled a highly significant interaction between the sound and the visual pattern for all cultural groups. Sparse patterns were selected for sine wave and dense patterns for square wave tones and noise. Similar couplings were made by all groups between the stimuli and their verbal descriptions with sine tones perceived as "smooth", square tones and noise as "rough". Additionally, participants based their justification for the correspondence either on an association or a sound feature and less on an emotion, though some differences were found between the groups.

Conclusions

We could observe that sound-to-pattern correspondences depend on the sound's structure whereas verbal judgments of sound are facilitated by the sound's timbre for all groups. The justification given by the participants showed that the interpretation of sound information was made in terms of semantic meaning that necessitated associations and mental images. In this case differences between cultural groups were noticed. Further research is necessary to unveil whether crossmodal correspondences between sound and visual patterns are universal or not.

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An Expectancy-Based Model for Measuring and Visualising Musical Variability

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Background

Compositional variability refers to the dispersion (spread) of musical materials deployed over time and it often helps identifying cardinal points in a piece. Shannon entropy, which has traditionally been used as a general measure of 'freedom of choice', provides an average of information without considering the ordering of the materials. Therefore, different works

could plausibly have the same entropy provided that their materials are statistically equivalent, rendering this approach to entropy inappropriate as a measure of variability. An ideal method would assume variability to be high when neither repetition or variety are excessive. It is hypothesised that compositional variability across corpora of sufficient sizes might indicate meaningful trends in comparative studies.

Aims

The aims of this paper are to propose an expectation-based mathematical model for measuring and visualising compositional variability.

Method

An algorithm was developed to extract pitch-classes (PC) from a corpus comprising all piano sonatas by Beethoven and all solo piano pieces published in life by Chopin. The extracted data was then processed in accordance with a time-weighted entropy difference (TWED) model consisting of calculating the difference, weighted according to a chronological criterion, between consecutive Shannon entropy states across a piece on a two-dimensional time-information space. Expectations about future events are then modelled by TWED as the music unfolds, taking into account the overall cognitive framework of statistical learning and musical expectancy, for which there is empirical support. The result is a 1-gram sequence which can be plotted as a representation of dynamic surprise. By calculating the variance of the sequence, it is possible to obtain a statistical measure of PC-related variability for the piece, which can then be compared with the measures obtained from other pieces.

Results

The application of the model to the corpus showed remarkable differences and similarities between composers. For instance, results showed wider range of both entropy and compositional variability in Chopin's collection; Chopin's average variability was also found to be significantly higher than Beethoven's; in both collections, it was found that variability descends to the lowest levels toward the last phases of the composers' creative careers. Furthermore, variability has an overall downward trend in the corpus.

Conclusions

PC-related variability was generally high in rondo movements, confirming the assumption that the alternation between repetition (the refrain) and variety (modulating episodes) is a good conduit for variability. The fall of variability in both composers is chronologically correlated with the worsening of their health problems. Particularly in the case of Beethoven, variability starts a downward trend by the time the composer, realising the seriousness of his deafness, issued the 'Heiligenstadt Testament'. Chronological correlations between entropy and variability suggest that in their very early periods they generally avoided radical departures from tradition. Higher entropy and variability average and wider variability range seem to be connected to Chopin's chromaticism and richer variety of genres. While chronological correlations are preliminary and merit further investigation, the results demonstrate that the TWED model can provide meaningful structural information, assisting corpus-based musicology in analytical studies.

Cube Dances: Embodiment and Image Schemas in Neo-Riemannian Analysis

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Background

Neo-Riemannian theory is a response to understanding music that is not entirely tonal, a systematic way to navigate the shifting diatonic landscape of the late nineteenth century and after. Theorists have adopted ideas from abstract algebra and group theoretic structures as attempts to establish patterns, paths of parsimonious voice-leading motion, and Klang transformations. In this process, they bring new musical meanings and relationships to light.

As theorists, why do we construct visual models as tools for understanding musical structures? To what extent do Neo-Riemannian models reflect our auditory experiences? Could such music-theoretic tools provide insight into our underlying cognitive processes?

One way to address these questions is via a "cognitive science of the embodied mind" proposed by Lakoff and Johnson (1999), which involves studying the "imaginative structures by which embodied meaning is extended to abstract concepts and inference patterns" (Johnson 98). Such imaginative structures are termed image schemas and are essential for our ability to derive meaning via our physical interactions with the world. This paper uses four image schemas – Container, Cycle, Center-Verticality-Balance, and Source-Path-Goal – as lenses to interpret Neo-Riemannian models.

Aims

In this paper, I explore how Neo-Riemannian tools can be interpreted or understood as examples of visual metaphors that are derived by cross-domain mapping processes from mathematics and embodiment (as source domains) to music theory (target domain). This paper argues that such visual tools were developed in accordance with principles of embodied cognition, and that the particular language employed to define them reflects this.

Main Contribution

I adopt Johnson's image schemas to investigate explanations of three significant Neo-Riemannian analytical tools: the generalized Klang transformations as set forth by David Lewin (1982), Brian Hyer's interpretation of Riemann's Tonvorstellungen (1995), and Cohn's and Douthett's Cube Dances (1996, 1998 respectively). Throughout, I draw on insights from the cognitive sciences, specifically Lakoff's and Johnson's work, to examine ways in which Neo-Riemannian theory is grounded in principles of embodiment, and how this grounding can reflect our understanding of basic physical forces.

Implications

Interdisciplinary collaboration between music theorists, philosophers, and cognitive scientists can lead to new insights into how we react to our various environments, and particularly how we communicate this understanding uniquely through music. Image schemas allow us to interpret Neo-Riemannian visual constructions in terms of embodied cognition. These schemas are a useful metaphor for further understanding how music can be communicated and understood via physical forces and motion.

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The Influence of Extra-harmonic Similarity on Familiarity with Chord Progressions

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Background

Previous research has shown that the identification of songs from chord progressions is greatly influenced by the extra-harmonic similarities between their original songs and the test chordal stimuli (e.g., similar timbre, tempo, etc.) (Jimenez & Kuusi, 2017). However, it is possible that the effect of extra-harmonic similarity on memory for harmony extends beyond the identification of specific songs to more widespread phenomena, such as the sense of familiarity often triggered by common chord progressions (Doll, 2017).

Aims

The present study investigates whether or not register has an effect on a familiarity task in which participants' responses can be equally influenced by both song-specific and schematic harmonic knowledge.

Method

Six chord progressions were composed for the experiment. Three of the chord progressions were chosen because they occurred in the intro/verse, chorus, and bridge of a very popular song released in 2015 (hereafter 'target song'). The remaining three chord progressions were rotations of the progressions from the target song. In the experiment, these six chord progressions were instantiated in a way that resembled the beginning of the target song in terms of certain extra-harmonic features, such as timbre and tempo. Two versions of each chord progression were prepared: a version in the low register used by the target and another version one octave higher. The participants (N=260) were assigned to either

register condition and were asked how sure they were of having heard “at least one pop/rock song” that used each of the four-chord progressions.

Results

Most participants (89%) were familiar with the target song, and of those participants, 51% said that one or several of the chordal stimuli made them think of the target song. Low-register chord progressions prompted participants to think of the target song more often (55%) than the high-register stimuli (42%). In the second phase of an ongoing analysis, the participants who were familiar with the target song were divided into two categories: players and participants who had never played an instrument. Additionally, we ranked the six chord progressions on an ordinal scale according to their harmonic similarity with the opening piano part of the target song. The correlations between this target-related ranking and the averaged confidence ratings for each chord progression suggest that register had an effect on the confidence ratings of participants who had never played an instrument. Averaged confidence ratings of participants who had played instruments did not correlate with the target-related ranking but instead with the frequency of occurrence of those six chord progressions in an eight-thousand-song corpus of predominantly post-1990 pop/rock music.

Conclusions

The results from our experiment suggest that extra-harmonic similarity can have a measurable impact on the sense of familiarity triggered by common chord progressions. Future experiments could investigate the extent to which other parameters can also affect the experience of familiarity with chord progressions.

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Similarity versus rule-based processing of musical scales in the Maqam system of Arabic Music

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Background

The distinction between rule- and similarity- based processing plays a pivotal role in explaining a plethora of aspects in cognition. Similarity-based processing has been characterized as flexible, holistic, context-sensitive, involving more concrete representations and involving a partial matching of these incoming representations with stored representations in memory. Associated responses have been typified as being graded in nature.

Rule-based processing, on the other hand, has been characterized as involving more abstract representations, selective attention (and the resulting differential weighting of attributes) and a strict matching of incoming representations with stored representations in memory. Associated responses have been typified as being all or none (Hahn & Chater, 1998; Pothos, 2005; Smith & Sloman, 1994).

Aim

The aim of the research is to test the hypothesis that the taxonomic classification of scales derived from the melodic-modal system of Arabic music (the Maqam system) rests upon a similarity-based strategy of categorization while modulations between the scales are governed by a rule-based inferential strategy. A similarity measure is proposed including the following factors: proximity between tonal centers of two musical scales, ratio of common interval classes in intervallic sequence, commonality of non-aligned subsets and interval class vector based similarity measure). Also, a modulation rule is formulated as a modus ponens rule of inference whose components are partial (hence more abstract) than the components of the similarity measure and they comprise of a limited number of altered tones.

Methods

Analysis of modulations from the classic Egyptian repertoire in approximately 50 musical pieces.

Experiment with Arab musicians (N = 12) performing a similarity judgment task on transpositions of the scale of Maqam Rast using 24 equal tone octave division as an intonational approximation.

Results

Analysis of transitions between scales in the repertoire gives substantial support for the proposed perceptual implicit modulation rule.

Preliminary results suggests Arab musicians performed randomly on transpositions with no common tones (51% success) and improved significantly on transpositions involving commonality of tones (69% success). Results are significant under a chi squared test. Success is relative to the similarity measure.

A similar experiment with Western musicians is scheduled next and a mixed scales version experiment (mixed meaning different scales from the same family and from other families) with Arab musicians is going to test the hypothesized differentiation between judgments of similarity and modulations.

Conclusions

The above results imply that there is probably no uni-dimensional transposition rule representation based on the distance between tonal centers among the Arab musicians. Adding a second factor (a second dimension), commonality of tones, improved similarity judgments.

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Can Western Listeners Detect Pitch Deviations in Makam Music Sequences?

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Background

Earlier studies showed that tonal context influences pitch processing (eg. Bigand & Pineau, 1997; Marmel, Tillmann, & Dowling, 2008). To our knowledge, all studies conducted so far used the Western 12-tone equal temperament (12-TET) system. In their 2008 study, Marmel et al. looked at pitch deviation sensitivities for final notes in a two-measure melodic sequence, which ended either tonic or subdominant. They found an effect of tonal function on pitch deviation sensitivity. We were curious to see whether the same would hold Turkish makam music. It typically uses the Arel-Izgi tuning system, where an octave is divided into 24 uneven intervals where pitch changes as small as 22.5 cents can correspond to a note change rather than a mistuning.

Aims

Our aim was to see whether:

1. being entrained or encultured in Turkish makam music would generate finer pitch deviation sensitivities in the Turkish groups compared to Western participants,

2. the effect of function would be observed in Turkish makam music.

Method

Materials. Six pairs of two-bar long Western tonal melodies (Marmel et al., 2008) and comparable six pairs of Turkish makam melodies were used. The only difference between the melodies of a pair was their key, which was changed through a slight manipulation in the first bar of the melody. This caused the tonal function of the final tone to change (tonic/karar vs subdominant/asmakarar). Three additional melodies were used to run practice trials. The melodies were created as .wav files with Mus2 Software, using its “Kanun” sample as the instrument. The duration of each melody was 7 s. Final tones were shifted by cent degrees varying from ±7 to ±35 ¢.

Procedure and Design. Twelve Western musicians were instructed to listen to the melodies and make an in/out-of-tune judgment for their final tones on a 4-point scale. A 2 (function) x 3/4 (deviation amount) x 2 (deviation direction) design was used with correct in-tune and out-of-tune judgments as the dependent measure. Participants’ pitch discrimination thresholds were also assessed with a 3-up-1-down staircase procedure for each of the eight target tones used in the preceding experiment.

Results

We only found lower discrimination thresholds for Turkish makam musicians. The thresholds of Turkish non-musicians and Western musicians did not differ. We had expected to find an effect of tonal function on pitch deviation sensitivity for Western listeners in Western tonal context, but not in Turkish makam music context since they should not have been able to detect functional differences in the Turkish makam context. Our Western participants did not indeed show a tonal function effect in the Turkish makam music context, but unexpectedly, also not in the Western music context. The latter might have been an effect of the Kanun timbre, which seemed to have transformed the Western tunes into quite non-Western-sounding tunes.

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Musical scales and timing: Implications from music psychology for Eastern-European ethnomusicology and vice versa

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Background

The last few decades show a significant increase in cross-cultural research regarding perception of musical scales and timing. Most of the studies dealing with musical scales and tonal hierarchies, and relevant for the present paper, showed fairly reliable recognition of the original qualities of the scales, yet with some influences of cultural exposure and musical training (cf. Castellano et al 1984, Lynch et al 1990, 1991, Eerola et al 2009, Raman & Dowling 2016). Generally, the same tendencies were found for the timing domain (cf. Drake & Ben El Heni 2003, Toiviainen & Eerola 2003, Soley & Hannon 2010, Yates et al 2017). In addition, basics of music perception (such as categorization and the emic/etic problem) and a number of psychoacoustical phenomena (such as masking and roughness, relevant for the present study) are well known.

It should be noted that musical scales and timing have long been topics attracting tremendous attention among East-European ethnomusicologists, resulting in vast studies (for just a few examples, see Čiurlionytė 1969, Alexeyev 1976, Račiūnaitė-Vyčinienė 2002, Engovatova & Efimenkova 2008).

The studies of music perception are largely unknown in Eastern-European ethnomusicology and vice versa.

Aims

The present paper examines how findings in music perception could contribute to Eastern-European ethnomusicological research and vice versa.

Main Contribution

Eastern-European ethnomusicological treatises on musical scales and timing, as well as examples of transcription are examined. The transcriptions are considered indispensable data for the revelation of perceptual phenomena. Applications of the techniques employed in experiments in cross-cultural studies are shown to be promising in the modifications of ethnomusicological interpretations. Understanding of categorization and collision of emic systems is shown to result in dissolution of “aural ghosts”, such as false categorization of pitch and time, “chromaticisms”, and ostensible Ancient Greek modes found in ethnomusicological studies. Psychoacoustical roughness is shown to be responsible for some cases of scale formation in Schwebungsdiaphonie cultures.

As a majority of cross-cultural studies of music perception employ “exotic” musical cultures, it is shown that some “exotic” elements in “non-exotic” (e.g., East-European) cultures are typically overlooked. The universal of asymmetries in musical scale is questioned, i.e., certain cases when the asymmetries are not needed or “getting our bearings” regarding where we are in the scale (Snyder 2000:140) is achieved by other means than scale asymmetry. Peculiar profiles of tonal hierarchies can be revealed with application of Krumhansl’s probe-tone technique (such as in Ambrazevičius & Wiśniewska 2009). In the time domain, perception of mostly simple (or not too complex) accented meter is analyzed in the psychological studies. But what about the “ethnomusicological” non-isochronous pulse, non-accented meter (“time-measuring/time counting”

meter; Alexeyev 1990: 88), ametrical structures, and the specific meter-phrasing relations found in ethnomusicological studies? The ethnomusicological studies could shed a light on this topic.

Implication

A majority of the discussed questions are actually mutual interdisciplinary psychological-ethnomusicological questions and fields of study, and a closer collaboration of the two disciplines could contribute to the development of both.

The Joy and Fear of Music – Influences of False Feedback on the Emotional and Aesthetic Perception of Music

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Background

In 1966, Stuart Valins introduced a now prominent phenomenon: given false autonomic feedback on visual stimuli, participants rated pictures significantly more emotionally potent according to what they believed was their own heart-rate changing. Valins proposed that the cognitive information provided by the false feedback would lead to an interpretation of the alleged physical reaction as an emotion that must have been triggered by the stimulus. Parkinson (1988) states that the results could be confunded by increased attention to the sounds functioning as false feedback. However, a study by Forster et al. (2015), in which visual false feedbacks were used instead of auditive ones, also shows that responses can be influenced by false suggestions of physiological responses.

Aims

In this study, the responses to music are investigated regarding their aesthetic perception and affective rating while accompanied by pictures of bogus skin conductance responces.

Method

Participants are paired in two groups, both lead to believe that their skin conductance is recorded during the experiment due to gauging the measuring instruments, so they are instructed to respond veridically. Additionally, all participants are told that increasing graphs indicate a high arousal and strong perception of emotion. The first group receives pictures of neutral skin conductance patterns after one half of each stimulus set and pictures of increasing curves after the other half of each stimulus set. The second group receives combinations of stimuli and false feedbacks complementary to the ones in the first group.

The stimuli were devided in two sets of 10 stimuli each. The first set consists of musical pieces that in prior studies have proven to trigger strong negative emotions such as fear and sadness, the second set consists of stimuli that have proven to trigger strong positive emotions such as happiness (Mühlhans, 2017).

At first, each stimulus is presented for 30 seconds, followed by a message to please wait while the responses are prepared for display. Afterwards, the bogus skin conductance feedback is shown. Then the participants are asked to rate the musical pieces concerning the emotion that best describes what they were feeling during the stimulus presentation, and the intensity, with which they were feeling the respective emotion. Additionally they rate their aesthetic perception of the stimulus on various dimensions.

Results/Conclusions

Since the study is currently being conducted, there are no results to be presented yet.

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“Played it till my fingers bled“: Domain-related fields of practicing and gaining expertise in popular music

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Background

Expert performance is generally explained by the accumulated amount of deliberate practice (Ericsson, Krampe & Tesch-Römer, 1993; Gruber & Lehmann, 2014). While research on musical expertise exclusively focusses on the prerequisites of European classical music, little to nothing is known about the role of deliberate practice in the field of popular music (Kaczmarek, 2012). We follow the premises that there are noticeable differences between popular music and classical music regarding concepts of musical ability and practicing processes (Gembris, 2014) and that existing findings about musical expertise cannot be applied to the culture of popular music without revision.

Aims

Our aims are to identify domain-related fields and practices of gaining expertise in popular music and to explore the differences in musical expertise and deliberate practice in comparison to classical music. It should be traced which abilities are trained and how much effort is spent on practicing. Environmental and sociodemographic factors as well as professional status are taken into account.

Method

540 musicians were interviewed using an online survey methodology. 60% of the participants identified the music they played as popular music, 17% as classical music, and 22% stated they played both types of music likewise. The questionnaire included questions concerning the typical amount of practice, the use of electronic media as a tool for practicing, and furthermore questions on the engagement with other musical aspects like performance, composing, and knowledge of musical artists and genres.

Results

Data show that musicians in the field of popular music are significantly older when they start playing their instrument and that they do less frequently take lessons on their instruments than classical musicians do. They also invest less time in deliberate practice on their instrument. In contrast, they do use electronic media (video tutorials, software, apps) more often and their practice is more self-determined than in the case of classical musicians. No significant differences can be observed regarding their preference to play with other musicians (collaborative learning). Furthermore, musicians in the field of popular music show stronger engagement in writing and practicing own compositions. While their knowledge of musical notation and harmonics is limited compared to classical musicians, they invest more time in exploring musical artists and genres.

Conclusions

Deliberate practice, practice behaviour, and domain-related knowledge clearly differ between musicians in the fields of classical and popular music. That means that prevalent concepts of musical expertise should be rethought and differentiated. Further research is required regarding the characteristics of practicing processes in their relationship to different (popular music) genres.

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Design and Implementation of a Support Tool for Piano Teachers to Identify Bad Fingering Habits

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Background

In piano playing, fingering is important as a basis for advanced performance techniques such as delicate keystrokes and fast keystrokes. However, there are pianists who have bad fingering habits, such as making overly forceful keystrokes, and removing the fingers from the keyboard. In a face-to-face lesson, the teacher can only see the student's fingers from one direction, and evaluates the student by listening to their performance. There are cases in which students can play well, even if they have bad habits, meaning teachers cannot identify bad habits just by listening. Furthermore, due to limited lesson time, it is difficult for teachers to point out all students' bad fingering habits

Aim

The goal of our study is to propose a piano teaching support system with a function to identify bad fingering habits.

Methods

In order to determine the necessary functions for our proposed tool, we conducted an experiment to observe the fingering of six subjects who won prizes in a piano contest. We filmed the subjects playing a set piece from three directions and recorded MIDI data on a personal computer. After the experiment, the piano teacher analyzed fingering using the MIDI and video data. Based on the analysis, we designed a support tool for finding bad habits.

Results

As a function of the bad habit finding support tool, in addition to a movie player, we propose a multi-view sync function and sound unit playback function. The multi-view sync function is a function to sync up videos taken from multiple directions. Multiple viewpoints are more effective than filming from a single direction, because a teacher can identify bad habits more accurately by viewing from multiple directions. The sound unit playback function is a function to play back the video from when the student's finger approaches a key to when it releases that key. Bad habits can be detected not only at the time of striking a key but also at the time of approaching and releasing, so we designed our tool to be able to observe this whole process. When analyzing fingering, it is necessary to view the same scene many times. Therefore, it is possible to reduce analysis time and complexity by allowing the teacher to navigate through the video using the seek bar on the movie player. It is expected that these functions will improve the work efficiency of piano teachers.

Conclusions

We proposed and developed a support tool for piano teachers to identify bad fingering habits. We will conduct experiments to verify whether multiple perspectives are effective for finding bad habits.

Positioning Learning Support System for Violin Beginners using Multimodal Information

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Background

Violinists need to master various techniques such as reading a score and positioning, that is using only the fingers of the left hand to press strings onto the fingerboard to produce the note indicated. However, as the violin has no frets to stop the strings, the learner must memorize exactly where to place the fingers on the strings (Requirement 1). Moreover, since the violin's tuning is easily affected by the temperature and humidity at the time of playing, the learner must delicately modify positioning according to the current tuning (Requirement 2). In conventional positioning learning stickers corresponding to each note are stuck on the fingerboard to present positioning. Kumaki et al. propose a system which has functions such as superimposing correct positioning information on the image taken by a camera installed on the fingerboard [1]. Wang et al. propose an intelligent tuner function (Wang et al. 2012). These trials satisfy Requirement 1 with optical support information, but do not satisfy Requirement 2.

Aims

The goal of our study is to design and implement a positioning learning support system for violin beginners. The proposed system satisfies Requirement 1 by using optical support information based on the method of Kumaki et al [2]. The system also provides auditory support information which enables learners to compare their own playing of each musical notation to the correct playing, by ear. This information improves comprehension of relative pitch, and satisfies Requirement 2.

Methods

We developed the proposed system and conducted an assessment to evaluate the effectiveness. Subjects performed scale practice and the musical piece Twinkle Twinkle Little Star, referred to as the test piece, as one set, and they repeated three sets with breaks of approximately 5 minutes in between each set. In scale practice, the musical scale from the A4 sound to A5 sound was repeated eight times, making a total of 64 sounds played. The purpose of scale practice is to memorize the violin positioning. Subjects practiced scales using the information assigned to their groups. In the test phase, we measured the ration of correct positioning.

Results

Comparing the average scores for the first test, the score of the Experimental Group was lower than that of the Control Group, whereas the score of the Experimental Group was higher in the third test. Regarding the increase in the average score from the first test to the third test for each group, conducting a two-sided t-test at a significance level of 5% produced the result $t(12)=2.01$, $p=0.0495 < 0.05$. This revealed that the difference in increase in average score for each group was significant.

Conclusions

In this study we constructed a positioning learning support system using multimodal information. The results of the assessment demonstrated that the subjects using the proposed system played with significantly enhanced learning effectiveness.

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S6G/S6M: Symposium 5 - What do we hear in contemporary and experimental music? New answers to an old question

Time: Wednesday, 25/Jul/2018: 13:00 - 15:00 · *Location:* Graz_2
Session Chair: Riccardo Wanke

This symposium is happening in Montreal and Graz simultaneously.

Outline

The majority of studies on music perception draw on a musical database comprised of works from Western classical, World, and popular music repertoires, while only a small number of such studies deal with contemporary and experimental music. What is evident is that traditional methods of music perception research are often inapplicable to contemporary or experimental practices. This is primarily because such practices often evade tonal constructions, traditional forms and narratives, and linear conceptions of temporal structure, and contains instead, various combinations of noises, real-world sounds, sonic clusters, and other sounds of acoustic and electronic nature. The absence of any sort of grammar equivalent to that of the tonal system opens to a variety of sonic constructions that has been in some cases codified (e.g., spectromorphology), and those involve new perceptual modalities and sonic experiences (e.g., representational and narrative recognitions), instinctive (e.g., perceptual and affective) and descriptive (i.e., immanent features as figure-background characterizations) responses. This symposium aims to cultivate a discussion on modern and idiomatic approaches to the study of music cognition and perception in the context of contemporary or experimental practices. In doing so, it aims to highlight and encourage innovative research methods and theories that take into consideration the use of specific semantic and extra-sonic associations in music, and is able to deal with cultural prejudices and conventions that commonly segregate these types of music from large audiences.

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Contributions

Çamcı, Anıl; Özcan, Elif “Comparing the Cognition of Abstract and Representational Structures in Electronic Music”

Lembke, Sven-Amin “Towards a perceptual framework for spectromorphologies in electroacoustic music”

Noble, Jason D. K.; McAdams, Stephen “Meaning Beyond Content: Extramusical Associations are Plural but not Arbitrary”

Wanke, Riccardo“How do we listen at today’s experimental and contemporary music? The blind spot in studies on musical perception”

Comparing the Cognition of Abstract and Representational Structures in Electronic Music

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Background

As the electronic medium opens music to any and all sounds, the communication between the composer and the listener no longer depends upon a culturally established language of music. The research into what listeners hear in electronic music has a robust history. Composers (e.g., Smalley 1996), musicologists (e.g., Demers 2010), and researchers (e.g., Bridger 1989) have utilized a variety of methods to inquire into the perceptual qualities of experiencing works in this genre. A growing number of researchers today are conducting listening experiments to explore these qualities.

Aims

In this study, we focus on two works of electronic music, which were composed in tandem using vastly different sonic vocabularies. Although both works utilize purely synthetic sounds, one of the works stem from the composition of a visual narrative while the other work relies on a performance-based exploration of perceptual structures such as variations in pitch and amplitude. With this study, we aim to understand the factors that contribute to the cognitive processing of abstract and representational structures in electronic music, and how such structures shape the listening experience.

Methods

We conducted a study involving 36 subjects, who listened to these two works in a two-stage, between-subject design. Among the participants were composers, sound engineers, and those who described themselves as having no background in music. In consecutive stages of the study, the subjects were asked to provide both after-the-fact and in-the-moment descriptions of their experiences. We analyze the in-the-moment descriptors on a timeline of the musical track that they correspond to. We then compare descriptors between subjects, and contextualize these within the after-the-fact accounts of the works. We also offer a comparison of these descriptions with the compositional intents underlying these works.

Results and Conclusions

We find that, despite their structural similarities, the difference in vocabulary stemming from compositional intent has a significant impact on how listeners describe their experience of these works. There is a strong preference towards representational descriptors for the piece that emerge from a visual narrative. We offer an in-depth analysis of how various narratives outlined by participants corroborate in terms of actors, settings and events, and how these relate to the composer's program. Conversely, the work that explores more abstract structures has primarily yielded perceptual and affective descriptors. Comparing the results for the two works, we look at higher-level implications of whether an electronic music piece is primarily abstract or representational; these include where the listener situates themselves in relation to the piece, whether the listener is aware of their “listening self”, and how affective meaning is mediated.

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Towards a perceptual framework for spectromorphologies in electroacoustic music

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Background

Spectromorphology (Smalley, 1997) assumes an important role in electroacoustic music, a sound-based musical genre lacking the syntactical structure that tonality or meter can provide in note-based, instrumental music. In order to generate musical discourse, spectromorphology instead draws on analogies to extra-sonic phenomena such as gestures, textures, motion or growth. On the most basic level, the interplay of gesture and texture shapes sound spectra over time, and although this theory bears upon both acoustics and perception, the underlying auditory processes have received little attention to date.

Aims

This paper aims to establish how sound gesture and texture operate within the perceptual framework of auditory scene analysis (ASA; Bregman, 1990). This concerns different musical scenarios, a methodology on how to investigate these experimentally, and also a discussion of spectromorphology's relationship to timbre perception.

Main Contribution

Spectromorphological tropes, such as trajectories along geometric shapes or spirals, will be contextualised into the ASA framework, notably, identifying the relevant underlying Gestalt principles of grouping (e.g., proximity, good continuation, common fate). For instance, even a granular sound shape can be perceived as a single morphological entity (e.g., Lembke, under review). The discussion will consider methods for determining relevant morphological qualities and quantifying their contribution to either gesture or texture. Furthermore, investigating more complex spectromorphologies may bring about methodological issues. For one, scenarios involving several, concurrent sound shapes require special means to effectively characterize the perception of multiple auditory streams or foregrounded vs. backgrounded layers, which could be informed by previous music-psychology research (e.g., perception of melodic contours). In addition, electroacoustic sounds concern the same perceptual issues known for instrumental timbre, because not only qualitative features but also the sound source or cause influences perception (Handel, 1995). Within spectromorphology, the latter influence is termed source bonding (Smalley, 1997), with stronger bonding possibly mediating the perception of those qualitative features that convey gestures and textures; initial studies on this topic are currently under way.

Implication

Establishing how fundamental parameters of spectromorphology relate to ASA will pave the way for future studies on electroacoustic music that address higher-level, cognitive factors, e.g., how the musical discourse relies on recognition of gestures or how the interplay of gesture and texture may affect emotions. On another level, spectromorphology's strong reliance on extra-sonic references may exploit implicit understandings stemming from cross-modal correspondences (Spence, 2010). Such cross-modal links may in fact be inherent to spectromorphological thinking and even relate to note-based, instrumental music, which sometimes attempts to mimic extra-sonic gestures (e.g., Mickey Mousing in film music).

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Meaning Beyond Content: Extramusical Associations are Plural but not Arbitrary

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Background

Although listeners routinely experience extramusical associations in response to music, such associations are excluded from formalist study and the concept of "absolute" music, and are relatively little-studied in music perception and cognition research. Why such reluctance to engage this aspect of musical experience?

Musical meaning is often conceptualized via a dubious metaphor – MEANING IS CONTENT – likening music to a container that delivers meaning to listeners and implying that meaning is fixed within the music. Skeptics observe that listeners draw different and even contradictory associations with music. We argue that the solution is not to conclude that extramusical meaning is arbitrary, but to conceptualize it differently.

Aims

We propose replacing the "content" metaphor with a dynamical model in which meaning arises through homologous or topical relations between musical and extramusical domains. Music presents a complex of attributes, and listening involves dynamically and selectively attending to subsets of those attributes. The attributes attended to during a given listening (e.g., noisy timbre, busy texture) may share properties with attributes of an extramusical domain (e.g., busy crowd), and this homology may provide a plausible basis for a cross-domain mapping. But those same attributes may also provide plausible homologies to other extramusical domains (e.g., swarm of bees, agitated state of mind, etc.), and attending to a different subset of attributes yields a different set of potential homologies. Thus, a plurality of plausible, non-arbitrary extramusical associations with a given musical example may coexist, drawing on different combinations of attributes, homologies, topics, and other contextual associations.

We support this hypothesis with findings from an empirical study in which listeners rated excerpts of 20th- and 21st-century music along a battery of semantic scales. Results show significant consistency between listeners in their extramusical associations, suggesting they are not arbitrary. However, mappings between musical and extramusical attributes appear to vary between categories for a given excerpt, and between excerpts for a given category, suggesting there is no fixed mapping between musical attributes and extramusical domains.

Major Contribution

By looking past the "content" metaphor, this theory accounts for plurality in extramusical meaning while still relating extramusical meaning to musical attributes, thereby avoiding arbitrariness. The experimental method studies listeners' extramusical associations without invoking problematic ideological categories such as programmatic-absolute and formalism-referentialism.

Implications

Shifting the concept of musical meaning from fixed content within music to dynamical interactions between music and listeners changes the goal of the study of musical meaning. Rather than an exegisis aiming to uncover music's extramusical content, we instead search for patterns in listeners' interpretations, to better understand how they select musical attributes and relate them to extramusical domains.

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How do we listen at today's experimental and contemporary music? The blind spot in studies on musical perception

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Background

The perceptual aspect of music has been the subject of an immense range of studies in the cognitive sciences from psychology to neuroscience, and concerns human reactions to simple stimuli all the way to complex feelings and emotions. However, within this large group of studies on music perception, only a small number deal with the contemporary experimental scene. This lack seems paradoxical as many genres of experimental music are themselves concerned with these very questions of sonic perception. The difficulty of this type of music in reaching larger audiences beyond elitist contexts is largely known, and the strong insistence by specialists to restrict interpretations and limit the accepted approaches to understanding new music is a common occurrence in our recent past.

This work considers certain genres such post-spectralism, electroacoustic music and glitch electronica that share similar perspectives in approaching sound, explore complex spectra, develop periodic movements within globally rich and sculptural sonic textures (Wanke 2015).

Aims

In order to develop new ways to approach today's contemporary experimental practices, this paper aims to examine, through listening questionnaires, how a set of pieces –brought together under a common conception on sound– are perceived.

Method

The examination consists of a listening session combined with a questionnaire. Participants (N=75; 46/29 male/female; age, M = 36.2; SD = 32.3; 89% with a (semi)professional link to music) are, first, invited to sort the audio samples into groups and to indicate which criteria they have applied; second they should associate to each extract a series of adjectives from a given list of semantic structural descriptors (Lesaffre 2008).

Results

This study shows that in presence of an appropriate aesthetic framework (i.e. the shared perspective on sound), participants show a multiple listening approach: analytic (i.e. description of sound source and genre identification), affective (i.e. description of emotive associations) and immanent (i.e. direct apprehension of musical forms and shapes). There is a minor correlation between modes of listening and familiarity with the audio samples and these modes are best seen as fluid and dynamic processes: participants often integrate these modes.

Experimental practices, lacking codified musical conventions, cause the listener to favour analytic and affective criteria. The presence of a genuine tendency to focus on listening to sonic material is –within experimental and contemporary music– of great interest: supported by a common perspective on sound, listeners grasp material aspects of sound and expand on spatial and temporal concepts, cultural and external factors, and emotive descriptions.

Conclusions

The article addresses the difficulties in conveying our perception of these styles of music. This research shows how a coherent aesthetic framework favours the creation of new keys of interpretations, provides listeners with new tools of comparison and assessment, and empowers them to focus on the structural aspects of sonic material. This strategy may lead to new convergences within musicological studies and the world of contemporary experimental music.

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L9G: Long Talks 9 - Emotion

Time: Wednesday, 25/Jul/2018: 13:00 - 15:00 · *Location:* Graz_3
Session Chair: Tommi Himberg

Orchestrated Sadness: When Instrumentation Conveys Emotion

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Background

While recent research has refined the scientific understanding of how musical features convey affect, the impact of orchestration techniques on emotion remains understudied (McAdams, 2013). Countering claims that orchestration cannot be taught (Rimsky-Korsakov, 1912/1964) and that doing so kills creativity (Piston, 1969), this study systematically investigates solo and offstage instrumentation. Potentially, orchestral solos may prove suitable for expressing individuality, vulnerability, and loneliness (Rimsky-Korsakov, 1912/1964), thus evoking sadness in listeners. Offstage instrumentation may metaphorically represent distance or separation, also traditionally associated with sadness (Bowlby, 1980). If so, sadness-related musical features—e.g., quiet dynamics, slow tempo, legato, minor mode, low pitch, narrow pitch range, smooth rhythms, and dark-timbre instruments (Hansen, 2013)—should be more prevalent in solo and offstage passages.

Aims

To test the hypothesis that solo/offstage orchestral passages exhibit more sadness-related features than controls.

Methods

330 orchestral excerpts composed after 1800 for violin, viola, cello, contrabass, flute, oboe, clarinet, bassoon, trumpet, trombone, and horn were randomly sampled from www.orchestraexcerpts.com. Of these, 131 contained "solo" designation and/or employed solo-like textures whereas 199 were categorized as "non-solos". Offstage passages were sourced from Nieweg (2016) and matched with non-offstage control passages from the same works. Sadness-related features were coded in terms of dynamics, tempo, articulation, mode, pitch height, pitch range, and nPVI.

Results

With the notable exception of strings, instruments rated high on sadness capacity (Huron, Anderson & Shanahan, 2014) more often play solos, $rs(6) = .88$, $p < .01$. Furthermore, designated solo passages more often show 'sad/relaxed' expressive features (Horn & Huron, 2015), $\chi 2 = 14.5$, $p < .01$. Finally, a logistic regression model significantly predicts solo status, $\chi 2 = 47$, $p < .01$, with quiet dynamics, legato articulation, and (surprisingly) high pitch as significant predictors. Analysis of offstage passages is still in progress.

Conclusions

These findings contribute to understanding the effects of compositional decisions on listening experience. While absent fast-tempo and minor-mode effects may be due to these factors expressing passion and seriousness rather than sadness in Romantic-era music (Horn & Huron, 2015), the reverse pitch-height effect may arise from the competing compositional goal of increasing audibility of solo passages.

References

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Universality in the language of emotions revisited: Towards a revised methodology for interpreting acoustic cues in musical affect

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Background

Much progress has been made in understanding the relationship between acoustic cues and musical affect, but minimal attention has been given to this in a cross-cultural context. In a meta-analysis, Juslin and Laukka (2003) showed similar acoustic cues were used in both music and speech to communicate basic emotions. These cues are suggested to be universal due to the shared evolutionary history of the two modalities. They further hypothesise specific patterns of acoustic cues for discrete 'basic' emotions (p. 802).

Laukka, Eerola,Thingujam, Yamasaki and Beller (2013), undertook one of the most comprehensive cross-cultural music studies to date. Six emotions were cross-culturally recognised above chance, although basic emotions sadness, happiness, anger, fear were more identifiable than peacefulness and humour. These results broadly support Juslin and Laukka's (2003) hypotheses.

Aims

This study aimed to replicate and extend the findings of Laukka et al. (2013) through a revised full-factorial methodology and re-assess the prevalence of basic emotions in previous cross-cultural music psychology research.

Methods

Participants (N=77) representing 25 nations rated a set of 48 pseudo-randomly synthesised musical stimuli, representing a full-factorial manipulation of the acoustic cues tempo, intensity, timbre, vibrato and mode. The clarinet was used to expand upon Laukka et al's use of 'super-expressive' stringed instruments. Online respondents used a ‘fuzzy-set’ (Coutinho & Scherer, 2017) description of nine emotions: five basic (anger, fear, happiness, sadness and tenderness), and four non-basic (longing, peacefulness, humour and other) on a Likert scale 1-7 thus negating problems with forced-choice paradigms (Nelson & Russell, 2013). Participant results were grouped to represent Western and non-Western cultures.

Results

Eight emotions were perceived across cultures with no observed preference for basic emotions. The fundamental acoustic cues vibrato and tempo interacted with culture. The fundamental cues loudness, tempo, vibrato represented the dimension of arousal cross-culturally. Timbre was ambiguous in a dimensional interpretation. Interactions between cues were also revealed (intensity*timbre, tempo*mode). Results are discussed in the context of a dimensional model which is suggested as a better interpretation of the results.

Conclusions

Elements of both universality and cultural-specificity were observed in the perception of musical emotion through fundamental acoustic cues. This supports a dialect theory of emotional communication in music. The results of previous studies may have been artificially inflated through methodological choices, such as unbalanced designs and forced-choice paradigms. Ultimately, while music may appear to communicate emotions universally, it may not be universally understood and there is an intriguing future ahead for those who wish to decipher this language of emotions.

References

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Perceptions in Pregnancy: An investigation of women's perceptions of emotional vocalizations and musical excerpts during the perinatal period

Katie Rose Sanfilippo[1], Aifric Lennon[1], Christine Parsons[2], Vivette Glover[3], Lauren Stewart[1,2]

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Background

The ability to decode emotion through facial expressions and vocalisations are important tools in the mother-infant relationship. This ability may be affected by biological and environmental changes during pregnancy. Yet, little is known about how auditory perception might be different during pregnancy and after birth in humans. Music, a more abstract form of emotional communication, may also be affected by these changes in pregnancy. This study will add to our understanding of the emotional and auditory perceptions of women during the perinatal period.

Aims

This study investigates women's perception of affective vocalisations, such as laughing and crying, and emotional music when they are not pregnant, during pregnancy and after birth.

Method

35 pregnant women will be recruited from the London area, as well as online. Using valence ratings, we will measure the perception of emotional vocalisations of adults, infants, and animals from the Oxford Vocal (OxVoc; Parsons et al., 2014) Sounds database. Additionally, we will measure their perceptions of emotional music using the Geneva Emotional Musical Scales (GEMS 9; Zentner, Grandjean, & Scherer, 2008) test. All measurements of these perceptions will be taken during pregnancy and about 2-4 months after they have given birth. We also plan to conduct the same task with 35 age-matched controls.

We will collect information about the women, their pregnancy and birth as well as their mental health. We will measure their depression symptoms using the Edinburgh Postnatal Depression Scale (EPDS) and anxiety symptoms using the Generalized Anxiety Disorder Questionnaire (GAD-Q).

Results

Data collection is still ongoing. There are promising preliminary results of the data collected so far (N=13 pregnant women and N=13 controls). Using a MANOVA, results indicate that pregnant women perceived infant vocalisations more positively than non-pregnant women ($p < 0.01$, $\eta 2 = 0.335$). Using a linear regression we also found that higher anxiety scores predicted negative valence ratings of infant laughter vocalisations in pregnant women ($r = 0.57$, $p < 0.05$).

We propose to use mixed effects linear modeling to examine how the valence ratings of different emotional vocalisations and the GEMS scores of musical pieces change throughout pregnancy. We will also investigate the mediating and moderating effects of mental health on these scores.

Conclusions

This is one of the first studies investigating potential differences in the perception of affective vocalisations and emotional music in women during the perinatal period. This research will provide information on how music perception is impacted by pregnancy. It will also inform future research working to create and test musical interventions to help support pregnant women.

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Are musical aesthetic emotions embodied?

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Background

Utilitarian emotions, have been in the foreground in research on experienced emotions in music. However, Scherer (2004) suggests that music evokes a wider scope of emotions, including aesthetic emotions that lack the activation of the physiological reaction component due to their lack of associated behavioral tendencies. Therefore, specific scales have been developed for the assessment of aesthetic emotions (e.g. Geneva Emotion Music Scales (GEMS) by Zentner, et al. (2008) or Aesthetic Emotions Scale (AESTHEMOS) by Schindler, et al., 2017).

Aims

We wanted to test whether self-reported aesthetic emotions evoked by music are accompanied by physiological changes typically associated with utilitarian emotions. In Experiment 1 we tested whether the activation of facial muscles associated with emotional valence and physiological changes associated with emotional arousal while listening to music predicted participants' subsequent ratings on the GEMS. In Experiment 2 we tested whether distinct facial expressions of emotion and physiological changes predicted participants' subsequent ratings on the AESTHEMOS.

Method

In Experiment 1, participants listened to four pieces of live performed contemporary music. We measured electromyography in two facial muscles (zygomaticus major and corrugator supercilii), galvanic skin response (GSR), and heart rate (HR) in 41 participants (10 males, mean age 23 years, range 18-42 years). The participants retrospectively rated their felt emotions (GEMS-25). In a second experiment, 39 participants (14 males, mean age 28 years, range 19-61 years) listened to 15 excerpts of film music, via headphones in our listening lab. We measured GSR and HR, and took video recordings of participants' faces. Facial expressions of emotion were subsequently classified using automated face analysis software. Participants retrospectively rated their felt emotions (AESTHEMOS).

Results

Results show that the GEMS-factors wonder, tension, joyful activation, peacefulness, power, and transcendence could be significantly predicted by changes in GSR, HR and activation of the zygomaticus major and corrugator supercilii muscles. Results of the second experiment indicate that the AESTHEMOS-factors negative emotions, animation, sadness, amusement, and nostalgia/relaxation could be significantly predicted by changes in GSR, HR and distinct facial expressions.

Conclusions

Our results suggest that some aesthetic emotions are embodied and can be predicted by various physiological changes typically associated with utilitarian emotions. We therefore conclude that physiological changes in various body activation parameters influence retrospective ratings of aesthetic experience. These findings therefore question the simple dichotomy between utilitarian embodied and aesthetic non-embodied emotions.

References

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L10G: Long Talks 10 - Flow and Therapy

Time: Wednesday, 25/Jul/2018: 13:00 - 15:00 · *Location:* Graz_4

Session Chair: Mats Küssner

The influence of background and contextual factors on professional orchestral musicians' experiences of flow and music performance anxiety (MPA)

Susanna Cohen, Ehud Bodner

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Background

Recent studies have provided empirical support for the suggestion that there is an antithetical relationship between experiences of MPA and flow and the suggestion that facilitating flow maybe useful for alleviating MPA and encouraging optimal performance (e.g., Fullager et al, 2011). In order to develop methods for facilitating flow and reducing MPA, it is important to understand the influence of background (e.g., gender, age and culture) and contextual variables (e.g., orchestral role, instrument and performance context) on MPA and flow. Although there is substantial research investigating MPA (Kenny, 2011), there are still gaps in the literature, and investigations into musicians' experiences of flow are less developed. Whilst there is evidence that MPA is associated with exposed, evaluative performing contexts (Kenny, 2011), the influence of orchestral role and instrument on MPA has barely been examined. The association between flow and superior performance is readily recognised in sport (Jackson & Csikszentmihalyi, 1999), however the association between orchestral role and flow in music has not been investigated, and there is little exploration of the effect of instrument on flow. Flow and MPA are generally regarded as stable across culture, however there is little supporting empirical evidence. The varied cultural demographics of Israeli orchestras provide an opportunity to explore this subject.

Aims

To explore the influence of background and contextual variables on professional orchestral musicians' experiences of MPA and flow.

Method

Participants: 202 professional orchestral musicians (49.5% female), mean age 43.22 (SD = 12.18). Flow measured using the Dispositional Flow Scale (DFS-2 short; Martin & Jackson, 2008). MPA measured using the Performance Anxiety Inventory (PAI; Nagel, Himle & Papsdorf, 1981). Questionnaires were completed in Hebrew (60%), Russian (27.3%) and English (12.7%).

Results

ANOVAs showed that section principals experienced higher flow $F(2,156) = 6.63$, $p<.01$, and there was higher flow amongst English speakers $F(2,162) =5.39$, $p<.001$ and percussionists $F(3,159) = 2.92$, $p<.04$. Solo performing context was associated with higher MPA $F(2,67)=4.89$, $p<.01$, and percussionists experienced lower MPA than other players, Welch's test $F(3,46.10) = 21.28$, $p<.01$.

Conclusions

The higher flow reported by section principals corresponds to findings in sport, where higher flow is associated with superior performance. The higher MPA in solo contexts replicates existing findings in the literature. The influence of culture on flow has not been found in other domains, and merits further exploration. Percussionists' higher flow and lower MPA compared to other players supports the antithetical nature of the relationship between MPA and flow. These findings may have important implications for performers and teachers in improving performing experience.

References

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Emotions and Flow in performance: the soloist's perspective

Catherine Foxcroft

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Background

Optimal performance requires a relaxed concentration which is incompatible with experiencing certain emotions (Juslin, 2009). While research shows that performers do "engage" emotionally or cognitively with music at some level during performance, there is no real consensus on the nature of the engagement.

Aims

This research aimed to explore the extent to which performers emotionally engage with music during a solo recital, from the performer's perspective.

Method

The research project was a qualitative study, using interpretative phenomenological analysis (IPA). The research participants consisted of eight concert pianists (four students and four professionals), each of whom performed solo recitals lasting 60 -70 minutes. The pianists were interviewed by means of semi-structured, in-depth interviews immediately after their performances. The interview data was collated from the semi-final round of the 2011 National University of South Africa (UNISA) piano competition (student pianists), and professional performances in South African concert halls in 2011/2012 (professional pianists).

Results

Three broad categories of results emerged. 1) Emotions: performers experienced two categories of emotions during performance: musical emotions which relate to the emotional content of the music, and performance-related emotions which relate to the performance circumstances. Musical emotions appeared significantly more complex and nuanced than emotions experienced in an everyday context. Performers preferred to represent musical emotions perceived to be in the score rather than experience them directly (induced) during performance. The performers maintained strict emotional control during performance, as excessive musical and performance-related emotions impacted negatively on a performance; 2) Embodied cognitive, emotive experience: An intense dialogue evolved between performer and composer when preparing for a performance. This manifested in performance as a complex stage persona, which displayed a cognitive-emotive duality; 3) Flow: During optimal performance, the performers appeared to transcend reality and enter a "zone", or state of altered consciousness. The heightened elation experienced by the performers when in the zone was synonymous with a state of Flow (Csíkszentmihályi, 1990). Several factors facilitated or inhibited musical Flow, but did not guarantee its occurrence.

Conclusions

The research suggests that performers' engagement with musical emotions (perceived and induced) during performance is incidental and does not play a significant role either in the successful representation of musical emotions, or the performer's experience during performance. The euphoric "high" which performers experience during optimal performance does not relate to musical emotions, but rather is synonymous with a Flow experience.

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Clinical Trials of the Encephalophone Music Prosthetic for the Motor Impaired

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Background

The Encephalophone is a brain-computer interface which uses EEG signal to generate music with intentional control, without movement. Mental imagery controls the pitch of the electronic instrument in real time. It's basic efficacy has been demonstrated with healthy subjects (1). However, with the goal of re-enabling the motor impaired to play music again - as a musical prosthetic - it's use with patients who have lost their musical ability due to ALS, brainstem stroke, spinal cord injury, or MS has not been shown.

Aims

To demonstrate real-world efficacy of the Encephalophone brain-music interface to enable patients with motor disability to generate music in real time without movement.

Methods

15 patients undergo three one hour-long sessions consisting of accuracy testing, free play, and then a second accuracy test. During accuracy testing, subjects are given a target note and must match the note 3 times in a row within 9.5 seconds. They are given 5 minutes to match as many notes as possible. During free play, patients are left to solo over accompanying music of various styles, tempos, and keys. A questionnaire is completed on the final session, to assess tolerability and satisfaction.

Results

Two patients, both near locked-in, have completed the trial out of a total of 15 patients. Patient 1, with severe ALS, achieved an accuracy of 93%. Patient 2, with brainstem stroke, achieved an accuracy of 78%.

Conclusions

Initial results are encouraging in suggesting that patients with severe motor disability due to ALS, brainstem stroke and other neurological disorders can be enabled to play music with reasonable accuracy without requiring movement.

References

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Subtle changes of consciousness during performance: A theoretical framework

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Background

The topic of consciousness and altered states of mind has long captured the attention of music psychologists. Despite of this fact and recent advances in neuroscience, changes of consciousness in the act of performance have barely been investigated in depth, mainly due to the lack of an appropriate theory. Also, theoretical and empirical investigation linking real-time changes in consciousness during performance with elements of the performance process, as well as with listeners' perception and evaluation of a performance, has so far been scarce.

Aims

In my paper, I propose a theoretical framework, based on concepts and empirical results taken from performance analysis, pedagogical practice and sports science (especially from recent research of attentional control in sports), to account for subtle but significant and well-definable changes in the performer's consciousness during an actual performance that are related to the temporal 'navigation' in the musical process.

Main contribution

Changes in the performer's consciousness in the course of performance typically mark moments when the performer 'positions' herself into different time perspectives. In the act of performance, positioning into the future involves the formation of a cognitive map of the forthcoming structural units (including estimating the durations of the forthcoming – usually hierarchically embedded – structural units through feeling their length), immersing in the present involves deep

feeling of the sounding moment (which allows the musician – and, through empathy, the musician's audience – to fully enjoy the present sounding moment), whereas active recalling of the past involves the development of a mental image of the preceding musical units to which the subsequent ones are to be measured. Cognitive navigation is thus intimately linked to feeling the time, and based on this consideration, the theory represents an integration of cognitivist and emotivist approaches to music processing.

Implication

Further development and operationalization of the theory can open the way for an innovative cognitive approach in music theory, analysis and aesthetics. Furthermore, the theory has a strong potential for applications in performance pedagogy as it can contribute to the development of a novel approach and methodology of enhancing and practicing performing abilities, bringing a novel, cognitive approach to performance pedagogy as well.

Literature

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S5M/S5G: Symposium 5 - Understanding the Role of Music and Emotion in the Human Cognitive Process

Time: Wednesday, 25/Jul/2018: 13:00 - 15:00 · *Location:* Montreal_1, Graz_1

Session Chair: Matthew Moreno

This symposium is happening in Montreal and Graz simultaneously.

Background

Research has explored the combined effect of the experiential, expressive and psychological traits (Lundqvist, Carlsson, Hilmersson, & Juslin, 2009) of music as well as the causal relationship between music and psycho-motor states (Juslin, Harmat & Eerola, 2014). The emotionally-rich qualities of music, and the interaction with human affect (Schubert, 2013; Sloboda & Juslin, 2001), have been thought of as being mediated by the human cognitive process (Koelsch, 2015; Schulkin, 2013). It is paramount to continue exploring the relationship between music as a stimulus and the various cognitively-mediated actions and processes in the mind.

Aims

The aim of this symposium is to bring together researchers from across the globe who are exploring new and innovative findings in the field of music and human emotion, as well as cognitive processes. This symposium acts as a platform to share new innovations in the measurement of emotions, theories of music that inform our understanding of the cognitive process, as well as discuss the implications and future steps for research in this field. Researchers who are currently conducting work in this field, as well as all those interested in exploring research on music and the mind are encouraged to attend.

Contributors

Moreno, M., & Woodruff, E. Music for understanding: A study into the emotions of music during a reading comprehension task.

Millet, B., Ahn, S., & Chattah, J. Voluntary Background Music and Cognitive Capacity: A Theoretical Process Model.

Schultz, B., & Kotz, S. A. Musical emotions: The relationship between valence, arousal, salience, and motor responses.

Agrawal, T., Vuoskoski, J., & Clarke, E. Moved by Music: A Preliminary Exploration of a Powerful Music-Induced Emotion.

Main Contribution

The researchers contributing works to this symposium are advance our collective understanding of the theory behind emotional response, new innovations in the measurement of affect in music and the application of such research into various settings. Through a comprehensive approach to examining the psychophysiological and emotional response to musical stimuli, we can advance our collective knowledge to how the mind processes music and the response mechanisms associated with it.

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emotion: Theory and research, 71–104. Oxford, Oxford University Press.

Music for understanding: A study into the emotions of music during a reading comprehension task

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Background

Research has indicated that emotions are an integral part of the learning process (D'Mello & Graesser, 2012) to optimize performance and cognitive decision-making. Music plays a role in shaping implicit emotions and subsequently, has an affect on its listeners (Sloboda & Juslin, 2001; Stalinski & Schellenberg, 2012) that can act on our cognitive-making systems. Further research examining real-time emotions and the interactivity between this emotional stimuli in the cognitive process of music and emotions is needed in the field of education.

Aims

Are there differences in the emotions of learners who have or have not listened to music while completing a comprehension task? What emotions contribute to enhanced performance in combination with music?

Methods

Participants are elementary students in Grades 7-9 in Canada. In this experimental study, participants are randomly placed into one of two conditions: 1) no music (control), and 2) music, during the task. Participants are asked to read passages from the comprehension component of the Nelson-Denny Form G while a text-to-speech system reads along with the participant, followed by accompanying comprehension questions. During the trial, participants' faces are recorded with iMotions Emotient facial coding software to measure the facio-muscular movements at 19 Action Units (AUs) and generate probability scores for nine emotions.

Results

Data collection and analysis is continuing at this time. The mean value of all the emotions & AU's for the initial 11 participants were placed in 2-Sample T-tests, indicating that there are statistically significant differences ($p=0.05$) in the mean values of anger, frustration and confusion between test conditions. Participants in the test condition with music, displayed lower values of these 3 emotions. Differences in confusion suggest alignment with findings from D'Mello, Lehman, Pekrun and Graesser (2014) suggesting confusion functions as a motivator/sustainer of learning performance as well as an inhibitor of success across a spectrum. Mean values on comprehension task scores did not statistically differ between conditions, but initial results begin to suggest musical condition participants had higher scores. More data will help to solidify these initial findings.

Conclusions

This study provides empirical evidence on the use of facial recognition technology to identify the emotional states of learners. Research will continue to provide data on the emotions, AUs that contribute to identifying how music may engage, sustain or enhance emotions for optimizing success while learning.

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Voluntary Background Music and Driving Performance: A Systematic Review, Meta-Analysis, and Theoretical Process Model

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Background

Background music, understood as music not demanding focused attention, is ubiquitous in modern everyday life. Much research attends to the pervasive presence of music in stores, gyms, elevators, and restaurants, as a strategy to embed 'involuntary' listeners within a complex sonic tapestry carefully tailored to modulate their behavior. A systematic review of findings within this area, suggests that involuntary background music affects the listener's behavior via cross-modal correspondences and symbolic priming (Angel et al., 2010; Ziv, 2016). Background music in cars, however, is often user-defined—i.e., listeners may carefully customize playlists that (they believe) enhance mood, improve task performance, and/or promote task engagement (Brodsky, 2015). In contrast to the fairly consistent findings within research on background music in stores, gyms, elevators, and restaurants, research on the effects of (voluntary and involuntary) background music and vehicular performance offers conflicting views. Fully understanding the underlying mechanisms whereby various dimensions of background music (e.g., genre, tempo, loudness) moderate behavior (e.g., performance) is of vital importance when considering background music in driving settings.

Aims

Given that the underlying process regarding the effect of background music during vehicular performance is unclear, it is essential to identify what and how constructs/variables are related to various dimensions of music, and subsequently develop the theoretical framework underlying their relationships.

Method

We conducted (1) a systematic review of the literature to develop a theoretical process model that underlies the effect of background music on driving performance, and (2) a univariate meta-analysis that summarizes the overall effect of background music while driving and further identifies moderators that explain variations in effects.

Results

A systematic review of the literature reveals mixed findings regarding (1) the effect of background music during vehicular performance, and (2) the mechanisms whereby background music supports or hinders vehicular control.

Conclusions

This study offers a critical piece of scholarship that (1) re-examines widespread intuitions in light of empirical research, and (2) provides a theoretical process model designed to generate predictions about the effects of background music listening while driving.

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Musical emotions: The relationship between valence, arousal, salience, and motor responses.

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Background

Groove is the pleasant desire to move to music(Janata et al., 2012). The brain stem reflex theory suggests that acoustic features that signal environmental threats increase arousal and subsequent motor responses. Therefore, unpleasant motor responses to music may also occur. However, the perceived salience and emotion of music has received less attention. The present experiment examined how perceived emotion and salience affect implicit (involuntary) motor responses as measured though surface electromyography (sEMG).

Aims

We investigated relationships between several acoustic features and continuous recordings of arousal (activation-deactivation), valence (positive-negative), salience (how much a sound stands out), and sEMG responses.

Methods

Participants (N=20) heard 12 music excerpts from films that had previously been classified as happy, sad, tender, or tense in three different tasks: 1) listening passively, 2) rating arousal and valence continuously on the two-dimensional emotional space, and 3) rating salience continuously. Acoustic intensity (amplitude of sounds), spectral centroid, and inharmonicity (frequency dissonance) were compared to the subjective ratings and sEMG using time series analysis. We hypothesized that acoustic intensity and spectral centroid are salient acoustic features that positively correlate with arousal and salience ratings, as well as sEMG activity during passive listening. We further hypothesized that inharmonicity correlates with valence.

Results

As hypothesized,intensity and spectral centroid demonstrated moderate positive correlations with perceive salience and arousal, and sEMG activity. Inharmonicity, conversely, showed relatively weak correlations with salience, arousal, and sEMG Perceived salience demonstrated higher correlations with these acoustic when the music was tense compared to the other three emotion conditions. Valence ratings positively correlated with inharmonicity regardless of emotion condition. Overall, sEMG activity showed stronger correlations with salience than with arousal or valence.

Conclusions

Overall, results suggest that motor responses to acoustic intensity and spectral centroid occur regardless of the perceived emotion. The perception of salience, however, relates more strongly to these features when the music is tense or fear-inducing. These results indicate that the urge to move to music may not necessarily rely on the music itself being perceived as pleasant. The impact of music on the motor system will be further discussed in light of studies on rhythmic acoustic stimulation for motor therapy.

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Moved by Music: A Preliminary Exploration of a Powerful Music-Induced Emotion

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Background

There is a very long history of writing about the moving effects of literature, art, and music. Being moved has consistently been one of the most frequently reported feelings by listeners when describing strong, emotional experiences with music (Gabrielsson, 2011). Surprisingly however, despite its prevalence in everyday life, this feeling has received very little academic attention. No well-founded, distinctive understanding of the phenomenon and its underlying mechanisms currently exists in the literature, and current models of music and emotion (Juslin, 2013; Zentner et al, 2008) offer no account of these feelings.

Aims

Our exploratory, empirical study aimed to understand what it means to feel moved by music – to capture the character of this elusive feeling, and understand why it is experientially meaningful. To this end, we analyzed listeners' emotional responses to an experimenter-selected as well as a participant-selected moving audio clip. We also tested whether prosocial trait empathy is related to how moved listeners feel in response to familiar and unfamiliar music.

Methods

138 participants around the world, who responded to online advertisements on Facebook and Oxford University email list-serves, completed a web-based questionnaire designed to evoke the experience of being moved in real time. The survey consisted of five sections: emotional responses to an experimenter-selected moving musical excerpt; general questions on past experiences of being moved by music; emotional responses to participant-selected moving music (that participants were requested to listen to on YouTube); the Interpersonal Reactivity Index (a measure of trait empathy); and demographic information. We used word clouds as well as thematic content analysis on participants' free descriptions, and ran a correlation analysis on quantitative data.

Results

Our findings suggest that being moved by music may be: (1)experienced in two forms: as 'beautiful-sadness' causing contemplation; or as 'overwhelming exuberance' leading to bodily motion; (2)deeply immersive, viscerally felt, and a powerful prosocial motivator; (3)consistently related to the higher-order concept of empathy. A statistically significant relationship is shown to exist between listeners' dispositional empathy scores (specifically, the Fantasy and Empathic Concern sub-scales) and how moved they reported feeling in response to both familiar and unfamiliar music.

Conclusions

Through this study, we provide the beginnings of a framework for better understanding the prevalent and powerful experience of being moved by music. Furthermore, we highlight the relationship between empathy and feelings of being moved. Finally, we discuss applications of this research: A critical examination of moving musical experiences may provide an important perspective on the paradox of sad music enjoyment; and the role of empathy in being moved, as well as the acoustic characteristics of moving music, may shed new light on music and social bonding.

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L3P: Long Talks 3 - Performance

Time: Wednesday, 25/Jul/2018: 13:00 - 15:00 · *Location:* La Plata
Session Chair: Manuel Alejandro Ordás

The role of the score in amateur choral practice. The perspective of directors against the perspective of choristers.

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Background

Amateur choral practice is an integral artistic training field that allows learning and developing different musical skills. Although amateur choristers are not familiar with musical notation, it is common for the director to distribute the scores as a support to learn to sing the piece of music. From the score, choristers formulate certain hypotheses about the way in which musical notation is organized, which is confirmed or refuted during the musical practice.

In a study conducted with choir directors, Demorest (1995) warned that, among the advantages that the domain of musical notation would have, was the possibility of gaining greater autonomy, avoiding mechanical methods to learn the parts and decreasing repetitions. However, even when amateur choristers learn by memorizing music, they continue to use the score while singing. From this customary evidence, what functions does the score play for choristers? Although score has traditionally had a mnemonic function, in literacy studies the functions of writing go beyond these possibilities. Consequently, writing is also seen as powerful tool for thinking about language (Kittay 1991, Olson 2016). Is this function considered by choral directors?

Aims

The aim is to describe and correlate between the conceptions that choir directors and choristers have about the use of scores in amateur choral practice.

Method

Individual interviews were conducted with 10 directors of amateur choirs and 16 choristers with experience in amateur choirs.

Results

The responses of the directors and the choristers were initially analyzed independently by both authors, using in both cases the constant comparison method (from grounded theory, Glaser and Strauss, 1965). First, we identified and defined categories that would reflect the functions giving to score by each group, and secondly, we established relationships and differences between both groups.

Conclusions

These results allow us to sketch a variety of functions of the score for choristers. These functions exceed the mnemonic function and encompass epistemic, metalinguistic and communicative one. In that way, the score functions go beyond those assigned not only by the musical tradition, but also by the director practices, which use to be centered on the support for memory.

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Participatory Sense-Making in Joint Sight-Singing

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Background

Sight-singing has been traditionally seen as a core musical skill to be achieved through an individual development even in contexts naturally of joint singing, such as a choir (Demorest, 2004; Pollock, 2017). Such a solipsistic approaching to sight-singing entails both to make and to communicate the sense of the music represented by the score, and to reject all possibility of collective construction of such a meaning. Alternatively, it is possible to think in a modality of participatory sight-singing, in which musical sense is made on the interaction with other reader. One dimension of this “collective creation” of sense can be seen from an enactive perspective as "Participatory sense-making" (PSM) (De Jeagher & Di Paolo, 2007). In PSM agents keep their autonomy for making decisions in order to regulate the interaction. According to this, agents coordinate their intentional activity in the course of the interaction, affecting the individual sense-making processes and contributing to new domains of collective sense. From PSM perspective music performers could be considered interactive agents who communicate and negotiate their skills in real time (Schiavio & De Jaegher, 2017).

Aims

To characterize joint sight-singing as an intersubjective process from the PSM perspective. In order to this, some microgenetic aspects of the basic sight-singing ability are analyzed in interaction with others.

Method

Participants: 12 novel music students (average age: 20 years). Apparatus: Performances were recorded with 1 digital recorder connected to 3 individual microphones, and filmed by 2 HD cameras. Design and procedure: Participants were divided into 4 trios. They had to read a sheet of music singing aloud the three together. Sound and movement analyses were run assisted by softwares for voice analysis (Praat) and video annotation (Elan) respectively.

Results

Recordings were analyzed according to three microgenetic variables: (1) movement initiative; (2) singing initiative; (3) vocal tuning profile (VTP). Microanalysis indicates that although one participant tends to take the initiative both singing ($p<.000$) and moving, the VTP is stabilized after a "period of accordance" during the performance where the three participants go establishing a common pitch. The VTP, and the distribution of initiatives describe how a shared sense of the melody, as emerging from the score in real time, were co-elaborated.

Conclusions

Core concepts of the PSM theory (coordination; coupling; etc.) can be found not only in visible movement of the agents but also in voice-behaviours (tuning). Initiative, guide, break and accordance can be observed at the level of micro-time interaction. Therefore, joint sight-singing could be an opportunity for developing basic vocal and reading skills.

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Self-percieved personality traits and flow experiences on music performers.

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Introduction: The research and the theory of optimal experiences of flow seeks to understand the phenomenon of intrinsically motivated or autotelic activities (Csikszentmihalyi, 1975/2000). In this sense, the execution of a musical instrument presents a good opportunity to explore the subjective phenomenology of intrinsically motivated activities. The state of flow is a dynamic equilibrium; it depends on establishing a balance between the perceived capacities for action and opportunities for action. The study of the self-perceived personality contributes to the understanding of the flow state; the Personality Model of the Five Factors (FFM) provides a conceptualization of the personality structure developed over the last five decades (Costa & Mc Crae, 1992) and replicated in a variety of very different cultures (Mc Crae et al. al.,

2005). The purpose of this study was to know if self-perceived personality traits are predictors of the flow experience during the execution of a musical instrument, and observe the differences by sex.Method: 210 participants, women (18.8%), men (81.2%). Instruments:

Characteristics of Adolescent Personality (ACPA) (Leibovich and Schmidt, 2013), valuates the self-perceptions of the traits that allow knowing the self-perceived personality domains (Neuroticism- Extroversion- Opening to experience- Agreement - Conscientiousness). Results: on the regression analyzes for the complete sample, the model obtained only explains 9% of the variance. Models with greater predictive power were found when the sample was divided by sex. The main predictors of the experience of flow in women were: Agreement and Openness to experience. The percentage of variance explained by the model is 34% (R^2 .34; F (2,37) = 11.06; p <.000; f^2 = 0.52). In contrast, in males, the percentage of variance explained by the model is 8%. The best predictor of the flow experience in males is Extroversion, followed by Conscientiousness. Conclusions: The self-perceived characteristics of personality influence the of the flow experience in a differentiated way for men and women of this sample. Women who perceive themselves with greater Agreement and greater Openness to experience have a greater predisposition to experience flow. These personality traits are consistent with gender stereotypes, which tend to define women in terms of warmth and men in terms of competence.

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S9G: Symposium 9 - Moving in synchrony and social harmony

Time: Wednesday, 25/Jul/2018: 15:30 - 17:00 · *Location:* Graz_1
Session Chair: Joshua Bamford

Background

In the Western Art Music tradition, concert halls have stood firmly between music and movement. However, the relationship between musical rhythm and dance may be integral to how we understand the origins of music (Fitch, 2016). Dance relies upon our ability to synchronise movement with music, which may exist as one of the many component processes in musical ability (Honing, Cate, Peretz, & Trehub, 2015). Before we had music as we know it, behavioural synchronisation may have served an important social bonding function, enabling early humans to live in larger social groups (Dunbar, 2012) which, in turn, would have displayed group membership to others (Hagen & Bryant, 2003). Investigating the synchrony-bonding effect has become a vibrant field of research, which has employed a wide range of novel research methods – from silent discos to rhythm battles – some of which will be presented here.

Aims

This symposium will discuss the importance of interpersonal synchronisation as a component of musical ability, and the potential role of synchrony in the evolution of music and dance.

Contributors

Bamford, J. S. How humans found their groove: A review of social-bonding through music-dance

Stupacher, J., Wood, G. Effects of cultural background and musical preference on affective social entrainment with music

Himberg, T., Laroche, J., Hicks, L., Lutes, C., Dalla Bella, S., Bachrach, A. United we stand, divided we fall: Studying group cohesion and resilience with "rhythm battle"

Main Contribution

Multiple functions for the synchronisation of movement through music-dance have been proposed. Four of these will be discussed in the first paper and, where possible, reconciled with each other: group bonding, coalition signaling, parenting-infant bonding and sexual selection. The existing literature on the synchrony-bonding effect will then be briefly reviewed and critiqued.

Music is more than just isochronous synchrony, and usually occurs within a cultural context, so the second paper investigates the role of culture on the bonding effect of music. Synchrony has often been studied with dyads or occasionally groups of four, but the third paper investigates interpersonal synchronisation in a large group setting using the novel research paradigm of a “rhythm battle.” These studies will provide the starting place for a broader discussion of the social functions of synchronisation, which may be used in musical contexts to bind groups together and advertise group membership in both the present day and during our evolutionary history.

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How humans found their groove: Social bonding through music-dance

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Background

Music and dance are regularly used in situations that may forge a sense of group cohesion or even attraction between individuals. In recent years, the social bonding effects of music have increasingly become the topic of systematic research. This is of interest to evolutionary theorists, as social cohesion through music-like behaviour may have conveyed an advantage to our early ancestors, leading to a selection pressure for the musical abilities we have today. Central to the study of music as an evolved phenomenon is to consider musical behaviour as a combination of multiple components which may have evolved under different selection pressures (Fitch, 2015). It may be that some components of musical behaviour have evolved for a social bonding function.

Aims

This presentation will review the evidence for a social bonding effect of music-dance behaviour. It will discuss some of the methods used to study this phenomenon, and the current theories attempting to explain it, while providing suggestions for how these may be improved in the future.

Main Contribution

Studies that have separated different components of music-dance behaviour have identified synchronisation of movement to have a specific effect (eg. Bamford, Burger, & Toiviainen, 2016; Hove & Risen, 2009). Efforts to explain the underlying neuro-cognitive mechanisms of this synchrony-bonding effect are now ongoing. Some of these invoke specific hormones, brain networks, and cognitive processes (eg. Tarr, Launay, Cohen, & Dunbar, 2015; Woolhouse, Tidhar, & Cross, 2016), however these theories have not entirely been reconciled. In addition, the current methods for measuring social bonding and manipulating synchrony present a range of challenges.

Implications

Interpersonal synchronisation appears to have a specific effect on social bonding, although the current theories are yet to fully explain it, and our methods for testing it are still imperfect. Other features of music-dance, such as shared creativity and personal expression within the context of a group, should also be examined in the future. Furthermore, the importance of synchrony for social bonding with novel partners, for the maintenance of social bonds, and for sexual selection, may need to be investigated when considering selection pressures for synchronisation ability.

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Effects of cultural background and musical preference on affective social entrainment with music

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Background

When people come together to interact with music, they might not only synchronize their movements (temporal social entrainment), but also harmonize their emotional states (affective social entrainment). Musical ensembles of the same community are more likely to entrain than ensembles of different communities (Lucas, Clayton, & Leante, 2011). For individuals with high trait empathy, listening to music from a specific culture increases the preference for pictures of persons from that culture (Vuoskoski, Clarke, & DeNora, 2017).

Aims

We investigate how culturally typical and atypical music influences affective social entrainment.

Method

Sixty-one participants with Western cultural backgrounds watched videos of two walking stick-figures. One figure represented the participants themselves and the other represented an unknown person (Stupacher, Maes, Witte, & Wood, 2017). Two variables were manipulated: Musical pattern (Western vs. Indian) and synchrony (both figures in phase with the music [sync] vs. self-figure in phase and other-figure out of phase [async]). Participants rated how connected they felt with the other person and how much they enjoyed the different types of music.

Results

A 2×2 ANOVA on connectedness ratings revealed main effects of synchrony ($F(1,60)=124.27$, $p<.001$; sync > async) and musical pattern ($F(1,60)=24.28$, $p<.001$; Western > Indian), and no significant interaction. To investigate the effect of musical preference, we divided the participant sample into two groups based on the median of enjoyment ratings of Western and Indian music, respectively. A 2×2 ANOVA on connectedness ratings of videos with Indian musical patterns with the within-subjects factor synchrony and the between-subjects factor music preference (higher vs. lower enjoyment of Indian music) revealed main effects of synchrony ($F(1,59)=124.92$, $p<.001$; sync > async) and music preference ($F(1,59)=6.00$, $p=.017$), and a significant interaction ($F(1,59)=4.27$, $p=.043$). Similar effects were found for Western musical patterns. In general, music with Western patterns was enjoyed more than music with Indian patterns ($t(60)=6.69$, $p<.001$).

Conclusions

High familiarity with and enjoyment of the music one interacts with might lead to a higher predictability of movements and a stronger presence of social norms that would be fulfilled when moving in interpersonal synchrony, or violated when another person moves asynchronously. Additionally, the higher enjoyment of Western musical patterns might have led to a more positive mood, which, in turn, might have positively influenced social connectedness.

The current design does not enable a clear separation of the effects of cultural familiarity and enjoyment of music. Thus, future research on social entrainment should try to disentangle these influences in more detail. Additionally, our findings should be validated in more ecological settings, such as real-time face-to-face interactions with music related to different (sub-)cultures.

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United we stand, divided we fall: studying group cohesion and resilience with "rhythm battle"

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Background

Maintaining group cohesion in collective dance and music performances is difficult under external distraction, especially a rhythmic one. A model of this situation is congado (Lucas, Clayton & Leante, 2011), where marching bands resist entraining to other groups. In this study, we tested cohesion within the in-group, and resilience to influence from an out-group in a dance improvisation setting ("rhythm battle"). Our competitive setting might strengthen in-group cohesion, and thereby modulate the effects of synchronisation on affiliation (e.g. Hove & Risen, 2009).

Aims

- to study the mechanisms underlying group entrainment, using a naturalistic and embodied protocol.

- link tempo similarity with measures of social closeness in the group.

Methods

Four groups of 10–14 participants took part in the study. Their expertise in dance ranged from beginner to semi-professional, but none were expert musicians.

Participants were randomly divided into two teams. At stage 1, each team created a collective body rhythm, using clapping, clicking, stepping, etc. Teams were in separate rooms and were given different tempi (metronomes at 85 or 100 BPM). In stage 2, the divider wall was removed, allowing teams to see and hear each other. In stage 3, metronomes were turned off, leaving teams to rely on internal means in tempo-keeping. In stage 4, teams moved as groups past each other, switching places in the room.

Continuous measures of the participants' movement tempo were calculated from chest accelerometers. Mean and SD of tempi within teams were used to identify the "winning" team. Mantel tests for correlations between tempo similarity, tempo identity, and closeness measure matrices were used to investigate associations between these variables. Participants rated their closeness with everyone else in both teams, using a version of the Inclusion of other in the self (IOS) measure (Aron, Aron & Smollan, 1992).

Results

We observed two ways of "losing": 1) failing to resist entraining with the other team; 2) splitting up as a team due to a loss of internal cohesion. Mantel-tests indicated that all teams successfully produced instructed tempi when in isolation, but some participants lost their tempo already in stage 2, when still hearing their metronome. Participants rated their own team members closer than opposing team members (Kruskall-Wallis: $X2 = 7.03$, $p < .01$). Closeness ratings also correlated with tempo differences at the latter two stages of the game.

Conclusions

The affiliation-boosting effects of synchronisation seem to apply also to participants in a competitive, embodied, rhythm game. Our mostly non-musician participants often were distracted by the other team, even when they had a metronome. Our novel task seems promising in both studying group entrainment processes, and gauging their social effects.

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L13G: Long Talks 13 - Musician's Health

Time: Wednesday, 25/Jul/2018: 15:30 - 17:00 · *Location:* Graz_3

Session Chair: Edith Van Dyck

Can high standards really cause anxiety? Examining classical musicians' perfectionism in relation to their levels of music performance anxiety

Emese Hruska, Arielle Bonneville-Roussy, David Hargreaves

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Background

Perfectionism can be differentiated into two forms: healthy, as perfectionistic strivings (high standards) and unhealthy (maladaptive), as perfectionistic concerns. In music, it has been suggested that perfectionism is one of the main causes of music performance anxiety (MPA, Kenny, 2011), and that perfectionism in musicians has both positive and negative elements (Stoeber & Eismann, 2007). However, research exploring the link between perfectionism and MPA remains scarce.

Aims

This study aims to explore which aspects of maladaptive perfectionism can have a stronger effect on the cognitive and the physiological aspects of MPA, and to examine whether perfectionistic aspirations (high performance standards) and fear of negative evaluation are independent of MPA.

Methods

Two-hundred and thirty-three professional musicians and tertiary level music students completed a battery of validated scales (1) for music performance anxiety, anxiety sensitivity as well as some items measuring the frequency and level of the disturbing effects of MPA over the quality of the performance, and (2) for perfectionistic aspirations and maladaptive dimensions of perfectionism.

Exploratory factor analysis of the responses suggested a two-factor solution for MPA, in which the first factor consisted of items about Negative Cognitions (reliability, $\alpha = .89$) describing worries about the performance, and the second about Anxiety Sensitivity ($\alpha = .92$) describing aspects of sensitivity to physiological symptoms and disturbed focus. For perfectionism, five factors emerged expressing participants' Negative Reactions to Mistakes with Self-doubt ($\alpha = .94$), Fear of Negative Evaluation ($\alpha = .78$), Satisfaction with Achievement with Self-confidence ($\alpha = .90$), and Perfectionistic Aspirations in Practising ($\alpha = .90$) and in Performing ($\alpha = .93$). To test how the five factors of perfectionism predict MPA, two sets of multiple regression analyses were performed, in which the two factors of MPA were entered into the model as the dependent variables, and the five factors of perfectionism as the independent variables.

Results

The perfectionism dimensions of Negative Reactions to Mistakes with Self-doubt positively and Satisfaction with Achievement with Self-confidence negatively predicted both MPA factors. However, Perfectionistic Aspirations in Practising and Fear of Negative Evaluation had a small effect on the prediction of Negative Cognitions (MPA) but they did not contribute to predicting Anxiety Sensitivity (MPA). In total, perfectionism factors yielded strong effect sizes, explaining between 42% and 54% of the variance in MPA, $p < .001$.

Conclusion

The results of this study suggest that classically trained musicians' high performance standards and fear of criticism are not the major causes of MPA. However, musicians' low confidence levels about their playing, experiencing distress and frustration to imperfections during practising and performance, and being dissatisfied with the quality of the performance, can significantly increase their MPA levels. The discussion will highlight the importance of the cognitive aspects of MPA and perfectionism, will offer suggestions for future research and methods about advising performing musicians addressing these two issues.

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Musicians' health education: Programme design and evaluation

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Background

The Health Promotion in Schools of Music (HPSM) project has recommended the implementation of undergraduate health courses for music students (Chesky, Dawson, & Manchester, 2006). Few such courses have been evaluated to date. The World Health Organisation (WHO) defines health education as a process aimed at improving health literacy and developing life skills which are conducive to health (WHO, 1998). On this basis, a health education programme was designed and implemented at the Royal Northern College of Music, in Manchester.

Aims

To design, run and evaluate a six month health module for first-year students, as part of their core curriculum, starting from October 2016.

Methods

The module design was based on a critical appraisal of the literature, consideration of HPSM recommendations and the availability of staff members and preparation. Lectures and seminars covered a range of relevant topics such as effective practice and rehearsal strategies; anatomy and physiology; music performance anxiety; lifestyle (physical activity, sedentary behaviour, nutrition, sleep and stress management); the latest data on musicians' health in terms of prevalent problems and effective interventions; as well as a toolbox of behaviour change techniques applied to preventative health, time management and practice planning and labeled as life skills (including coping with emotion, stress management and critical thinking) (WHO, 1998). Self-report data on a variety of health-related issues, behaviours and attitudes were gathered, both before (T1) and after the module was delivered (T2). Quantitative data were analysed using the Wilcoxon Signed-Rank Test. A total of 20 semi-structured interviews were conducted at T2 and verbatim transcription were thematically analysed.

Results

Increases were found for perceived knowledge of effective practising strategies ($Z=-4.325$, $p<.001$); ergonomics and posture ($Z=-2.450$, $p=.014$); music performance anxiety ($Z=-4.972$, $p<.001$); behaviour change techniques ($Z=-3.671$, $p<.001$); resources for healthy music-making ($Z=-4.520$, $p<.001$); sound intensity levels associated with hearing loss ($Z=-2.090$, $p<.01$); and awareness of risk factors for performance-related musculoskeletal disorders (PRMDs) ($Z=-3.091$, $p<.01$). A few themes emerged from the qualitative analysis of the interview data, such as perceived benefits of the course (including behavioural changes in both practice patterns and lifestyle and their further benefits); effective components of the course such as the intimate and informal nature of seminars; potential barriers such as a perceived lack of relevance of the heath content with regards to performance quality and a preference for quick and clear solutions; and suggestions for improvement (including providing reliable information in an electronic manner, more information, and more seminars).

Conclusions

A health education programme among music students was associated with increases in perceived knowledge and awareness of some relevant health-related topics. However, without a control group, the conclusions remain tentative. Findings from the evaluation could be incorporated into an improved version of this course, in an attempt to make health education among musicians a more rigorous and evidence-based process.

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Let's face the music: Attitudes on the use of hearing protection in early-career musicians

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Background

Noise-induced hearing problems are well documented amongst musicians. Hearing problems affect musical performance skills, as well as impacting on communication and quality of life. Preventative measures (e.g. hearing protection) are effective in guarding against hearing problems, but the use of hearing protection amongst musicians may be as low as 22% (Wilson and Ennis 2016), despite average sound levels reaching 100 dBA for classical musicians (Peters et al. 2005).

Aims

The aim of this study was to explore attitudes about the use of hearing protection in early-career musicians to determine reasons for non-use.

Methods

Seventy-three early-career musicians (female n = 35, mean age = 20.3 years) were recruited from the Royal Northern College of Music and the University of Manchester (UK) as part of an ongoing investigation into hearing health in musicians. Participants completed a series of questionnaires and a semi-structured interview to determine: i) how often they use hearing protection, ii) their attitudes towards using hearing protection (rated on 7-point Likert scales), and iii) their thoughts on hearing loss in musicians and reasons for non-use of hearing protection. Thematic analysis of the interview responses was conducted using NVivo 11.

Results

The frequency of hearing protection use varied amongst musicians; 23% reported never using hearing protection, 37% reported using hearing protection less than once a week, and 40% reported using hearing protection at least once a week. The most common problems associated with using hearing protection were: hearing other players (57%), effects on own performance (38%), and physical discomfort (38%). Participants generally expressed positive attitudes towards wearing hearing protection [5.7/7; $t(72) = 11.271$, $p < .001$], irrespective of the frequency of hearing protection use [$F(2,72) = 1.777$, $p = 1.77$]. However, there was a significant difference between groups on personal standards [$F(2,72) = 21.241$, $p < .001$], whereby musicians who use hearing protection at least once a week more strongly agreed that their use of hearing protection was consistent with their attitudes (5.1/7) compared to those who infrequently (< once a week; 2.4/7) or never (2.2/7) use hearing protection (both $p < .001$). A general theme arising from the semi-structured interviews was that hearing loss, and thus the use of hearing protection, is more specific to certain genres of music and/or types of instruments. In addition, numerous participants noted that education on noise-induced hearing loss and the use of hearing protection was only introduced once they had started their degrees.

Conclusions

We will use these data to develop an intervention to improve the use of hearing protection amongst early-career musicians. Rather than focussing on changing attitudes to hearing protection, interventions could include increasing awareness of sound levels produced by the musicians' own instruments and educating child/adolescent musicians on the benefits of using hearing protection.

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L3G: Long Talks 3 - Ensemble

Time: Wednesday, 25/Jul/2018: 15:30 - 17:00 · *Location:* Graz_4

Session Chair: Michelle Phillips

Metaphorical cognition in the discourse of professional string quartet rehearsal

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Background

Current research on the role of metaphor in music analysis and cognition has mostly focused on writings about music rather than the experience of practitioners. This study on the conceptual, rhetorical and social interactive roles of metaphor in rehearsal discourse is part of a long-term ethnographic project that documents and analyzes the collaborative and communicative strategies of the Hong Kong-based Romer String Quartet and the Japan-based Quartet Excelsior.

Aims

1. To document the rehearsals by two professional string quartets;

2. To study how the performers conceptualize and communicate about music by way of metaphor;

3. To investigate the interactions between verbal metaphors and musical and gestural modes of communication;

4. To explore the cognitive implications of metaphorical usage in rehearsal discourse.

Main Contribution

Both Quartets' rehearsals were recorded regularly over two roughly 9-month periods to generate multiple sets of data that tracked the musicians' discourse about their creative process; interviews with the players were also conducted at various stages. We tagged and extracted conversational segments involving metaphorical usage for qualitative analysis from four inter-related perspectives. First, using Lakoff and Johnson's theoretical framework of conceptual metaphor (1980) as a starting point, we view metaphorical language as indicative of metaphorical conceptualization, a process by which a target domain (here music) is understood in terms of the entities, properties and relations of a source domain drawn from everyday human perceptions and actions. Thus, categorization of the metaphors used by professional musicians can be a means to access how they understand abstract musical concepts in terms of concrete, embodied experiences. Second, we examine agential ascriptions implied by the players' metaphorical usage, and argue that the act of performance not only realizes potentially agential elements within the musical work, but also create levels of agency beyond the score. Third, we study the metaphors as rhetorical devices and aim to discover how they serve specific discursive needs. Finally, we consider the interactions between verbal and non-verbal modes of communication in rehearsal, and hypothesize that speech and gesture serve as complementary modes of expressing conceptual metaphors about musical events and processes.

Implications

1. The unique field data collected through this project can serve as a valuable resource for future research.

2. Our interdisciplinary methodology integrates ethnographic-documentary and critical-theoretical approaches in new ways.

3. The data analysis demonstrates the multivalent and processual nature of metaphorical cognition in practical music making.

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Development of music rehearsal processes in a newly-formed vocal ensemble: Revealing 'hidden' patterns in verbal interactions

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Background

Preparing for ensemble performance is generally achieved through a framework of rehearsals and performance goals, involving the concurrent evolution of social, technical and musical elements. Emergent patterns of verbal interactions in high performing teams have been shown to influence team performance (Lei et al, 2016). In professional music ensembles, time pressures and complex task demands create challenges for development. Improved understanding of how emergent patterns of behaviour relate to performance outputs in a musical context is therefore of potential value to performers and educators in group settings.

Aims

To track the musical and social development of a newly-formed vocal ensemble, by investigating relationships between amount and type of rehearsal talk, verbal interactions, and rehearsal task focus.

Method

Participants were five postgraduate students specialising in vocal ensemble performance enrolled on a one-year MA course, who formed an SAATB consort for the programme. They video-recorded self-directed rehearsals over a 9-week period, working towards an assessed performance. Video recordings were transcribed and coded according to a pre-defined scheme ('Behaviour Analysis', Rackham, Honey and Colbert, 1971). Amount of rehearsal talk, and observed rehearsal tasks were also recorded. Temporal patterns were analysed using the pattern detection software THEME® (PatternVision Ltd).

Results

Musical development was reflected in measures of rehearsal tasks, topics of discussion, rehearsal logs and time spent music-making. Notably, there was an increase over the study period on work on expressive aspects. Rehearsal discussion also showed peak in future planning week 5.

Social development showed a shift from 'task' behaviours, which reduced from weeks 1-5, then increased in week 7; whilst 'process' and 'social' behaviours increased from weeks 1-3, and then reduced over weeks 5-7. Pattern detection analysis revealed the presence of complex, recurring interactions. Notable features not evident from observation alone included the recurrence of patterns in early rehearsals which were found to influence decision making in later sessions.

These patterns were related back to observation and interview data to build a richly nuanced picture of the musical and social development processes of the group.

Conclusions

Time-bound and fluctuating task demands are part of the dynamic environment in which ensembles form, work towards and achieve performance goals. The main contribution of this research was to surface complex relationships between tasks, verbal behaviour and interpersonal interactions. Pattern detection techniques were a useful tool in revealing the presence of tacit or 'hidden' patterns of communication in rehearsal, especially when combined with observation methods. It is proposed that these techniques can provide additional insights into the development of coordination processes in music ensembles. For example, early detection of large scale patterns may have value in detecting or predicting emergent leadership behaviours. Future work will aim to relate these processes to specific performance outcomes, including vocal synchronisation.

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Dancers' trait empathy relates to perceived interaction and similarity in dyadic movement

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Background

Previous research suggests that synchronized movement, such as take places in dance, can promote social bonding and prosocial behavior (Rabinowitch & Meltzoff, 2017). Trait empathy has also been related to imitative behaviors and synchronization ability (Bamford & Davidson, 2017; Chartrand & Bargh, 1999). However, social dancing often consists of free, improvised movements, which has not been studied in a dyadic context.

Aims

The current study aims to explore how trait empathy modulates interaction and entrainment in dyadic dance in a free movement context using perceptual and empirical measures.

Methods

Stimuli were created using motion capture data selected from a sample of 99 dyads, based on self-reported trait empathy. Empathy Quotient (EQ) scores in the sample ranged from 51 to 73. Individuals whose EQ scores were in the top or bottom quartile of all scores were considered to have high or low empathy, respectively. Twelve dyads comprised of four high-high, four low-low and four high-low empathy combinations were identified, and 24 point-light animations were created using motion capture data of these dyads dancing together to two Pop music excerpts. Animations were presented to 33 participants, who rated their level of agreement with the statements that dancers were "interacting with each other" and "dancing similarly to each other" on a scale from 0 to 100.

Results

One-Way Repeated Measures ANOVAs were conducted comparing the effect of empathy combinations (high-high, high-low and low-low) on perceived levels of interactivity and similarity. There was a significant effect of empathy combination on perceived interactivity, $F(2,64) = 42.9$, $p < .001$, and perceived similarity $F(2,62) = 8,45$, $p < .01$. Bonferroni-corrected pairwise comparisons showed that high-low stimuli were rated as significantly more interactive than either high-high or low-low stimuli, $p < .001$; for perceived similarity, pairwise comparison showed that high-high stimuli were rated as significantly less similar than high-low and low-low, $p < .05$. Period locking between dyads was significantly associated with rating of interaction $r = .48$ and similarity $r = .45$; rated similarity also correlated with hand movement $r = .64$ and head orientation, $r = .85$.

Discussion

Results suggest that period locking was sufficient for similarity, but not interaction, to be perceived. Hand movement and orientation could in this case communicate intention to interact. Although trait empathy may play a role in these variables, current results suggest this relationship is complex and should be further studied.

Conclusion

That perceived interaction and similarity gave different results suggests that entrainment encompasses a broader spectrum of behaviors than exact imitation, and that trait empathy may affect interactive behavior differently depending on the empathy level of the partner.

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L14G: Long Talks 14 - Perception

Time: Wednesday, 25/Jul/2018: 15:30 - 17:30 · *Location:* Graz_2

Session Chair: Jukka Louhivuori

Formant Distances and the Similarity Perception of Wind Instrument Timbres

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Background

There are only a few approaches to a comprehensive description of musical instrument timbres. Beside MFCCs (Loughran et al. 2008) and MPS (Elliott et al. 2013) the formant principle has proven successful so far. Formants turned out to be a useful predictor for timbre blending and separation (Reuter 1996; Lembke & McAdams 2015) as well as for timbre similarity (Reuter 2000). Plotting the formants of 586 wind instrument sounds of all reachable pitches in ff and pp into a X/Y scatter diagram (X-axis: first formant, Y-axis: second formant), it is possible to distinguish musical instruments and their registers by their formant positions in this depiction (Reuter et al. 2017).

Aims

The aim of this study is to test the advantage and suitability of the formant model by investigating two questions:

Do shorter distances between the formant positions of two sounds correlate with the impression of greater timbre similarity (and vice versa)?

Is the calculated vector of formant positions an adequate means for a precise computational classification of the involved instruments?

Methods

In a listening test, 22 participants rated the (dis)similarity of 40 loudness-adjusted timbre combinations including wind instruments like flute, oboe, clarinet, bassoon, trumpet, trombone, French horn, tuba on a scale between 1 and 8 (8 = maximum dissimilarity). Half of the stimuli contained sounds with extremely close/overlapping formant regions while the other half contained sounds with very distant formant regions.

With the help of support vector machines (SVM), k-nearest-neighbor (KNN), and further methods, the precision of the instruments' classification by means of their formants was tested using five-fold cross validation. Furthermore, a set of 89 additional timbre descriptors was examined to amend the classification.

Results

Between the perceived timbre (dis)similarity and the Euclidean distance of the formant positions a remarkable correlation ($r=0.759;p<0.001$) could be shown: Timbres with very close formant positions were perceived as very similar while timbres with very distant formant positions were deemed very dissimilar.

We achieved a precision of 46.1% (cubic KNN) when matching the formant positions of the examined timbres with their respective musical instruments. By adding further timbre descriptors, the classification precision could be increased to 84.6% (quadratic SVM).

Conclusions

The perception of timbre similarity is closely connected with the formant positions. Regarding computational musical instrument classification, formant positions alone do not seem to be a sufficient criterion compared to other more powerful means, but regarding the evaluation of perceived timbre similarity, the distance between formant positions is a helpful explanatory tool.

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Psychological constraints on string-based methods for pattern discovery in polyphonic corpora

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Background

Researchers often divide symbolic music corpora into contiguous sequences of n events (called n-grams) for the purposes of pattern discovery, key finding, classification, and prediction. Several studies have reported improved task performance when using psychologically-motivated weighting functions, which adjust the count to privilege n-grams featuring more salient or memorable events (e.g., Krumhansl, 1990). However, these functions have yet to appear in algorithms that attempt to discover the most recurrent chord progressions in complex polyphonic corpora.

Aims

This study examines whether psychologically-motivated weighting functions can improve harmonic pattern discovery algorithms. Models using various n-gram selection methods, weighting functions, and ranking algorithms attempt to discover the most conventional closing progression in the common-practice period, ii6-“I64”-V7-I, with the progression’s mean reciprocal rank serving as an evaluation metric for model comparison.

Methods

The corpus features 275 pieces of symbolic Western classical music that were time-aligned to audio recordings of expressive performances. To derive chord progressions, we performed a full expansion of the symbolic encoding, which duplicates overlapping note events at every unique onset time (Conklin, 2002). We then applied the voice-leading type representation (Quinn, 2010), which produces an optimally reduced and key-invariant chord typology that models every possible combination of note events in the corpus.

The pattern discovery pipeline consists of the following parameters:

1) Skip-grams – Include n-grams whose constituent events occur either within a fixed number of skips (fixed; up to 0, 1, 2, 3, or 4 skips), or within a specified temporal boundary (variable; up to 0.5, 1, 1.5, or 2 s between event onsets).

2) Weighted counts – Weight the count for each n-gram on the real-unit interval [0,1], assigning higher weights to n-grams with temporally proximal event onsets (proximity), periodic inter-onset intervals (periodicity), or inter-onset intervals close to the periodicities at which listeners tend to tap (resonance).

3) Ranking – Rank each distinct n-gram type in the distribution using a family of information-theoretic attraction measures from corpus linguistics: pairwise mutual information (PMI), directed PMI, local PMI, and piece-weighted PMI.

Results

The cadential progression, ii6-“I64”-V7-I, obtained the highest rank for (1) skip-grams including up to two or three skips, and which were (2) weighted according to the periodicity of their constituent inter-onset intervals, and (3) ranked according to piece-weighted PMI.

Conclusions

This study demonstrates that applying psychological constraints to pattern discovery algorithms improves task performance. These methods also reveal the temporal intervals over which recurrent progressions appear with significant frequency in polyphonic corpora.

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Acknowledgements

This project has received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme (grant agreement n° 670035).

Investigating the underlying principles of perceived accents using a modelling approach

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Background

The notes in a melody are perceived as differently important even when they are performed without any emphasis or expression. This is a crucial aspect for forming the perception of the musical structure such as the metrical grid (Large and Jones, 1999). Several models have been suggested that predict perceived accents from musical structure (e.g. Thomassen, 1984; Bisesi et al., in submission). These models often use a top-down approach starting from theoretical principles with rather limited data sets. Thus, a general model trained on a large database is still lacking.

Aims

We aim to formulate a model that predicts perceived accents from the score using a set of context-dependent local principles derived e.g. from pitch curve, note duration, and metrical position, and to use this model to investigate which principles are being used by listeners to determine perceived accents.

Methods

Our approach is data-driven instead of starting from a specific theory. We computed several features from the score representation, expressing different hypotheses about the origin of perceptual accents (see also Müllensiefen et al., 2009).

A representative set of 60 melodies (30 vocal and 30 instrumental) was selected from three different styles (baroque, romantic, and post-tonal). They were recorded on a Yamaha Disklavier without any performance variations. Thirty amateur musicians listened to all melodies and rated each note according to their perceived importance. Music analysis of a selection of answers was carried out in order to formulate hypotheses about the underlying principles used by listeners in their decisions. These hypotheses, as well as other principles gathered from the literature, constituted our ground-truth. Most of them were local principles derived from neighbouring notes' context, and were related to pitch contour, duration, and metrical position. These features were extracted for each note from the score representation of each melody. Using different machine learning methods, the average perceptual data was predicted from this set of features.

Results

The resulting data is currently analysed so we lack robust results. However, preliminary analyses indicate that (1) listeners used different strategies, (2) the task was relatively hard, in particular for the complex melodies, (3) a meaningful average can be extracted across the listeners, corresponding to the principles we have assumed, and (4) the model is able to predict the average with adequate accuracy. Further music analyses will address differences between different music styles, participants' backgrounds, and individual strategies.

Conclusions

Our model will provide further insight in how listeners do perceive accents in melodies featuring different degrees of structural complexity and musical styles.

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Eye movements in film perception: The impact of emotional music and playback speed

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Background

Slow motion is an increasingly popular technique in films, often combined with expressive music. It serves various functions such as drawing attention to otherwise unseen details and inducing emotional states (Rogers, 2013). Eye movements and pupillary responses provide insights into these experiences (Gingras et al., 2015; Schäfer & Fachner, 2015). This study examined the perception of original slow-motion scenes focusing on audiovisual interactions and playback speed.

Aims

We investigated the influence of music as well as playback speed on pupil diameter and eye movements. We hypothesized that music compared to visual-only conditions without music leads to higher arousal levels and influences attentional processes while watching slow-motion scenes. Furthermore, we expected that playback speed would cause different scene perceptions.

Method

Thirty-nine participants (mean age = 24.00 years, SD = 4.23) watched three original slow-motion film excerpts in a multimodal repeated-measures design. Excerpts were presented in original audiovisual (slow motion with music) and manipulated visual-only conditions (slow motion without music and real-time motion without music), resulting in 3 x 2 x 2 stimuli. While watching the film excerpts, participants' eye movements and pupil responses were recorded using a SMI REDn eye-tracker.

Results

Results show that participants' pupil diameters were larger in the audiovisual compared to the visual-only condition ($p < .001$), indicating higher arousal. Analysis of eye movements yielded a main effect for blink frequency ($p < .05$), showing that participants blinked more often in the audiovisual condition. Fixation frequency, fixation duration and saccadic frequency did not show main effects of music (all $p > .05$), and dispersion of dwell times did not differ between conditions ($p > .05$). In contrast, playback speed influenced all eye movement parameters. Slow motion compared to real-time motion caused an increase in fixation frequency, shorter fixation durations, a higher saccadic frequency, and an increase in blink frequency (all $p < .01$). Dispersion of dwell times differed as well ($p < .01$), showing that participants looked at various details in the slow-motion film scenes rather than concentrating on the center of the screen.

Conclusions

Our findings suggest that music compared to no music leads to higher arousal while watching slow-motion scenes and causes more attentional shifts, as indicated by pupil diameter and blink frequency (Stern et al., 1984). Slower playback speed leads to a different scene perception, so that viewers fixate a greater variety of visual objects and presumably attend to more detail.

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D1M: Demonstration 1

Time: Wednesday, 25/Jul/2018: 20:00 - 21:00 · *Location:* Montreal_1

Analyzing recorded musical performances with the Automatic Music Performance Analysis and Comparison Toolkit (AMPACT)

Johanna Devaney

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Background

The study of musical performance continues to be dominated by keyboard-based instruments due, in part, to the ease with which one can record performance data directly from the instruments themselves. Work on other instruments and the voice requires robust signal processing approaches to measure timing, tuning, loudness, and timbral parameters from recorded audio of performances. The goal of the Automatic Music Performance Analysis and Comparison Toolkit (AMPACT) is to provide researchers who are interested in studying recorded musical performances but who do not want, or have the skills, to implement the necessary signal processing algorithm themselves. Although AMPACT is currently a coding-based library (in MATLAB, soon to be ported to Python), it requires far less code-writing than implementing algorithms or building them from scratch. Furthermore, the algorithms implemented in AMPACT have been validated and published (Devaney, 2014; Devaney and Mandel, 2017; Devaney, Mandel and Ellis, 2009).

Aims

This workshop will demonstrate the functionality of AMPACT through examples of monophonic and polyphonic recordings.

Main content

The workshop will demonstrate how to use AMPACT's score-informed paradigm for making low-level frequency and power estimates from recorded audio as well as summarizing these data into perceptually-informed note-wise descriptors. These include note onsets and offsets, perceived pitch, perceived loudness, and a range of timbral descriptors used in the psychological literature, as well as estimates of vibrato rate and depth, the slope and curvature of note-wise fundamental frequency trajectories, jitter, shimmer, and mel-frequency cepstral coefficients. It will also demonstrate how users can implement their own note-wise summaries and how to export performance data linked with the appropriate note data to Humdrum and MEI.

Implications for practice

AMPACT allows a broader range of scholars to study a broader range of instrumental and vocal performances with computational tools than was previously possible. This opens up new questions in performance research, particularly regarding tuning and timbre.

Specific value of demonstration for conferences

AMPACT will be of interest not only to attendees who are interested in studying musical performances themselves but also those who are interested in measuring aspects of musical performance in order to understand listener responses better. Since AMPACT is a coding-based library, new users can benefit from hands-on demonstration as well as discussion about the overall architecture and the assumptions built into the toolkit.

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T3P: Short Talks 3 - Improvisation

Time: Wednesday, 25/Jul/2018: 20:00 - 21:00 · *Location:* La Plata
Session Chair: Clara Marcia Piazzetta

EFFECT OF MUSICAL IMPROVISATION IN AFFECTIVE MEMORY. A STUDY WITH OLD ADULTS

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Background

As a part of the set of complex creative behaviours, musical improvisation is a high-level cognitive process characterized by contextually significant generation of new sound and music ideas. It requires sudden elaboration of music components such as melody, harmony or rhythm. Musical improvisation, from a music therapy perspective, is a technique that is widely used with different populations understanding that any person could perform such a creative act (Abrahan & Justel, 2015). Despite its wide use in music therapy, little is known about the direct incidence of musical improvisation in modulating general cognitive processes such as affective memory (Justel & Rubinstein, 2013). Besides, research in music-therapeutic improvisation, particularly from the neuropsychological point of view, is relatively incipient. Recently, some studies indicated that both music perception and musical improvisation could modulate memory in young adults.

Aim

This study aims to investigate the effect of musical improvisation, as a music-therapeutic technique, on visual emotional memory of old adults without musical training.

Method

Fifty-four participants without musical training (67% female), over 60 years (M: 70.07, SD: 0.88), participated in this study, from different cultural and social senior' centres', randomly assigned to three different conditions (improvisation, imitation and silence). Thirty-six images from the International Affective Pictures System (IAPS) were selected: 24 of them were emotionally activating (12 with positive and 12 with negative valence) and 12 were neutral. Firstly, participants had to observe the images and to rated (in a 10-point scale) how emotional the images were for them. Then, they were exposed to a three-minute experimental treatment (a free musical improvisation, with a musictherapeutic orientation. In this condition, participants improvised musical patterns with instruments, their voices or bodies, spontaneously creating some musical feature) or control conditions (no music stimuli or imitation condition). We evaluated the memory through two tasks: Free recall (the participant had to write the images that they remembered) and recognition (the participant had to recognize within a set of 72 images, the original 36 ones), both immediately and deferred (after a week).

Results

The general result of this study indicate that emotional stimuli are better remembered and recognized than neutral information [$F(2, 102)=95.689$, $p<0.0001$ ($\eta^2p=0.652$)]. Besides, improvisation condition's participants achieved higher scores in deferred free recall $F(4, 102)=5.869$, $p<0.0001$ ($\eta^2p=0.187$) and immediate recognition [$F(2, 51)=4.393$, $p<0.0001$ ($\eta^2p=0.978$)]. Meanwhile imitation condition's participants achieved lower scores in free recall and recognition for emotional images.

Conclusions

These results reinforce previous evidence showing that playing music would be more effective in improving certain cognitive functions than merely listening to it. However, the data here emphasize that it is not the same to perform in an improvised way that to adjust the performance to a model. Because music improvisation modulates emotional memory, music treatment may provide a simple, safe and effective method of preventing the potentially harmful physiological concomitants of memory impairment.

Focusing attention during improvisation or recall of music.

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Background

Musical recall is a sample of convergent production that requires intensively focused attention (see Toplyn, 1999). Inversely, musical improvisation is a divergent task and probably requires a different way of attentional control. The first research question is whether musical improvisation is related to broader (more extensive, see Kolanczyk, 2012) attention.

Extensification of attention can be made through the use of smaller attentional resources (Kolanczyk, 2012). But De Dreu et. al (2012) showed that musical improvisation required high working memory capacity. The second question is whether the musical improvisation needs the high or low central executive attentional resources.

Aims

The main goal of the research was to investigate differences in attention in two kinds of musical performance - recall and improvisation. There were two hypotheses. H1: Recall of music requires more intensive attention than improvisation. H2: The more extensive attention (improvisation, according to H1), the less central executive attention resources are needed to solve the task.

Experiment 1

30 volunteers took part in the research. They were all musicians, students of various years of the Academy of Music in Krakow. Participants were divided into two equal groups. Participants were not expert improvisers.

Experiment 1 was designed in a dual-task paradigm. Participants were to remember a short melody and then recall or improvise, simultaneously performing the spatial attentional test on a computer screen. The Ellipses test was used to measure the extensification of attention (Roczniewska et al., 2011).

Results

Two main indicators of extensive attention were significantly higher during the improvisation than the recall task.

Experiment 2

20 volunteers took part in the research. They were all musicians, students of various years of the Academy of Music in Krakow. Participants were divided into two equal groups. Participants were not expert improvisers.

The procedure was similar to Experiment 1, but the Ellipses test was replaced by random number generation task (Towse & Neil 1998).

Results

There were no significant differences between groups in experiment 2.

Conclusions

The results of Experiment 1 show that improvising participants find spatial goals in more disperse way. The conclusion is that musical improvisation requires extensification of attention to occur. Results of experiment 2 suggest that improvisation needs as much attentional resources as the recall task. Thus, the extensive attention, although it is broad, may be controlled as strong as a narrow, intensive attention.

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T3M: Short Talks 3 - Memory

Time: Wednesday, 25/Jul/2018: 21:00 - 22:00 · *Location:* Montreal_1

Session Chairs: Daniel Shanahan, Elizabeth Monzingo

The Effects of Melodic Contagions in the Oral Transmission of Melodies

Elizabeth Monzingo[1], Daniel Shanahan[1], Anthony T. Marasco[1], Emily Elliott[1], David John Baker[1], Connor Davis[1], Joshua Albrecht[2]

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Background

Previous research into the transmission and altering of musical signals has primarily examined recognition tasks, emphasizing the role of memory (e.g. Halpern & Bartlett, 2010). Recent studies suggest that the physical act of melodic production might also play a role. Shanahan and Albrecht (forthcoming) found that ascending stepwise motion at cadences tended to be replaced by descending stepwise motion over the course of oral transmission of melodies in a linear transmission train.

Aims

The current study hypothesizes that this effect will be amplified over the course of oral transmission in a diffusion-based model, in which we examine the influence of a “contagion” cadence. We also examine the ability of measures of working memory capacity and musical sophistication to predict participant choice of cadence.

Method

Participants (N=66) listened to, and then recorded themselves singing, eight unique melodies. Participants heard each melody four times, as demonstrated by four different vocalists. They either heard the melody sung three times with a descending cadence and one time with an ascending cadence (the ascending contagion cadence), or three times with an ascending cadence and one time with a descending cadence (the descending contagion cadence). They then completed the Goldsmiths Musical Sophistication Index (Müllensiefen et al., 2014) and one block each of three measures of working memory capacity (Foster et al., 2014).

Results

Findings show that the contagion cadence serves to influence the type of cadence participants sing, and the descending contagion cadence exerts more influence than the ascending contagion cadence. Further, measures of working memory capacity and musical sophistication have no significant effect on the cadence chosen.

Conclusions

A “contagion” cadence demonstration significantly influenced whether the participant sang a descending or ascending cadence, and the descending cadence contagion was more influential than the ascending cadence contagion. We propose that this is due to physiological affordances, especially given that neither working memory capacity nor musical sophistication were predictive of cadence transformation.

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Disentangling schema- and saliency-based expectation effects on recognition memory for musical tones

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Background

While it is well-established that expectations play an important role in music listening, the influence of expectations on memory for musical tones is not fully understood. Previous studies investigating expectancy effects on recognition memory have manipulated notes in a melody that either maintain or disrupt the overall pitch contour or key-relatedness (e.g. Cuddy & Lyons, 1981; Vuvan et al., 2014). However, these studies did not systematically control the expectedness of individual notes in targets and foils.

Aims

By systematically manipulating the expectedness of target tones and foil tones that are either congruent or incongruent with the expectancy of the target, the present study aims to distinguish empirically two competing hypotheses: a schematic hypothesis (predicting better memory for expected tones and more false alarms for expected foils) and a saliency hypothesis (predicting better memory for unexpected tones and more correct rejections for unexpected foils).

Methods

We used the Information Dynamics of Music model (Pearce, 2005) trained on a corpus of Western folksongs and hymns to select short melodies ending on target notes that were either high or low in information content (IC), an information-theoretic measure of predictability that accounts well for listeners' pitch expectations (Pearce et al., 2010). We produced two altered versions of each melody containing a foil note that was either congruent or incongruent with the target IC, but always different in pitch. In the experiment, participants experienced a series of blocked exposure melodies. After each block of four exposure melodies, they were randomly presented with targets (50% of trials) and foils (25% IC-congruent, 25% IC-incongruent) and asked whether each test melody was 'old' or 'new'.

Results

In a first study with a single long exposure block, we observed superior performance for melodies that were low-IC over high-IC at exposure, $F(1, 16) = 5.52$, $p = .032$, potentially ascribable to more false alarms for low-IC foils when the stimulus was high in IC at exposure, $t(16) = 2.39$, $p = .031$. This provides tentative support for the schematic hypothesis. However, performance was overall very low. We are presently running a second study with several exposure blocks and test sessions containing fewer melodies to alleviate floor effects. Results from this optimized task will be presented.

Conclusions

To our knowledge this is the first study to manipulate expectedness of both targets and foils. The results will elucidate how expectations influence human recognition memory.

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Dynamics of short-term pitch memory as a basis for temporal order effects in tonal perception

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Background

Pitches in tonal music are organized around tonal centers that function as stable reference points. Previous research has focused on the role of pitch distribution in determining the hierarchy of tonal stability. However, it was also found that the same set of pitches can imply different chords and keys when arranged differently in time, which indicates that the temporal order of pitch events influences their relative stability. The temporal-order effects were mostly attributed to the listener's tacit knowledge about structural regularities in tonal music. An alternative explanation is that the pattern of relative tonal stability arises from the interaction between individual pitches in short-term memory which is determined in part by their temporal order.

Aims

Here we use a computational model of short-term pitch memory to test if the dynamics of pitch memory can explain the temporal-order effects found in previous studies of tonal perception.

Method

We use a biologically realistic model of short-term pitch memory, consisting of a network of nonlinear oscillators tuned to an equal-tempered chromatic scale. The connections between the oscillators enable two types of pitch interaction found in previous experimental studies, namely, the inhibition between close pitches and the stability of consonant intervals. We drive the network with audio signals and compare the pattern of oscillator amplitudes to existing human behavioral data on the inhibition and disinhibition in pitch memory (Deutsch, 1972; Deutsch & Feroe, 1975), melodic anchoring and the influence of tone duration (Bharucha, 1984; Laden, 1994), the influence of temporal order on key judgment (Brown, 1988; Brown & Butler, 1981) and the similarity judgment for tone pairs in a tonal context (Krumhansl, 1979).

Results

We found that the interaction between oscillators driven by pitch events largely explained the temporal-order effects in the human data. We also found that the pitch memory model was less successful for some of the key judgment data which suggested the involvement of tonal expectation. We discuss how tonal knowledge and expectation could be incorporated into the dynamical model by means of long-term plasticity.

Conclusions

Simulations using a dynamical model of short-term pitch memory showed that the low-level interaction between musical pitches can explain much of the temporal-order effects found in tonal perception.

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T4M: Short Talks 4 - Computation

Time: Wednesday, 25/Jul/2018: 21:00 - 22:00 · *Location:* Montreal_2

Session Chair: Michael Schultz

A Statistical Approach to Measure the Usage of Notes Over Different Musical Eras

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Background

The Yale Classical Archives Corpus (YCAC) [1] is a repository of music compositions by over 500 western European classical composers from the 16th to the 20th century. The corpus represents each composition in a computer-readable format. This allows music studies from a computational and mathematical angle e.g. [2, 4].

Aims

We aim to provide statistical evidence from YCAC that, with the progression of music eras, composers use a larger set of notes, both in terms of the range of notes and the frequencies of sharps and flats.

Methods

We focus on the major composers defined by YCAC. They range from Byrd (b. 1540) to Debussy (b. 1862), covering the Renaissance, Baroque, Classical, Romantic and Impressionist eras. In an YCAC music file, a salami slice contains a collection of notes that are played simultaneously. A new slice is created whenever a note enters or leaves the music [3]. For each piece, we compute the duration and the occurrences (or equivalently the number of slices) of each note. This simple task illustrates the distribution of the note usage. Not surprisingly, for the same composer, the note counts differ significantly from note to note. We also explore the similarities of this distribution for different composers and for compositions from different eras.

Results

We discuss several trends:

First, composers use more sharps and flats as the music eras progress from Renaissance to Impressionist. At the two extremes, sharps and flats only make up 7.4% of Byrd's total note count. In contrast, almost 45% of Debussy's total note count comes from sharps and flats. Between the two extremes, the Baroque and Classical composers gradually migrate away from Byrd: their sharp/flat percentages range from Telemann's 19.5% to Haydn's 27.4%. The Romantic composers gradually migrate towards Debussy: their percentages range from Saint-Saens' 28.9% to Chopin's 44.2%.

Second, most composers use more sharps and flats later in their composing years. Wagner was the most pronounced example, as the compositions during his later period used extreme chromaticism extensively.

Third, earlier composers use a smaller set of notes from a smaller range, whereas more recent composers use a larger set of notes from a wider range. Only 19 notes make up 90% of Byrd's compositions, and he used notes exclusively between the second and fifth octaves. In contrast, Romantic and Impressionist composers used nearly 50 notes to make up 90% of all compositions. They also used notes well beyond the sixth octave.

Conclusion

Our study provides statistical evidence that music gets richer, more complex and more sophisticated over time.

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Temporal changes and musical timbre: New software for analysis and synthesis of musical sounds

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Background

One challenge in teaching auditory perception is the difficulty of conveying the combined spectral and temporal complexity of natural musical sounds. Single instrument tones produce sounds varying simultaneously in two dimensions (frequency and intensity) over a third dimension-time. This makes it difficult to convey the full picture of musical timbre in 2D textbook figures. Consequently, the importance of dynamic temporal changes in the acoustic structure of musical sounds is often overlooked (Schutz, in press). This pedagogical challenge mirrors a larger issue in auditory perception, where the role of temporal changes is often underexplored (Schutz & Vaisberg, 2014).

Aims

Our aim with this project was to create software offering an intuitive framework for exploring important concepts related to timbre perception. Additionally, we wanted a tool affording experiential learning for students with a background in either the arts or the sciences.

Method

Our software uses an intuitive Graphical User Interface (GUI) that runs on either Mac/PC to convey dynamic amplitude information for natural musical instruments. It can also easily generate time-varying stimuli from the GUI, facilitating better use of complex sounds without the need for programming. This tool is specifically designed for hands-on exploration by students, and does not require any programming in order to explore. It also works well for class demonstrations, as interested students can replicate and explore sounds independently.

Results

After debuting a beta tool (Ng & Schutz, 2017), we added additional functionality for extended and are exploring potential research applications. This software is freely available to interested parties at https://maplelab.net/maestro/

Conclusions

Our team has previously noted a disproportionate focus on “simplified” sounds in psychological acoustics (Schutz & Vaisberg, 2014), which has led to theories of auditory processing that do not generalize to complex, time-varying acoustic information (Chuen & Schutz, 2016; Schutz, Stefanucci, Baum, &Roth, 2017; Vallet, Shore, & Schutz, 2014). This tool allows student from a variety of disciplines to explore the importance of time-varying amplitude properties in understanding musical sounds.

References

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Designing Effective Auditory Interfaces: Exploring the Role of Amplitude Envelope

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Background

The cacophony of auditory alarms is problematic; a cost-efficient solution is through amplitude envelope manipulation. Amplitude envelope refers to temporal changes of a sound's shape over time. Percussive envelopes are exponentially decaying whereas flat envelopes, used in much auditory research, exhibit little temporal variation (Schutz, 2016). Recent work suggests that time varying structures are processed preferentially to beeps, facilitating faster encoding and better recall (Schutz, Stefanucci, Baum & Roth, 2017). Flat tones are employed by most auditory interfaces, including the global medical device standard, the IEC 60601-1-8. The IEC alarms used monitor patient care and machine-related problems are associated with specific tone sequences (Edworthy & Edworthy, 2015). These alarms are criticized for being difficult to be learned, identified, and are perceived to be annoying (Sanderson, Wee & Lacherez, 2006).

Aims

This experiment aims to improve the design of the IEC alarms by incorporating percussive envelopes into the existing tone sequences.

Methods

Forty undergraduates randomly assigned to the "flat" or "percussive" conditions, respectively listened to tone sequences comprised of entirely flat of percussive envelopes. The experiment consisted of a study phase, a training phase, a break, an evaluation phase, and an annoyance task. During the study phase, participants learned eight alarms and their referents after listening to each pairing twice. During the training phase, participants practised identifying the correct alarm with feedback until they identified 7/8 alarms on two consecutive blocks, to a maximum of 10 blocks. After a short break involving a silent distractor, participants tested on their ability to identify the correct referent during the evaluation phase. To assess annoyance, all participants listened to both flat and percussive tone sequences and identified which version they perceived to be more annoying during a two-alternative forced choice task.

Results

Learning was measured using t-tests on the a number of training blocks required during the training phase while short-term memory was measured by t-tests performance on the evaluation phase. There was no effect of envelope on learning or short-term memory of alarms (p's$>.05$). Annoyance was assessed using chi-square goodness-of-fit tests on trials comparing envelope. Chi-square goodness-of-fit tests revealed that percussive alarms are generally less annoying that flat, although the degree of difference varies based on exposure and training (p's$<.05$).

Conclusions

These results suggest that percussive tone sequences suggest reduce perceived annoyance without harming learning. This highlights the importance of temporal considerations in creating auditory interfaces and in auditory perception research to reduce the negative effects of prolonged exposure.

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T4P: Short Talks 4 - Movement

Time: Wednesday, 25/Jul/2018: 21:00 - 22:00 · *Location:* La Plata

Session Chair: Pablo Padilla

Music as environment: movement cues as descriptors of musical experience

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Background

Enactivism considers cognitive processes as originated in perceptually guided-actions; it sees cognitive activity as an outcome of the circular dynamic interactions between an organism and its environment (Schiavio et al., 2017), and the minds as inherent attributes of bodies in the world (Di Paolo et al., 2017). From this perspective, body movement might bring cues to explore self-organization phenomena of musical experience.

We focused on physical movement properties employing two analytical frameworks: (a) impulsiveness based in Effort Laban`s model that relates low-level physical movements to mid-level expressive qualities; and (b) Recurrence Quantification Analysis (RQA) Entropy, from Dynamic Systems Theory.

Aims

To explore movement features that account for differences in the dynamical interaction between the musical 'organism' and the musical environment.

Method

Assumption: if a given movement pattern is configured as an environmental coupling of music and movement, the repetition of the pattern without music might lose structural and/or expressive features prompted by the music.

A paired designed experiment was carried out where seven musicians (all right dominant handed) were asked to choose, perform, and loop hand-movement patterns in two conditions: (i) [+MaE] while listening to an Argentine chacarera rhythm of one-minute duration (Music as Environment); and (ii) [-MaE], preserving and repeating the movement pattern just performed without the chacarera rhythm's soundtrack. Hand movements were captured with infrared cameras. Calculations were run analysing the time series' Euclidean velocity, as to find differences in the expressive quality of movement (impulsiveness) and the pattern organization (RQA entropy) between conditions.

Results

As regards impulsivity values, movement patterns exhibited in [-MaE] a decreased as compared to [+MaE]. Left hand's impulsivity accounted for the found difference (Mdiff = -0.93, 95% CI [-1.72, -0.15], N = 7, r = .94) showing a medium sample effect size (dunbiased= 0.35, 95% CI [-1.21, 0.40]). Right hand's impulsivity showed no effect.

As to entropy values, movement patterns also exhibited an overall decrease in [-MaE]. In this case, both hands decreased in the same way. Considering both-hands movement as a whole, the result shows a moderate effect size (Mdiff =-0.29, 95% CI [-0.63, 0.06], dunbiased= 0.43, 95% CI [-0.97, 0.08], N= 14, r = .61).

Our analysis was exploratory. An independent replication is needed to reduce potential carryover effects on the experimental design.

Conclusions

Impulsiveness could be assumed as a cue that accounts for the way our interaction with music is expressed by more energized body movements. Additionally, we interpret entropy as a cue that informs about how interaction with music organises our movements, conveying structure, order and predictability to them.

The differences between [+MaE] and [-MaE] suggest that our dynamic interaction with the musical environment nourishes our experience, prompting expressive and structural alignments in our embodied sense-making.

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Incidence of verbal commentaries on musicians' corporality during a chamber music rehearsal

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Background

Embodied music cognition theory emphasizes the fundamental role of the human body in cognition, and postulates that music is perceived as moving sonic forms that produce corporal resonances through which it is assigned meaning (Leman, 2008). Intersubjectivity refers to the ability to elaborate representations about the mental states of others, allowing us to interpret features of their subjectivity. Joint musical interpretation in rehearsal situations can be understood as an intersubjective process of constructing meaning, which is manifested through various aspects of musical production, during which verbal commentaries play an important role in the formation of joint musical ideas that can be reflected in the musicians' corporality.

Aims

Analyze if the corporality of a chamber music duet shows modifications as a result of verbal commentaries between musicians in a rehearsal situation.

Method

2 advanced music students (1 female, 1 male, mean age= 25) volunteered to participate. They had not previously played together. Each participant received a score with a fragment of the piece "Se Florindo è Fedele" by Alessandro Scarlatti, two weeks before the study. They were asked to play their parts individually. Then they were given time to have a small rehearsal, which was recorded for analysis. Finally, a joint performance was recorded.

Performances were recorded with two microphones and two cameras. Movement data was analyzed using the microanalysis technique with ELAN software, using LABAN system categories. Verbal commentaries were analyzed applying categories proposed by Jane Ginsborg (2006). It distinguishes between the basic type (refers to information contained in the score, and to basic assembly issues), and the interpretative type (interpretive decisions made by the performers).

Results

Analysis showed the presence of both types of verbal commentaries. During the first half of the rehearsal, the basic verbal interaction was oriented to the temporal adjustment and correction of reading errors. Towards the end, the emergence of an interpretative verbal interaction -focused on issues such as pauses and dynamic changes- was observed. From the beginning, the second part of the rehearsal was characterized by a greater degree of temporal adjustment between performer's bodily movements, as well as a greater agreement in the intentionality assigned to the performance, evidenced in the shape and mutual correspondence between the movements of both musicians.

Conclusions

Interpretative verbal commentaries affected the corporality of the performers and their mutual attunement, helping to achieve a 'being together with music', necessary in joint performance. Participants in the present study were advanced music students; future studies could focus on whether these exchanges affect musicians of other levels of expertise. The results of this study could be useful for the approach of chamber music study in contexts of musicians' professional training.

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P1M: Posters 1

Time: Wednesday, 25/Jul/2018: 22:00 - 23:00 · *Location:* Montreal Poster Room

Music preferences in an Asian culture: An examination of the MUSIC Model in a Singaporean context

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Background

Recent studies suggest that music preferences can be conceptualized along five dimensions: Mellow, Unpretentious, Sophisticated, Intense and Contemporary [MUSIC; 1, 2]. While cultural differences in music mood perception have been demonstrated [3], it is less clear if such cultural differences would underlie the structure of music preferences.

Aims

Given that the majority of music preference studies have been conducted in the Western context, the current study aims to investigate the validity of the MUSIC model in a non-Western culture.

Method

Eighty-three undergraduates (28M 55F, age: M = 21.9 ± 2.41) were recruited from Nanyang Technological University, Singapore. 77 (93%) were Chinese, two (2%) were Malay and four (4.8%) had other ethnic backgrounds. Thirty-one (37%) participants received formal musical training and 14 (17%) learnt an instrument informally. Sixteen (19%) previously participated in band, 12 (14%) in choir, and four (5%) participated in both musical activities. For participants with prior musical activities involvement, 15 had formal musical training, nine had informal musical training, while eight had no musical training. Overall, participants spent a mean of 6 ± 1.70 days a week listening to music. They completed questionnaires on acculturation [SL-ASIA; 4] and music background, and completed a music listening task (random presentation of 50 commercially unreleased musical excerpts, taken from 21 music genres and subgenres, each approximately 15 seconds, [2]) where they rated their level of preference for each musical excerpt on a 9-point Likert scale (1: Not at all, 9: Very much).

Results

A mean of 2.15 ± 1.17 was obtained on the SL-ASIA, indicating that this sample is Asian-identified. Kaiser-Meyer-Olkin measure of sampling adequacy was .66. Factor analysis with orthogonal target rotation showed that the factor structure in the current sample was congruent but not perfect with that of [2]. Factor congruence indices ranged from .82 to .93, with the lowest index being the Unpretentious factor, and the highest indices being the Sophisticated and Intense factors.

Conclusions

The current study yielded a fairly similar five-factor structure underlying music preferences in a Singaporean context, as compared to the original MUSIC model [2]. Substantial amount of exposure to classical music and rock genres among Singaporean listeners could possibly account for high factor congruence of the factors Sophisticated and Intense. Conversely, less familiarity with country and folk music [5], coupled with cultural differences in music mood perception [3] might contribute to lower factor congruence in the Unpretentious factor observed in the current sample. Future studies could thus examine the level of familiarity and musical/emotional aspects of these excerpts to help elucidate potential cultural differences in music preferences.

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Associations Between Music Perception and Reading Skills in Children

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Background

Research suggests that music perception and reading (particularly word decoding, which is identifying or "sounding out" words) rely on similar auditory skills (Ahissar, Protopapas, Reid, & Merzenich, 2000). In fact, children with dyslexia (a specific reading disorder) are also impaired at music perception (Atterbury, 1985). However, there is conflicting research on whether these impairments are timing-specific or more general, and whether associations between music perception skills and reading skills remain after controlling for potential confounds (e.g., demographic, cognitive, and personality variables).

Aims

Our goal was to examine the specificity of associations between musical perception skills and reading skills in typically developing 6- to 10-year-old children as well as children with dyslexia.

Methods

Children completed child-appropriate versions of the Profile of Music Perception Skills (PROMS; melody, tuning, accent, and speed subtests; Law & Zentner, 2012) and the perceptual Beat Alignment Test (BAT; Einarson & Trainor, 2016). On each trial of the PROMS, children decided whether a third musical excerpt was the same or different from the previous two. On each trial of the BAT, children decided which of two puppets drummed best, where one puppet drummed on the beat, and the other did not. Children also completed the Word Reading subtest of the Wide Range Achievement Test (Wilkinson & Robertson, 2006), and the Peabody Picture Vocabulary Test (Dunn & Dunn, 2007) to control for cognitive abilities. Parents completed questionnaires on their child's demographic information and personality.

Results

Data collection is ongoing (target N = 150). Based on previous results in our lab with adults (Hansen & Corrigall, 2016), we expect widespread associations (i.e., general rather than timing-specific) between performance on the music perception tasks and performance on the reading task, even after controlling for demographics, cognition, and personality.

Conclusions

The current study will help elucidate the specificity of associations between music perception and reading skills. Knowing which aspects of music perception are most associated with reading may help researchers and clinicians target musical interventions for children with dyslexia.

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Associations Between Music Perception and Spelling Errors in Children and Adults

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Background

Many studies have investigated the link between reading—especially word decoding, which is identifying or "sounding out" words—and auditory skills (e.g., Anvari, Trainor, Woodside, & Levy, 2002). Because reading and spelling rely on many of the same sub-skills, it is reasonable to hypothesize that music skills are associated with spelling as well. However, fewer studies have examined this link, and none have examined whether musical abilities are associated with spelling error type. Phonological errors occur when a phoneme is missing or incorrect (e.g., "ca" instead of "cat"), revealing difficulty with speech sound processing. By contrast, orthographic errors occur when a word is spelled plausibly but incorrectly (e.g., "throte" instead of "throat"), revealing difficulty with memorizing orthographic patterns. Individuals with dyslexia, who also show music perception impairments (e.g., Forgeard et al., 2008), exhibit many phonological errors (Pennington et al., 1986).

Aims

We examined whether music perception and music training were associated with spelling in both undergraduate students as well as 6- to 10-year-old children.

Methods

Undergraduates and children completed a spelling test, a measure of general cognition, as well as age-appropriate versions of the Profile of Music Perception Skills (PROMS; Law & Zentner, 2012), and Beat Alignment Test (BAT; Einarson & Trainor, 2016; Iversen & Patel, 2008). We also collected information on demographics and personality. Spelling errors were coded as phonological or orthographic.

Results

After accounting for cognition, which explained 3.3% of the variance in undergraduates' spelling scores, music perception (melody, tempo, and rhythm scores) explained an additional 6.8% of the variance, $F(1,3)=4.003$, $p=.009$. Data collection in children is ongoing (target N=150), as is spelling error coding. We expect that music perception skills and duration of music training will be negatively associated with phonological spelling errors.

Conclusions

Our results have the potential to clarify the association between music and spelling skills. The findings may have important implications for providing musical interventions to poor spellers.

References

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Associations between extracurricular activity involvement and memory skills

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Background

A significant body of research has investigated the association between music training and memory skills; however, the type of stimuli used for memory tasks is important (Talamini, Altoè, Caretti, & Grassi, 2017). Musicians perform better on short-term and working memory tasks when tonal or verbal stimuli are used compared to visuospatial stimuli (Talamini et al., 2017). These associations may result from the cognitive demands of music: musicians are required to remember long sequences of notes. By contrast, dancers are required to remember sequences of complex movements, which may be place higher demands on visual than on auditory memory. Previous research suggests that dancers have better memory for movement in particular (e.g., Smyth & Pendleton, 1990); however, there is little research examining the association between dance training and memory skills more generally.

Aims

The goal of the current study is to systematically examine the associations between specific memory skills (e.g., auditory vs. visual; short-term, long-term, and working memory) and different kinds of extracurricular activities (e.g., music training, dance training) while controlling for general intelligence, personality, and demographic variables. We hypothesize that duration of music training will be associated with memory for auditory stimuli, such as spoken words, whereas duration of dance training will be associated with memory for visuospatial stimuli, such as face recognition or spatial span.

Methods

Participants completed the Wechsler Memory Scale (Wechsler, 1997), an extensive memory battery that assesses short-term, long-term, and working memory in both the auditory and the visual domains. Participants also completed the Wechsler Abbreviated Scale of Intelligence II (WASI-II; Wechsler, 2011), and the Big Five Inventory (John, Donahue, & Kentle, 1991) to measure personality. Finally, information was collected about type and duration of extracurricular activity involvement (music training, dance training, physical activity, and other) as well as demographic variables (e.g., annual income, parental education).

Results

Preliminary results of the 93 participants tested to date (target sample size: 150) suggest some evidence of memory-specific effects: duration of music training was correlated with auditory long-term memory ($r=0.21$, $p=0.039$), whereas duration of dance training was correlated with auditory ($r=.23$, $p=0.028$) and visual ($r=.21$, $p=0.045$) long-term memory.

Conclusions

Memory skills associated with music and dance training may exhibit some domain-specificity. However, the direction of causation is still unclear: particular memory skills may be practiced and improved through these activities, or pre-existing memory advantages may encourage particular individuals to stay in certain activities for longer.

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Assembling a Database of Validated Audio Stimuli: Evaluating Valence in Musical and Non-Music Sounds

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Despite the popularity of research on music-related emotions, results across studies remain inconsistent and well-designed experiments produce inconclusive results. The current work aims to refine the emotional spectrum. A literature review of 202 studies on music and emotions is presented. The 3516 passages of emotional music previously used in these research studies are coded according to the nominal emotion and its operationalization, length, whether it is an excerpt from a longer work, and whether the passage has been used in studies about perceived or induced emotion. We will show that the literature has relied on approximately 12 emotional terms. The implications of previous research conflating multiple emotional states are profound, as the ability to discriminate different emotions affects all music and emotion literature, including meta-analyses. The full database is available at the following website: https://github.com/hleveillegauvin/PUMS.

Expressivity and emotion: the importance of performer controlled cues

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Exploring the Relationship between Structural and Expressive Cues in Emotional Communication

Background

Music's well-known ability to communicate emotion derives from a combination of structural cues (supplied by composers) and expressive cues (supplied by performers). Together, they powerfully influence listeners, affecting perceived expressivity (Kendall & Carterette, 1990) and emotions conveyed (Juslin, 2003). Although structure alone can reliably convey emotion (Thompson & Robitaille, 1992), performance cues also play an essential role in enhancing this communication (Quinto, Thompson & Taylor, 2014).

Aims

In this experiment, we begin an exploratory investigation into how composer (structure) vs performer (expressive) controlled cues influence listeners' judgements of perceived emotion in response to Bach's Well-Tempered Clavier (WTC) excerpts containing only composer dictated cues.

Methods

Thirty non-musician participants rated the perceived emotion of expressionless renditions of 48 excerpts from the WTC. After each excerpt played, participants rated two aspects of perceived emotion, using scales for valence and arousal adapted from Russell's 2D circumplex model of affect (Russell, 1980).

Results

Using regression and commonality analysis, we examined how cues of attack rate (timing), modality (major or minor) and pitch height contribute to listener ratings of valence and arousal in expressionless, MIDI renditions of a renowned musical work. Although all three cues significantly predicted valence ratings, modality appeared as the strongest predictor. In contrast, only attack rate significantly predicted for ratings of arousal. Our three-cue model for predicted ratings of the expressionless stimuli, had R2 values of 0.83 and 0.59 for valence ratings and arousal ratings respectively.

Conclusions

Listeners attended to all three cues to perceive emotional valence, and only attack rate to rate the perceive emotional arousal. The cue of modality predicted the largest amount of listener variance, suggesting the influence of compositional cues is most important for ratings of valence. Attack rate, a significant predictor of both listener ratings of valence and arousal, appeared as the most important cue for arousal ratings and second most important cue for valence. Although attack rate functioned as a composer controlled cue in this study, its importance over cues like pitch height may suggest that as a cue often used for expression, it is more influential than some composer controlled cues for predicting ratings of emotional valence.

References

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Induced emotion within musical experiences: testing the universal paralanguage theory via musical sounds

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Background

The theory of a universal paralanguage posits the existence of a "sound code" that is utilized within speech, music, and animal communication for the purposes of transmitting & receiving emotional information (Gussenhoven, 2001). Recent research suggests that the direct perception of psycho-mechanical properties of a sound source may contribute towards a better understanding of this theoretical universal paralanguage, and implicates musical timbre perception as an important aspect of the theory (van Dinther & Patterson, 2006; Plazak & McAdams, 2017). Specifically, thru the direct perception of timbral features, such as sound source mass, size, materiality, and energy, it becomes theoretically possible to perceive external sound sources in relation to oneself, thus facilitating the ability to engage appropriate emotional responses to music, and other types of sound.

Aims

In two related experiments, we aimed to test the universal paralanguage theory by attempting to induce specific emotional responses from sounds via manipulations of psycho-mechanical timbre features.

Methods

Using a within-subject design, we recorded participants singing, and thereafter, utilized a vocoder to alter the perceived psycho-mechanical properties of each participant's recording. Participants listened to their own manipulated sound recordings; each trial was uniquely normalized for every individual participant. Our first study measured electrodermal activity to determine if human listeners would display larger arousal responses after hearing psycho-mechanical timbre features consistent with sound sources that were larger and more energetic than their original recordings. In order to test cross-species response patterns (implicated by the universal paralanguage theory), we utilized a similar experimental paradigm with domestic canines and recorded looking time duration as an operational measure for perceptual salience of our timbral manipulations.

Results

Results from both studies found evidence consistent with the hypothesis that size-manipulations may have some predictive power for the perception of sound source size, but the results were not consistent with the hypothesis that these sound source size manipulations could explain induced emotional responses to musical stimuli.

Conclusions

Along with previous research, these results highlight that the ability to perceive the size of a conspecific through sound cues alone occurs across species, and further, posits that responses to larger and more energetic sound sources may potentially be prioritized across species. Ultimately, these cross-species findings may guide us towards a better understanding of induced emotional responses to music, particularly with regards to how emotional responses resulting from various orchestrations (or in the case of electronic music, various types of sound modelling) can result in reliable patterns of induced emotional responses for some listeners.

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The Influence of Timbre on Emotion Perception: A Cross-Cultural Investigation

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Background

The perception of emotion in music is correlated to various factors such as tempo, mode, and timbre. Studies examining timbres individually have confirmed that listeners are able to rate perceived emotion of short samples, equalized for pitch, loudness, and duration from different musical instruments, accounting for instrumental register (Eerola et al., 2012; McAdams et al., 2017). A comparison of Western and Indian classical music similarly noted an influence of timbre on emotion perception in music (Balkwill & Thompson, 1999), though succeeding studies have not yet investigated this relationship.

Aims

This study aims to establish whether Western listeners recognize emotion conveyed in Indian melodies utilizing Hindustani timbres through reliance on familiar psychophysical cues in an unfamiliar musical context.

Method

The influence of timbre on perceived emotion was investigated both independent of and in interaction with other musical parameters. Participants provided ratings of the perceived emotion of stimuli using a 7-point Likert scale for two tasks: one examining timbre along with melody, mode, and tempo; the other investigating timbre alone. In the first task, four unfamiliar melodies exhibiting a range of intended affect were utilized; each were presented in two contrasting timbres (the unfretted and plucked string sarod and the transverse bamboo flute bansuri), tempos (M.M.= 96 and 132), and modes (major and minor). The second task utilized 21 samples from six instruments identical in duration (1s), covering each respective instrument's pitch register (D2-D6).

Results

For the first task, an ANOVA yielded significant differences ($p<.01$) in timbre, tempo, and mode: the sarod timbre, faster tempo, and major mode received more positive affect ratings. Whereas a previous pilot study did not demonstrate a significant difference between two presented melodies, a significant difference was presented for the four melodies in the current study. For the second task, an ANOVA demonstrated significant differences ($p<.01$) between three Western and three Indian timbres, with the Western harp and flute generally receiving the most positive affect ratings, and Indian dilruba (bowed string instrument) generally receiving the most negative ratings.

Conclusions

The present quasi-cross-cultural study demonstrates that timbre carries emotional weight alongside melody, tempo, and mode. Aligning with previous literature, timbres with a greater brightness level correlated to more positive affect, while those with a lower brightness level to more negative affect ratings. Our study provides an initial framework for the relationship between psychophysical features and emotion in music, integrating considerations for future research.

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The effect of inattentive music listening on affective evaluations of compassionate scenes: The role of stimulus type and personality.

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Background

Research has shown that auditory and visual domains influence each other during the processing of affective stimuli. However, previous studies have looked at these crossmodal correspondences mainly while dealing with only basic emotions (happiness, sadness, fear or anger). It is yet to be observed whether similar correspondences can be found for more complex emotions. Compassion is one of the complex emotions that hold relevance of musical experiences. Evidence from music and emotion research suggests that emotional contagion is an important underlying mechanism through which music evokes emotions (Juslin & Västfjäll, 2008) and recent evidence shows that trait empathy plays a relevant role in modulating listeners' emotional responses to music (Eerola, Vuoskoski, & Kautiainen, 2016).

Aims

The aim of the current study was to explore the effect that music may have on the emotional response to compassionate scenes. The study aimed to test whether different types of music have different effects on compassion-inducing and neutral scenes, and to evaluate the related role of personality traits such as empathy, and musical preference.

Method

We collected ratings on valence, arousal, and compassion of compassion-inducing (CI) and non-compassion-inducing (NCI) pictures under five different music and silence conditions. The music stimuli consisted of short excerpts of film music previously validated as perceptually distinct both using discrete emotional categories and the dimensional model of emotion. As a measure for empathy the Empathic Concern subscale of the Interpersonal Reactivity Index was obtained, as well as a liking score for each of the music pieces.

To analyze the data, we used a three-way mixed multivariate analysis of variance (MANOVA), with ratings of Valence, Arousal and Compassion as dependent variables; Listening Condition and Picture Condition as the within subjects factors; and Empathy as a between subjects factor. In addition we assessed how preference for each music piece correlated to the ratings during that listening condition.

Results

Results showed that High-Valence+Low-Arousal music significantly increased the compassionate response to both types of pictures, whereas Low-Valence+Low-Arousal and Low-Valence+High-Arousal music showed virtually no effect. High-Valence+High-Arousal music, although preferred by most participants, decreased the compassionate response to CI pictures and increased it for NCI. More empathic participants displayed overall stronger feelings of Compassion and also showed less consistency in those ratings during the music conditions when rating NCI pictures.

Conclusions

Our findings suggest that music can influence feelings of compassion, and that personality traits, such as empathy, are important when it comes to how much we are influenced by music. However, the relationship between audiovisual interactions and personality is complex, and more research is needed to fully comprehend how this works. This study is a first attempt into looking at audiovisual interactions on emotion processing for a complex emotion, such as compassion.

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Real-time behavioral and psychophysiological indicators of emotions in response to sad music

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Background

Humans tend to avoid situations that cause sorrow or grief in everyday life. At the same time, many people have a strong attraction to sadness when expressed through music (Vuoskoski et al. 201. This so-called “tragedy paradox” is not well understood and it remains unclear if individuals who report liking sad music feel genuinely sad in response (Sachs et al. 2015). How do feelings of an emotion relate to feelings of enjoyment while listening to music and are concurrent moments of intensity of emotion and enjoyment associated with psychophysiology changes? Moreover, are there acoustical features of sad pieces of music that are correlated with concurrent moments of peak sadness and enjoyment ratings?

Aims

The aims of this study were twofold: (1) To assess how simultaneous ratings of enjoyment and intensity of emotion covary during sad-music listening and (2) To evaluate how coherence between the two ratings is correlated with psychophysiological measures and acoustic features. We hypothesized that concurrent moments of enjoyment and sadness would be correlated with changes in psychophysiology.

Method

Forty-one participants listened to one full length piece of music selected to induce feelings of sadness (Eerola, Vuoskoski, & Kautiainen, 2016). During listening, participants were instructed to continuously rate the intensity of feelings of sadness or their feelings of enjoyment using a slider in their dominant hand. Each participant did both ratings for all pieces and therefore listened to each piece twice. Heart rate was measured continuously during music listening. Participants additionally completed the Goldsmith Musical Sophistication Index and the Interpersonal Reactivity Index to have a measure of trait empathy.

Results

Continuous ratings of feelings of sadness and enjoyment were correlated over the entire piece, but were not correlated at certain sections of the piece. Both intensity of sadness and enjoyment were correlated with measures of heart rate and changes in key acoustic features overtime. Individual differences in personality were also found to be associated with differences in ratings of sadness and enjoyment. Preliminary neuroimaging results from a sample of participants who listened to the same piece during scanning are also presented.

Conclusions

The results from this study address outstanding questions regarding the relationship between feelings of sadness and enjoyment when listening to sad pieces of music. By recording separate measures for both emotional intensity and enjoyment, we were able to assess how moments of pleasurable sadness relate to neuro-psychophysiological indicators of emotions as well as acoustic features of the music. Such a result furthers our understanding of human attraction to negative-valent stimuli as well as the process by which music can become rewarding.

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Can Music Support Emotion Regulation Development? Exploring the Fidelity of a Music Intervention Strategy

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Background

Children who do not develop adaptive emotion regulation (ER) skills during early childhood show developmental deficits in school readiness, social skills, and self-regulation that potentially continue into adulthood. Interventions that offer opportunities to practice regulating emotional experiences may help prevent this. Young children are easily engaged in musical experiences, and as music can be altered to imitate high and low arousal sensory experiences, they offer opportunities to practice regulating emotions. Thus, the Musical Contour Regulation Facilitation (MCRF) intervention was designed as a preventive intervention to provide in-the-moment practice of ER for preschoolers at-risk of developing maladaptive ER skills. As a complex intervention, it requires careful development and examination of intervention characteristics and effects.

Aims

The aim of this project was to determine how adequately the music as implemented adhered to the theory-based framework underlying the MCRF intervention. This poster reports on the first phase of a larger study exploring the theoretical fidelity of the MCRF intervention, with the purpose of analyzing and modifying its design and implementation.

Methods

This project was conducted as a retrospective evaluation of videotaped footage of MCRF sessions facilitated May 2014 through July 2014. A representative sampling of 30% of sessions were selected (n = 12). Independent coding was conducted by three student assistants from two universities, utilizing fidelity criteria established by the co-investigators. Coders viewed the videos to assess the characteristics of the music stimulus as they related to the fidelity of the MCRF intervention and contributed to child participant behaviors. Inter-rater reliability was assessed at 80.0% agreement between the coders.

Results

Results indicate the music as facilitated had a high level of adherence (85.4% overall) to the theoretical framework. Musical characteristics of texture and tempo seemed key to the high arousal portions of the MCRF intervention, whereas characteristics associated with rhythm and style were more often utilized for the low arousal components.

Conclusions

Overall, study results indicate the development and facilitation of the MCRF intervention functioned as intended. Findings helped generate guidelines for the creation of additional music experiences to be incorporated in future implementations of the MCRF intervention. Implications are explored in relation to how they inform music therapy clinical practice and research.

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Individual differences in Emotional Responses to Music

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Background and **aims** *Experiment 1*

The Behavioral inhibition system (BIS) and Behavioral activation system (BAS) are known to influence one's perception of the world (Carver & White, 1994). BIS is a drive to avoid aversive stimuli. BAS is a desire to seek positive and more appetitive stimuli. The first study was designed to assess how these motivational systems influence perception of music.

Peynircioglu, Rabinovitz, and Thompson (2008) found that people respond emotionally more to the melody of songs than to the lyrics We hypothesized that people who are more BIS oriented will be more sensitive to negative emotions in either the melody or lyrics. Conversely, BAS oriented people should respond more to whichever musical aspect carries positive emotion.

Methods

One-hundred twenty-four participants completed Carver and White's (1994) modified BIS/BAS scale then listened to twelve short clips of the chosen songs (three examples each from four categories, fully crossing the emotionality of the music and lyrics) and were asked to rate them on 4 semantic differentiation scales: happiness, excitement, familiarity, and liking.

Results

High BAS people rated the music more happy, likable, familiar, and exciting. High BIS people rated all the music more likeable than low BIS people. There were significant interactions between BIS and song type for both happiness and excitement ratings such that high BIS people rated songs with happy melodies as both happier and more exciting than low BIS individuals. However, low BIS participants rated songs with sad melodies as happier and more exciting than high BIS participants.

Conclusions

High BIS people were more sensitive to the emotionality of the melodies than low BIS people. Meanwhile, high BAS people tended to rate every song higher than low BAS people.

Background and **aims** *Experiment 2*

In experiment 2 we explored dispositional optimism and need to belong. Noguchi, Gohm, and Dalsky (2006) noted that more optimistic people are biased to detect positive stimuli. Since high optimism has implications similar to high BAS we would expect similar responses. Lorsch and Arbuckle (2013) found that individuals with higher musical reactivity scores showed greater need to belong. In conditions where social belonging was threatened, musical reactivity scores increased and participants became more sensitive to emotional messages of the music.

Methods

The design was the same with the Life Orientation Test (McPherson, Jason, & Mohr, Philip, 2005) and Need to Belong Scale (Leary, Kelly, Cottrell, & Schreindorfer, 2013) substituted for the BIS and BAS scale. The same musical stimuli were used.

Results

Level of optimism significantly affected ratings of happiness, liking, and familiarity, but not excitement ratings. More optimistic participants tended to be more influenced by happy aspects of music regardless of whether it was the music or the lyrics. Need to belong only affected excitement; those high on need to belong rated all happy music as more exiting and the sad music as less exciting (regardless of lyrics).

Conclusions

Personality factors that influence how individuals orient to the environment influence their emotional perceptions and liking of music.

The Cognitive Correlates of Musical Working Memory in Adolescents with ASD

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Background

Autism Spectrum Disorder (ASD) is often associated with social and executive functioning difficulties (Hill, 2004), and strengths and weaknesses in visual-spatial and verbal skills (Mottron et al., 2001). Music perception also tends to be a strength of people with ASD, with most studies investigating perception of music-evoked emotions (Quintin et al., 2011), pitch and melody (Heaton, 2003), and long-term musical memory (Stanutz et al., 2014). One aspect of music-related cognition that has yet to be systematically assessed in ASD is musical working memory.

Aims

Our aims are to assess whether a short-term musical working memory task could be used to measure working memory in ASD, and investigate cognitive correlates (i.e., visual-spatial, verbal and executive functioning skills) of short-term musical working memory in ASD.

Methods

Twenty-seven adolescents with ASD participated in this study. To assess short-term musical working memory, sequences of 3, 4, and 5 pitches were presented in pairs to participants who were asked to identify whether sequence-pairs were similar or different. Participants also completed the Visual-Spatial and Verbal Comprehension Indices of the Weschler Intelligence Scale for Children-Fifth Edition (WISC-V), as well as the Behaviour Rating Inventory of Executive Functions-Second Edition (BRIEF-2) questionnaire.

Results

Performance of adolescents with ASD, calculated with Hits – False Alarms, was above chance on the short-term musical working memory task for the 3- and 4-pitch sequences, and below chance-level performance on the 5-pitch sequence. Further, a hierarchical linear regression revealed that musical working memory overall task performance (3,4, and 5 pitch sequences combined) was positively related only to the Visual-Spatial Index of the WISC-V.

Conclusion

These findings add to the growing evidence of enhanced and/or preserved music perception skills of individuals with ASD. Results reveal that these strengths extend to musical working memory and are in line with those of previous work showing an association between (non-musical) short-term working memory and visual-spatial skills of people with ASD. Findings also suggest that music tasks can tap into working memory while minimizing reliance on verbal skills, which are an area of weakness for some people with ASD. This work thus holds promise of direct clinical application in terms of developing appropriate tools to avoid underestimating the cognitive skills of people with ASD.

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Exploring the Relationship between Rhythm Perception, Autism Spectrum Disorder Symptomology, and Cognitive Functioning

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Background

Individuals with Autism Spectrum Disorder (ASD) have demonstrated strength in perceiving musical stimuli, with most studies focusing on pitch and melody perception and memory (Heaton, 2009). Few studies have assessed musical rhythm perception of individuals with ASD (Lim, 2009; DePape, Hall, Tillmann & Trainor, 2012) and found typical performance when processing and producing simple and complex rhythms, which seems associated with their visual perceptual skills (DePape et al., 2012). However, rhythm perception has not been investigated in relation to ASD symptomology, other neurodevelopmental disorders (NDDs), and cognitive ability.

Aims

The purpose of this research is to assess whether musical rhythm perception is related to ASD symptomology and level of cognitive functioning of adolescents with ASD and other NDDs.

Methods

Thirty-six adolescents (12-18 years old) with ASD and NDDs (N= 36, 25 with ASD) with varying levels of cognitive functioning (WISC-V Visual Comprehension Index: 45-127; Visual Spatial Index: 57-144) completed a rhythms perception task. Performance was analysed by calculating Hits (number of correct responses for off beat trials/number of off beat trials) minus False Alarms (number of incorrect responses for on beat trials/ number of on beat trials) (HiFa as per Tillmann, Schulze & Foxton, 2009). Teachers completed the Social Responsiveness Scale-2 (Constantino, 2012) questionnaire as a measure of ASD symptomology.

Results

Participants performed above chance. Greater accuracy (based on HiFA) in rhythm perception was associated with higher cognitive functioning in visual spatial processing and fewer ASD symptoms, specifically in social motivation, social cognition, social communication and restrictive repetitive behaviours for participants in the entire sample.

Conclusions

Our results are consistent with previous findings showing preserved rhythm perception for people with ASD and expand these findings to people with NDDs. Results also indicate that rhythm perception is related to visual spatial skills and ASD symptomology. The current findings support the implementation of music interventions to target cognitive functioning; for example improving rhythmic skills may be associated with improvement in visual spatial abilities.

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Musical Neglect Training for Unilateral Visual Neglect in Right Hemispheric Stroke Patients

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Background

Unilateral visual neglect from right hemisphere stroke is a condition that reduces a person's ability to attend to and process stimuli in one half, mostly left side, of their environment. Even though several rehabilitation techniques have been developed for patients with visual neglect, techniques have not significantly demonstrated clinical effectiveness (Bowen et al., 2007). Musical neglect training (MNT) has been developed by using musical exercises which are structured in pitch, time and tempo, and musical equipment (tone bars, keyboards, drums) configures to focus attention to the neglect visual field (Thaut and Hoembert, 2014). Research has shown that musical instruments playing (e.g. tone bar) helped to improve attention in the left sides for patients with visual neglect (Bodak et al., 2014; Bernardi et al., 2015).

Aims

The purpose of this study was to examine the immediate and longer-lasting effect of Musical Neglect Training (MNT) on unilateral visual neglect to improve their spatial attention.

Method

Two participants underwent six individual 30 minutes long MNT sessions (twice a week for three weeks). During MNT sessions, participants were asked to play the scales on the tone bar. This training allowed participants to complete musical patterns emphasizing attentional focus towards the neglect visual field. Two standardized assessments (Albert's and Line Bisection Test) were used. The assessments were administered immediately before and after each of the 6 MNT sessions to assess the immediate effect of MNT. Moreover, follow-up testing was done one week after their 6th session to examine the longer-lasting effects of MNT. Paired t-test and Wilcoxon test were used to examine the immediate effect. Longer lasting effects were compared with raw scores.

Results

Both participants showed a significant improvement with Albert's Test in immediate effect ($p < .05$). Both participants showed positive immediate and following-up effectiveness in spatial attention from both Albert's Test and Line Bisection Test.

Conclusions

Playing the predictable musical scales associated with tone bars to provide feedback and initiate intention for movement into the neglect may provide advantages to reduce perceptual attention deficits of visual neglect.

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Response to empathizing and systemizing aspects of music: gender differences and ASD symptomology

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Background

The Empathizing-Systemizing (E-S) theory posits that gender differences and the unique behavioural characteristics among individuals with autism spectrum disorders (ASD) are related to biases towards empathizing (i.e., drive to recognize and respond to others' emotions) or systemizing (i.e., drive to analyze and construct systems, Baron-Cohen 2009). Support for the E-S theory comes from research examining such traits within separate domains (e.g., tasks of emotion recognition versus mental rotation), which showed that females are generally inclined towards empathizing while males and individuals with ASD to systemizing. Music is a unique domain to directly examine the validity of the E-S theory because it conveys emotions and has predictable structure. Yet, few researchers have examined how gender and individual differences in E-S traits are related to how people perceive both the emotional and structural aspects of music.

Aims

The aim is to examine the relationship between musical empathizing and systemizing task performance (i.e., accuracy and response time) and gender, individual differences in E-S traits, and ASD symptomology within the general population.

Methods

48 young adults (25 males) completed a musical systemizing (i.e., a same/different melody task with one pitch altered on different trials) and musical empathizing task (i.e., identifying whether musical excerpts were happy, sad, or scary) and questionnaires assessing their level of E-S traits (Empathizing and Systemizing Quotients; EQ and SQ), ASD symptomatology (Autism Quotient; AQ), and musical training (Goldsmith Musical Sophistication Index – Musical Training Factor).

Results

A comparison of task performance revealed significantly greater accuracy in the empathizing task compared to the systemizing, but faster response times in the systemizing task compared to the empathizing. After controlling for the effect of musical training, an ANCOVA revealed a significant main effect of gender on response times for the empathizing task, such that females responded faster than males when correctly identifying emotions. ANCOVAs did not reveal a significant effect of gender on accuracy for the empathizing and systemizing tasks and on response times for the systemizing task. For males and females combined, a regression revealed that performance accuracy on the systemizing task was related to musical training but not EQ, SQ, and AQ scores. Performance accuracy on the empathizing tasks and response time on both empathizing and systemizing tasks were not related to musical training, EQ, SQ, and AQ scores.

Conclusions

The results from this study partially support the E-S theory, in that gender may play a role in facilitating identifying emotions from music. However, we did not find males to be faster than females on the systemizing tasks, which would have fully supported the E-S theory. Further, there were no gender differences in endorsement of E-S traits within our sample. Future directions include extending this research to populations with greater variability in E-S traits, such as individuals with ASD to thoroughly assess whether the E-S theory applies to the musical domain.

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Receiver Operating Characteristic Analysis to Classify Treatment-Resistant Schizophrenia (TRS) from Non-TRS Using the Harvard Beat Assessment Test

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Background

Previously the Montreal Battery for Evaluation of Amusia (MBEA)[1] was used to find the associations between amusia and schizophrenia[2]. However, the detailed mechanisms of amusia in schizophrenia has not yet been elucidated and furthermore the differences in degree of amusia due to the subtypes of schizophrenia is not yet known in detail. Here, schizophrenia is clinically classified into treatment-resistant schizophrenia (TRS) and non-TRS based on the response to antipsychotics, dopamine antagonists. Recently, a battery of tests named the Harvard Beat Assessment Test (H-BAT) has been developed to assess the ability of beat perception and production [3].In this study, we examined whether the difference in therapeutic response of patients with schizophrenia (i.e. TRS vs. non-TRS) can be distinguished by the H-BAT.

Aims

The aim of this study was to investigate whether the H-BAT was able to distinguish TRS and non-TRS. There is a possibility to use the H-BAT as a tool for predicting the efficacy of dopaminergic antipsychotics on patients with schizophrenia.

Methods

Thirteen TRS patients and eight non-TRS patients participated in this study. In addition to the H-BAT assessment, we assessed their crinical symptoms with the Positive and Negative Syndrome Scale (PANSS) and cognitive impairment with the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS). We performed correlation analysis among the H-BAT scores and scores on the crinical/cognitive outcomes in patients with TRS and non-TRS. Furthermore, We conducted the Receiver Operating Characteristic (ROC) analysis using the H-BAT scores and clinical diagnosis of subtype to delineate the sensitivity and specificity of the H-BAT.

Results

The H-BAT score measuring the beat saliency production ability was correlated with the PANSS and RBANS scores measuring the attentional deficits in patients with non-TRS group ($r = 0.487$ and $r = -0.662$, respectively) but not in patients with TRS ($r = 0.267$ and $r = -0.262$, respectively). The Area Under the Curve (AUC) of the H-BAT beat saliency production score generated from ROC analysis was 0.822. The diagnostic accuracy of the H-BAT beat saliency production score being able to identify the patients with TRS correctly was 76%.

Conclusions

The H-BAT beat saliency production score successfully was able to distinguish between patients with TRS and non-TRS, suggesting that beat saliency production ability may reflect, at least in part, pathophysiology underlying patients with TRS and including dopaminergic neurotransmitter dysfunctioning. Our results also suggest that the H-BAT can be used for identifying the subtypes of schizophrenia.

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A Sound Mind in a Rhythmic Body: Severity of Clinical Symptoms Correlates with Meter Production Ability in Patients with Schizophrenia

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Background

Patients with schizophrenia suffer from a distorted sense of time, which may result in cognitive dysfunction1. There is a possibility that dopaminergic and glutamatergic dysfunction in the basal ganglia contribute to the pathology such a cognitive impairment of schizophrenia2. Previous studies have noted that the basal ganglia system plays a central role in processing beat and meter in music3 4. Thus, we hypothesized that the ability of beat perception and production would be impaired in patients with schizophrenia.

Aims

We aimed to examine whether patients with schizophrenia may have difficulties in beat perception and production compared with healthy controls. We also explored whether the ability of beat perception and production could be associated with severities of clinical symptoms and cognitive function in this population.

Method

Forty-four patients with schizophrenia and thirty healthy controls participated in this study. Clinical symptoms and cognitive function were assessed with the Positive and Negative Syndrome Scale (PANSS) and Repeatable Battery for the Assessment of Neuropsychological Status (RBANS), respectively. To assess beat perception and production abilities, we used the Harvard Beat Assessment Test (H-BAT) 5. We performed partial correlation analysis to examine relationships among scores in the H-BAT and scores in the PANSS and RBANS by controlling for severity of extrapyramidal impairment measured with the Simpson-Angus Scale (SAS) and Chlorpromazine dose equivalent dose in patients with schizophrenia.

Results

Scores on the H-BAT were lower in patients than controls ($p = 0.001$, $d = 0.75$). There were correlations between score in the H-BAT and RBANS ($p < 0.05$). One of the H-BAT subtest scores, that assessed the ability to produce the beat interval, was highly correlated with the score of the RBANS ($r = - 0.5$, $p = 0.001$).

Conclusions

Patients with schizophrenia have difficulties in beat perception and production compared with healthy controls. The link between the ability to produce beat interval and the severity of cognitive function suggest the pathophysiology in the basal ganglia that may be involved in the symptoms of schizophrenia including music rhythm disorder.

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Healing Trauma Through Musical Bonding

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Group Identity through Entrainment as a Therapeutic Tool for Special Populations

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Background

Entrainment involves the ability to accurately predict environmental cues (London, 2012) and coordinate individualized actions into a group (McNeill, 1995). Musical stimuli often evoke neurological entrainment which can manifest as a group identity (Freeman, 2000).

Aims

This poster examines music as a facilitator for group identity by exploring neurological, perceptual, and social indications of entrainment.

Main Contribution

This theory of musical bonding proposes that entrainment facilitates an enriching group identity. This poster presents a theoretical understanding of this process along with potential models for quantitative analysis of this phenomenon.

Implications

Musical bonding can be used to prime participants within special populations in therapeutic settings prior to engaging in traditional counseling sessions. While this phenomenon is beneficial for a wide variety of groups, it holds unique promise for groups struggling with isolation, such as Post-traumatic Stress Disorder, or interpersonal dynamics, such as those with Autism Spectrum Disorder. This poster explores potential behavioral manifestations of music bonding including increased social communication and increased positive affect.

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Effects of singing and rhythmic speech in stuttering

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Background

Stuttering is a developmental fluency disorder provoking interruptions of the rhythmic flow of speech. Around 5-9 % of children and adolescents are, at least temporarily, affected by stuttering. Disfluencies characterizing stuttering are repetitions of segments and syllables, blockades, and segmental prolongations. Moreover, breathing difficulties can lead to untimely interruptions within words or phrases. Interestingly, stuttering has been shown to reduce considerably during so-called fluency-inducing conditions, such as singing or speaking along with a metronome. The reasons for this fluency improvement are still not well understood.

Aims

Our goal is to examine to what extent control and coordination of speech movements, indicated by temporal and rhythmic speech properties, are altered by singing and speech paced by a metronome in children and adolescents who stutter.

Method & Results

We tested German-speaking children and adolescents who do and do not stutter. In one study, a group of 8 adolescents who stutter and 8 matched controls (11-16 years old) read an unfamiliar text or sung it to the melody of the song “Happy Birthday”. In a second study, 14 children and adolescents who stutter and 14 matched controls (8-17 years old) read a list of words while paced by a metronome. Acoustic analyses showed that temporal characteristics were altered in individuals who stutter compared to controls in both tasks. During singing, all the participants altered Voice Onset Times (VOTs) of stops, pointing towards more efficient temporal control and coordination of laryngeal-oral movements during song. Overall, VOTs during singing were reduced compared to speaking, but only adolescents who stutter also reduced the temporal variability of VOT during singing vs. speaking. During metronome-speech children and adolescents who stutter systematically delayed the start of vocalic nuclei in relation to the metronome beat, compared to children and adolescents who do not stutter.

Conclusions

Our results show that fluency-inducing conditions which have musical and rhythmic structure can enhance temporal control of speech events and movements in children and adolescents who stutter. Results are discussed in light of related studies on fluency-reducing techniques in stuttering and recent theories about rhythmic predictions and predictive timing fostering the coupling between perception and action and thereby, the fluent production of speech.

Music Performance Anxiety: The Relationship Between Objective and Subjective Measures of Arousal State

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Background

Some expert musicians experience an exaggerated stress response to performing in high-stakes situations, a type of anxiety called Music Performance Anxiety (MPA). Music performance requires optimal arousal and is achieved through a balance between attentional control and bodily awareness. Anxiety increases negative symptoms of bodily arousal (e.g., heightened heart rate) but often decreases overall attentional awareness, due to overwhelm and anxious thoughts. The present study examines the degree to which MPA contributes 1) to an overall higher state of arousal for MPA pianists (compared with nMPA), as measured both subjectively and objectively and 2) whether MPA contributes to a misperception of arousal level, both independent of and during a stressful performance situation.

Aims

The primary aim of the present study is to compare musicians with MPA and without MPA on how self-awareness of their own anxious state relates to objective measurements of their level of arousal.

Methods

High-level pianists were separated into two participant groups: those with and without MPA. Both groups took part in two performance situations: one in front of an empty auditorium (jury-absent) and one in front of an expert jury (jury-present). Each pianist played two pieces, in the same order for each condition. During each performance, both objective (mean heart rate) and subjective (STAI - State portion) measures of arousal state were recorded at three time points across each performance: baseline, post-song 1 and post-song 2.

Results

We predict that, overall, MPA musicians will subjectively report and objectively display higher levels of physiological arousal than nMPA musicians. We expect positive correlations between subjective and objective measurements of arousal for both MPA and nMPA musicians, for both jury-absent and jury-present conditions. More specifically, we predict that in both jury-absent and present conditions, nonMPA musicians show greater accuracy in interpreting their arousal state and thus, a stronger correlation between subjective ratings and objective measurements than MPA musicians. Moreover, we predict that an MPA-specific stressor (i.e., jury present) will enhance this pattern, further strengthening the correlation for nonMPA musicians and weakening the correlation for MPA musicians.

Conclusions

Yerkes and Dodson (1908) describes the dependency on an ideal balance between attentional awareness and arousal state for high level performance. Anxiety disorders typically amplify arousal and negatively influence self-awareness

(Ingram, 1990; Speilberger, 2010). The similarities between MPA and other anxiety disorders is currently unknown. The results of this research work hope to contribute to a greater understanding both of MPA and of underlying processes to inform research on therapeutic interventions for MPA.

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Multilayer integration and metacognition: an exploratory study

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Background

An increasing body of research has explored the importance of deliberate practice (Chaffin, 2003) and effective learning strategies to build instrumental performance by heart (Hallam, 1997). Few studies, however, have addressed the way that music itself (style, structure) and the cognitive profile of the musician determine performance and retrieval cues. Performers gradually build a multilayered mental representation of music: eminently multimodal at the cognitive level, visual, motor, auditory, perceptive, emotions (etc.) mental representations constitute the different components or layers of inner audition. We consider that inner audition results from the psychological individuality of the performer and the particular features of repertoire.

Aims

As a first approach, in this exploratory qualitative study, we investigated the associative nature of inner representations of different types of music, while collecting some elements of the cognitive profile. We studied the memorisation strategies and retrieval structures adopted by expert pianists according to a sample of works involving different hierarchies types of cognitive skills.

Methods

A multiple case study was undertaken with six pianists with 5 to 40 years of professional experience. They were asked to play by heart works from Debussy, Takemitsu, Bach and Debussy, which were part of their repertoires. Participants followed a test to assess the episodic buffer component of working memory (Quinette, 2013) and a semi-structured interview. Through this metacognitive approach, participants revealed the understanding they had on their cognitive patterns as well as the complex interplay between cognition and emotion (Quirk, 2006).

Results

Comparing pieces involving different types of hurdles (motor, expressive, cognitive load, mental imagery), we found that polyphonic pieces were particularly difficult to memorise, even for a population with high standards of working memory as revealed by the memory test. Collected data suggested that difficulties were related to high cognitive load (monitor several voices at the same time) as well as to motor integration entangled by homogenous writing. Retrieval of impressionist and contemporary music was more highly associated with musical imagery and emotions. Our results also shed light on individual diversity on combining aural, kinesthesic and mental imagery.

Conclusions

Our results suggest that inner representation of music is a result of a multimodal and multilayered information processing. The cognitive strategies adopted by the pianist to memorise depended on the musical writing but were also determined by the cognitive profile. A deeper assessment of the individual differences will be tested to further examine associations between creativity, information processing, empathy and personality. This preliminary work supports the interest of approaching cognitive psychology from a musicology perspective and suggests further directions.

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Effects of focus of attention on muscle activity of trained singers

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Background

Studies of motor skill performance have shown that adopting an external focus of attention is beneficial to performance in a variety of tasks including balance, long jump, golf, basketball, and swimming (for a review see Wulf, 2013). Additionally, iEMG evidence reveals that an external focus produced small, more frequent muscle movement during execution, and an internal focus resulted in larger muscle movement at a slower frequency (Lohse, Sherwood, & Healy, 2010; McNevin, Shea, & Wulf, 2003; McNevin & Wulf, 2002; Wulf, Dufek, Lozano, & Pettigrew, 2010; Wulf, McNevin, & Shea, 2001).

This phenomenon has been studied in music performance on a keyboard task (Duke, Cash, & Allen, 2011), singing tasks (Atkins, 2017; Atkins & Duke, 2013), and a woodwind task (Stambaugh, 2017). Though results were mixed in the piano and woodwind performance tasks, studies in singing replicate the findings in other motor skill literature. Untrained singers' performances were ranked higher when they directed their sound to a microphone or a point on the back well (external) compared to internal and no instruction conditions (Atkins & Duke, 2013). Trained singers' resonance and overall tone quality was described more positively and rated higher by expert listeners under the external conditions (fill the room, direct sound to the back wall) compared to no instructions and internal instructions (think of soft palate, keep vibrato consistent) (Atkins, 2013, 2017). It is still unknown how these instructions affect coordinated muscle activity within the vocal mechanism and the body.

Aims

We are testing the effects of internal and external focus of attention on singers' respiratory and phonatory muscle activity through surface electromyography.

Methods

Participants (9) were undergraduate applied voice students from a large university in the southeast region of the United States. The singers performed a cappella the first full phrase of "My Country 'Tis of Thee" and the first two phrases of a well-rehearsed song under a baseline condition (no focus), followed in randomized order by thinking about two near-internal tasks (soft palate, tongue), two far-internal (directing sound to the mask area, focus on breath), and three external tasks (emotion/character, filling the room, directing the sound to point on the back wall). After each condition we asked singers to speak specifically about what they were thinking about as they performed each condition.

Results

We extracted the frequency and muscle activity of the trapezius (TZ), posterior neck (PN), and sternocleidomastoideus (SCL) beginning with the onset of sound to the onset of the final pitch (before the breath) of the first full phrase. A preliminary inspection of the data show slight differences in amplitude and frequency between conditions, but these effects varied for each individual singer. Reports of what participants were thinking specifically also varied.

Conclusions

Directives from voice teachers and choir directors may be interpreted differently by each individual singer and may result in varying muscle activity. Further analysis and research is warranted.

The impact of continued choir training on auditory perception abilities in older adults

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Background

Several studies have reported musicianship advantages for various aspects of auditory processing in older adults, suggesting that musicians' sensitivity to detailed acoustic features may promote the enhancement of auditory perceptual abilities that decline in the aging process (Alain et al., 2014; Zendel & Alain, 2012). Our recent work examining choir training as a short-term musical intervention for older adults demonstrated that choir participants show improvements across auditory measures, including speech-in-noise, pitch discrimination, and neural responses to sound after 10 weeks (Dubinsky, Nespoli, & Russo, 2017). In contrast, no gains were observed in control groups (music appreciation and do-nothing).

Aims

In the current study, we track individuals who have continued to participate in choir training beyond our initial 10-week assessment. Doing so allows us to examine whether short-term gains are sustained and whether they may even accumulate with increased choir participation.

Method

Choir participants recruited from a singing class at the Ryerson 50+ Program (n=10) underwent 24 weeks of weekly two-hour choir sessions and approximately one hour of online music training at home. Age and audiometry matched do-nothing controls (n=7) were engaged in no musical activity for the duration of the study. Participants underwent pre-training, 10 weeks post- and 24 weeks post-training assessments, which included speech-in-noise (QuickSIN), frequency difference limens (FDL), and the neural response to brief auditory stimuli (frequency following response; FFR).

Results

A preliminary analysis of speech-in-noise performance revealed a significant interaction between group (choir, do-nothing) and session (baseline, 10 weeks, and 24 weeks post-training). While both groups had equivalent speech-in-noise performance at baseline, the choir group outperformed the do-nothing group at both 10 weeks and 24 weeks post-training. There were non-significant improvements in choir participants' mean speech-in-noise that relate to duration of training (baseline < 10 weeks post-training < 24 weeks post-training). Conversely, there were non-significant declines in do-nothing controls over the same period. All other auditory measures (FDL and FFR) showed no change across group and session.

Conclusions

Our results suggest that speech-in-noise gains observed after 10 weeks of choir training continue to be sustained after 24 weeks. Based on the current findings, we are unable to rule out participant motivation as a possible source of gains; choir participants may have been more motivated to perform well in testing than our do-nothing controls. Although we observed no changes in FDL or FFR, prior work in our lab has found improvements in these measures in a larger sample of choir participants (Dubinsky, Nespoli, & Russo, 2017). The null findings involving these measures in the current study may have been due to our limited sample size.

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Motives and motivation in violin practice

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With the scientific investigation Motives and motivation in violin practice we discovered the psychosocial keys of love for practicing the violin. In these modern times filled with different types of entertainment and also being surrounded with high-fidelity sound instruments, it is important to know why a child chooses a violin, an old acoustic instrument, and gives it an important place in his life. How and why? The answers to these questions can lead us to discover the reasons that account for and explain this behavior: initiation in the practice of violin. The theoretical framework tries to explain the crucial processes related to the musicality and the motivational development of the individual who practices the violin, from birth to its fullness and maturity (Lehmann, Sloboda y Woody, 2007). Though the tendency of Spanish children to learn a musical instrument is on the rise, it's still behind with regards to other European countries.

This investigation aims to study the system and variety of motives and motivations of the students who study violin, during an important moment in their musical career: the initiation in practice. Special emphasis has been put on the variable age of a student, sex of a student and opinion of their violin teachers about the motivation. The methodology that we used in this study is the selective methodology of transversal design (Pérez-Llantada, 2001).

Within the empirical part, an evaluation instrument has been designed and validated to measure the motivation of violin practice. This evaluation was applied to 245 violin students and 17 teachers coming from four conservatories and one music academy in the Canary Islands, Spain.

The research with regard to motivation, considers that we are facing a context of achievement (models of need for achievement, attributive, perceived competence, self-efficacy, intrinsic / extrinsic motivation), experience of flow, influence of parents and fun. Significant differences were found between the reasons for initiation depending on sex and on age of students. We also have to highlight significant differences between the opinions of the students and their teachers.

The theoretical importance of our investigation comes from a better knowledge of the nature and structure of motivational processes in general and the practice of violin in particular, also serves as a support in the development of motivational, musical and cultural psychology. We consider that the practical importance derives from the results of empirical research and its analysis that can be very useful in music teaching, specifically in the practice of violin: in the sense of a diagnosis of the reasons for starting which gives us a better approach to our students and their needs, making it easier for us to guide them through the teaching of violin in a more successful way, but at the same time knowing other non-personal factors that can influence motivation.

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Taking the Synchrony Out of Sinigng

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Background and Aims

Our previous research compared the effects of group singing and moving to examine their separate effects on social bonding. Moving in synchrony strongly increased social bonding. Singing increased social bonding when there was no movement or the movement was asynchronous (Harring, et al., 2016). In that study, groups always sang in unison creating a possible confound in the synchrony manipulation because the singing condition was a form of synchrony. To control for this bias, the current study compared synchronous and asynchronous singing.

Method

We randomly assigned seventy-one participants to one of four conditions. Participants were told they were participating in a study on mindfulness and attention. In each condition three confederates stood with the participant and sang Row, Row, Row Your Boat. In one condition, all confederates sang in unison (synchronously) with the participant. In another, the group sang the song in a round where one confederate sang in unison with the participant and the other confederates sang together creating a different form of synchrony. The third condition was similar in that one confederate sang in unison with

the participant; however, instead of rounds, the other two confederates carefully mismatched their singing to what the participant sang (partial asynchrony). In the final condition all three confederates carefully mismatched their singing with the participant (total asynchrony). After singing the song twice, the participants rated their level of rapport and entitativity with each of the three confederates. Five questions assessed perceptions of rapport on a series of 7-point Likert-type scales. In addition, four questions assessed perceptions of entitativity on similar scales. Participants rated their mood on a series of 7-point semantic differential scales with varying emotions. These emotions include: happy/sad, negative/positive, excited/calm, confident/insecure, etc.

Results

A four-way mixed analysis of variance was conducted with the singing condition as the between subjects variable and the separate ratings of the three confederates and the two bonding measures (rapport and entitativity) as the within-subjects variables. No significant differences existed between the two bonding measures so we combined them into an overall measure of bonding. There was a significant main effect across ratings of the three confederates, $F(2,134) = 58.38$, $p < .01$, $〖 pη〗^2 = .47$. The confederate who sang in synchrony with the participant was rated the highest on bonding. There was also a confederate by singing condition interaction, $F(6,134) = 23.15$, $p < .01$, $〖pη〗^2 = .51$. When everyone sang in unison, all confederates were rated equally. In both conditions where two confederates sang out of synchrony with the participant, those two confederates were rated very low on bonding. The bonding ratings of the one confederate who sang in unison with participant became significantly higher as the other confederates sang out of synchrony. In the total asynchrony condition, the participant rated all three confederates low on the bonding measures.

Conclusions

Asynchronous singing had a negative effect on bonding which suggests that synchrony plays a mediating role on the effect music has on social bonding. Synchronous singing may bolster social connection through emotional regulation, perceived similarity, and common fate.

Analysis of Objective Descriptors for Music Performance Assessment

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Background

The assessment of musical performances in, e.g., student competitions or auditions, is a largely subjective evaluation of a performer's technical skills and expressivity. Objective descriptors of audio have been proposed for performance assessment in such a context [1, 2]. Previous work on automatic performance assessment [1] introduced 46 descriptors extracted from middle school alto saxophone student performers auditioning for the Florida all-state band. The descriptors describe different aspects of pitch and timing of a performance. These descriptors have been reasonably successful in modeling human assessments of the student performances through regression.

Aims

Taking a closer look at the descriptors, this study aims to identify the influence of individual descriptors on the human assessments in the 4 categories musicality, note accuracy, rhythmic accuracy, and tone quality. The goal is to gain insights into which objective descriptors contribute most to the human assessments as well as to identify a subset of well-performing descriptors.

Methods

The Spearman correlation between all the individual descriptors and the four assessment categories is computed to determine the best descriptors for each category. Subsequently, the subsets of descriptors that are able to explain most of the variance in the assessments are identified with sequential forward selection using the adjusted R-squared as metric. We also compare different subsets of descriptors to the full set of descriptors.

Results

For the quantitative analysis, the top five selected descriptors for each of the categories are able to account for 27 - 44% (mean of 35%) of the variance in the corresponding assessments. The selected descriptors show some interesting patterns. For instance, the inter-onset-interval histogram bin resolution, the descriptor for the number of note insertions, and the cost of aligning the audio with the score using dynamic time warping are among the top descriptors for all

assessment categories. We also find that score-dependent descriptors are have higher contribution in explaining the variance than score-independent ones.

Conclusions

The selected descriptors include properties pertaining to note dynamics, pitch trajectory, and tempo. This is consistent with our understanding of music performance assessment. The descriptors underperform for the tone quality criterion since they do not incorporate tonality and additional tone and timbre descriptors are required. We also find that only around 30 of the 46 descriptors are contributing towards improving model performance. While this may be the curse of dimensionality, it may also be pointing towards redundancy in the descriptors. Therefore, future work is to add descriptors capturing timbral characteristics and to reduce redundancy in the current set of descriptors.

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Pitch and rhythmic succession in German folksong, 19th-century art song, and classic rock melodies

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Background & Aims

As an increasing amount of music from diverse genres and epochs are encoded, the opportunity arises to identify salient melodic characteristics in a variety of styles across time and place. Using German folksong from the Essen collection (Schaffrath, 1995), French and German art song from the 19th century (VanHandel, 2005), and rock melodies from the Rolling Stone 500 Greatest Songs of All Time (de Clerq & Temperley 2011), we hypothesized that since all three historically distinct corpora are diatonic in nature, they will correlate significantly within the pitch-based parameters. Given that rock from the 20th century incorporates rhythms from cultures outside the western tradition of the Essen and 19th-c. melodies, the rhythmic content of Rolling Stone melodies will not correlate strongly with the rhythms of the earlier styles.

Method

We compiled probabilities for three melodic attributes from the melodies of the three corpora: pitch successions (analyzed as zeroth-order directed intervals), first-order scale-degree successions, and first-order rhythmic successions. Limiting our investigation to major songs in 4/4 meter, we analyzed 1,408 folksongs, 50 art songs, and 95 rock songs.

Results & Discussion

Each of these melodic variables showed a significant main effect of corpus membership. Pairwise correlations reveal a rich picture of stylistic relationships between corpora, and lend support to several items of music-stylistic conventional wisdom:

- Rock and folk melodies correlate most strongly with respect to scale degree succession (r=.82), due to the greater use of chromatic notes in 19th-century melodies.

- Folk and 19th-c. melodies correlate strongly with respect to rhythmic usage (r=.98), but far less with rock melodies (r=.50 and r=.54, respectively).

- The pentatonic tendency of rock melodies can be seen in their significantly greater proportion of major 2nds and minor 3rds when compared to art song melodies (all comparisons $p \leq .02$, $d \geq .05$). Given the lack of similar contrast with Essen melodies, rock melodies in some sense return to a more traditional folk style in terms of melodic intervals.

- At the same time, however, rock and 19th-c. melodies contain significantly more unison pitch successions than do folk melodies, pointing to a similar approach to text setting in the 19th and 20th centuries. With these note repetitions ignored, the Rock and 19th-c. melodies are negatively correlated with respect to interval usage, with the Essen intervals predictive of both.

Overall, in the pitch-based parameters traditional European folksong and 20th-century Rock melodies seem most closely related. These pitch-based findings thus provide mixed support for our initial pitch hypothesis. In the domain of rhythm, Rock melodies do indeed stand out, providing clear support for our rhythm hypothesis.

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P1P: Posters 1

Time: Wednesday, 25/Jul/2018: 22:00 - 23:00 · *Location:* La Plata Poster Room

Music Protolanguage. Comparison to Motherese in Human Mother–Infant Interactions and animal

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Background

According to the Darwinian Biolinguistics Hypothesis (Pennisi & Falzone, 2014) the acquisition of language implies that some of its elements are the result of clear biological constraints as well as natural ones, which have ensured its continuity. Assuming that the language has evolved on the basis of structures that allow vocalism (e.g. vocal tract, larynx, tongue, lips, etc.), I will try to illustrate how the inception of a protolanguage is found in the very first forms of communication between mother and child amongst non-human primates (motherese). This special relationship is often marked by a form of simple communication, high intonation and singsong which ensure the continuation of the mother-child bond. Furthermore, such reciprocity is guaranteed by the child's predisposition to learning (Koda, 2008). Therefore, although the relationship may initially appear limited mostly to "immediate" exchanges due to stimulus-response, eventually the baby begins to respond to the mother as an individual within a dyadic relationship involving much more than species-specific stimuli. This opens a scenario in which two different personalities communicate in an increasingly rich and complex way. Just like in the blabbering of babies, the prosodic unit produced during animal parental care is the result of a natural bond that determines which sound goes after another, apart from those physical restrictions that limit the production of speech sounds. The existence of forms of infant-direct speech in some primates (e.g. Macaca fuscata) suggests, in addition to the social function of the infant-specific vocalization and thanks to the melodic intonation and rhythmic signal, some information on the emotional condition of the speaker (Whitham et al., 2007). Vocal, visual, physical, and species-specific signals characterize the parental care of many primates; specifically, the infant vocalizations appear to carry more information that is likely to vary depending on the socio-ecological aspect and on the characteristics of the different species of primates (Maestrepieri, Call, 1996).

Aims

The purpose of this study is to demonstrate the theory according to which the origin of the language is detectable in the continuity of morphological structures which influenced the use of vocalizations of prototypical music and language. The human capacity to acquire language including the ability to produce, perceive, and learn complex signals. Therefore, to be able to understand the evolution of human language, we should first understand which of these abilities were present in the common ancestor of humans and primates. This study shows a comparative perspective on the biology and the evolution of musical protolanguage.

Conclusions

The data suggest that there may be a continuum, in the ability to transmit information, that becomes particularly evident in some mother-child communication. Therefore, it can be assumed that spoken language may have developed first after the vocalizations used within the mother-child communication across non-human primates, and later by female hominids who interacted with their children.

Early evidence of algorithmic "pay to play"

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Background

Payola refers to the practice of bribing someone to promote a product in music industry. This practice, developed together with recording technology, has converged with the exponential growing of musical databases. The phenomenon has not only grown big since the "pay to play" concept, but it has also been controlled by automatic means. Therefore, purposes are also engineered in the form of sophisticated algorithms. Music is an ancient form of knowledge and technology, highly relevant for perceptual systems because it permeates almost every social and individual activity (Honing et al., 2015). Understanding the design of payola algorithms is crucial to learn more about our use of music as a technological device, by clearing the path between sound and effect.

Aims

Investigate the distortion induced by automatic means in an early artist rating database.

Methods

Analysis of a database comprised by two tables collected in march, 2004. Main table has 115,579,440 registers: artist, user and rating. A secondary table has 43,602 artist names.

Results

Main table has been summarized by user (n = 1,948,882). The number of ratings (M=59.30, SD=164.15) range from 1 to 97,993. An anomaly probably exists under the assumption that 3,600 could be a maximum of ratings per month. Next, the case of the three most frequently rated artists is studied. This analysis revealed another inaccuracy: 330,865 artists were rated with an unfair quantity (rating = 255); this is, 2.5 times more than the maximum value in the normal range (i.e., 0 to 100). Noticeable, this was applied by 52,572 users (2.95% of the population of raters) when qualifying 12,512 artists. For instance, User ID:1656418, the one that has recorded 97,993 records per month, displays an interesting distribution: 97,992 of its ratings are 0 and one is 255. Furthermore, an analysis of frequencies of ratings is performed. It is interesting that multiples of ten emerge above the average, showing them as the most popular among other options. Another relevant feature is that 0 is the most frequently used qualification, this is, 29.53% of all the ratings in the database. If the hypothesis of automatic induction of distortion holds true, the analysis of frequencies of ratings may aid in unveiling the design. This is, the purpose of the uncovered algorithm was twofold: to make a given target emerge by sinking its competitors.

Conclusions

Development of musical preferences happen mainly through recommendations, being these from a social network or an algorithm. This study suggests that it is important to reevaluate the reasons to accept a recommendation, since values have silently shifted with the exponential growing of databases and use of algorithms. A future direction for this research is an empirical investigation about the impact that such change has on human beings.

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Expert teacher: investigation on pedagogical practices used in music performance

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This paper aims to understand the development of musical expertise of Brazilian clarinet players who also work as teachers, and that has inspired me to investigate the practices used by clarinet teacher who have trained certain students to became expert performers.

Research on expertise in different domains begun in 1980, especially in the field of pedagogy, where the characteristics of individuals who had shown a superior performance were of interest to researchers on educational fields, as those characteristics were directly linked to the characteristics of effective teachers. Berliner (1988) took an interest on the subject and adapted the heuristic model of development proposed by Dreyfus & Dreyfus to the development of pedagogical expertise.

The aims is to identify the artistic and pedagogic practices used by expert teachers in developing expert performance among clarinet players and the pedagogic processes used by expert clarinet teacher in their classes, which have led to the development of expert clarinet players in Brazil, and to investigate how the development of musical expertise is related to the access to expert clarinet teachers.

The main hypothesis is that the development of expert performance in music is related to the access to the expert teachers, and in this investigation aims to investigate this relation in the development of expertise in music performance.

The methodology will be the analysis protocol (Ericsson, 2006). Three clarinet teachers were selected due to the renown among their peers as expert teachers, and through this methodology the data will be collected, and compared to the literature in pedagogy in order to comprehend the development of expert performance in music.

The contribution of this research is to understand the factors relating to the development of musical expertise in light of expert teachers, as to investigate how pedagogic and artistic expertise are linked.

The implication of this research on teaching expertise has frequently been discussed and analyzed in the field of education, and identifying those high pedagogical practices in the field of music research could help to understand how musical expertise can be developed based on high pedagogical models.

Results of my data collection are still ongoing, and I propose to establish a dialogue between the results of my research with education literature, highlighting the data could confirm the narrow link between the role of expert teachers in the development of expert music performance in their students.

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MOTIVATION, SELF-REGULATION AND CREATIVITY IN MUSIC EDUCATION: CONTRIBUTIONS OF A CASE STUDY FOR TEACHER PRACTICE

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Background

This article integrates approaches from the areas of psychology, cognition and music education: motivation, from the perspective of self-regulation of learning, and creativity in the relationships of teaching and musical learning. Self-regulation consists of processes mobilized to direct thoughts, feelings and actions to achieve personal goals, from the selection of strategies, self-monitoring, self-assessment and maintenance of motivational, factors that ensure persistence and continuity in challenging situations (McPherson and Zimmerman, 2011). Motivational dimension of self-regulation is associated with self-efficacy beliefs. These self-beliefs represent an important motivational mechanism and concern the personal perception of the skills, knowledge and resources available to perform a task, interfering in the quality of personal involvement and, consequently, in the motivation (Schunk and Pajares, 2009). Creativity, in its turn, is a social, cultural and psychological phenomenon, being an inherent aspect of human nature. The creative processes, the products that result from such processes, and the creative persons are objects of interest in the field of creativity (Barret, 2000). Thus, in educational contexts, the motivational dimension highlights the questions "Why?" and "How much?", while the dimensions of self-regulation and creativity are associated with the "How?" and "What?" questions. In this way, the integration between these theoretical approaches in the foundation of this investigation is justified.

Aims

The objective of this study was to analyze the processes of teaching music in a children's and youth choir from the perspective of the conductor, based on studies on motivation for learning, with emphasis on the multidimensional approach of self-regulation and from the perspective of creativity.

Methods

The methodology used was a Case Study conducted in a traditional children's choir in the city of Curitiba (southern Brazil). The choir in question stands out for the time of performance and for the excellent musical results achieved. The focus of the case study was the conduction processes of the musical activities developed by the conductor. Data were collected through "observation of rehearsals" and a "semi-structured interview", organized into three topics: (1) conductor's training, (2) professional experience with choral singing and (3) didactic conduction with choir. For the analysis of data from the interview, was used the technique of "content analysis", proposed by Laurence Bardin (2011).

Results and conclusions

The results highlighted aspects of the teaching practice of the conductor responsible for the group, evidencing self-regulatory competences with emphasis on the dimensions: motivation, method, behavior and social influences. Regarding

the motivational dimension, the conductor showed great intrinsic motivation to develop her practice, strong self-efficacy beliefs in their engagement with the choir activities and the mastery of strategies to promote motivation in children. Finally, it was possible to identify creative elements in the didactic conduct of the conductor, especially in the teaching of new repertoires; in the rehearsal of repertoires already acquired; in the development of scenic posture in children; and in the work of tuning and vocal technique, evidencing the use of strategies that stimulate creative learning, musical sensitivity and the valorization of social interactions among the members of the choir

Recognizing the musical creativity in a reflexive interactive context

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Background

This work explores the reflexive interaction paradigm. The reflexive interaction has been presented as a resource that promotes musical creativity in the field of musical improvisation (ARAUJO; ADDESSI, 2014). This paradigm is based on the mechanism of repetition with variations in which the child plays and, when it stops, the teacher answers repeating with variations the phrase played by the child. To ensure the reflexive quality of action is necessary some elements, such as imitation with variations; turn taking, co-regulation, and regular time of turns (ADDESSI, 2014). Thus, the concept of reflexive interaction can be useful to discuss the process of musical creation. In this research, the discussion about creativity is associated with aspects of novelty, singularity and meaning within a specific context (WEBSTER, 2016).

Aims

The aim was to investigate the relation between reflexive elements and the creativity during a task carried out in a music school in the south of Brazil with a beginner child on drums.

Methods

An assessment tool was developed and applied in a single case study involving a teacher and a child aged 11 years old carried out in a drum class context. The selected task was an improvisation game where the teacher acted as a "mirror with a defect" of the child. The task was recorded in audio and video format. To evaluate the creative degree of each phrase played by the child, a five-point likert scale was used, from "none" to "very high". Three external evaluators participated scoring the level of creative quality for each phrase indicated in the video during the task.

Results

The results confirm the potential of reflexive interaction to promote a creative musical dialogue. It was observed, however, that the phrases that presented more reflexive elements did not correspond exactly with the points indicated by the evaluators as moments of greater creative quality. In this sense, it was possible to conclude that the presence of the reflexive elements was relevant to stimulate the musical exploration on drums, stimulating the interactive dialogue of the child and, consequently, her creative process.

Conclusions

It was possible to conclude that the obtained results corroborate with another studies realized by Addessi (2012); Araújo; Addessi (2014), which indicate the potential of the paradigm of reflexive interaction for the development of musical improvisation and exploration. In this study, the reflexive interactive paradigm was an important didactic tool for the teaching of instrument (drums) with a focus on creativity. Furthermore, the reflexive elements offers a possibility to discuss the creative process.

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Musical education and contemporary art at school: creation processes and autonomy

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Background

Recent research points to the important development of individual's autonomy in the processes of teaching and learning, prioritizing a critical approach to musical education in the final years of elementary school (Green, 2012). This presentation portrays the audiovisual creation process using the twelve-tone scale, combined with visual composition with Colégio Marupiara 9th grade students, in the East side of São Paulo City, Brazil, in September and October 2017.

Aims

The main goal of this musical pedagogical proposal was to provide a creative space in a contemporary perspective, with integration art and use of the resources technological of student domain, converging music and visual art in audiovisual material for resignification of musical knowledge worked. Stimulating autonomy in the teaching-learning processes and restructuring the scope of the teacher / student relationship offering the partnership restricted orientation have become a secondary objective throughout the project, but of equal importance.

Method

This presentation, a qualitative research, circumscribed by contemporary art is based on critical pedagogy, in which action and reaction (Freire, 1979) are seen as premises in the relation of the subject to the object of knowledge. The project was divided into three phases: theoretical foundation of Schoenberg's proposal for a serialist dodecaphonic composition; collective composition, musical writing and manipulation of sound material; and visual composition. In the first phase a brief explanation was offered on the twelve-tone scale and serialism from a historical perspective aiming to demonstrate their relevance in the discourse of contemporary art, deconstructing paradigms and requesting from the listener a critical listening coupled with prior knowledge. In the second phase, students were divided into two groups (A and B) and the collaborative collective artistic creation with Boomwhackers (percussive melodic tubes) using the twelve-tone scale; the criteria for composition based on the manipulation of musical material, experimenting with the inversion and retrograde features used by Schoenberg (Griffiths, 1987).

Results

The composition was registered in the application Notion and an audio recording was made to start the third phase: the visual composition. In this phase the chosen tasks were edition of photos from a socio-political theme (group A) and frame-by-frame animation (group B).

Conclusions

A relationship of co-participation between the teacher and the students was restructured, in which the subjects together manipulated the knowledge in partnership aiming the construction of the school space centered on the student's choices and needs. Throughout the project the students contemplated about the creation process in consonance with the discourse of the contemporary art, which contributed to the creation of a more critical spirit.

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Self efficacy and musical projects as epistemic disobedience in music students

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Background

A recent research about values and beliefs of university students entering to music career found preconceptions and expectations about the university identified with the hegemonic musical pedagogical model rather than with their actual musical activities and future life projects (authors, in press). The hegemonic model of music education is inherent to the Eurocentrically constituted power matrix of the modern civilizational project (Holguín & Shifres, 2015; Lander at al., 2000). In this context, to accomplish activities and sustain values outside the logic of the model could be seen as resistance to it (epistemic disobedience, according to Mignolo, 2010)

However, the most significant features of the everyday musical practices of the students (musical genre; modality of practices, music partners, etc.) are far from academy music practices, its epistemology and the music ontology granted. In this way, a musical common-sense is configured on the tension between the experiential meanings within both the epistemological structures of the musical coloniality and the daily "disobedient" musical praxis.

Aims

This work inquiry the epistemological coloniality of manifested in the common sense of novel university students from their own assessment of both their self-efficacy and their daily musical practices.

Methods

Students entering to a music department of a public university in Argentina, answered a 10-open item questionnaire about: (i) previous musical experience, (ii) self-efficacy on core musical skills, and (iii) expectations regarding the career.

100 questionnaires were analyzed and categorized according to an ad hoc categorial system by two independent judges assisted by the QDA-mining software (inter-raters agreement was significant).

Results

Data were categorized in two broad areas: (i) musical experience in everyday life and (ii) the musical experience in academic life. For both areas, categories related to (1) prejudices, (2) expectations, (3) ways of relating in music and (4) validity criteria of knowledge, were identified.

In general terms, the results show a divergent tendency between the experiences of everyday life and the expectation of academic life, especially in terms of valuing the forms and content of valid knowledge.

Conclusions

These findings can account for the tension between the acceptance of the hegemonic musical models and the students' strategies of epistemic disobedience.

The results, also allow us to explain some problems of musical higher education such as student desertion.

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Emotional communication and musical expertise of listeners: an experimental study conducted in a Brazilian context

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Background

The Expanded Lens Model was developed in an attempt to explain the cognitive processes related to the communication of emotions in music (Juslin & Lindström, 2010). According to the model, musicians use parameters of musical structure to encode emotions in the music to be decoded later by listeners. Accurate communication occurs when listeners recognize emotions intended by musicians.

Aims

The study aims to investigate if listener's emotional responses are influenced by their musical expertise.

Method

Participants (n = 61) were asked to rate emotions of musical excerpts composed and performed, by an expert guitarist, to convey emotions present in the Geneva Emotional Music Scale (Zentner, Grandjean & Scherer, 2008): (1) admiration, (2) transcendence, (3) love, (4) nostalgia, (5) peace, (6) power, (7) joy, (8) tension and (9) sadness, (10) created without intention of communicating emotion. After the experimental task, listeners answered a brief questionnaire designed to classify their musical expertise according to musical expertise pyramid model (Lehmann, Sloboda & Woody, 2007).

Results

Data analysis revealed that participants had difficulties in distinguishing the emotions intended by the musician in most of the excerpts. However, the responses remained regular between the different groups of listeners (laypeople, amateur musicians and expert musicians). Power's music excerpt (6) was the only one in which significant statistical indices of accurate communication were found for all listener's groups.

Conclusions

Our results indicate that musical expertise did not influence the course of the emotional responses. Similar findings were presented by Bigand and Poulin-Charronnat (2006) when evaluating the ability of musically experienced listeners and untrained listeners to perceive elements such as emotion in music. Regarding the results to power's excerpt, responses of the complementary questionnaire indicates that accuracy was probably obtained due an activation of an underlying mechanism (Juslin, 2016), such as rhythmic entrainment (external rhythm influences some internal bodily rhythm of the listener). Finally, we believe the use of a scale adapted to Brazilian Portuguese may have dispersed listener's responses, especially among first-order factors of the same second order-factor from GEMS. Future research will focus the creation and validation of a Brazilian emotional scale to avoid the cultural deviation observed.

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Emotional responses are influenced by differences in the information-focus during a music listening task

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Background

The Unified Theory of Musical Emotions points out eight underlying mechanisms in which the induction of emotions is activated during a musical listening: brainstem reflex, evaluation conditioning, emotional contagion, visual images, episodic memory, musical expectancy, rhythmic entrainment and aesthetic judgment. Empirical studies corroborated by this theory suggest that these mechanisms activate emotions in listeners by a multi-mechanism framework, according the influence of several variables that seem to be extremely relevant to this process, among them, the information focus (Juslin, 2016).

Aims

Our aim is to investigate the effects of extra-musical information from a piece of music on listener´s emotional responses.

Method

36 undergraduate music students (19-32 years old) divided in two groups listened to Louange à l'Éternité de Jesus by Olivier Messiaen, unknown to them. They filled four emotional scales related to emotional intensity, affective valence, motivation to listen the music again and experience emotional engagement. Finally, they answered a questionnaire with qualitative data about their previous responses. Control group did not receive any information about the music before listening. Experimental group received information about dramatic conditions in which the work has been composed and premiered - in this case, when the composer was imprisoned during World War II, in which the work was played in a poor condition of resources, counting on available musicians in that context.

Results

ANOVA showed differences among listeners' emotional responses between groups ($F=3,4231$; $p=0,025$). Experimental group gave higher responses rates than control group in emotional intensity scale ($p=0,0002$), affective valence scale ($p=0,005$) and "motivation to listen the music again" scale ($p=0,001$). No differences were found in "experience emotional engagement scale". ANOVA also showed that engagement scale presented higher rates than all other scales in control group ($p=0,0003$; $p=0,006$ and $p=0,001$, respectively). These differences disappeared in experimental group. Complementary data showed that control group participants attributed emotional responses to the music associated to sadness. In contrast, experimental group considered information given before listening task to attribute their emotional responses to sadness in a higher level than control group (in this case, associated mainly with pain and suffering).

Conclusions

Participants were emotionally engaged in a different way to the music in function of having or not information during the listening task. Our data corroborate with Unified Theory of Musical Emotions considering that underlying mechanisms and its associated variables cannot be neglected in future studies about emotional responses to music (Juslin, 2013; Juslin, Harmat & Eerola, 2014; Juslin, 2016).

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Final Ritardandi and the Expression of Musical Emotion

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Background

Musical performers routinely diminish tempo at musical section boundaries. This raises the question: How might these timing variations, known as final ritardandi, impact emotional responses to the music? According to Juslin (2001), final ritardandi form part of the acoustic code used by performers to communicate distinct emotional states to listeners. More specifically, he proposes that when the overall valence of slow-tempo music is negative, final ritardandi contribute to the perception that the music is expressing sadness, whereas when the overall valence is positive, they foster the perception that the music is expressing tenderness. Although some evidence suggests that musicians are more likely to perform final ritardandi when expressing sadness or tenderness, there is no research specifically assessing whether ritardandi interactively shape decoding of emotional expression in the manner proposed by Juslin.

Aims

The present study was designed to rectify limitations of prior studies and to systematically assess Juslin's (2001) proposal regarding the moderating influence of final ritardandi on the musical communication of sadness and tenderness, two of the predominant emotions expressed by music.

Methods

In Experiment 1, participants were asked to rate the sadness expressed by each of a set of hymns that were played using a synthesized piano timbre. In half of the hymn stimuli, a ritardando was implemented during the closing harmonic progression. In addition, to manipulate whether the hymns were generally perceived as expressing positive versus negative affect, half of the hymns were heard in a major key and set at a relatively fast tempo, whereas the remaining two versions were transposed into a minor key and set at a relatively slow tempo. Experiment 2 replicated the first experiment and additionally included hymns that were set at the same tempo as those conveying sadness, yet that were transposed to a major key to create a positive valence. Participants were either asked to rate the sadness or the tenderness expressed by each hymn.

Results

Consistent with Juslin's (2001) model, results revealed that when implemented in music that conveys negative emotion, final ritardandi heightened the perception that the music was expressing sadness. However, when they appeared in music that conveys positive emotion, final ritardandi instead heightened the perception that the music is conveying tenderness. Inclusion of ritardandi did not detract from the expression of happiness in happy music nor promote the expression of tenderness in sad music. This suggests that final ritardandi only strengthen the emotional message already firmly established by other cues, particularly those based on mode and global tempo.

Conclusions

The present findings newly contribute to understanding the emotional impact of final ritardandi, suggesting that they may amplify either the emotional pains or pleasures expressed by music. As such, they powerfully demonstrate how the very same acoustic cue may convey a distinct emotional message to listeners, depending on the prevailing musical context.

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Musical emotional processing in patients with Alzheimer's Dementia

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Background

Music produces intense emotional reactions, similar other stimuli (Blood & Zatorre, 2001). The ability to process musical stimuli requires a group of processing components (Peretz & Colheart, 2003), and involves different brain regions (Koelsch & Siebel, 2005).

Patients with Alzheimer's Disease (AD) present episodic memory deterioration and deficits in the emotional processing of visual stimuli. However, music emotional judgment is preserved (Gagnon, Peretz, & Fulop, 2009).

Aim

The aim of this study is to carry out a bibliographic review of preserved and impaired musical abilities in patients with Alzheimer's Dementia. We carried out a qualitative search, including papers that studied the subject in patients with AD. Studies focusing on music and memory where excluded.

Main Contribution

Patients with AD show impaired performance in some aspects of musical processing, such as global melody (Golden et al., 2016). Koelsch & Siebel (2005) suggest that temporal regions are involved. If these regions are commonly affected in the pathology of AD, it is not uncommon to expect such impairment.

In spite of that, the emotional processing of melodies is preserved (Gagnon et al., 2009). The emotional processing component (Peretz & Colheart, 2003) would be preserved in AD. And the areas activated are similar to healthy subjects, such as the cingulate gyrus, the cerebellum, and frontal areas (Leggieri, 2018). Music seems to aim to processes and areas that are preserved in AD (Peck, 2016).

The study shows the importance of studying emotions in music, focusing on what is preserved in AD. This could be the key to explain the relative conservation of musical memory in this pathology, and to develop music based treatments.

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Towards a new multidisciplinary and interprocessual vision in the Aesthetics of Music: Aesthetic Globalization of Musical Listening

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Although philosophical themes have remained almost constant since the Enlightenment (Fubini, 1994), we consider that "In art there is nothing but the new" (Amount, 2001, p.163). Therefore, knowledge should not been limited what it already know, or the ways of knowing to what it was thought been known about art, with independence of whatever it wanted to know. The analysis of music is conditioned and limited by the conceptual models used (Martínez, 2005), but music research has presented a progressive advance towards multi-disciplinarity. However, none of the analyzes has attended to diverse agents simultaniusly. For example, Kivy (2005) always understands production, interpretation and perception as different entities. But there must be new proposals to contemplate music that goes "beyond the recurrent explanation to the experience of music as a type of communication that always says and does not say something deep and full of meaning" (Vilar, 2010, p 162). We propose two main topics of study of emotion in music: inter-disciplinarity and inter-processing, independently and related. From a perspective that we have called Aesthetic Globalization of Musical Listening, we intend a new organization of knowledge accumulated in other areas and of the different agents and situations that can be included in it. From the support of authors such as Calle (2006), Jiménez (2010) and Gianetti, (2002), we trying to concretize their study topics and possible relationship with other disciplines. The breadth of thematic approaches with which to share musical emotion from aesthetics, as well as the novelty of contemplating processes, agents, contexts and systems in it, could allow a work that responds to musical emotion in parallel with other truths.

What is in-between the formation of meaning in music. Embodied and socio-cognitive foundations

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Background

The question about musical meaning is long-standing in music. It has been proposed that, unlike linguistic signs, musical signs are of a less-direct, non-mediational type (Turino, 1999). Otherwise, if music is about something, the object of that something is not well defined, it is ambiguous; musical experience is credited floating intentionality (Cross, 2010). In the field of musicology efforts were made to reconcile the opposition between musical meaning as either inherent or socially constructed. Recent approaches from embodied music cognition tell about the importance of the body-mind complex as a meaningful agent that makes sense, based on the interaction between low-level sensorimotor schemes and high-level cognition. It is out of question the close relationship that exists between meaning formation and the development of musicianship. In spite of the importance of meaning formation in musicianship, it is not quite well understood how meaning is built in the context of music as a socio-cultural practice.

Aims

To contribute to a better understanding of the formation of meaning in the acquisition of musicianship, highlighting the role of the social embodied cognition in music´s sense-making.

Main Contribution

Musical expressiveness -the capacity to intentionally communicate meaning- rests on the fact that musicianship is achieved through the mastery of vocal-instrumental technique and music notation. However, the way meaning is formed in this context remains elusive. It is proposed that above all, musical meaning has a social cognitive foundation. It can be traced in the interactive contexts of communicative musicality, where dynamic sound-kinetic embodied forms are shaped. Joint-action in time, and the gestural forms prompted by movement are the key elements. As social enacted cognition, music involves second person interactions, where participants not only attend to their own actions, but also continuously adjust their movements, gestures, and sounds in time with others. On the other hand, imaginative cognition allows the creation of musical meaning, due to our capacity to make correspondences of the type to hear a stream of sounds as an ascendant gesture. Metaphorical thinking provides most of the concepts used to explain music.

Implications

The roles that social enacted cognition and imagination play in the formation of meaning have strong implications in musicianship’s development. Observe a well-designed master class on the interpretation of a romantic lied: you will attest the unfolding of a significant experience of sense-making. Communication between participants will involve verbal

interpretations of the poetic content and the emotional meaning of the song. Metaphorical language will be used to create meaning analyzing the energetics of the melodic contour, or the desire of one tone to move onto the other. Non-verbal descriptions -sound-kinetic gestural forms- will be part of the teacher's embodied repertoire to communicate meaning to the performers. Hence, attribution of meaning to music notation goes beyond its structural understanding. It requires the construction of sonic-kinetic musical signs.

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The Relationship of Musical Life and Music Studies: Science or Fiction?

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Perception and cognition of music are two aspects closely related to emotion and motivation towards the music activity. Their importance has been verified by numerous disciplines that provide a part of their global knowledge: Aesthetics (Collier, 2007), Musicology (Shaw, 2001), Morals (Fairlay, 2006), Politics and Economics (Fouce, & Pecourt, 2008), or Sexuality (Trotta, 2009). However, Social Psychology and Neuroscience are, perhaps, the nearest (Hargreaves, Hargreaves, & North, 2012; Sloboda, 2012; Ockelford, 2012). In this communication is presented an introduction of state of the matter in Music Neuro-Psychology. From these disciplines, a previous research and empirical data in different student cases on listening and music activity is also provided. These cases are different from each other case studies, but present similar results in relation to student musical real life. Main objective analyzes and compares the role of music in different age students in six case studies of different educational systems from southeastern Spain. The results make it possible to discern common areas in which the informal environment in perception, emotion, motivation and musical cognition is revealing. From them is extracted some general conclusions and contributions to the improvement of the musical educational practice in any of its levels, in which student's musical life should have a greater presence.

T5M: Short Talks 5 - Performance

Time: Thursday, 26/Jul/2018: 0:00 - 1:00 · *Location:* Montreal_1

Session Chair: Gabriela Pérez-Acosta

Understanding mental representations during performance practice through the experience of expert musicians

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Background

Through several studies, different definitions have been proposed for the term mental representation or mental image of music. From the term artistic image proposed by Neuhaus to the description of motor and auditory neural representations of music, it appears to be a certain consensus regarding the implementation of different types of mental images during performance practice. However, there is still a lot to be elucidated about this complex cognitive process, particularly considering its inherent phenomenological nature.

Aims

To identify whether expert musicians reported the implementation of some sort of mental image or representation during their performance practice; if so, to classify them according to what has been described in previous studies and based on that, propose a descriptive model of the process.

Methods

Explicitation interviews (Vermersch, 1990) were conducted with 10 expert musicians (6 men, 4 women; mean age: 47.9 years; mean years of experience as professional musicians: 29). Subjects were asked to practice for 10 minutes a piece they were preparing for a public performance, followed by the explicitation interview. All sessions were videotaped. The information was processed through template analysis (Brooks et al., 2015) using ATLAS.ti software.

Results

Three categories were defined for the analysis: mental representation, mental image and motor representation. Fifteen topics were selected and 153 quotes were identified that could be coded within those categories. Considering this classification and what the subjects reported, a descriptive model that consist of a series of feedback loops over 4 different levels is proposed. The first level corresponds to the neural motor and musical features representations, which are coded through learning, practice and experience (Gruhn, 2012). The second level corresponds to the mental representation of the concept of the piece/artistic image that is constructed through the analysis of the score and entails the auditory image, the emotional idea and the 'story' intended to be conveyed. The third level, based on the previous ones, corresponds to the physical training for the performance, forming a feedback loop among the auditory imagery, auditory perception, motor practice and the sensation of the correctness of the movements. Once this is achieved, the fourth level constitutes the new motor representations that correspond to the concept of the piece.

Conclusions

According to expert musicians in this study, the starting point for performance practice is the concept of the piece. In this concept a clear auditory image, consciousness of the 'story' to be told and the emotional intention are integrated. Performance movements have to be planned according to it and practice consists of a continuous feedback between movement sensations and the sounds that are being produced until they correspond to the original idea.

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A cost of musical training? Acquiring novel sensorimotor associations in musical keyboard performance

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Background

When learning a musical instrument, associations between action planning and auditory feedback are acquired rapidly (e.g., Mutschler et al., 2007). On the keyboard, these associations involve mapping spatial goals on the lateral plane to pitch height, with low pitches to the left and high pitches to the right. This study concerns whether these associations constrain a pianist's ability to remap associations between pitch and space.

Aims

We examined how well pianists and non-pianists could learn to play melodies on a keyboard that used a standard mapping of higher pitches toward the right, or an inverted mapping, with higher pitches toward the left. Following melody learning on standard or inverted mapping, feedback associations were varied during performance of the learned melodies to test the stability of participants' pitch mapping.

Method

Pianists and non-pianists were randomly assigned to learn melodies on a keyboard with a standard mapping or an inverted mapping during a 20-minute training session. Participants learned to reproduce two melodies incrementally by ear in a trial and error fashion, using a paradigm based on Bangert and Altenmüller (2003). Participants' progression through training was contingent on reproducing correct pitches sequences and timing of the aurally presented sequence.

Immediately after training, participants performed each melody repeatedly without pause while hearing auditory feedback that varied to match feedback used during training or the alternate feedback that was not used during training. In other words, someone trained on inverted feedback could experience standard feedback as the alternate feedback. Participants were instructed to maintain the same key presses to play the melody as they had learned during training, regardless of auditory feedback.

Results

Pianists took fewer training trials to learn melodies than non-pianists. However, learning rates did not vary across different feedback mapping conditions. Thus, pianists exhibited flexibility in learning melodies in either feedback condition. However, this flexibility did not lead to stable learning. In contrast to non-pianists, who exhibited similar performance in the test phase regardless of training, pianists who learned melodies based on an inverted mapping generated considerably higher errors in the test phase than pianists who learned melodies with a standard mapping. In addition, both groups produced more errors when auditory feedback in test differed from the feedback mapping used during learning.

Conclusions

Learning a musical instrument may constrain sensorimotor plasticity in later learning. Whereas both groups exhibited sensorimotor learning, this learning was unstable for pianists who learned melodies with an inverted pitch mapping. Task-specific sensorimotor associations that are formed during motor learning may therefore facilitate flexibility within one motor skill while limiting the flexibility of adapting to new sensorimotor regimes.

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Self-Compassion and Music Performance Anxiety

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Background

Self-compassion is a relatively new way of measuring and understanding mental health and well-being, negating the potentially negative psychological outcomes that result from maintaining high self-esteem, like anxiety and narcissism (Neff & Vonk, 2009). This construct, described as how an individual treats oneself in the presence of obstacles or failure, has not been thoroughly examined within the music education research community. A more thoroughly examined phenomenon, music performance anxiety (MPA), has been examined in relation to age, gender, instrument type, musical background, developmental auditory orientation and emotions, but not in relation to self-compassion (Taborsky, 2007). Previous research by the current authors explored differences in self-compassion levels of college music and non-music majors and found no difference between groups, with both exhibiting variable levels of self-compassion. While no difference was found, the authors did find a significant relationship between self-reported levels of performance anxiety and a negative component of self-compassion: over-identification.

Within self-compassion, over-identification occurs when an individual tends to obsess or fixate on their internal ruminations. It works in opposition to the component of mindfulness, an individual's ability to keep emotions in balance and aware of the world around them (Neff & Vonk, 2009). Previous research in MPA has found relationships between worry, judgmental thinking and catastrophic thinking (Lehrer, et al., 1990; Steptoe & Fidler, 1987). These two paradigms need further exploration in musicians to determine the potential relationship between self-compassion and MPA. After finding a relationship in the previous study while using a rather blunt instrument of MPA evaluation, a single item asking participants how often they experience performance anxiety, the authors hypothesize that a relationship between levels of self-compassion and MPA will be detected by using a more precise instrument. If a relationship between MPA and self-compassion is identified, self-compassion techniques may be viable intervention for remedying MPA symptoms.

Aims

The aim of this study is to examine the relationship between self-compassion and MPA by using validated psychometric instruments in a sample of university music students.

Method

The authors are in the process of recruiting participants from a major university in the southeastern United States who are currently enrolled music majors in a program with particular emphasis on performing as part of the degree requirements. Participants will be evaluated on their self-compassion levels using the Neff & Vonk (2009) Self-Compassion Scale as well as the Adult Music Performance Anxiety Scale developed by Kenny, Davis & Oates (2004). Results will be compared to determine an overall relationship between MPA and component parts of self-compassion (self-judgment, self-kindness, over-identification, mindfulness, isolation and common humanity).

Results/Conclusions

The authors anticipate finding a strong relationship between levels of self-compassion and MPA. Neff & Vonk (2009) found a focus on self-compassion to be beneficial in disciplines that exhibit high anxiety, a prevalent phenomenon in music performance. If a relationship between self-compassion and MPA is detected, future research will focus on interventions that include self-compassion techniques as a means to improve self-treatment as well as to relieve the negative effects of MPA.

T6M: Short Talks 6 - Musical Structure

Time: Thursday, 26/Jul/2018: 0:00 - 1:00 · *Location:* Montreal_2

Session Chair: Solena Davine Mednicoff

The Effects of Tone Duration in Discriminating Major/Minor Modes

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Background

The major and minor scales play vital roles in western music; however, many listeners have difficulty discriminating between major vs. minor melodies (Leaver & Halpern, 2004). Tone-scrambles are stimuli designed to isolate musical qualities produced by variations in scale from other aspects of musical structure. Most listeners (≈70%) perform near chance in classifying major vs. minor tone-scrambles (rapid, random sequences comprising 8 G5's, 8 G6's, 8 D6's, and either 8 B5's (major) or 8 Bb5's (minor)), while the other 30% perform near perfect (Chubb et al., 2013). Moreover, the sensitivity required for this task generalizes to other tone-scramble tasks requiring judgments unrelated to differences between the major vs. minor scales (Dean & Chubb, 2017).

Aims

In previous tone-scramble studies, all stimuli were very rapid. This raises the possibility that high-performers differ from low-performers solely in being able to extract scale-generated qualities from these rapid, musically degenerate stimuli. If so, when the stimuli are presented more slowly, the gap in sensitivity separating high- and low-performers should disappear. The current study tested this prediction.

Method

Seventy-three participants with variable musical training were tested in 4 tasks: the 1-task, 2-task, 4-task and 8-task. In the k-task (k=1,2,4,8) each (randomly sequenced) tone-scramble contained k copies of each of the notes G5, G6, D6, and either k B6's or k Bb6's. The duration of each tone was 520/k ms; thus all stimuli lasted 2.08 sec. Listeners strove (with feedback) to classify stimuli as major vs. minor.

Results

Performance (a) was strongly correlated across tasks, (b) conformed to the same bimodal distribution as observed previously, and (c) was equally good in the 2-, 4- and 8-tasks but significantly worse in the 1-task. Although performance correlated with musical experience, some listeners with no musical training performed near perfectly, and some highly trained musicians performed near chance; thus, musical training is neither necessary nor sufficient for high performance.

Conclusions

High-performers in tone-scramble tasks do not differ from low-performers solely in their ability to extract scale-properties from very rapid stimuli. The difference in sensitivity persists across all four conditions. Findings to date suggest that the cognitive resource required for tone-scramble tasks provides sensitivity to the entire spectrum of qualities conferred to music by being in a scale. Accordingly, we call this resource "scale sensitivity."

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Expectation Theories: Towards a Noumenal Tonality

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Background

Beginning with John Dewey's "conflict theory of emotions" (1894), theories of expectation and their role in emotion, aesthetics and affect have been deeply explored. Major figures that have engaged in expectation theory include Meyer (1956), Narmour (1990), Margulis (2005), and Huron (2006), with significant contributions in between. These theories have common threads of gestalt principles, statistical learning, and the objectivity of the subjective experience via the examination of the stimulus that produces that experience (Meyer, 1956, p. 32). However, even with these common threads, the status of their empirical claims often have philosophical shortcomings that pertain to the categories of phenomenal vs. noumenal (perceived vs. the object/event in itself) and a priori vs. a posteriori (self-evident vs. empirical) (Kant, 1998).

Aims

This study aims to unify expectation theories by explicating the component that is shared between all theories. That is, what is the normative principle that allows us affective responses via our expectations? In other words, what is it that universally creates expectations apart from genre or surface details? I call this normative principle "Tonality as a noun" (TN) (Hyer, 2006): the organizing principle that exists before, and separate from the music. I argue that through the application of the aforementioned metaphysical and epistemological categories we can address the question of what is tonality as a noumenal event (its metaphysics), how we can know about this noumenal event through its phenomenology (i.e. how expectation theory expresses the thing in itself), and what type of organizing principle tonality is when expectation theories are considered to be a priori knowledge (its epistemology). Beyond the theories, I will engage with empirical studies (such as Schellenberg, 1996) that have operationalized and thus identified particulars in the object (music) that lead to various replicable aspects of TN.

Main Contribution

The main contribution is a survey of existing expectation theories and their experiments to demonstrate the least common denominator, which I characterized broadly as TN. By defining tonality as a normative feature as such then both music's ontology and epistemology are solidly grounded.

Implications

By identifying the common element(s) between various theories of expectation, we begin to understand the root (i.e. noumenal/metaphysical) properties of the normative principle that are expressed in the phenomenal events that have been systematized in various theories of expectation.

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T4S: Short Talks 4 - Pitch

Time: Thursday, 26/Jul/2018: 0:00 - 1:00 · *Location:* Sydney
Session Chair: Andrew Milne

Distributional analysis of 7-note scales within a multi-dimensional feature space

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Background

The familiar diatonic scale is described by Cohn (1997) as ‘over determined’: More than any other possible scale, it seems to exhibit many features both structurally and acoustically that may describe its dominance in music globally today and historically. To mention a few, it is well-formed (Carey & Clampitt, 1989), leading to low complexity or entropy, tetrachordal (Erlich, 1998), resulting in structural repetition involving consonant intervals, and it provides consonant intervals and chords in abnormally high abundance. Many of these features help enable the diatonic scale to create a tonal context, from which expectations can be formed and exploited (Tymoczko, 2011). From a spectral pitch similarity model of probe tone data from Krumhansl and Kessler (1982), Milne, Laney, and Sharp (2015) predicted the ‘tonicness’ of notes from familiar and novel scales, commenting on their ability to create a tonal context.

Aims

In order to prepare an experiment to empirically test the predictions of spectral pitch similarity and the effect of structural and acoustic features of scales upon their ability to create a tonal context, many features of all possible 7-note scales of 22-TET are explored and an exemplar set maximally representative of the entire space is compiled.

Main contribution

Along with a large collection of scale features discussed by many different theorists, empirical data collected for this project on the perceived stability of all possible triads in 22-TET informs the choice of exemplar scales. Whereas many commonly discussed features are higher-level and are typically correlated with each other, this project focusses upon maximally independent lower-level features. This aids the visualisation of scales in multi-dimensional feature space via cluster diagrams, leading to the selection of exemplar scales.

Implications

This project distils structural and acoustic scale features into their most independently descriptive representations. It also enables the construction of an experiment that seeks to uncover what it is about a scale that makes it ‘tonal’, and considers the viability of a bottom-up description of the cognition of tonality.

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Developing a psychometrically advanced version of the Pitch Imagery Arrow Task

Rebecca W. Gelding[1,5], Peter M.C. Harrison[2,3], Blake W. Johnson[1,5], William Forde Thompson[4,5], Daniel Müllensiefen[3]

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Background

The Pitch Imagery Arrow Task (PIAT) was designed to induce pitch imagery in participants with a range of musical backgrounds (Gelding, Thompson, & Johnson, 2015). Given a tonal context and an initial pitch sequence, arrows are displayed to elicit a scale-step sequence of imagined pitches, and participants indicate whether the final imagined tone matches an audible probe. Competent task performance requires active musical imagery and is very difficult to achieve using alternative cognitive strategies. However, the task itself is quite long (N = 90 trials). One way to optimise individual differences tests, making them more time-efficient and reliable, is through modern psychometric techniques such as Item Response Theory (IRT), computerised adaptive testing (CAT), and automatic item generation (AIG) (Harrison, Collins, & Müllensiefen, 2017).

Aims

The main prerequisite for a PIAT version using IRT, CAT, and AIG is a psychometric model that predicts the difficulty of PIAT items. The aim of this study was to construct such a model.

Methods

The present study involved two phases, one exploratory and one confirmatory. In the exploratory phase, the original PIAT was completed by 115 participants. These results formed the basis of an initial psychometric model. The confirmatory phase uses a new stimulus set (N = 3000 items) that systematically manipulates the difficulty predictors, identified in the exploratory phase. This stimulus set is used to calibrate a new psychometric model with a new participant group (N > 100), where each participant receives 30 randomly selected items from the set of 3000.

Results

The exploratory phase confirmed the classification accuracy, including random effects, of the best model for item difficulty was 66.15%. Several predictors of item difficulty were identified. The largest predictor was the number of tones that the participant had to imagine: more tones led to higher difficulty. The second largest predictor was the proportion of other items in the item bank that shared the same probe tone: less frequent probe tones led to higher difficulty. Difficulty was also found to increase when the probe tone matched the first tone in the sequence, and when the sequence started on the tonic. These may be confounds introduced by the staircase design of the original PIAT; the revised PIAT aims to remove these confounds. Data collection is ongoing for the confirmatory phase.

Conclusions

An exploratory psychometric model has been constructed for the PIAT that explains much of the variation in the difficulty of test items. After being refined in the confirmatory phase, the model should form the basis of a substantially more efficient test.

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Modelling novice and expert listeners' ability to detect changes in short melodies

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Background

Although musical memory and melodic change detection (ChDet) have received significant attention in the literature, the relative influence of different parameters on ChDet performance is not well understood. To explore this, we developed a computational model, based on the salience of notes arising from tonal and rhythmic features, to simulate the results of two previous experiments (Agres, 2018). In these experiments, listeners (either professional musicians or non-musicians) indicated whether a standard and comparison melody were the same or different (different melodies contained one changed tone).

Aims

We aimed to model the results from two ChDet experiments by systematically varying the relative weights (i.e., relative contribution to the model) of several rhythmic and tonal features. By discovering which feature combinations best account for listeners' ChDet performance, we aim to better understand the cognitive mechanisms underlying short-term memory for melodies.

Method

Our model predicts the likelihood of a change being detected in a pair of melodies. The model quantifies the salience of each note as a weighted sum of normalized values representing its duration, metrical strength, tonal stability and tonal instability. Tonal stability, t, is quantified as the normalized tonal hierarchy rating (Krumhansl, 1990), tonal instability is defined as 1 – t and metrical salience is based on the note's metrical strength within a metrical hierarchy. We compute which combination of weighted salience features best predicts listeners' ChDet performance. We obtained separate optimal relative feature weightings for musicians and non-musicians. Seventy-two melodies were used: 36 stylistic melodies conforming to Western musical norms, 18 non-stylistic melodies containing unusual melodic leaps or implied harmonies, and 18 random melodies containing tones randomly selected from a diatonic scale. Each stylistic and non-stylistic melody could contain at most one non-diatonic tone.

Results

Tonal instability in the comparison melody was the most reliable predictor of ChDet performance for both musicians and non-musicians (cf. temporal asymmetry effects in Krumhansl, 1990). Note duration and tonal stability in the first melody also had an effect, as did tonal instability in the first melody (for musicians only). We were able to model non-musicians' performance with a correlation of 0.51 (Exp 1) and 0.55 (Exp 2), and musicians' performance with a correlation of 0.58 (Exp 1) and 0.65 (Exp 2). All correlations were at a significance level of $p < 0.001$.

Conclusions

By using a linear combination of rhythmic and tonal features, we modelled listeners' ability to detect tone changes in pairs of melodies. Our results indicate that an important factor for both musicians and non-musicians is the tonal instability of notes in the second melody presented. Other contributing factors were note duration, tonal stability and tonal instability in the first melody. This approach allowed us to discover which features are most likely to drive listeners' change detection performance in music.

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L3S: Long Talks 3 - Violence

Time: Thursday, 26/Jul/2018: 1:30 - 3:00 · *Location:* Sydney
Session Chair: Amanda E Krause

Enhanced processing of violent imagery among fans and non-fans of violent music

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Background

It is suggested that exposure to violent media reinforces aggressive thoughts and behaviours (e.g., Anderson, et al., 2003), and decreases sensitivity to depictions of violence (e.g., Anderson et al., 2010). However, it is unknown whether short-term and long-term exposure to violent music is associated with the manner in which people process and respond to non-musical violent imagery.

Aims

Using a binocular rivalry paradigm, we investigated whether short-term and long-term exposure to violent music is associated with enhanced or decreased subconscious processing of violent imagery.

Methods

Thirty-two fans and 48 non-fans of violent music, aged 18 to 35 years, participated in a binocular rivalry paradigm. In the learning phase, participants viewed violent and neutral pictures one after another. In the binocular rivalry phase, both pictures were presented simultaneously for 60 seconds, with the neutral picture presented to one eye and the violent picture to the other. Participants focused on a fixation point and indicated via key presses when they perceived each of the images, or “SPACE” if they perceived both, or a blend of the two. There were two test blocks of 16 trials, while music with happy or violent lyrics and acoustic characteristics was playing throughout respectively.

Results

Non-fans of violent music perceived violent images more frequently and longer while listening to violent music than listening to happy music whereas such difference was not observed in fans of violent music. Furthermore, compared with violent music, happy music primed non-fans to perceive neutral images more frequently and longer while fans responded to the neutral images equivalently under these two music conditions. Across groups, participants perceived violent pictures longer than neutral pictures regardless of which music they were listening to.

Conclusions

The results indicated that fans and non-fans exhibited a bias for processing violent imagery over neutral imagery, consistent with previous binocular rivalry research suggesting that there is greater conscious awareness of negative information over neutral or positive information. Interestingly, long-term exposure to violent music has little impact on this bias. However, exposure to happy music reduced this bias for non-fans, who exhibited a smaller bias for violent imagery following exposure to happy music than violent music. In contrast, fans of violent music exhibited a strong and robust bias for perceiving violent imagery regardless of whether they listened to happy or violent music. These results suggest that fans of violent music, rather than being desensitized to violent imagery, have a clear and robust bias for processing violence.

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The enjoyment of music with violent themes

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Background

Although negative emotions are normally avoided, people appreciate artistic expressions of sadness, a paradox that has been the subject of considerable research and theory (Eerola et. al, 2018; Menninghaus et. al, 2017). Research has identified motivations for listening to sad music, and the emotional effects this music evokes. It is well established that 'sad music' often has connotations that include positive emotions as nostalgia and tenderness, so is not merely "sad". What about music with extremely violent themes, such as certain "death metal" bands that feature aggressive themes and endorse acts of violence in their lyrics? Who listens to such music, and why?

Aims

We had three aims: (1) to identify differences in personality traits and empathic capacity between fans and non-fans of violent "Death Metal" music; (2) to uncover their primary motivations for engaging with music; (3) to characterise their emotional and aesthetic experiences of death metal music.

Methods

48 fans and 97 non-fans of violent "death metal" music completed the 'Big-Five Personality Inventory', the 'Interpersonal Reactivity Index' of empathy, and listed their motivations for engaging with music. They were also presented with eight 1-min excerpts of Death Metal and rated their emotional responses to the music using scales such as the Brief Music in Mood Regulation Scale, the Geneva Emotional Music Scale (GEMS-9), the Positive and Negative Affect Scale, and others.

Results

Relative to non-fans, fans of violent music were less agreeable and less conscientious, but more open to experience. They were also less inclined to exhibit concern and sympathy for unfortunate others; and more inclined to use music to help release negative emotions and strengthen social bonds. Compared with non-fans, fans reported significant increases in positive emotions while listening to death metal music, including increased 'Wonder', 'Power', 'Peacefulness', 'Happiness', 'Joyful Activity', and 'Engagement'. They also experienced decreased 'Tension', 'Anger', and 'Fear' while listening to this music.

Conclusions

There is a growing body of research on the short- and long-term effects of violent media, but little understanding of violent music, as exemplified in certain death metal bands. It is therefore useful to identify the personal characteristics of fans of this type of music, and characterise their emotional and aesthetic responses. Such information may provide insight into communities that ostensibly enjoy and endorse violence in music. Our results provide a valuable step towards such an understanding, and will be discussed in view of current research and theory on the enjoyment of negative emotions in music, and the psychosocial consequences of exposure to media violence.

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T7S: Short Talks 7 - Health

Time: Thursday, 26/Jul/2018: 6:40 - 7:20 · *Location:* Sydney
Session Chair: Kirk Nicholas Olsen

Listening to music to cope with everyday stressors

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Background

Everyday stressors—the stressful, irritating, and disturbing events that happen in the context of everyday life—are common. Due negative health outcomes associated with stress, people are increasingly interested in the possibility of using non-invasive approaches, such as music listening, to mediate stress (MacDonald, 2013). Although inconsistent results have been reported (Linnemann, Ditzen, Strahler, Doerr & Nater, 2015), experimental and laboratory-based research implicates that music can play a role in relieving stress (e.g., Beck, Hansen, & Gold, 2015; Radstaak, Geurts, Brosschot, & Kompier, 2014). However, little research has specifically considered the relationship between everyday stressors and everyday music listening.

Aims

The primary aim of this research was to consider how music listening is used as a coping mechanism for different types of everyday stressors. The relationship between the use of music listening to cope with everyday stressors and listener characteristics (including age, gender, country of residence, listening style, and device use) was also examined.

Method

Five hundred and fifty-three participants residing in Australia, USA, and Malaysia (Mage = 24.49; 69.30% female, 30.60% male, 0.20% non-binary) completed a quantitative questionnaire online. The questionnaire included demographic questions and measures concerning daily stressors (Kohn & MacDonald, 1992), music engagement (Greenberg & Rentfrow, 2015; Miranda & Claes, 2009), and music identity (Krause & Hargreaves, 2013).

Results

Firstly, a factor analysis identified five types of everyday stressors: “social”, “financial”, “performance responsibilities”, “work-related”, and “daily displeasures”. A one-way repeated measure ANOVA indicated that individuals were significantly less likely to use music to cope with financial everyday stressors than use music with regard to the other four stressor types, and individuals were significantly more likely to listen to cope with social and work-related stressors than to cope with performance responsibilities and daily displeasures. A Generalized Linear Mixed Model analysis indicated that younger individuals were more likely to use music to cope with daily stressors than older individuals and that US residents were more likely to listen to music to cope with stressors when compared to both Australian and Malaysian residents. Moreover, the results of a second Generalized Linear Mixed Model analysis revealed that individuals who listen to more hours of music daily on average and those who demonstrate a stronger affective listening style are more likely to listen to music in order to cope with everyday stressors.

Conclusions

Together, these results provide an in-depth understanding of everyday music listening behaviors with regard to how individuals use music to cope with stress. These results concern the use of music for therapeutic self-regulation and have implications for both individuals and health professionals. Further research will be able to consider the utility of music listening as a self-administered coping tool, relative to people’s intentions and its effectiveness, as well as develop specific intervention strategies to promote well-being.

COMPARATIVE ANALYSIS OF GENRE-BASED MUSICAL INTERVENTIONS' IMPACT ON SLEEP QUALITY IN YOUTH POPULATIONS

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Background

Sleep is a very important bodily function that aids growth and relaxation. However, sleep loss is very common especially amongst the youth demographic of population, whether due to sleep deprivation (one extended wake episode) or sleep restriction (multiple sleep episodes of insufficient duration). Its causes encompass primary medical or psychiatric causes, such as not allowing sufficient time for sleep due to work, social, or family demands. This makes non-invasive and well-proven methods of Music Intervention an interesting alternative therapeutic tool, which is what we aim to study.

Aims

In this study, we perform a comparative analysis of whether various Musical Intervention Styles, based on different genres, can impact sleep quality and quantity in a group of people ranging from ages 18-30, from various backgrounds like students and office-going occupations.

Methods

The three Musical Intervention approaches of Binaural Beats, Western Classical Music-based Intervention, and Sur Sanjeevan Musical Intervention (based on Indian ragas) will be considered and analyzed for sleep quality improvements using questionnaires developed based on currently relevant and non-invasive sleep quality assessment methods, i.e. the Pittsburgh Sleep Quality Index, and Sleep Diary.

In the experimental design for this hypothesis, the subjects are divided into three groups, and a control group.

Initially, each participant is required to answer an initial survey regarding their sleep patterns in order to analyze their current sleep quality that can be used to gauge differences post musical intervention period.

In each group other than the control group, the subjects listen to a single piece of music (approx. 25 minutes in length) every day for a certain number of days consecutively right before going to sleep.

After completing their sleep, these subjects answer a questionnaire (which will also be answered by the control group participants), that gauges the changes in their sleep quality due to listening/not listening to the music.

Results

Preliminary experiments on a small group of 40 participants, performed over 20 days, give us very encouraging results, with 72.5% of the subjects stating that they felt that the music they listened to helped them sleep better.

Furthermore, the mean differential increase in hours of sleep on introduction of Music Therapy is 0.7482 hours, which is 44.88 minutes, wherein, the mean sleep hours amongst the subjects considered was 6.625 hours.

Another interesting factor seen is the improvement in sleep quality reported by non-control groups with respect to the control group which means Musical Intervention in general is a very good tool to aid improvement in both sleep quality and quantity.

It was also noticed that the style of the musical intervention had an impact on the subjects' response to the intervention. This means that having a background related to the genre helped improve sleep quality. This was determined by asking subjects if they had backgrounds in Western or Indian Music.

Conclusions

The results discussed above prove the hypothesis that Musical Intervention aids in improving sleep quantity and quality, with an interesting correlation between genre, style and the subjects' listening preferences and backgrounds.

T13G: Short Talks 13- Emotion

Time: Thursday, 26/Jul/2018: 7:00 - 9:00 · *Location:* Graz_2

Session Chair: Niels Chr. Hansen

Use of music for experiencing strong sensations is modulated by intelligence and musicianship

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Background

Intelligence is a widely studied psychological feature, characterized by a relative stability during lifespan and connected to individual behavior, emotion and perception (Sternberg, 2000). Music is strongly linked to emotional experience and sensation seeking (Rentfrow & Gosling, 2003; Saarikallio, Nieminen, & Brattico, 2012). Wolf and Ackerman (2005), in a meta-analysis, highlighted that strong sensation (SS) seeking, extraversion and intelligence seemed to be overall negatively correlated.

Aims

Considering the central role of both intelligence and emotional experience in human life, we aimed to explore the relation between those two features, focusing on the SS seeking related to music. We hypothesized that intelligence was able to mediate the use of music for achieving a strong emotional experience and that musicianship played a role in that mediation.

Methods

In this study, we recruited a Finnish sample composed by 53 musicians and 54 non-musicians. The use of music for experiencing strong emotions has been assessed through the Music in Mood Regulation (MMR) test developed by Saarikallio (2008), while the intelligence quotient (IQ) has been calculated using the Wechsler Adult Intelligence Scale III (WAIS-III).

Results

We found a negative correlation between the general IQ score and the use of music for SS across all participants. More specifically, the use of music for SS was negatively correlated with Verbal IQ and Verbal Comprehension index in musicians, while in non-musicians the use of music for SS was negatively related to Performance IQ, Perceptual Organization and Processing Speed indexes.

Conclusions

Our results suggest that the use of music for experiencing SS is related to general intelligence, meaning that higher IQ corresponds to less use of music for SS purposes. Since impulsivity and extraversion have been shown related to high-sensation seeking (Zuckerman, 1993), our results might be linked to the previous evidence of negative correlations between intelligence and extraversion, and intelligence and impulsivity. Furthermore, our findings might strengthen the hypothesis that people with higher intelligence scores tend to use music for SS scopes less than when they utilize it for aesthetic purposes. In this latter case, listeners might prefer more complex, structured and instrumental music to high-arousal one. Future studies might explore this finding in relation to personality differences.

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Musical awe: appraisal models and complex emotional experiences

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Background

A proposed model for the emotion of awe suggests that musical awe may be experienced through an encounter with music that is perceived as vast and requires a need for a change in existing mental schemas—known as accommodation (Keltner & Haidt, 2003). Ancillary appraisals, namely those of beauty, ability, and threat are thought to shape the hedonic tone of the emotion and account for the variety found in experiences of musically-induced awe. Awe has also been proposed as a reaction to the sublime, comprised of joy and fear (Konečni, 2005). Within this understanding, musical awe is part of an Aesthetic Trinity that is accompanied by feelings of chills/thrills as well as being moved. Currently there is a lack of empirical research into musical awe to support these proposed models.

Aims

The aims of this study were to gather experiences of musical awe to empirically test proposed appraisal models, evaluate commonalities in experiences, and derive a better characterization and understanding of musical awe.

Method

Online questionnaires were collected from the general public (N = 70). Participants were asked if they have experienced awe (defined as ‘a combination of appreciation of beauty surprise and possibly fear’) in response to music and to describe their experience in their own words. Based on their accounts of awe, participants rated the music for vastness and ancillary appraisals through psychometric scales.

Results

Participants identified previous powerful experiences of music as inducing awe, with 96 percent reporting to have experienced awe from music. Participants’ vivid recollections described highly intense yet pleasurable experiences with beautiful and virtuosic music. These recollections detailed diverse musical genres and settings. Music that produced awe was perceived as large, supporting proposed appraisal models of awe and promotes further empirical investigations into music’s relation to perceptions of size. Participants also reported an increase in their enjoyment and engagement with the music due to their emotional state. Few participants described their experience as fearful, however chills were reported during most experiences of awe.

Conclusions

Musical awe was found to be a complex emotional experience that is not perceived as fearsome but has retained its sense of power from its perception of vastness. These positive associations suggest that musical awe may be a particular reaction to the sublime that is formed through music’s vastness, beauty, and virtuosity and is closely related to states of being moved. Vastness will be the specific target of future investigations as it will be examined in relation to the production and perception of musical size.

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Factors Influencing Discrimination of Emotional Expression Conveyed through Music Performance

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Background

A recent replication of a study carried out by Gabrielsson and Juslin (1996) investigated participants' ability to decode an intended emotional expression, conveyed through musical performance (Akkermans, et al., under review). Decoding accuracy was found to be associated with level of musical training and emotional engagement with music.

Aims

The present study aimed to assess traits and abilities that might influence emotion recognition, and to create a new, effective test of emotion decoding ability. Two experiments were carried out in order to achieve this.

Methods

Experiment I. 33 participants (age: M=37.06, SD=22.65) took part in an Emotion Discrimination Task (EDT), in which two short excerpts of solo performances were played that differed in terms of performer-intended emotional expression. Extracts varied between trials, in terms of instrument, melody, length, as well as target and comparison emotion.

Experiment II. 99 participants (age: M=24.11, SD=6.26) were recruited for the second experiment; this experiment utilised the refined EDT and also assessed individual differences in emotional intelligence, emotional contagion, musical training and emotional engagement with music. Psychoacoustic tests were also used to measure participants' ability to discriminate tone duration and pitch.

Results

Experiment I. Musical features were assessed in regard to their contribution to item difficulty in order to inform a shorter test of emotion discrimination. Results from this experiment indicated that the difficulty of the stimuli depends on the length of the melodies (χ^2 (2, 693)=9.43, p=.009), as well as the target emotion categories (χ^2 (3, 693)=15.12, p=.002). Musical feature variables were entered into a logistic regression model as predictors of test performance; this analysis confirmed the results of the chi-square tests.

Experiment II. Performance on the EDT was significantly associated with high levels of emotional intelligence (p=.008), emotional contagion (p=.047), and emotional engagement (p=.004), but not with low-level psychoacoustic abilities. In addition, linear regression using backwards variable selection yielded a model with emotional intelligence and emotional engagement as predictors (R^2=.12, adjusted R^2=.1, F(2, 96)=6.39, p=.002).

Finally, an item response theory-based selection procedure was performed on the data of Experiment II to increase the validity, reliability, and efficiency of the test. The final model comprised 18 items and displayed a standardised Cronbach's alpha of .62 and a test-retest reliability correlation of .69 (N=25).

Conclusions

This study describes the development of a short and effective test of an individual's capacity to identify intended emotional expressions in music. The test has acceptable psychometric qualities and is publicly available (http://shiny.gold-msi.org:3838/emotion-discrimination-test). A comprehensive validation study of the EDT with a large sample is currently being conducted.

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An Investigation into The Effect of Induced Empathy On Emotional Responses to Music.

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Background

There are multifarious theories how emotional responses are elicited by music, many of which attribute empathy as being partly responsible (Scherer & Zentner, 2001). In the presented investigation, the common coding model of prosocial behaviour processing has been used to explain the concept (Schubert, 2017). Here, empathy is defined as the result of three interrelated components: affective empathy (alternately emotional contagion), cognitive empathy (alternately perspective taking), and prosocial behaviour.

Aims

In an online study, we tested 1) If individual levels of trait empathy will have a significant effect on the degree to which participants experience situational empathy in response to musical stimuli; 2) If written background information about a composer's expressive intentions and motivations will significantly affect the degree to which participants are reporting to empathize with the composer; 3) If the emotions expressed in the music have a significant effect on the participants' emotional response to music and if the empathy-induction text intensifies the effect of those emotions expressed.

Method

229 participants were randomly assigned to three groups: The experimental group was given a text describing the emotions of the composer during the composition process. To control for the effect of reading text during music listening, one control group was given a text describing the musical content of the excerpts and the other control group was not given any textual information. In a repeated measures design all participants listened to 30 seconds of four pieces of music, all taken from film scores and selected to express emotion from the four quadrants of the circumplex theory of emotion. Following each excerpt, participants rated their felt valence and arousal, completed a newly devised state empathy measure that assessed affective and cognitive empathy and (at the end of the questionnaire) the Interpersonal-Reactivity-Index (IRI).

Results

The results show, that state empathy in response to music is significantly associated with trait empathy, especially with the Fantasy-Subscale of the IRI. Different to those in the control conditions, participants in the experimental group responded with significantly higher levels of situational empathy. Receiving this text significantly moderated the effect of the expressiveness of stimuli on induced emotion, indicating that it induced empathy and lead to stronger responses to expressions in the music.

Conclusions

We conclude that empathy can be induced in relation to music listening through the provision of information on the specific emotions of a person relating to the music; the composer in this case. Furthermore, we showed that this increase in empathy strengthens the emotional response to expressive musical characteristics. These findings contribute to understanding the psychological mechanisms that are involved in emotional responses to music.

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Social-contemplative and Relaxation-sensational Pleasures of Music

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Background

Music listening effectively induces pleasure and positive affect (Blood & Zatorre, 2001). While everyday musical rewards (Mas-Herrero, et al, 2013) and music-induced emotions (Juslin & Laukka, 2004) have been actively researched, the inter-relatedness of these facets has not been investigated. To comprehensively understand how musical pleasure is constituted in people's daily life the combined knowledge of related emotions and motivations/rewards is of essence.

Aims

The current study aimed to elaborate the emotional-motivational constituents of musical pleasure, particularly in terms of how the emotional and motivational elements interrelate to create a pleasurable musical experience.

Method

Data were collected through an online questionnaire (N= 464). Participants were instructed to choose a musical piece that would induce pleasure in their daily life. Emotions evoked by the chosen song were evaluated on 66 emotion terms (derived e.g. from Juslin & Laukka, 2004; Scherer & Zentner, 2008). Motivational aspects related to the song were assessed through 12 items derived from Tiger's (1992) model of pleasure types. Structural contents of emotions and motivations were captured through exploratory factor analyses (EFA) and their interrelations were explored through linear regressions.

Results

EFAs resulted in 3 motivation factors and 6 emotion factors. The highest-scoring motivation factor, Object sensations, (R^2 = .413) was significantly predicted by emotion factors Relaxation (β = .137, p = .011), Power (β = .238, p = .003), and Passion (β = .108, p = .036). The other two motivation factors, Contemplation (R^2 = .330) and Social Values (R^2 = .525) were both negatively predicted by the emotion factor Relaxation (β = -.169, p = .005 / β = -.310, p <.001), and positively by an emotion factor Kinship (β = .380, p <.001 / β = .766, p <.001).

Conclusions

The results reveal two major emotional-motivational dimensions underlying the musical pleasure that people relate to the songs of their daily life. On one hand, music provides relaxation, strength and passion through enjoyment of object-induced sensations. On the other hand, music offers social and contemplative gratifications through experiences that are not relaxing but filled with feelings of kinship, empathy and consolation. This two-dimensionality resonates well with recent work on music as affect self-regulation (Baltazar & Saarikallio, 2017).

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The role of empathy in musical chills

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Background

Why do some people experience musical chills much more often than others? Previous research has shown a connection between chills and openness to experience (e.g., Nusbaum & Silvia, 2011). Similarly, empathy is associated with openness to experience (e.g., Melchers et al., 2016). Furthermore, altruism is motivated by empathy (e.g., Persson & Kajonius, 2016) and chill-inducing music promotes altruistic behavior (Fukui & Toyoshima, 2014). Although several studies point toward a link between chills and empathy, it has never been directly tested.

Aims

The aim of this study is to investigate the role of trait empathy in the experience of chills while listening to music.

Methods

In this online study participants (n=306) reported the frequency of experienced chills and answered questions regarding their experience and engagement with music in everyday life. Additionally, they completed measures of the Interpersonal Reactivity Index to assess trait empathy (Davis, 1983), the Big Five Inventory (Rammstedt & John, 2005), and the Short Test Of Music Preferences (Rentfrow, Goldberg, & Levitin, 2011).

Results

A multiple linear regression model showed that empathy (especially the fantasy scale and empathic concern) is a strong predictor of experiencing musical chills. Furthermore, the frequency of experiencing chills is associated with the frequency of listening to music attentively and rating music to be important. A marginal effect was found for the connection between a preference for intense musical genres and musical chills. No effect was found for gender nor years of playing an instrument. A mediation model showed that the previously found connection between openness to experience and chills was completely mediated by empathy (fantasy scale and empathic concern) as well as the rated importance of music. However, no mediation effects were found for empathy.

Conclusions

This project provides new insights into the role of empathy in music perception, contributing to a better understanding of musical chills while listening to music. The results indicate that the previously found connection between openness and musical chills is mediated by empathy.

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T14G: Short Talks 14 - Cognition

Time: Thursday, 26/Jul/2018: 7:00 - 9:00 · *Location:* Graz_3

Session Chair: Andrea Schiavio

Sharing and Enacting Cognitive Metaphors in Musical Distributed Contexts: A Case Study from IRCAM

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Background

Cognitive linguistics and cognitive psychology have led to an important shift that has touched many fields of research wherein multimodal givens are scrutinized. For instance, Conceptual Metaphor Theory (CMT) (Lakoff & Johnson, 1980) and Conceptual Blending Theory (CBT) (Fauconnier & Turner, 2008) have reached music theory. Conversely, their implementation in current musical practices remains relatively infrequent.

Aims

This paper aims at understanding the role of cognitive metaphors when shared within a real situation of distributed musical creativity, in which several ideations may also be physically enacted (Gallagher, 2017). The underlying research hypothesis is that musical thought is not a sphere detached from other mental activities end embodied interventions, which may play a fundamental role while creating music.

Method

Research is based on qualitative data through the ethnographic tracking at IRCAM, gathering composer Hèctor Parra, astrophysicist Jean-Pierre Luminet, and computer music designer Thomas Goepfer. Data was qualitatively analysed through the aforementioned cognitive theories, and some theoretical extensions were also taken into account: material anchors (Hutchins, 2005) and pragmatic developments of the CBT (Brandt, 2004).

Results

The paper focuses in a particular task of the creative team: the development of a Max/MSP patch aimed at reinterpreting gravitational waves. Goepfer implemented a Human-Computer Interaction (HCI) device by means of a haptic tablet for reshaping wave-like curves in real time.

The cognitive bases of the patch can be accurately described as a material anchor in which the cognitive concept of fictive motion (Talmy, 1996) seems to explain the anchoring process. Parra and Luminet showed completely different behaviours when playing the HCI device, in terms of multimodal interaction with stimuli, bodily emphases, and hand gesture. Parra took advantage of the device for a metaphorical enaction while Luminet did not.

Conclusions

First, CMT is suitable for understanding the basis of a communicative exchange in distributed creative contexts, but insufficient for deeply understanding complex musical ideations. Second, material anchors have proven relevant for explaining some creative choices. Third, the different interactions with the HCI device put into question the pertinence of the pragmatic extension of the CBT, because its hypothesised relevant space might not capture a minimal shared relevance.

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Inhibitory Control in Transposing Musicians, Non-Transposing Musicians, and Non-Musicians

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Background

Inhibitory control (IC) is the ability to "control one's attention, behavior, thoughts, and/or emotions to override a strong internal predisposition or external lure, and instead do what's more appropriate or needed" (Diamond, 2013, p. 137). Music transposition is a highly complex process in which notated music to be played might not correspond to the sound to be produced, and as such is conceptually similar to a typical IC task. Despite this intuitive similarity between IC and transposition, no previously reported research has tested it.

Aims

To test whether there are differences in IC task performance among transposing musicians, non-transposing musicians, and non-musicians.

Method

Twenty-nine participants were categorized as transposing musicians (n = 9), non-transposing musicians (n = 10) or non-musicians (n = 10). All participants completed a questionnaire which allowed the identification of their main musical instrument, knowledge of reading music notation, and mother tongue. An additional questionnaire was administered to determine the note-naming system as well as the most familiar clef for every musician.

Two Stroop tasks were utilized. The music Stroop task (Grégoire, Perruchet & Poulin-Charronnat, 2013) presented participants with a whole-note on the stave which had written a note letter name inside. This name could correspond or not to its location on the stave. The task required to select the note written inside and ignore the pitch indicated by the position of the whole-note on the stave. The classic Stroop task presented words in a font colour which either corresponded to or differed from the written word. Participants chose the font colour while ignoring the written word. Both Stroop tasks began with a training session followed by an experimental session.

Results

A t-test revealed that transposing musicians ($M = .44$, $SD = .06$) did not differ significantly from the group of non-transposing musicians ($M = .41$, $SD = .06$) in the global interference music Stroop score, $t(17) = 1.10$, $p = .29$, $d = .50$, $1 - \beta = .18$.

A one-way ANOVA revealed that transposing musicians ($M = .47$, $SD = .10$), non-transposing musicians ($M = .54$, $SD = .09$), and non-musicians ($M = .53$, $SD = .10$) did not differ significantly in their performance of the global interference score of the classic Stroop task, $F(2, 26) = 1.41$, $p = .26$, $\omega 2 = .17$, $1 - \beta = .15$.

Conclusions

There were no statistically significant differences in inhibitory control task performance among the three groups. Although data suggest that a larger sample size might enable the detection of relatively medium effects of the manipulations.

More objective methods of categorization of musicians as transposing or non-transposing musicians are required in future studies. Additionally, future studies might test whether the Stroop tasks utilized here are suitable for measuring IC.

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Implicit memory and knowledge of musical stimuli in musicians and non-musicians

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Background

The phoneme monitoring task used by Bigand, Tillmann, Poulin, D'Adamo & Madurall. (2001) is a musical priming paradigm that looks at the difference in musicians and non-musicians on whether the processing of harmonic structures occurs in an automatic way. Results found that participants showed an implicit understanding of western harmonic structures, even in the absences of formal musical literacy (Bigand et al., 2001). There is an increased interest in the effects of musical training on implicit and explicit memory. Little research has focused on implicit music learning in musicians and non-musicians.

Aims

In this study, we have adapted Bigand et al.'s (2001) phoneme monitoring task to focus on both implicit knowledge of musical structure but also to study implicit memory for specific musical sequences. This current study aimed to investigate whether the phoneme monitoring task would identify any differences between musicians and non-musicians.

Methods

Thirty-two musicians and non-musicians (19 female and 13 male) were asked to listen to a seven-chord sequence and decide as quickly as possible whether the final chord ended on the syllable /di/ or /du/. Implicit knowledge of Western cadence structure was first tested by a block of 12 musical phrases that ended on either a perfect cadence or a non-cadence chord, where we were looking for facilitation on responses to the perfect cadence phrases. A further block of 12 musical phrases repeated six sequences that had been heard previously in the first block, together with 6 novel sequences, where we tested for implicit facilitation of the previously heard sequences. In a final block of trials, we tested whether participants had gained any explicit memory for previously heard sequences by presenting 12 previously heard phrases and six novel sequences with the final chord missing. Participants were asked to 'guess the final syllable' and give a confidence rating for their answer. It was anticipated that if explicit knowledge of the phrases had been gained, participants would respond with above chance accuracy to previously heard sequences.

Results

Musicians and non-musicians reacted quicker to previously heard sequences but showed no explicit knowledge of the familiar sequences. Musicians were quicker overall but non-musicians showed a bigger improvement in reaction times from the first time of hearing to the second. Unlike Bigand et al.'s (2001) study, musicians were faster to the non-cadence chord sequences, whereas non-musicians reacted quicker to the cadence chord sequences.

Conclusions

The current study has identified differences in implicit learning between musicians and non-musicians. Implicit memory was evident in both groups, with some improvement in performance being due to implicit learning and some due to practice effects. Group differences in harmonic priming showed that musical training effects the processing of manipulated musical sequences.

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Mechanisms versus Dynamical Processes: an Examination of Old and New Explanatory Frameworks.

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Background

Proposing the existence of cognitive mechanisms –for example, predictive coding mechanisms– is to make explanatory claims about the nature of the phenomena of the mind. Making explanatory claims is to make use of available explanatory frameworks (EFs). Mechanistic EFs are a portion of the variety of contemporary EFs available across sciences. Yet the direct discussion on the advantages or disadvantages of various, sometimes competing, EFs rarely takes place outside philosophy (philosophy of science, of biology, of mind, and epistemology).

The philosophical discussion examines the correspondence between frameworks and the best available scientific image of nature. EFs evolve and new frameworks may emerge once a better – more parsimonious – view emerges.

Strands in contemporary philosophy of cognitive science and philosophy of biology converge into a new kind of EF based on a view of dynamical processes in nature. In the previous decades this view has been re-introduced into the explanations of mental phenomena by approaches such as radical embodied cognitive science (RECS)(Chemero, 2009) and enactivism (Thompson, 2007). They rethink concepts from complexity science, dynamical systems theory, and ecological psychology.

Aims

To present a philosophical discussion on the advantages and disadvantages of various EFs in relation to music psychology. To define various levels of discussion: a) the intrinsic coherence and predictive power of frameworks, b) the extrinsic relation of frameworks with a wider view of nature as it is currently available.

Main Contribution

I argue that RECS and enactivism together correspond to a distinct EF in contrast to the traditional mechanistic (often computational) framework widely used in cognitive science. I compare these two EFs – one mechanistic and the other dynamical – on the grounds of their extrinsic relation to a naturalistic view of complex biological processes. To clarify this, I exemplify the contrast with recourse to observations of similar phenomena that may yield to distinct explanatory glosses. In specific I make this point with general examples of musical interpersonal interaction. I review new evidence from paradigms of social interaction such as the perceptual crossing paradigm (Auvray & Rohde, 2012). This paradigm offers the possibility of testing and comparing EFs in relation to a similar phenomenon that has not yet been the attention of mainstream psychology of music. In short, this paradigm shows that the minimal and more parsimonious unit of analysis of musical interaction is the interactive dyad, from which ordered patterns of behavior, at various levels, emerge as a result of the coupling itself.

Implication

A cross-disciplinary examination of EFs is possible thanks to the philosophical discussion on naturalism. The cognitive sciences of music may benefit from the incorporation of this discussion. A key implication consists of the possibility of a better interaction between the cognitive sciences of music and other empirical disciplines that study biological systems.

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Music as collective memory

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Background

Although memory for music has been an area of intense research, the connection between memory and music has always been conceived within the framework of an individual remembering music. However, recent approaches to memory aim to include more of the physical and social context of remembering by employing neglected alternative frameworks to cognition. These frameworks include autobiographical memory (Conway & Pleydell-Pearce, 2000), constructive memory

(Bartlett, 1932), extended cognition (Clark, 1997), and ecological cognition (Gibson, 1966). This results in a view of musical memory that is motivated by maintaining an identity and that makes use of resources outside of the body of an organism, such as natural objects, artefacts and even other organisms and groups of organisms. This view connects music to collective memory, which assumes that rather than being a record of a static past, memory has a close relationship with current identities and motivations of a group (Halbwachs, 1925/1994).

Aims

My aim is to delineate three possible ways in which music can be considered as a form of collective memory.

Main contribution

One obvious way in which music constitutes a form of collective memory is the way the products of a society's music tradition acts as a store of shared experience. However, these products can be made more or less conspicuous in order to reshape that record in a way that will fit the motivations of today. A second way in which music contributes to collective memory is by structuring socially important events. Music thus becomes part of the stability and perseveration of activities and institutions that are important for the society. A third way in which music connects with collective memory has to do with how music making itself is a practice that makes use of artefacts and traditions shared by groups of individuals in a society (Halbwachs, 1950/1997).

Implication

The content of a society's music as a tradition, the interaction of music with extramusical traditions in propagating the culture and identity of a society, and the musical artefacts and conventions that enable specific traditions of music making are parts of an extended and collective form of memory. The study of memory could extend to include the effects of the social context on memory for music, alterations and distortions in remembering music, and the influences of the affordances of external tools on memory for music.

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Investigating Musical Pattern Ambiguity in a Human Annotated Dataset

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Background

Ambiguity is ubiquitous in music research, especially in musical motifs and patterns recognition. In Music Information Retrieval (MIR) tasks such as automatic musical patterns extraction, however, ambiguity poses difficulties for evaluation. From previous works [1-3], a series of open questions arises: how should one take non-agreeing human annotations to evaluate musical motifs and patterns extraction algorithms? How much agreement among annotators is needed to use the annotations as a reliable evaluation? Can we leverage the agreement to develop effective computational systems?

Aims

In this paper, we aim to address the above questions and present a new musical motifs and patterns dataset: HEMAN (Human Estimations of Musically Agreeing Notes). This is a digitized, open source version of the dataset introduced in [4]. This collection comprises 6 music excerpts each annotated by 13 music students.

Methods

The annotators were exposed to the sheet music and audio, and were asked to identify musical motifs and patterns which are shorter than a musical phrase. Subjects also labeled the degree of importance/relevance of each pattern as Low/Medium/High. Each pattern is thus represented by a set of pitch and duration pairs plus its associated importance/relevance label. We hypothesize the identification of these motifs and patterns is subjective, yielding critical

differences between annotators. However, we also suspect a higher degree of agreement when only the most relevant patterns are considered.

Results

Our initial exploration shows supporting evidence for our hypotheses. Taking each individual annotator as the reference, we calculate the precision, recall, and F1 values ([5]) as measurements of agreement. When only considering the motifs and patterns labeled as of High importance/relevance, we see a significant increase of agreement. Using a thresholding technique, we calculate similarity measurements based on various degrees of the strictness of ”equivalent/matched annotations”. We observe that, with a more relaxed threshold, there is a higher degree of agreement amongst annotators.

Conclusions

We draw the tentative conclusion that motifs and patterns rated as highly important/relevant are more trustworthy than those rated with lower importance/relevance values. Therefore, if we choose the patterns of high importance/relevance, we could establish an evaluation measure with small irreducible errors for automatically extracted patterns. In the future, we would like to extend the work by collecting more data from a larger number of expert annotators using a web interface, and verify our current conclusions with more data and further similarity analysis. Finally, we would put the dataset into use for computational pattern extraction evaluation tasks.

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T19G: Short Talks 19 - Expression

Time: Thursday, 26/Jul/2018: 7:00 - 9:00 · *Location:* Graz_4

Session Chair: Olivier Lartillot

The Role of Music Performer Gesture in Creating Expressive Sounding Music

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Background

Music performer gesture is associated with expressive intent, artistic interpretation of the music, and visual communication of emotion. Sloboda (1996) suggested that musicians use bodily gestures and feelings as a way of storing representations of expressive musical ideas, while Juslin (2003) proposed that principles of biological motion are one of five factors that comprise musical expressivity. So far, no empirical study has explored the relationship between a performer's expressive body movement and the listener's perception of audible expressivity.

Aims

1. To investigate the role of violinists' expressive bodily gesture during performance in the creation of expressive sounding music, and to consider how this role may be mediated by the emotional content of the music performed.

2. To test the validity of the emotion labels given to the melodies used.

Method

Three violinists were recorded performing 8 melodies, each intended to convey one of the emotions happy, sad, tender, or scary, under the performance conditions immobile (as little movement as possible) and visually expressive (focusing on visual expression while playing). The musical material consisted of 4 short melodies, composed for scientific purposes, (Thompson, Vuoskoski, and Clarke, 2016), and 4 longer melodies, chosen from classical violin repertoire. Forty listeners (mean age = 26.4, SD = 6.88), recruited via social media advertising, rated expressivity and discrete emotions in each performance on 7-point linear scales. The hypotheses were: H1) Each melody will yield significantly higher emotion ratings for the intended emotion, compared to the other three emotion ratings, and H2) There will be an effect of performance condition on listener ratings of audible expressivity.

Results

Two factorial repeated measures ANOVAs were carried out; one for the emotion ratings, and one for the expressivity ratings. For the emotion ratings, H1 was supported for 6 of the 8 melodies. For the expressivity ratings, H2 was supported for the 2 sad melodies, and the short-happy melody only. For the 2 sad melodies, the immobile condition significantly reduced ratings of expressivity, and for the short-happy melody the immobile condition significantly increased ratings of expressivity.

Conclusions

This study shows that a performer's approach to expressive body movement can affect perceptions of audible expressivity, but that this effect is influenced by various factors such as the emotional content and technical difficulty of the music. This study can inform embodied music cognition, performance practice and pedagogy.

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Importance of felt mood and emotion for expressive movement characteristics in pianists

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Background

While many studies show that expressive intentions and perceived emotions can be conveyed through gestures in a musical performance, more recently it has been shown that felt emotions also influence performer movement.

Aims

In exploring the influence of felt emotion on movement features in performance, we hypothesised that 1) higher levels of emotional engagement with the music would elicit more expressive movement (operationalised as amount of movement in typically expressive locations, such as head and shoulders, and amount of postural fluctuations) and 2) positive and negative felt affect would have different movement characteristics.

Method

Ten pianists performed a piece of their own choice in three conditions selected to elicit different levels of emotional engagement: low (instruction to play the piece as accurately as possible), medium (instruction to "communicate" the music), and high (emotional recollection task, followed by instruction to play the emotion as much as possible). After each performance in each condition, participants completed a mood questionnaire (PANAS), followed by a semi-structured interview. Pianists' movement was recorded by an optical motion capture system and the following features were extracted: amount of movement (AM), jerkiness, posture, postural lean (distance from head to piano), shoulder hunch (distance from head and mean location of shoulders) and head tilt (distance between head and right shoulder).

Results

ANOVAs for PANAS scores confirmed that participants' emotion (and therefore also emotional engagement) was affected by the conditions ($p < .05$), even when valence of the piece was considered ($p < .05$).

In support of Hypothesis 1, one-way repeated-measures ANOVAs revealed that performers exhibited significantly more expressive movement in medium and high emotional engagement compared with low emotional engagement. Jerkiness was lowest in the high emotional engagement condition in locations associated with technical movement (wrists and fingers).

In support of Hypothesis 2, positive-affect scores positively correlated with amount of expressive movement ($p < .05$). Negative-affect scores negatively correlated with amount of expressive movement ($p < .05$) and positively correlated with jerkiness of the left wrist ($p < .05$). Stepwise regressions further revealed that movement associated with negative affect depended on whether it was evoked by the performance (e.g. anxiety) or the music (e.g. feeling the sadness of the music). Performance-related negative affect was predicted by jerkiness in wrists ($p < .05$) and music-related negative affect was predicted by stillness in posture and more hunching of the shoulders ($p < .05$).

Conclusions

These results may benefit musicians in professional and educational domains, especially if struggling with performance anxiety, by suggesting they engage more in the emotional aspects of the music (as well as enjoy it) to more likely result in a more visually expressive and smooth performance. However, further research should disentangle the effect of performance-induced or music-induced emotions on movement features on pianists, as well as exploring a (combination of) higher level features.

Musical Expressivity: An Approach from Simulation Theory of Mindreading

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Background

One of the troubles which we encounter when attempting to account for musical expressivity is that pure instrumental music does not seem to provide any situation to be evaluated which many of current theories of emotion claim to be necessary. This makes the question of how we experience music as expressive of emotions a philosophical puzzle. In my talk, I propose that it could be the solution to compare the way we recognize the emotions in music with the way we recognize emotions in other people. What justifies this comparison is the fact that in both cases we can recognize emotions

only with perceptual information. I accept simulation theory of mindreading (SM, hereafter) and argue that it is through simulation that we can recognize emotions in music only from the auditory information presented by music.

Aims

The ultimate goal is to give an answer to the question of how we experience music as expressive of emotions. Adopting SM as a solution, I aim to suggest the specific mechanisms which allow the simulation used in mindreading to operate for music.

Main Contribution

Following a duplex version of SM which distinguishes two levels of SM (Goldman, 2006), I argue that while it is low-level SM which makes it possible for us to recognize musical expressivity for primitive feelings, it is through high-level SM that we recognize musical expressivity for cognitively more complex emotions. For this argument, I present mechanisms underlying musical simulation such as mirroring responses for actions, emotions, and sensations, mirroring response based on audiovisual mirror neurons, musical entrainment, the inter-modal MMI and amodal MMI proposed in Cox' mimetic hypothesis (Cox, 2001), the multimodality of human perception and the evolutionary history of the origin of human auditory system as well as human narrative impulse and the process of dynamic interactivity between music and listeners.

Implications

There have been theories which attempt to solve the problem mentioned above from the same perspective I take. However, no theory has provided a clear account of the exact way the analogy between the way we recognize emotions in music and that we do in others is achieved. Exceptional is Cochrane's 'simulation theory of musical expressivity' which attempts to give an account of the mechanisms behind the analogy by adopting SM as I do (Cochrane, 2010). However, stimulating as it is, it lacks a clear account of how SM operates in general and specifically for music, and shows limitation in its suggestion for the mechanisms underlying musical simulation. In contrast, I clearly show the exact way our experience of musical expressivity could be understood in terms of SM, and provide mechanisms underlying musical simulation in a detailed, more comprehensive way.

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How do Musical Means of Expression affect the Perception of Musical Meaning?

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Background

Musical meaning is an ongoing concern of psychologists and musicologists. What does music convey is a question reflected in large scientific accounts. Another focal point of this debate is how music conveys meaning that is perceived by listeners. In this empirical work, we focus on the latter question within the context of music branding.

Genre and style (sub-genre) of a musical piece assign a socio-cultural context to music by labeling songs for example as Rock or Punk. Thus, they evoke music-external associations and are potential predictors for perceived musical meaning. However, they also aggregate information embodied in various musical dimensions, such as rhythm, harmony, or timbre (Rentfrow et al., 2011). In contrast to genre and style, we conceptualize these music-intrinsic features as distinct underlying means of expression.

Aims

Our main goal in this work was to investigate the explanatory power of different music-intrinsic dimensions and features in predicting perceived musical meaning. Furthermore, we aimed at comparing these results to findings from prediction models employing genre and style as predictor variables, as well as to models relying on both, music-intrinsic, and aggregated features.

Method

In a large-scale online listening experiment (n=10.603), participants rated the fit between a total of 549 music excerpts representing 61 different music styles grouped into 10 different genres and a list of 36 attributes expressing musical meaning on four different dimensions: 'Arousal', 'Valence', 'Authenticity', and 'Timeliness' (the General Music Branding Inventory, GMBI).

We described our stimuli by a large set of music-intrinsic features (extracted directly from the audio signal) as well as genre and style as aggregated music features.

Thereafter, we developed a series of statistical models using random forest regression to predict perceived musical meaning. Thereto, we stepwise increased the number of musical dimensions and music-intrinsic features used as predictor sets while considering all possible combinations of these feature sets. In a second step, we integrated genre and style as predictors. Finally, we evaluated the prediction accuracy of our models and the variable importance of the individual predictors.

Results

A preliminary series of models indicates that combinations of music-intrinsic feature dimensions such as timbre, rhythm and dynamics lead to a prediction accuracy of perceived musical meaning (R^2=0.52), which is comparable to prediction models based on genre and style (R^2=0.55). Moreover, timbre related features exceeded the explained variance of other musical dimensions, such as rhythm or harmony.

Conclusions

Our contribution illustrates to what extent perceived musical meaning can be influenced by different artistic means of expression. Furthermore, we discuss the role of genre and style as predictors for perceived musical meaning and demonstrate how Music Information Retrieval prediction problems can be approached in the light of complex feature landscapes.

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The Expressive Role of String Register: An Ethological Examination of Fingering Choices in Classical String Instrument Playing

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Background

Classical string players have to decide how to finger their musical passages, or decide which fingers should play each note and where on the instrument. Typically technical ease is the main goal of fingering. However, sometimes fingerings are based on expressive intention rather than technical ease alone. For example, when aiming to increase the emotional intensity of a passage, advanced string players sometimes choose to play a passage using a high position on a low string even though upper position playing is more challenging. This study investigates this seemingly counterintuitive performance choice. Research in speech offers a possible explanation. When highly emotional, people tend to speak higher in their range (Banse & Scherer, 1996). Accordingly, utterances at the identical pitch level will sound more emotional if the speaker is perceived to have a lower tessitura than a higher one. Moving to a high position on a lower string might mimic this vocal emotional communication practice to convey a higher emotionality.

Aims

The method was generated from the following questions: for listeners, is there an audible difference between string registers (low- versus high-positions) and does that difference impact their emotional perception of a performance?

Method

Cellists were recorded playing 14 sustained pitches. For each pitch, one recording was made of that pitch being played in a low position on a high string and one recording of the same pitch in a high position on a low string resulting in 14 pairs of recordings of the same pitch played in different positions. In the experiment, participants were given two "sound groups" with example recordings: Group A with low position pitches and Group B with high position pitches. Participants were asked to identify which recorded pitch (of each pair) sounded most similar to Group B. In part two, one short melody was

recorded in low and high playing positions. In a 2AFC paradigm, listeners chose which of the two versions of the melody they perceived as more emotionally expressive.

Results

Results demonstrate that listeners are reasonably able to differentiate between the playing positions ($p < .001$) but might not interpret melodies played in a high playing position as more expressive.

Conclusions

From a pedagogical standpoint, these results can inform string teaching practices for training string students on how to approach fingering a musical passage, an essential skill for becoming a professional string instrument player.

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T5S: Short Talks 5 - Cognition

Time: Thursday, 26/Jul/2018: 7:20 - 9:00 · *Location:* Sydney

Session Chair: Janet Hsiao

A novel model of nonlinear auditory distortions relevant to music perception

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Background

Neural responses to audio signals have been shown to add nonlinear distortion products: frequencies that are not present in the original signal. These distortion products occur in response to pitch intervals (Lee et al. 2009, 2015) and temporal rhythms (Large et al. 2015). Higher-level perceptual and cognitive processes relevant to tonality and meter (e.g., psychoacoustical roughness, harmonicity, spectral pitch similarity, entropy, or statistical learning) likely operate on these distorted signals rather than on the original acoustical signals. This means that to develop and properly test models of higher-level processes, it is essential to precede them with models of nonlinear auditory distortion applied to the raw audio signal.

An established model of nonlinear audition is Large's gradient frequency neural networks (Kim & Large, 2015), which has been fitted to the aforementioned data from Lee et al. I take a different approach: one that makes no assumptions about underlying neural structures and is, instead, inspired by basic signal processing techniques.

Aims

To develop a simple model of nonlinear auditory distortion products to transform raw acoustical signals prior to them entering into higher-level models of music perception and cognition.

Main Contribution

In signal processing theory, there are two classes of model for time-invariant nonlinearities. First, there are memoryless models such as waveshapers in which a function maps each input amplitude to an output amplitude (e.g., overdriving an audio amplifier can be convincingly approximated by a sigmoid waveshaping function). Secondly, there are "memoryfull" models such as Volterra kernels where the history of the signal also contributes, nonlinearly, to the output. The latter are capable of capturing a greater range of real-world nonlinear processes, but have a considerable number of parameters that can only be effectively optimized given a precise set of controlled measurements. Such data do not currently exist for human audition.

I explore the use of a simple waveshaping function parameterized as a polynomial. Under the plausible constraint that the frequency magnitudes resulting from the waveshaping must be invariant to phase inversion of the input signal, it is possible to make substantial simplifications to this parameterization. This results in a four-parameter model which, when optimized to the totality (all four intervals) of the Lee (2015) data, fits it with considerable accuracy ($R^2 = .72$).

Implication

Modelling fundamental nonlinearities of human audition allows us to gain greater insight into the perception and cognition of music.

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Music Reading Expertise Facilitates English but not Chinese sentence reading: Evidence from Eye Movement Behavior

Sara T. K. Li[1], Belinda H. J. Chung[1], Jeffery C. N. Yip[1], Antoni B. Chan[2], Janet H. Hsiao[1]

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Background

Our previous studies showed that music reading expertise enhanced English word reading but not Chinese character reading (Li & Hsiao, 2018). This effect may be because music notation and English word reading both involve mapping horizontally arranged visual components to components in sound, in contrast to logographic Chinese reading.

Aims

Here we aim to extend our investigation to sentence reading through an eye-tracking study. We hypothesize that music reading expertise facilitates English but not Chinese reading.

Method

Chinese-English bilingual musicians and non-musicians with similar language proficiencies read English sentences, Chinese sentences, musical phrases, and sentences in Tibetan, a language novel to the participants, with eye tracking. English and Chinese stimuli consisted of three structural regularity conditions: syntactically and semantically correct, syntactically correct and semantically incorrect, and syntactically and semantically incorrect, whereas music and Tibetan stimuli consisted of syntactically correct and incorrect conditions. Participants then completed a sentence comprehension (for syntactically and semantically correct English/Chinese sentences) or a recognition task (for the other stimulus types) to test their comprehension/recognition abilities.

Results

We used the EMHMM (Eye Movement analysis with Hidden Markov Models; Chuk, Chan & Hsiao, 2014; http://visal.cs.cityu.edu.hk/research/emhmm/) method to analyze eye movement data. This approach summarizes each participant's eye movements in terms of person-specific regions of interests (ROIs) and transition probabilities among the ROIs using a hidden Markov model. Through clustering individual models, we discovered two common eye-movement patterns in music notation reading: top-focus pattern (fixating mainly at the top halves of the musical segments) and bottom-focus pattern. More musicians adopted the top-focus pattern, which may be related to information distribution of music notations. Interestingly, there were also significantly more musicians adopting a top-focus pattern in English reading, and this pattern was correlated with faster reading time and better comprehension in English reading. In addition, there were marginally more musicians adopting a top-focus pattern in Tibetan reading, and the top-focus pattern was correlated with longer fixation duration in reading syntactically incorrect Tibetan sentences. These effects were not observed in Chinese reading. These results suggested that the top-focus pattern resulting from music reading experience facilitates English reading and enhances sensitivity to structural regularities in Tibetan reading, but does not modulate Chinese reading. This phenomenon may be because music notations and English/Tibetan sentences (or alphabetic languages in general) have similar global forms and information distributions, and their reading rely on similar local component-by-component processing, in contrast to logographic Chinese reading.

Conclusions

These results suggest that the modulation of music reading expertise on text reading depends on the similarities in the cognitive processes involved. It also has important implications for the benefits of music education on language and cognitive development.

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Intelligibility of Death Metal lyrics: Effects of genre-specific musical knowledge and music training

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Background

Death Metal music with violent themes is often characterised by aggressive vocal and instrumental sounds, with the most explicit representation of violence contained in lyrical content that often describe acts of rape, murder, decapitation, and suicide. Vocalisations in Death Metal commonly comprise unnaturally low fundamental frequencies and high levels of distortion and roughness. These attributes decrease the signal to noise ratio, leaving the impression of growling, screaming, or other non-linguistic vocalisations associated with aggression and fear. It is not yet clear whether listeners are capable of perceiving intelligible words when vocalisations comprise such 'noisy' acoustic characteristics. Specifically, we ask: does genre-specific musical knowledge (e.g., an experienced listener or 'fan' of Death Metal) enhance intelligibility, and does general music training confer an additional benefit?

Aims

To investigate whether: (1) experienced listeners (fans) of Death Metal music perceive vocalisations differently to non-fans; and (2) general musical expertise impacts intelligibility.

Methods

In a 2×2 between-subjects factorial design (fans/non-fans, musicians/non-musicians), four groups of participants (n=16 per group) were presented with 24 sung words (one per trial), extracted from recorded music by the popular American Death Metal band Cannibal Corpse. On each trial, participants completed a four-alternative forced-choice word recognition task. Our sample of target words included both context-congruent words expected in the Death Metal genre, such as 'Kill', 'Die', 'Pulverize', and 'Suffer', in addition to context-neutral words, such as 'Me', 'I', 'Out', and 'It'. In choosing the foils that accompanied each target word in a trial, we ensured they were matched, where possible, on the number of syllables, onset phoneme category, coda, and rhyming characteristics.

Results

Intelligibility (word recognition accuracy) was above chance for all four groups, yet was significantly greater for fans relative to non-fans, and musicians relative to non-musicians. However, these results significantly varied as a function of group. In the fan group, intelligibility between musicians and non-musicians was statistically similar. In the non-fan group, intelligibility was significantly greater for musicians relative to non-musicians. A series of item analyses confirmed that differences in target word accuracy were not explained by (1) whether the word was congruent to the Death Metal genre or not; (2) differences in each target word's relative frequency in the English language; (3) the frequency of occurrence of each target word's orthographic neighbour(s).

Conclusions

These findings show that when perceiving noisy speech (in this case, a Death Metal timbre), fans and musicians have a general intelligibility advantage over non-fans and non-musicians, respectively. When listeners do not have genre-specific listening experience, music training affords an intelligibility advantage similar to that of experienced listeners of the genre. Results will be discussed in the context of perceptual learning and the benefits of expertise for decoding relevant linguistic information in sub-optimum acoustic conditions. Future work measuring perception of speech in noise will investigate whether enhanced intelligibility is general or specific, and whether mechanisms underlying intelligibility of 'noisy speech' are the same as intelligibility of 'speech in noise'.

Imaginative and creative thought processes of seven-year-old beginner cello players.

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Background

Seven-year-old children demonstrate imaginative and creative thought in their learning processes (Burnard, 2012). However, this aspect of learning is rarely examined in music education research (Pitts, 2014). The present investigation uses a case study approach to explore students' creative and imaginative perceptions of music and music learning (Barrett, 2001). The instrumental teacher's role in harnessing these perceptions to enhance learning and promote future musical engagement is also examined (McPherson, Davidson, & Faulkner 2012).

Aims

1. To investigate seven-year-old children's creative and imaginative thinking in learning the cello.

2. To investigate how children's creative and imaginative thinking changes across 18 months and influences ongoing musical engagement.

3. To investigate how the teacher supports this thinking while promoting skill development.

Methods

Through a longitudinal Action Research methodology (Kemmis, McTaggert & Nixon, 2014), 14 seven-year-old children's lived experiences of learning the cello were tracked across 18 months. Interpretative Phenomenological Analysis (Smith, Flowers & Larkin, 2009) of interviews with the children and parents were integrated with the teacher researcher's observations to investigate how children's creative and imaginative thought processes contribute to learning and impact future engagement.

Results

Two themes emerged from this qualitative investigation. Firstly, within a few months of learning the cello, children identify themselves as emergent musicians with skills to compose and perform their instrument. Analysis of the children's compositions, including their graphic representations of music, coupled with their descriptions of compositional processes highlight variance in how music notation and musical elements are perceived and prioritised. Based on these perceptions, children may deliberately or unconsciously strategise and compensate in their instrumental learning. For students with processing issues, exploration of their learning in this way can be particularly meaningful for both the teacher and student.

Secondly, discussion of skill development with children reveals imaginative thought processes in which they describe dream-like magical, musical worlds. These constructed domains point to perceptions children have of their emotional experience of music. Children's internalised personal competencies in their procedural learning may also be detected.

Across 18 months, results show that children's perceptions of music evolve and their magical, imaginative narratives dissipate into more concrete processes. Differentiation in the rate and way this occurs reflects several variables in the lived experience of each student. Teacher sensitivity and flexibility to these areas of student evolvement are impactful ways of supporting musical development.

Conclusions

The bilateral results of this research demonstrate that children's perceptions of music and learning to play the cello are diverse but also inherently creative and imaginative. Understanding individual students' needs through their internal perceptions enables the teacher to identify areas of focus and tailor personalised learning plans. This has the potential to effectively promote skill development in students of all abilities while safeguarding their continued future engagement.

Content, Delivery, and Perception: Investigating the Voice Teacher's Approach in Australia

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Background

Anecdote and recent research indicates that historical vocal methods found in technique books are not frequently passed from one generation to another by reading, but principally through teacher and pupil exchanges (Saathoff, 1995). However, studies reveal the quality of this teaching depends on factors including teacher intelligence, aptitude, and cognition

(Ekstrom, 1976; Hattie, 2003; Goodwyn, 2017). In addition, teacher personality is of significance when relating to students (Polk, 2006; Teachout, 2001). Therefore the measure of a quality voice teacher is defined not only through the content of their methodology, but through effective delivery (Allsup & Reimer, 2015).

Aims

To formulate the overarching traits of successful classical and music theatre voice teachers in order to ascertain the leading characteristics of a master voice teacher. Further, this research adopted a psychological perspective to consider their leadership, empathy, and personality traits.

Methods

Face-to-face interviews were conducted with 27 Australian tertiary classical and music theatre voice teachers in order to capture knowledge base, approach to training singers, and the perception of that approach. Participants were selected through purposive sampling and seven internationally-renowned voice teachers, representing indicative and contrasting perspectives, were chosen for analysis based on their status, expertise, and reputation as determined by the success of their students. Interviews were transcribed and analysed using Interpretive Phenomenological Analysis (IPA).

Results

Results indicate that top-tier voice teachers: 1) were well-informed on method, anatomy, physiology, and voice science, 2) acquired technical approaches through experience and empirical learning, 3) demonstrated a high level of empathy, and 4) exhibited ethical awareness and respect their responsibility as a teacher.

Conclusions

The approaches currently employed by elite-level, classical and music theatre voice teachers in Australia demonstrate commonalities through a modern interpretation of historical methodology. While modern technology has informed on acoustics, anatomy, and physiology, experience and empirical learning are the greatest methods through which these participants have acquired their technical approach. In addition, the participants commonly demonstrated a high level of empathy and sensitivity to the students and great respect for their responsibility as a teacher. They seek to empower their students with a methodology that will develop them technically and support them physiologically and psychologically as growing performers. These results offer clarity in defining an expert voice teacher and inform employers and students on desirable qualities common to this level of teaching.

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T26G: Short Talks 26 - Education

Time: Thursday, 26/Jul/2018: 8:00 - 9:00 · *Location:* Graz_1

Session Chair: Elena Alessandri

When the Fixed Do Tends to Move: The Ambiguity of the Solfège Syllabary

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Background

Although ubiquitous in music pedagogy, the repercussions of various systems of mnemonic syllables are rarely the subject of empirical research in professional music education. Only a handful of surveys involve musicians or students of music (e.g. Mikumo, 1992; Rogers, 2007), while others deal with non-musicians. Most previous studies use short, context-deprived sequences of equal-length tones played on the piano or an electronic instrument, without excerpts from musical literature or comparisons with external criteria. It seems that the issue of choosing a suitable syllabary remains a matter of pedagogical tradition and is seldom examined in scientific research, although even expert subjects such as Huron (2006) confirm the importance of mnemonic syllables in conceiving and understanding pitch relationships. This study is an attempt to establish a new approach to the impact that solfège systems used in the ear training of professional musicians have on their understanding of music.

Aims

The aim of this study is to determine the correlations between the participants' hearing system, the syllabic system used, the perception of tonal relationships and other relevant factors in order to improve the awareness of the solfège-based ear-training processes in professional music education.

Methods

A study was conducted among 196 undergraduate music students who participated in listening exercises. The participants were asked to recognize and write down the didactic syllables which appeared in their mind while listening to excerpts of recordings of tonal, common-practice symphonic literature. A linear regression analysis was performed with the variables of the participants' age, sex, duration of music education, major subjects, solfège systems they were exposed to and the most recent grades achieved in ear-training courses.

Results

The results show that most of the participants use solfège syllables in their everyday professional activities. Their understanding of tonal processes such as modulation and mode mutation relies heavily on the nature of the solfège system they were exposed to in their earlier music education. The correctness and nature of their answers correspond closely with the nature of the applied solfège system and the internal logic of the musical material heard in the excerpts. Even listeners with absolute pitch showed better results if their training included relative solfège systems in tonal contexts, while participants with relative pitch displayed significantly poor results if trained by methods of absolute pitch intonation.

Conclusions

Greater awareness of the consequences of choosing a solfège system in music education could contribute significantly to students' understanding of both tonal and atonal repertoires. A flexible combination of approaches in accordance with the implicit logic of concrete musical material could prevent difficulties originating in the limitations of individual solfège systems and raise the level of comprehension of pitch relationships.

References

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The Relationship between the Recognition of Songs and Two Song-teaching Strategies among First- to Fourth-Grade Students

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Background

Research on integration or independence of songs' melody and text in perception and memory has shown contradictory results. However, there are few studies investigating song recognition among children (Feierabend, Saunders, Holahan, & Getnick, 1998; Morrongiello & Roes, 1990). In music education, this is of particular interest if classroom activities include songs presented with text and neutral syllable. In other words, when hearing or learning a song, do children establish text or melody as the primary mental image? Or is it a composite of both components? To our knowledge, little or no attention has been given to uncover children's cognitive processes in the songs' recognition.

Aims

This study investigates how children encode songs in memory depending on two song-teaching strategies, specifically it seeks to determine how children compare two songs with its modified versions (when melody or/and text changes occur).

Method

Children aged 6 to 9 (N=94) attending a city private school participated in a two-phase study. Phase one occurred during seven weeks in general music instructional time presenting a song A with text and a song B with neutral syllable, adding the text after four sessions. In phase two, children were individually interviewed. Two recognition tests were presented using a researcher-developed app for an iPad. For each song, children were asked to listen to four audios and decide if the new songs sounded like the song taught in class and why (same melody and neutral syllable; same melody and different text; different melody and same text; different melody and text). Data analysis was conducted using MaxQda software, version 12.

Results

For both songs, the component most valued in song recognition for all grades was the melody, although children also acknowledge text changes when it occurred. Text becomes a less valued component as children grow older. When comparing the code frequency in terms of components valued in recognition, the dissimilarity measure revealed song B had the most heterogeneous answers. For both songs, results also showed that components valued became less divergent as children grow older. Thirty-two different ways of comparing songs were coded (e.g., same, not the same, different, almost the same, really different).

Conclusions

Children appear to have the ability to treat independently melody and text in perception and memory, although there is evidence that a smaller group of children still focus on text to recognize songs. The song-teaching strategy seems to influence children's song recognition, especially for the song first taught in neutral syllable. For this song, children seem to use more diversified strategies in the recognition process. Further studies should replicate these procedures with younger children.

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A large scale study on the participants of the „Jugend musiziert“ music competition: Starting points and questions

Heiner Gembris[1], Claudia Bullerjahn[2]

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Background

The music competition “Jugend musiziert” (youth makes music) is the largest and most important music competition for young musicians in Germany since more than 50 years. The main aim of “Jugend musiziert” is to encourage activities and the advancement of talents in music. This competition, which takes place every year, is organized into three levels: the regional level, the federal state level, and the national level. Winners of the regional level can participate in the federal state level, winners of this level can enter the national level (Bundeswettbewerb). In 2017, ca. 25,000 young people attended the regional level, a number of ca. 2,500 participated in the Bundeswettbewerb. Interestingly, research on this competition and its participants is very scarce. About 30 years ago, Bastian (1987;1989;1991) carried out comprehensive research on “Jugend musiziert”, on the participants, their socio-cultural background, motivation, their experiences with music etc. Since then, only very little research has been published. This paper deals with the participants of the Bundeswettbewerb, carried out in June 2017 in Paderborn / Germany.

Aims

The general aim is to get a deeper insight into the socio-cultural contexts, motivation, interests, preferences, personalities, leisure activities etc. of the participants of the Bundeswettbewerb “Jugend musiziert”. Furthermore, aspects like health and wellbeing, preferences, stage-fright are included as well.

Methods

We developed a standardized paper-pencil questionnaire, which covers a broad range of aspects, e.g. experiences with the “Jugend musiziert” contest, socio-cultural variables, personality, musical training and practice, motivation, musical preferences, support by the family, etc. On the one hand, the questionnaire contains questions, which allow direct comparisons with earlier research carried out 30 years ago. On the other hand, we used questions related to up to date issues like the use of social media and the connections between making music, health, and wellbeing. All participants of the Bundeswettbewerb and their parents were informed about the research project before the contest started. The questionnaire was administered to ca. 2,260 participants. Virtually all attendees where contacted personally at the central registration desk. They were asked to fill in the questionnaire immediately, if possible, or to return the completed questionnaire in the following days into special boxes available at every of the 20 places where the contest was carried out. The data will be evaluated with SPSS 25.

Results

A number of 1,143 valid questionnaires was returned (rate of return = 50%).

The age ranged from 9 to 24 years (M = 15.1; SD = 2.14), 62% (n=692) were female, 38% male (n=425). The evaluation of the data has just started. We will be able to present a collection of results at the conference.

Conclusion

First inspection of the data is very promising and indicates lots of relevant results based on a large sample are to be expected.

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P2G: Posters 2

Time: Thursday, 26/Jul/2018: 9:00 - 10:00 · *Location:* Graz Poster Room

Investigating the effect of musical training on judgments of melodic expectancy

Chara Giannou[1], Ioanna Zioga[2], George Kosteletos[1], Christina Anagnostopoulou[1]

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Background

Lifelong exposure to music is strongly linked to the ability to form expectations about subsequent notes while listening to music. The fulfillment or violation of these predictions is a crucial component of the emotional and aesthetic experience of music (Huron, 2006). People with musical training are more accurate in detecting pitch violations compared to people without musical training (Zioga et al. ,2016).

Aims

There has been little research on how melodic expectancy is modulated by musical expertise. In the present study, we aimed to fill this gap by investigating the effect of musical training on judgments of melodic expectancy. Considering the previous work, first we hypothesized that musicians would be more accurate in identifying different degrees of expectancy; second, that they would give higher expectancy ratings to expected notes, because they feel more sure; and finally, that they would be more tolerant to expectancy deviations (consider less unexpected) due to higher familiarity with the musical corpus.

Methods

Thirty-six individuals (18-30 years old) took part in the experiment. They were split in two groups, 18 musicians and 18 non-musicians, based on their amount of musical training, as measured by the Gold-MSI Musical Training factor (Müllensiefen et al., 2014). The task used 200 five-note isochronous melodies ending either on a high- or a low-probability note. They were created using the IDyOM computational model of expectation (Pearce, 2005), which generates probabilistic predictions about upcoming events in an evolving melody, based on the frequency with which each of these events has followed the context in a previously given corpus of music. Participants listened to the melodies and were prompted to rate how well the last note fitted its previous context on a 5-scale: 1 (highly unexpected) to 5(highly expected).

Results

Musicians rated both expected and unexpected notes as being more expected, compared to non-musicians, but that this was statistically significant only in the expected condition. Both musicians and non-musicians were able to discriminate the expected vs. unexpected notes, and this was statistically significant.

Conclusions

Musicians' higher expectancy ratings in response to the expected notes could be due to their increased confidence of the degree of expectancy. Musicians' higher ratings to the unexpected notes could be related to their increased familiarity with unusual notes, compared to non-musicians. We speculate that the familiarity of some musicians with other non-western musical systems could also be a factor. We suggest that the findings have novel implications for investigating the effect of musical expertise on judgments of melodic expectancy.

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Dissecting the "Plink": From Guessing to Understanding the Gist of Very Short Musical Elements

Felix Christian Thiesen[1], Reinhard Kopiez[1], Christoph Reuter[2], Isabella Czedik-Eysenberg[2], Daniel Müllensiefen[3], Anna Wolf[1]

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Background

Rapid musical recognition capacities have been investigated by several studies since the turn of the millennium. Many publications suggest high recognition rates for specific compositions and genres, mostly for stimuli extracted from popular songs (e.g., Krumhansl, 2010). Different authors report durational thresholds for title identification between 100 and 400 ms. For genre recognition, reported minimum durations vary between 125 and 400 ms. However, many previous studies suffer from unclear stimulus selection criteria, probably resulting in biases by lucky strokes of prominent passages. At the same time, none of the studies known by the authors use intramusical parameters (e. g. instrumentation, gender of voice, etc.) as target criteria. An extensive online study will investigate the role of these parameters in overall recognition processes.

Aims

Using a set of randomized excerpts from popular songs in a first online study (n = 517), we identified a realistic range of absolute recognition rates for different stimulus lengths. We then isolated a set of intramusical parameters which were highly agreed upon in a subsequent expert rating. These arrangement specific items will be used in a second online study, allowing for insights on the unfolding of partial recognition processes.

Methods

Using a strictly controlled and randomized process of stimulus extraction, we generated 330 short elements (50 ms to 800 ms). An expert rating (n = 6) on 17 items (voice, guitar, percussion, bass, etc.) was conducted for all stimuli, followed by an Intra-Class Correlation analysis. In an online study with n = 517 participants (f = 317, m = 185, n/a = 3; age M = 32.7, SD = 12.8), each participant was presented with randomized stimulus subsets. Participants indicated the presence of intra-musical parameters as well as title-specific meta information.

Results

While genre specific agreement in the expert rating remained poor to fair for stimuli with a length from 50 to 400 ms (κn = .15 to .34), specific parameters such as the presence of a singer's voice (κn = .46 to .48) and gender (κn = .66 to .69) were highly agreed upon in a quite stable way. In the online study, we observed high dependencies of recognition rates from the source materials, ranging from 0 to 20% – even at 400 ms stimulus duration. Pearson χ2-analyses show statistically significant associations between song section (verse or chorus) and detection rates, $\chi2(2, N = 517) = 85.1$, p = < .001. An additional recursive partitioning revealed voice recognition and perceived sonic entropy as main predictors for title identification.

Conclusions

Rapid musical recognition processes seem to be dependent on complex interactions of a great variety of sonic parameters. Target criteria used in previous studies do not allow for more insights on the unfolding of these differentiated human capacities. For obtaining stimuli with objective arrangement parameters, we constructed a set of stimuli on the basis of multitrack recordings for an additional online study. This will allow us to observe what parameters could be suited best as predictors for overall recognition rates.

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Are musicians at an advantage when processing speech in babble noise?

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Background

Several studies have shown that musicians may have an advantage in a variety of auditory tasks, including speech in noise perception. The current study explores whether musical training enhances understanding two-talker masked speech. By combining an off-line and an on-line measure of speech perception, we investigated how automatic processes can contribute to the potential perceptual advantage of musicians.

Aims

The aim of the current project is to test musicians' and non-musicians' speech processing in the presence of two-talker masker, as captured by:

1. A behavioral measure of sensory sensitivity sentence recall in different target-masker ratios (TMRs)

2. An online measure of speech processing eye-tracking and pupillometry employing visual world paradigm

Method

Materials. The first experiment is a sentence recall task: participants are asked to recall target sentences embedded within two-talker maskers. Both target and maskers are female Dutch speakers. Maskers are presented in varying TMRs, ranging from -3 to -9 dB. Based on the results of the pilots of this experiment, the target-masker ratios were determined for the eye-tracking experiment. The stimuli were presented in three conditions: target sentences presented in quiet or with two-talker maskers at 0 and -5 dB.

Procedure and Design. 10 musicians and 21 non-musicians participated in the study so far. In the first experiment, participants were asked to repeat the words they can recall from the target sentence that was presented with two-talker maskers. The onset of the target sentences was delayed by 500 ms from the maskers' onset, and the participants were instructed to repeat the sentence that starts later. The percentage of correctly recalled key-words were used to estimate listeners' thresholds.

The second experiment implemented the visual world paradigm. Participants' gaze fixations and pupillary responses were measured during a visual search for a target that was presented auditorily. Participants were instructed to identify among four images displayed on a computer screen, a target word, that they heard in the target sentence. The images consisted of a target and a competitor (phonologically similar to the target) and two distractors. The participants' time course of gaze fixations to the target and/or the competitor indicated how quickly they can integrate the acoustic information in the signal when they were accessing the mental lexical.

Results

The preliminary results showed that musicians slightly performed better as the TMR levels increased in the sentence recall task. The gaze fixations were delayed and were less in proportion in the masked conditions and as the intensity of the masker increased for both groups. The event related pupil dilations for both groups exhibited less change in ERPD in the -5 TMR condition compared to the 0 TMR condition. For the musician group, quiet condition appeared to have the biggest change in ERPD across conditions.

Conclusion

We aim to collect more musician data before drawing any further conclusions and conducting statistical analysis.

The Effects of Music on Episodic Memory

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Background

Music evokes emotional responses and influences mood, promoting its universal use and important status in many human societies. Furthermore, the association between music and events where emotion plays a role has been shown to make certain musical content more memorable (Mikutta et al., 2015). This phenomena results from a significant interaction

between emotion and memory mechanisms in limbic structures, alongside the significant influence of auditory stimuli on memory (Cahill & McGaugh, 1990). Time-specific experiences are held in episodic memory, and interpreted as events in a serial form. Autobiographical events can be reconstructed, and time-sensitive details can be regurgitated. The interaction of auditory stimuli with memory is described in a current memory model by Alan Baddeley (2015), and supports the view that episodic memory permits the association of emotions and other contextual knowledge with auditory details, while semantic memory stores a more structured record of adopted facts and meanings. Distinct neural networks serve the retrieval of information from semantic and episodic memory (Platel et al., 2003). Functional imaging studies have exhibited similarities in the effects of verbal and visuo-spatial material, and musical material. Separate groups of neural connections enable the interpretation of separate components of music (such as loudness, pitch, timbre, rhythm), and networks combine to facilitate our perception of music as a whole.

Aims

The authors advance a deeper understanding of the effects of the specific musical dimensions on episodic memory. This review forms part of a larger body of research, whereby the authors are working towards multiple perceptual and computational models of human auditory perception.

Methods

This poster details the current understanding of how music and emotional responses are connected through memory systems.

Results

The outcome of this review has influenced the design of user-studies to be conducted by the authors, which test the effects of certain characteristics of audio on memory, and their disruption of specific cognitive tasks. In studying the effects of specific musical dimensions on memory processes, the authors have discovered research implications in the field of multimodal interface design. The authors propose to provide guidelines for sonification design within application frameworks whereby information will be conveyed via auditory streams. This will facilitate software developers, providing control over disruptive, distracting and memory-triggering elements in sonic content. Mechanisms in control of emotional reactions influence the effects of certain sonic attributes on cognitive function.

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"Dance, Dance, Dance" – Towards Integrating Embodied Music Cognition into Music Recommender Services via Smartphone-Assessed Movement

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Background

Numerous studies have shown a close relationship between movement and music and proclaimed the body to be an active contributor in meaning formation (Maes, Leman, Palmer and Wanderley, 2014). That is why Leman (2007) calls for new non-verbal, embodied possibilities to describe music and its experience as well as technologies to query music in a corporeal way. Smartphones and their inherent motion sensors are ideal devices to capture movement during music listening for two reasons: Compared to Motion Capture, it is possible to collect data from a larger audience because the experimental setup is easier. Second, smartphones also allow the collection of data in the field.

Aims

The goal of the presented study was to explore how and to which extent movements captured by mobile-device generated motion sensor data can be related to musical qualities. The study further aims on establishing models to perspectively

provide music recommendations based on smartphone-assessed movements. Thus, users should be enabled to interact with music databases by moving a mobile capturing device (like a smartphone or smartwatch) and receive music recommendations based on that very movement.

Method

Participants (N = 23, mean age = 34.6 yrs, SD = 13.7 yrs, 13 females, 10 males) moved a smartphone to 15 musical stimuli of 20s length presented in random order. After each piece, participants were interviewed about their movements and the music. An additional video camera captured participants' movements for reference and to record the interviews. The following stimuli's musical qualities were assessed by three music experts: rhythm, downbeat, backbeat, syncopation, tempo, accentuation, articulation, beat position, melodic direction, consonance, pitch level, pitch range, mode, complexity. A factor analysis of music qualities yielded three factors: "rhythmicity", "pitch level + range" and "complexity". Motion features related to tempo, smoothness, size, regularity, and direction were extracted from smartphone motion data and correlated with the above music factors. Motion and Music properties were averaged over time for each stimulus and participant.

Results

Results revealed significant correlations between movement features and musical qualities. The motion features selected by a 20-fold lasso predicted the musical properties to the following degrees "rhythmicity" (R^2: .47), pitch level and range (R^2: .03) and complexity (R^2: .10).

Conclusions

So far, results show that we were able to predict the rhythmicity of musical pieces through participants' movements, whereas for "pitch level + range" and "complexity" only little variance could be explained. Future work will focus on applying time series features that could lead to further insights for qualities related to non-periodic "gestalt" in particular.

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Exploring the reward prediction error and its relevance to music

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Background

The reward prediction error is a relatively young psychological concept only seldom contained in textbooks. It was discovered in 1993 by a group of neuroscientists around Schultz et al. and later refined by (Fiorillo, Tobler, & Schultz, 2003) in a modified setting of classical conditioning. It was shown that the response of dopaminergic neurons is maximized when a presented reward (food) was least expected. The same thing happens with unexpected gifts for Christmas, unexpected lottery-wins or those of (inferior) sports teams etc.

Aims

It is the attempt of this contribution to transfer and extend the concept of the reward prediction error to music and its aesthetic appreciation. So far, unexpected progressions or developments have mostly been conceptualized as violations of expectations, e.g. Koelsch and Siebel (2005). However, these sometimes miss the vast importance of higher-tier, more structurally important, and thus potentially positive musical violations. And while an empirical verification will certainly be a challenge, these kinds of violations may extend from the micro level of milliseconds to the meso level of formal processes up the macro level of historical stylistic change in music.

Method

In the first place, this is a theoretical approach and integrates a broad spectrum of sources from neuroscience, cognitive processes music (Koelsch, Rohrmeier, Torrecuso, & Jentschke, 2013), research on expectation (Margulis, 2007) up to aesthetics and emotions (Meyer, 1956, p. 70). To provide at least some empirical verification for formal processes in music, continuous response measurement (Geringer, Madsen, & Gregory, 2004) was applied to music with unexpected courses of development.

Results and conclusions

The core of this poster is a graphical representation visualizing these aspects: 1. Four options of what can follow an existing expectation are identified and placed on a continuous spectrum: negative violation, non-fulfillment, fulfillment and positive violation. It is assumed that the reward-experience increases in this order along the spectrum. 2. The various implications of the reward prediction error for music can be conceptualized on a neuronal, cognitive, textual and contextual level. 3. The longer the musical excerpts or processes to be examined, the lower is the degree of (potential) empirical verification.

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The impact of memory and stimulus features in inducing sadness and melancholy

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Background

Music is known to evoke emotions through a range of mechanisms, but empirical investigation about the mechanisms for different emotions is sparse. The present study investigated how affective experiences to music and pictures vary if induced by personal memories or mere stimulus features. The particular focus is on examining the impact of the induction mechanisms and modality on the experience of sadness and melancholy.

Aims

This study aimed to find out a) whether stimuli involving personal memories and stimuli for which the emotional impact was based on stimulus features would differently impact the experience of sadness and melancholy and b) whether this would be different between two distinct modalities (music and picture).

Methods

Prior to the experiment the participants were asked to select four types of musical and four types of picture stimuli according to distinct criteria concerning the emotion induction mechanism (memory vs. stimulus features) and valence (pleasant vs. unpleasant/aversive). In the experiment the participants (N = 30) evaluated their affective experiences to the self-chosen material. Evoked sadness and melancholy for each stimulus were rated on a 7-point scale from not at all to extremely. EEG was recorded throughout the session.

Results

Significant main effects over sadness were found for all variables: modality ($F(1, 29) = 6.24$; $p = .018$), valence ($F(1, 29) = 30.39$; $p = .000$), and mechanism ($F(1, 29) = 16{,}15$; $p = .000$). Sadness was generally experienced more prevalent when evoked by pictorial stimuli, and when induced by memories rather than stimulus features. Analysis also evinced significant interactions of mechanism×valence ($F(1, 29) = 20.66$; $p = .000$), and modality×mechanism×valence ($F(1, 29) = 5.03$; $p = .033$). The impact of memory was particularly strong in inducing sadness when the stimuli were unpleasant. When evoked by pleasant musical stimuli, sadness was induced prevalently through stimulus features.

In respect of melancholy significant main effects of valence (F (1, 29) = 10.33; p = .003), and mechanism (F (1, 29) = 24.17; p = .000) were found. In contrast to sadness, melancholy was experienced more typically in the context of pleasant stimuli. Memory was more effective than stimulus features in inducing melancholy. Significant interactions were found for modality×valence (F (1, 29) = 5.93; p = .021), mechanism×valence (F (1, 29) = 6.07; p = .020), and modality×mechanism×valence (F (1, 29) = 4.84; p = .036).

Analysis of EEG-data corroborated the findings by relating frontomedial theta activity to memory-evoking material.

Conclusions

The results showed certain interaction effects of mechanism, stimulus valence and stimulus modality. While effects were mainly similar in music and pictures the findings suggest that when personal memories are involved, stronger positive emotions were experienced in the context of music even when the music was experienced unpleasant. Sadness and melancholy were generally more efficiently evoked by memories than by stimulus features. The experience of these emotions increased strongly by the involvement of memory, particularly in the condition of unpleasant music.

Off-beat phrasing and the interpretation of the singer's tone of voice

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Background

Singers, composers, and rappers often create off-beat onsets of phrases and stressed syllables (Temperley, 2001; Condit-Schulz, 2016). However, off-beat linguistic events have turned out to be difficult to process (Gordon et al., 2010). In line with this, off-beat phrasing is thought to cause instability, not only in the music, but also in the listener's interpretation of the singer's tone of voice, and the meaning of the lyrics. For example, off-beat phrasing might sound less sincere, as if there is a subtext to it (Pattison, 2017).

Aims

An online listening experiment was created to investigate the effect of timing as a prosodic cue expressing affect.

Method

Thirty participants (average age 55,4; SD = 17,8) listened to 27 sung sentences, consisting of five or six syllables, preceded and accompanied by a piano accompaniment. All sentences were sung once but were digitally edited in three different ways, creating syncopations. In one version the stressed syllables were aligned with the first beat, in another version, they were timed one-eighth note before the first beat, and in the last version, they were aligned with the second beat. Sentences were statements, questions, commands, and ellipses, distributed over nine melodies. After each sentence the listener's rated on a 7 point Likert scale to what extent the singer was sincere, insecure, and sounded compelling; whether the lyrics were emotional, superficial, and sounded natural; whether the fragment sounded loaded and energetic; and whether the melody was interesting, and music and lyrics were a good match.

Results

After a factor analysis on the ten Likert scales, three factors remained: Rightness, Upsetness, and Compellingness. Regressions on these factors revealed that timing just marginally affected the ratings. Nevertheless, Rightness was rated slightly higher for on-beat phrasings, compared to early and late phrasing, especially in Iambic sentences. As Rightness seemed to be a combination of both moral and aesthetic rightness, this result is in line with the hypothesis that there is a connection between musical stability and the interpretation of the singer's tone of voice. A striking secondary finding was that the effects of other musical aspects (for example measure and tempo) on the ratings for all variables was much higher than the effect of sentence type.

Conclusions

Music in general, and timing in particular, function as prosodic cues in language perception, affecting the listener's interpretation of the singer's 'tone of voice'.

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Strong Experiences with Yodel

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Background

"Strong Experiences with Yodel" is a subproject of a PhD thesis investigating the relationship between the local yodel style in Unterwalden (Central Switzerland) and emotion. It is methodologically based on the "Strong Experiences with Music" (SEM) system by Gabrielsson (Gabrielsson, 2011; Gabrielsson & Lindström Wik, 2003). Gabrielsson collected over 1300 individual reports of people describing the strongest experience with music (any genre) they have ever had. Content analysis revealed that these experiences consist of physical, perceptual, cognitive, emotional, existential and transcendental, personal and social aspects. Although active yodelers usually describe the Unterwalden yodel in connection with identity and emotion constructs (Gasser, 2014), no systematic investigation has yet explored this relationship.

Aims

The study aims at analysing the physical, psychological and contextual components of strong experiences with yodel by comparing them with the SEM system to highlight commonalities and aspects specific to this musical style.

Method

52 yodel performers (34 male, 18 female, mean age 51yrs, range 27–75) active in choirs in the Unterwalden region were asked to describe (in writing) the strongest experience with yodel they have ever had and additionally to fill in a questionnaire asking personal data, context in which the experience took place, and emotional reaction to it (using the Geneva Emotional Music Scale [GEMS] [Zentner, Grandjean, & Scherer, 2008]).

These reports were content analysed using the SEM descriptive system to observe the extent to which different factors apply to the yodel population. Descriptive statistics were used to help contextualise and interpret the report texts.

Results

The written reports show a wide spectrum of strong experiences: positive feelings (83%), physiological reactions such as tears, shivers or piloerection (62%), a cognitive loss of control whilst being touched by the music (60%) and community aspects (56%) are the main characteristics reported. The questionnaires show that nearly all of the experiences emerged with live music (96%) and mostly with unaccompanied, purely vocal yodel (96%). 61% of the participants had their experience while they were yodeling.

According to the GEMS (5-point scale) wonder (3.3), transcendence (3.3) and joyful activation (2.9) are the predominant musical emotion categories among the nine first-order factors.

Conclusions

The results provide for the first time a detailed, solid account of yodelers' physical and psychological reactions to strong experiences, highlighting what makes this music style unique from the psychological perspective of the involved people and allowing a comparison with other genres of music.

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Preferences for different emotional response scale types in music experience

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Background

Zentner, Grandjean and Scherer (2008) suggest that musical emotions included in Geneva Emotional Music Scale (GEMS) are best for depiction of affective reactions to music, however listeners may also use another emotional terms.

Aims

The aim of the study was to find whether there are preferences in describing emotional response (modal emotion, music emotion or affect dimensions) to various musical excerpts.

Method

The procedure was performed twice with different music pieces for each participant. While listening to the music piece, the participants indicated their feelings on three emotional scales: modal emotions (e.g. happy, sad), music emotions (GEMS, e.g. nostalgia, transcendence) and affect dimensions – valence and arousal. At the end of the procedure, participants chose a response that best suited their feelings during listening to music. The sample (N=439, 131 men, mean age = 23.14, SD = 5.51) was recruited on-line (N=319) and in the laboratory (N=120). While the majority of the Internet sample had music education background (71%), the majority of the laboratory sample did not (57%).

Results

The analysis was conducted separately for three samples (Laboratory1 (L1), Laboratory2 (L2), Internet (IN)), due to differences found between the responses.

1. In sample L1 participants generally preferred to use the music emotions scale in the description of the emotional reactions to music ($p<0.01$). Additionally, the unpleasant and activating music led to the preference of modal emotions scale more often than the affect dimensions preference ($p<0.05$).

2. In sample L2 no general preference for scale type was found. However, the significant dependence between a music piece and the preference for scale type ($p<0.05$) occurred. For unpleasant and pleasant activating music the modal emotions scale was more often preferred than the music emotions scale ($p<0.05$, $p<0.05$). For pleasant and calm music the affect dimensions were more often preferred than the music emotions ($p<0.05$) and the modal emotions scales ($p<0.05$).

3. In sample IN participants generally preferred to use the music emotions scale ($p<0.001$). Additionally, for negative and activating music the least preferred was the music emotions scale ($p<0.01$) and for a piece denoted as deeply sad the least preferred was the affect dimensions type of response ($p<0.01$).

Conclusions

The findings suggest that there are differences in scale type preferences when describing emotional reactions to music, although these results were not fully consistent. The differences in the outcomes among samples might be connected with the type of sample: Internet or Laboratory and the way participants responded in these conditions. The second possible explanation could be the music education background that may influence the individual differences in granularity of affective reactions to music (Kantor-Martynuska, Bigand 2013) and therefore the measured preference. This explanation however should be further investigated by enriching the experimental procedure possibly with more precise measures of music education background.

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The Role of Enculturation in Music-Induced Emotions: A Study on Psychophysiological Responses During Music Listening

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Background

Cross-cultural studies on facial expression have suggested that while physiological responses are culturally invariant and more universal in nature, self-reports of experienced emotion are influenced by cultural learning and vary more across cultures (Levenson, Ekman, Heider, & Friesen, 1992). Soto, Levenson, and Ebling (2005) also found that the subjective responses of Chinese Americans and Mexican Americans to loud noise stimuli were predictive of the groups' tendencies towards emotional expression, whereas their physiology was less differentiated. However, it is yet unclear whether this pattern would be observed in a more complex auditory context, such as music listening. As existing cross-cultural studies in music and emotion have mainly focused on emotional recognition, the impact of enculturation on different components of music-induced emotions remains largely unexplored.

Aims

To investigate how different components of music-induced emotions (subjective feeling, physiology) are affected by enculturation.

Method

Sixty five participants (mean age 27.4, SD = 6.98, 35 females) were recruited in three groups based on nationality (Finns = 22, Greeks = 22, Chinese = 21). The stimuli were comprised of Western, Greek, and Chinese music that was selected from previous studies that rated the emotional character of the music. Twenty excerpts were used (8 Western, 6 Chinese, 6 Greek), with durations ranging from 50 to 67 seconds. Self-reports of the felt emotions were used to collect continuous ratings of valence and arousal, along with measures of physiological activity (heart rate, skin conductance, and respiratory rate). Ratings of intensity, familiarity with the excerpt and familiarity with the music style were collected after each excerpt was presented.

Results

There were significant differences across the groups in the familiarity of Greek and Chinese music ($p < .001$), but not in Western music. A multivariate analysis of variance (MANOVA) on the subjective ratings for Western music revealed a significant main effect of nationality $F(6, 114) = 5.78$, $p < .001$, $\square 2 = .24$. Further univariate ANOVA's indicated that there were significant difference in valence and intensity scores for Western music, while arousal responses were similar and not significantly different. A MANOVA on the physiology scores showed that there were no significant differences in the physiological responses across the groups $F(6, 98) = 1.61$, $p = .15$.

Conclusions

This study concurs with previous research and suggests that enculturation has a differentiated effect on the components of subjective feeling and physiological activity to music-induced emotions. It also shows that Western music can be used as a baseline across certain groups to minimize discrepancies in familiarity. The study has methodological implications as it argues for mixed methods of measuring emotions in cross-cultural research.

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Georgian folk music as a tool for emotional impact

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Background

It is widely acknowledged that folk music is closely linked with the vital needs of people. Not only do centuries-old folk samples represent a source of aesthetic pleasure: a utilitarian element was always dominant as well, especially related to folk music's emotional impact on people.

Aims

The aim of my paper is a demonstration of emotionally influential forms of folk music usage in contemporary Georgian society - Georgian folk music application in the context of political demonstrations, military operations, music therapy and the advertising industry, where Georgian folk music has different kinds of psychological influences on people.

Main Contribution

Historical sources demonstrate that already in the V-IV centuries BC the same result of emotional impact was caused by war songs (Donadze, 1990:8). This paper discusses the phenomenon in parallel with its modern equivalent – military operations and political demonstrations, where singing and listening to pieces based on heroic themes intensifies the growth of people's patriotic spirit and puts them in a state of "battle trance" – the brain produces different neurochemical materials and the person doesn't feel any pain or fear. Instead, he feels some excitement which causes patriotic feelings (Jordania, 2011:97). But research shows that in the case of Georgian military operations even the most powerful and motoric folk piece Khorumi causes not an increase of aggression but a feeling of power and unity.

The influential power of Georgian folk music is properly estimated by representatives of the advertising industry. Advertisements differ from each other according to their target groups – Georgian customers or foreign tourists. In the first case, the emphasis is on today's popular folk repertoire, which causes a feeling of familiarity towards the advertised product. In the second case folk music from the mountainous regions of Georgia is used. By demonstrating the exoticism of Georgian culture and the beauty of its nature, foreigners' interest is guaranteed.

Georgian music therapy appeared in the 1970s, although already a thousand years ago healing songs were part of any healing rituals here. One of the theories perceives Georgian folk song as the bearer of specific emotional information related to a certain archetype and its characteristics. By listening and/or performing a song, a person achieves an emotional state related to the specific archetype (Khukhunaishvili, 2014:4). As for the practical sessions of music therapy, coaches not only demonstrate folk songs but also teach it and sometimes try to sing with patients in the format of a folk play, revealing similarities with psychodrama (Moreno, 1995:336).

Implication

In my paper I discuss additional reasons and factors of the strong influential power of Georgian folk music. This is of major importance for understanding the role and potential of traditional culture in contemporary Georgia.

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Autopilot revisited – differences in emotion regulation between university based music and non-music students, and music college students

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Background

Emotional regulation plays a fundamental role during the adolescent phase (medically up to 25 years), and within a musician's life. Successfully learning to regulate emotions during adolescence is key. Individuals with better skills in emotion regulation have a lower risk of anxiety, depression, aggressive behaviour, and even unemployment. Despite evidence pointing towards music students as an 'at risk' population due to the anxiety they experience following the demands of their training, very little is known about their emotion regulation abilities. Depersonalisation, a disorder marked by emotion regulation difficulties, is a particular area of interest. The prevalence of depersonalisation – the number of individuals significantly affected by a condition – is higher than previously thought, and its frequency could be compared to anorexia nervosa. It occurs alongside a broad range of conditions and can occur amongst healthy individuals in transient phases. It can be a primary disorder or be secondary to sleep loss and anxiety disorders. Little is known about the age of onset, the prevalence and correlates of depersonalisation in adolescents, and no research has focused specifically on music students.

Aims

The study's aim was to investigate emotion regulation ability within an adolescent population via a measure of depersonalisation, and to compare the differences in prevalence and presentation of this condition between students of music (University vs. College) versus non-music students.

Methods

A total of 93 students, music college students (26), university (music) students (31) and non-music students (36), completed an online questionnaire. The groups were evenly distributed in age (mean = 21.3 years), education level, and relationship status. We analysed the prevalence of depersonalisation using the Cambridge Depersonalisation Scale, and investigated its correlates including distress, identification with profession, and hours per day and total number of years practised.

Results

The main finding was that 34% (music college), 40% (non-music students) and 43% (music students) were in the range of clinically significant depersonalisation. Non-music students' depersonalisation phases were lengthier and more frequent compared to both music groups and musicians reported less mental distress compared to non-musicians. Within the music student data there was an interesting relationship between the amount of time spent practising and professional identity. Students who had practised for longer (6 years+) reported fewer phases of depersonalisation than those who practised for less time. Overall, students who had practised for fewer years and longer hours were more affected by depersonalisation.

Conclusions

Experience of depersonalisation is common amongst adolescents, as was found in our sample. However, a closer view on the quality of depersonalisation revealed key differences between music students of varying experience; consistently practising an instrument/voice over a longer period was associated with more successful emotion regulation in our musicians. Rather than being pathological, experiencing depersonalisation, as shown here with the more experienced music students, could serve as tool or healthy coping strategy to learn to regulate emotions and reduce mental distress associated with the challenges of music training and performance. Prospective studies are needed to investigate (clinical) relevance of depersonalisation for the development in adolescents.

Reasons for liking sad music in a population from Turkey: Relations with music empathy and rumination

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Background

Paradoxically, many people are attracted to works of art that evoke negative emotions such as sadness and fear. Research on why people like sad music has shown that certain personality traits including empathy (Eerola, Vouskosky & Kautiainen, 2016) and rumination (Garrido & Schubert, 2013). Music empathy, which has been defined as an empathic style of thinking specific to music (Kreutz, Schubert & Mitchell, 2008), has also been found to be associated with liking sad music. There is no empirical work on liking sad music in Turkey despite existence of Turkish styles known for their specialization on sadness and distress (Stokes, 1992).

Aims

We intended to assess the relation of liking sad music with music empathizing and rumination. The reliability and validity of a scale for music empathy would also be established for this purpose.

Methods

Participants are asked to complete the Turkish translations of Liking Sad Music Scale (LSMS; Garrido & Schubert, 2013) and the Music Empathizing scale (Kreutz, Schubert & Mitchell, 2008), the Turkish version of the Basic Empathy Scale (Topçu, Erdur-Baker & Çapa-Aydın, 2010), and the Turkish version of the Repetitive Thought Questionnaire (Gülüm & Dağ, 2012).

Results

Both the Turkish translation of the LSMS and Turkish ME scale showed sufficient internal consistency. The significant correlation of the ME scale and the Basic Empathy Scale is evidence of its validity. ME correlated significantly with LSMS and was a significant predictor of LSMS after the variance due to age, gender, experience in performing music, and basic empathy has been controlled. Although rumination correlated with LSMS it was not a significant predictor after the other factors have been controlled.

Conclusions

Establishing reliability and validity of the music empathizing scale supported the cross-cultural significance of this concept. The results about the predictive power of ME and RTQ were mostly consistent with results obtained in other cultures and extended them in certain ways.

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Musical Affect and Embodiment: Fear, Threat, and Danger in the Music of The Lord of the Rings

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Background

Research in music perception suggests various ways in which music might portray, express, or evoke fear and danger (e.g. Huron 2015, Juslin & Laukka 2003), but how closely do these findings reflect musical practice? Do composers actually use these techniques when aiming to express fear and danger?

In J.R.R. Tolkien's The Lord of the Rings, the protagonists have much to fear along their quest, including the Nazgûl, or wraiths, who are determined to reclaim the Ring for their evil leader. The Nazgûl are the narrative's central symbol of fear; Tolkien writes that "their chief weapon was terror." Peter Jackson's three-film adaptation brings the threat of the Nazgûl to life not only visually, but also musically, through composer Howard Shore's soundtrack. The music accompanying the Nazgûl is directly connected to fear and danger and thus provides a rich opportunity to explore in musical practice principles observed by empirical literature.

Aims

I use recent research in music perception, speech prosody, and animal ethology to analyze ways in which the music of the Nazgûl in The Lord of the Rings communicates fear and danger. I argue that the effects of many of the musical techniques employed by Shore are derived from various aspects of human, physiological, and embodied experiences of fear.

Main Contribution

Studies in music performance and speech prosody suggest that acoustic features that communicate fear include fast tempo, variability in volume, high pitch, rising pitch contour, narrow pitch range, and microstructural irregularities (e.g. Juslin & Laukka 2003). Techniques theorized to express threat, danger, or aggression include scream-like and non-linear sounds, low pitch, loud volume, falling pitch contour, and approaching sounds (e.g. Arnal et al. 2015, Bach et al. 2009). Analysis of the soundtrack accompanying the Nazgûl demonstrates abundant use of these factors; I examine specific examples of each and consider how acoustic features as discussed in empirical literature are translated musically in practice. My analysis demonstrates high consistency between the ways in which recent perceptual research suggests that fear and danger are expressed through music and fear-related music in practice.

Implications

Future research might explore how widespread the use of these techniques is, particularly in soundtracks. As suggested by this case study, physiologically-based, fear-related musical techniques may be critical not only for horror films, but for other genres as well.

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Neural underpinnings of musical tension in preadolescents: a free-listening fMRI study

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Background

Musical tension refers to the different emotions that arise when listening to unstable musical events, such as dissonance or unstable tonal function [1]. These points in the music engender strong expectations for continuation that involves both cognitive and affective processes, and violation or confirmation of these expectations generate an experience of tension or resolution. In the Western tonal system, music contains tension-resolution relations that are partly determined by the harmonic functions among chords [2]. Using real musical pieces, a previous fMRI study in adults found that musical tension is associated with brain activations in key areas of affective processing such as the orbitofrontal cortex and amygdala [3]. However, despite the ubiquity of music listening in adolescents, the neural correlates of musical tension during this period of life remain unknown. Furthermore, preadolescence is marked by an imbalance in the development of prefrontal and limbic systems resulting in less influence of prefrontal systems relative to the nuclei accumbens and amygdala in emotional reactivity [4].

Aim

This study aims at investigating how musical tension is processed in the brain of preadolescents using fMRI and naturalistic pieces of music.

Methods

We scanned 20 preadolescents while they listened to 8 short pieces of music containing a melody played at the violin and an accompaniment played at the piano. For each piece, we extracted the final tonic and dominant chords ending the different musical phrases to create the resolution and tension conditions. In a separate experiment including 20 other preadolescents, we are collecting tension ratings for each final chords of the musical phrases to validate the experiment at the perceptual level.

Results

We will use the perceived tension ratings for the dominant chords and perceived resolution for the tonic chords as block regressors in our whole-brain analyses to identify brain areas related to musical tension and resolution. We also will test the regional hypothesis that musical tension is associated with higher activation in limbic regions compared to musical resolution, and will select bilateral amygdala and nuclei accumbens as regions of interest.

Conclusions

This study is the first to investigate the neural correlates of musical tension and resolution in preadolescents and might identify brain regions linking expectation and emotional experience during this transition period of life.

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Neural correlates of movement cued with heard and imagined music

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Background

Music and other auditory cues are increasingly used in movement rehabilitation. Functional magnetic resonance imaging (fMRI) findings suggest that imagined music may also act as a cue for movement (Schaefer et al., 2014). Frequency-domain electroencephalography (EEG) findings showed an alpha band desynchronisation for both perceived and imagined music (Schaefer et al., 2011) while the beta band was implicated in imagined rhythm (Fujioka et al., 2015). However, it is currently unclear how alpha and beta responses may interact during heard and imagined music-cued motor behaviors.

Aims

The main goal of the current study is to investigate the electrophysiological correlates of movement cued by either heard or imagined music, by measuring frequency-domain EEG responses. We hypothesize that heard and imagined music-cued movement will elicit similar beta responses compared to moving in silence, while the increased attentional demands of the mental imagery will lead to a greater alpha desynchronization as compared to music or silence, even when moving. A secondary goal is to explore the influences of cognitive abilities on motor precision and accuracy under different cueing conditions.

Method

Twenty-four non-musicians (13 male; Mage = 24.6 years, SD = 3.0) completed cognitive measures assessing working memory, attention, and auditory imagery abilities. As a motor task, participants watched a visual display that required presses with four fingers on a response button box, together with two musical stimuli for which the melody contour matched the sequence of button presses. The task was also completed while imagining music and in silence. They also completed the same task while hearing and then imagining music without moving. EEG was measured using a 32-channel Biosemi setup, data were processed and analysed in EEGlab (MATLAB), using full data segments. For the alpha and beta responses we extracted the 8-12Hz and 15-30Hz range respectively. To address the hypotheses, we statistically compared musical imagery, music, and silent conditions, both when moving and not moving, using permutation tests with a $p < .05$ threshold and FDR multiple comparisons corrections.

Results

Analyses suggest that both the alpha and beta responses are similar between hearing and imagining music, when moving or not. Compared to moving in silence, music- and imagery-cued movement conditions show significantly more beta desynchronization, but no difference in alpha desynchronization. Behavioral analyses of cognitive and motor measures are underway.

Conclusions

Preliminary findings indicate that hearing and imagining music may lead to similar neural activations while moving. These results can inform music-based intervention designs as mental imagery is increasingly used in movement rehabilitation practice.

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Are Chills Specific or Variable Experiences? Effects of Musical and Non-Musical Stimuli

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Background

Aesthetic chills, the experience of gooseflesh, shivers and tingling sensations, have been linked to musical features, personality traits and listening situations. However, there are significant limitations in the conceptualisation of the phenomenon (Maruskin, Thrash and Elliot, 2012), such as whether chills describe a specific strong emotional experience, or whether they reflect numerous distinct states that share physiological indices. Consequently, there is a further question of whether musically-induced chills differ from those experienced with non-musical stimuli (Zentner, Grandjean and Scherer, 2008), which could be significant when considering inconsistent findings across existing literature.

Aims

This study aimed to identify possible differences in emotional experience and physiological activity across chills responses, utilising chills-eliciting images, videos, texts and music.

Method

A web study was developed, where participants were exposed to one of three stimuli for each of five categories (image, text, video, music, music video). The stimuli were characterised by different thematic qualities. Reports of physiological activity and emotional response were collected to determine the experience of chills, with multiple correspondence analysis utilised to explore patterns in the data that may reflect distinct chills responses linked to distinct themes in the stimuli, Finally, ratings of trait empathy were explored.

Results

The web study showed that participants (N = 179) experienced a total of 344 chills responses; trait empathy scores were not significantly related to chills frequency. Results from the multiple correspondence analysis revealed patterns in physical activity and emotional response data, from which three distinct chills experiences were constructed: warm chills (warmth, smiling, warmth in chest, happy, energy, relaxed), cold chills (cold, frowning, sad, anger), and moving chills (lump in throat, tears, intense, moved, affectionate, tender). These categories mapped differently onto the stimuli used: cold chills were linked to themes of comfort in the face of injustice; warm chills were associated with certain pieces of music and large crowds acting in unison; and moving chills were linked to mixed negative and positive themes, such as reunions after separation, and certain pieces of music.

Conclusions

The current study provides novel evidence of a multi-mechanism process of aesthetic chills: different qualities and cues in a stimulus may engage with varying perceptual and cognitive processes, resulting in phenomenologically distinct chills responses. Furthermore, whilst chills elicited by music may not be consistently different to chills elicited by other art, variations in the response and eliciting features have substantial implications for existing musical chills research. Results are discussed in terms of underlying theories of chills, common chills-eliciting cues in various stimuli, future approaches to assessing musical chills, and the need to reconceptualise chills in terms of emotion and accompanying physiological indices beyond gooseflesh and shivers.

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The Screaming Strings of the Silver Screen: Signaling Fear with the Use of Acoustic Features of Human Screams

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Background

Film music scholars and reviewers have sometimes noted the scream-like quality of music used for scary scenes. Perhaps the most famous example is “The Knife” cue from Herrmann and Hitchcock’s Psycho (1960) with the “screeching, upward glissandi” in the violins (Brown, 1982). Music excerpts for scary scenes in other films, including The Shining (1980), The Exorcist (1973), and It Follows (2015), have also been described in reviews as “screaming”. Do these scary film soundtrack excerpts actually sound like human screams?

A unique acoustical feature of screams was recently demonstrated by Luc Arnal, et al. (2015). Specifically, screams occupy a niche range of the modulation power spectrum (MPS). The MPS is a 2D Fast Fourier transform of a spectrogram that exhibits both temporal and spectral power modulations. Screams occupy the region between 30 and 150 Hz (called “roughness”), which no other human vocal signal occupies. Artificial alarming sounds, such as fire alarms, are also found to exhibit the same acoustic feature (Belin & Zatorre, 2015).

Aims

This study investigates whether scream-like music from scary films has the same acoustic roughness quality of human screams.

Method

To test this, we will analyze and compare the MPS of the roughness region for musical passages from scary scenes from 10 films (scary scenes being operationalized as scenes containing an immediate threat that is attacking) to the MPS of the roughness range of actual human screams. Our hypothesis is that there will be no significant difference between the MPS of the roughness regions of the samples of scary film music and those of human screams.

Results

Pilot results comparing the MPS of music from scary scenes to non-scary scenes taken from 3 horror films demonstrated that the MPS values in the roughness range were significantly stronger for the scary excerpts than for the non-scary excerpts ($p < .0001$). Further results are pending.

Conclusions

Results will contribute to a deeper understanding of music and emotion and may contribute to dispel the notion that ‘scary’ musical devices have emerged via enculturation alone.

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Investigating the Suspenseful Potential of Drone Tones Using Ambiguous Images

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Background

Horror and thriller films often use drone tones (sustained low or high pitches) for suspenseful scenes. The use of drone tones for suspense in film may have been inherited from the use of repeated notes and pedals in the ombra and tempesta topics (McClelland, 2012, 2014, & 2017). But there may also be ethological reasons why drone tones are threatening. If there are, then drone tones should be able to communicate a threat outside the context of a horror film. It might be possible to investigate this conjecture using a paradigm involving ambiguous images. Jesse Prinz and Angelika Seidel examined the influence of fear on visual perception using ambiguous images (Prinz & Seidel, 2012). These images were drawings that could be interpreted as a threatening image or as an innocuous one. For example, one of the images could be seen as rope or as a snake. Prinz & Seidel had participants listen to a piece of music, briefly view the three ambiguous images, and then write down what they believed they saw. There were three conditions of music: fearful, happy, and neutral (no music). Consistent with their hypothesis, participants were more likely to see a threatening image in the fearful music condition than in either the happy music condition or the neutral music condition. If the addition of a drone-tone to a pre-existing non-threatening musical excerpt signals danger or suspense, we might expect a similar effect to occur in a pseudo-replication of this design.

Aims

This study tests whether a drone tone can communicate suspense outside the context of a scary film through a behavioral study design involving ambiguous images.

Method

Following the methodology of Prinz & Seidel, participants will listen to music, briefly view an ambiguous image, and be asked to write down what they saw. There will be two audio conditions: non-threatening music and threatening music (created by layering a drone tone underneath the non-threatening music). The drone will be electronically generated and will be low in pitch. I predict that participants will see a threatening image more often in the threatening music condition than in the non-threatening music condition.

Results

Pilot results demonstrate no difference between the two conditions incongruent with the hypothesis.

Conclusions

The results and post-experiment interviews suggest that several changes to the method need to be implemented for a more effective study.

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Effects of background music on the mental health and task performance of office workers

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Background

Many researchers have found that music influences the mental health and task performance of the listeners. Expecting these effects, background music (BGM) is frequently used in workplaces. However, such effects are not fully examined in real workplace settings.

Aims

This study examined whether BGM influences the mental health and task performance of office workers.

Method

Participants

Fifty office workers in an IT security company participated in this field experiment.

Stimuli and procedure:

During four weeks, no music (first week), a standard music program for office work (second week), a sedative music program (third week), and a lively music program (fourth week) were played in the office all day long. A music piece was not repeated within a day. Participants worked for a week with/without a BGM program and filled out a questionnaire on Friday.

Questionnaire:

The questionnaire consisted of items judging the impression of the BGM played, items from the Brief Job Stress Questionnaire (BJSQ), items on the Positive Health from the Psychological Lively Scale (ver. 2), and items concerning work performance in the office. The BJSQ includes five subscales; fatigue, anxiety, depressed mood, anorexia, and insomnia. The Psychological Lively Scale (ver. 2) has three subscales; emotional stability, sense of fulfilment, and vitality for living. The questions concerning work performance include four subscales; communication improvement, task performance, negative effect on task performance, and sleepiness.

Results

In order to examine the effects of BGM on office workers' mental health and task performance, We conducted separate repeated-measures ANOVAs for the twelve subscale scores, with BGM condition as the within-subjects variable. Only for task performance, the ANOVA yielded a significant main effect of BGM condition, but post-hoc multiple comparisons using the Bonferroni method found no significant differences between any pairs of conditions.

Next, the Pearson's correlation coefficients between these subscales and the evaluation of BGM were calculated. The scores on "unpleasant-pleasant" in the impression judgment of BGM were used as the evaluation of BGM. All subscale scores of the BJSQ had significantly negative correlations with the evaluation of background music. The scores on the task performance and communication improvement and those on the emotional stability and sense of fulfilment had significantly positive correlations with the evaluation of background music.

Conclusions

BGM did not influence stress levels, Positive Health, and the work performance of office workers. However, the evaluation of BGM correlated negatively with stress levels and positively with Positive Health and the work performance. Specifically, participants with a positive evaluation of BGM tended to have low stress levels, high Positive Health, and high work performance. In future, it is necessary to establish the causal relationship underlying these correlations.

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Personality, trait empathy, and kinds of musical reward predict healthy and unhealthy music listening strategies

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Background

The Healthy-Unhealthy Music Scale (HUMS) was developed as a tool to assess maladaptive ways of musical engagement that are associated with proneness to depression (Saarikallio, Gold, & Mcferran, 2015). However, to the best of our knowledge, there have been no studies that would have identified underlying personality and emotional traits that might be associated with such maladaptive engagement. Furthermore, the kinds of musical reward associated with healthy and unhealthy music listening styles have not been previously investigated.

Aims

The first goal of this research is to identify what kinds of musical reward are related to healthy and unhealthy music listening styles. Second, what kinds of personality traits (including empathic and emotional traits) best predict unhealthy and healthy relationships with music?

Methods

318 Participants (Age M = 32 years, SD = 12.45, 138 males), recruited through the mailing lists of universities and Prolific, completed an online survey comprising HUMS, Interpersonal Reactivity Index (IRI), Emotional Contagion Scale (ECS), Big-Five Inventory (BFI), and Barcelona Music Reward Questionnaire (BMRQ; Mas-Herrero, Marco-Pallares, Lorenzo-Seva, Zatorre, & Rodriguez-Fornells, 2013).

Results

Most significant positive correlations were observed between healthy (HUMS) score and BMRQ factors representing mood regulation, musical seeking, social reward, and emotional evocation (all $r >= .61$, $p < 0.001$), followed by happiness (ECS) ($r = .50$, $p < 0.001$). On the other hand, unhealthy (HUMS) score demonstrated most significant positive correlations with personal distress (IRI) ($r = .34$), emotional evocation (BMRQ) ($r = .30$), and neuroticism (BFI), (all $p < 0.001$) in addition to sharing a similar correlation profile with other BMRQ factors.

Stepwise regression analyses exploring the types of musical reward (BMRQ) that best predict healthy and unhealthy music listening strategies revealed that mood regulation, musical seeking, and social reward explained 66% of the variance in healthy scores, whereas unhealthy scores were best explained by emotional evocation, and musical seeking (10% variance explained).

Similar analyses investigating the personality traits underlying healthy and unhealthy listening strategies revealed that extraversion, openness to experience (BFI), and the sensitivity to ‘catching’ positive emotions (contagion of happiness and love) explained 20% of the variance in healthy scores, while personal distress, empathic concern, (-ve), perspective taking (IRI), contagion of sadness and love (ECS), agreeableness (-ve) and extraversion (BFI) explained 29% of the variance in unhealthy scores.

Conclusions

Our results suggest that the different kinds of musical reward are mostly associated with healthy rather than unhealthy music listening strategies. Many of the traits predicting unhealthy listening strategies are associated with sensitivity to negative emotions (high personal distress and contagion of sadness; low empathic concern and agreeableness), suggesting dysfunctional regulation of negative emotions and hence proneness to depression.

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Enhanced Pitch Discrimination Ability in Williams Syndrome: A Case Study with Newly-invented Non-verbal Assessment

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Background

Williams Syndrome (WS) is a genetic neurodevelopmental disorder caused by a microdeletion on 7q.11.23 chromosome, which involves growth retardation, intellectual disabilities, and cardiovascular disease. While individuals with WS exhibit various cognitive deficits, many of them show marked interest in music and some even possess absolute pitch. However, previous experimental studies reported lower basic music skills, such as pitch and rhythm discrimination, in WS compared to age-matched controls (e.g., Hopyan et al., 2001). Nevertheless, those studies may have underestimated musical abilities in participants with WS due to the use of verbal responses, considering their limited language capacity (e.g., Martinez-Castilla et al., 2016).

Aims

The present study invented a new pitch discrimination task with minimal involvement of language and aimed to further clarify musical abilities and discrepancies between musical and linguistic abilities in WS.

Methods

YO was 9 years 5 months old boy who was diagnosed as WS when 1 year old based on FISH. He had normal hearing, pulmonary artery stenosis, mild mental retardation, and receptive vocabulary equivalent to 7 years 2 months. In the pitch discrimination task, two piano tones (range: C4-A4, 60 dB) were presented sequentially (duration: 1000 ms, SOA: 2000 ms) whose intervals were either minor/major seconds or thboys, mean 6 years 9 months).

Results

YO earned full marks (4/4) for m2, M2, and m3, and 2/4 for M3, while averages of the control group were 2.1 (SD=1.20), 2.2 (0.97), 2.4 (1.12), and 2.4 (1.07), respectively. Crawford & Howell's modified t-test (1998) irds (m2, M2, m3, M3; four trials each). Participants made responses via a miniature three-step stairs and a small doll, and they were asked to let the doll climb one stair up or down when the second tone was higher or lower than the first one, respectively. Prior to the task, we ensured that YO could use higher/lower terminology correctly and understood the experimental instructions. YO's performance was contrasted with 35 typically-developing children matched for vocabulary level (18 showed that YO's performance was significantly higher in the M2 (p=.034) and tended to be higher in m2 (p=.059) and m3 (p=.078) conditions than the control group.

Conclusions

A boy with WS showed overall higher pitch discrimination performance than vocabulary-age matched controls. The elimination of linguistic demands in the present task may have revealed potentially enhanced pitch discrimination ability in YO. Although musical abilities have been indicated to increase along with vocabulary in typically-developing children (Martinez-Castilla et al., 2016), those in individuals with WS could be disproportionately high when contrasted to their language abilities. Our newly invented task should be useful for further examinations of musical abilities in neurodevelopmental disorders that involve language deficits, such as WS, intellectual disabilities, and autism spectrum disorder.

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Spatial perception in congenital amusia revisited

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Background

It is still under discussion in how far pitch processing and spatial processing share a common representational framework. If pitch and spatial processing rely at least partly on shared processes, then spatial processing deficits can be expected in congenital amusia. However, there are differing findings regarding this matter. Douglas and Bilkey (2007) found a connection between spatial processing difficulties in a sample of 8 amusics using a Mental Rotation task (Shepard & Metzler, 1971). Tillmann et al. (2010) tested amusics' spatial abilities with two different tasks, finding no difference between controls' and amusics' accuracy or reaction time and concluding that there is no deficit in spatial processing in amusia. Williamson et al. (2011) also addressed amusics' spatial processing utilizing a version of the Mental Rotation task and two further tasks assessing memory for sequences of spatial location (Milner 1971) and memory for visual patterns (Della Sala et al. 1997). No difference in accuracy between amusics and controls on any of these tasks was found.

Aims

While the memory aspect of spatial processing seems to be intact in amusia, as shown by Williamson et al., different components of spatial abilities, such as spatial orientation or perspective taking are yet unexplored in amusia. We therefore conducted two tests assessing different aspects of spatial rotation abilities in amusics.

Method

We administered the Object Perspective Taking Test (Hegarty & Waller, 2004), measuring perspective taking abilities, and the Santa Barbara Solids Test (Cohen & Hegarty, 2012), assessing not only mental rotation but the ability to identify the two-dimensional cross section of a three-dimensional geometric shape. This test also provides information on the source of difficulty by analyzing error patterns along the two dimensions included in the task: Complexity of the geometric object and the orientation of the cutting plane (Cohen & Hegarty, 2012). These two tests were chosen as they differentiate between spatial orientation abilities and spatial visualization abilities. We first administered the test to a dizygotic twin pair (see results section), of which one twin is amusic and the other one is not. In addition, we have tested seven further amusics and ten controls so far but testing is still ongoing.

Results

The twins performed differently on one of the visual tasks, with the non-amusic twin (83% correct) outperforming the amusic twin (20% correct). The results of both spatial abilities tests taken together indicate that the amusic twin can perform egocentric spatial transformations, as shown by the Object Perspective Taking Test. This was also the same strategy she employed incorrectly on the Santa Barbara Solids Test, resulting in her low scores. This shows that she is able to make egocentric spatial transformations but struggles with object-based spatial transformations that were required of her, with which her sister had no difficulties.

Conclusions

This study shows that at least this one amusic has impaired spatial visualization abilities with intact spatial orientation abilities. This warrants further scrutiny of amusics' spatial abilities and a fractionating of their skills in this regard.

Multi-modal communicative behaviours in music therapy as markers of depression

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Background

Humans are social: our mental lives shape, and are shaped by, our interactions with conspecifics. During interaction, we use a range of multi-modal communicative behaviours. Some of these behaviours are pragmatic: they show the cognitive/affective state of interactants. Examples include posture, vocal timbre and speech rate. Other behaviours are phatic: they create social bonds and interpersonal understanding. Examples include synchrony, imitation and turn-taking. Pragmatic and phatic behaviours are similar across different communicative activities: for example, pitch fluctuation features in speech and much music, while the temporal predictability underlying synchrony can characterise music, speech or gesture. Pragmatic and phatic behaviours inform us about normal variations in our states or relationships, such as

tiredness or disagreement (Nolan, 2006; Ogden, 2006). However, communicative behaviours are also impacted by variations beyond the normal, including mental health conditions such as depression. These behaviours are therefore a rich source of information about wellbeing. This information has the potential to greatly enhance existing mental health assessments, which have been criticised for psychometric weaknesses and subjective bias (Cummins et al, 2015).

Existing studies show that pragmatic behaviours change during depression; for example, speech becomes slower and lower in pitch (ibid.). It is thought that phatic behaviours also change during depression. However, little is known about these interactive aspects: existing studies typically examine speech-based, interview-style interactions, focusing solely on the interviewee's behaviour; they also typically examine one modality, despite the multi-modality of real-world communication.

Aims and **Main-Contribution**

In order to better understand the communicative changes that occur during depression, we need to examine richer, more intensely interactive communicative contexts. Active music therapy (MT) provides just such a context. It is strongly multimodal, embracing rhythmic, melodic and tonal material alongside and as part of song, speech and movement. Since it does not prioritise speech, it foregrounds non-verbal communication. Finally, it is profoundly interactive: the therapist is continually coordinating with and responding to the client. We therefore suggest that the MT context is especially informative about the links between how we communicate and our mental health. In particular, systematic examination of communication during MT seems likely to enable the identification of "behavioural markers" - features of communication which reliably indicate depression presence and severity. We will present specific, testable, theoretically-motivated hypotheses regarding the nature of these behavioural markers, both within client and/or therapist behaviours and also during interpersonal communication and behavioural adaptation between client and therapist. We aim to test these hypotheses empirically in the near future, and we hope our work will generate interest, and stimulate further systematic research, in this area.

Implications

The identification of behavioural markers will improve our understanding of depression, enhance reliability of assessment, and allow the collection of high-quality empirical evidence regarding MT's efficacy for depression. Furthermore, many pragmatic and phatic behaviours are shared across different communicative contexts; there is also evidence for behavioural markers in other conditions, such as autism spectrum disorders. There is therefore good reason to expect that this approach will generalise both beyond depression and beyond MT.

Going Beyond the Rhetoric of the 'Mad Creative' Myth – Musicians and Mood Disorders

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Background

Rhetoric is widely found in the language surrounding mental health for creative artists. The idea that creatives have a melancholic temperament dates to Greek philosophy and today's language still identifies melancholia with bipolar-depression, between creative and manic phases, often attributed to well-known musicians (e.g. Schumann).

This rhetorical shift from scientific to lay writing has many issues. Firstly, backdating mental health issues is problematic from a medical viewpoint. Furthermore, correlations between mania and creative productivity are taken erroneously to imply inverse causation, contributing to the concept of the 'mad genius' as a vital component for creative musicians. This situation has contributed to hostile attitudes towards medical mental health research amongst musicians as the 'creative mystique' theory is perpetuated from a perceived position of (scientific) power.

The 'mad creative' myth has developed an independent life, anchored in beliefs. In depression treatment, this myth has shown to be a significant impediment.

Aims

This article illustrates how rhetoric is used in mental health medical science, and aims to soften barriers for musicians to approach the subject of the 'mad creative' myth as exemplified by Robert Schumann's case.

Main Contribution

For the 'mad creative' myth, Schumann's case has proved crucial in many writings. It is frequently used to link bipolar-depression to creative output. Lay writers use inverse causation to demonstrate that phases of creativity, marked for example by numbers of successful compositions, coincide with phases of mania. How deeply this myth is rooted was demonstrated by the controversy ignited after Schumann's previously lost medical documents were published. These suggest syphilis rather than manic depression as root of his illness, and therefore don't support the idea of 'mad creative' in the same way. The main contribution of the present paper is to build on the doubt raised by latest evidence, and present Schumann's case as evidence against the 'mad creative' myth where it has previously been used in support.

The 'mad creative' concept is rhetoric and so an approach to questioning it should look beyond (medical) science. Leaving aside Schumann's possible bipolarity, historical and musicological clues that have not been previously looked at together promise new and interesting angles of challenge. In terms of historical facts, many do not match the myth's supporting timeline. The musicological argument is centred on gender: a female composer. Schumann's wife, a gifted composer herself, was encouraged by her husband despite the convention of their time. Consequently her compositions were published under his name. Research has restored many of Clara's works to her name. These works match those identified as in line with Schumann's 'peek/mania' years. Subtracting a substantial amount of Schumann's work from these years questions the peek/mania theory altogether.

Implications

Successful musicians' mental health outreach and treatment is based on acceptance and (peer) support, which can only be achieved if myths in this area can be convincingly replaced by science. In the light of the historical and musicological findings discussed in this paper, the 'mad creative' myth, rooted in rhetoric and public belief, must be reconsidered.

Anxiety in music performance: The clinical effects of cognitive hypnotherapy and eye movement desensitisation and reprocessing when applied to advanced pianists

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Background

Studies into music performance anxiety (MPA) are numerous; however the problem still exists. In fact 60% of performing musicians will experience this at some time during their lifetime (Wesner, Noyes & Davis, 1990). Current investigations are dominated by therapies that focus on conscious (explicit) processes for the reduction of MPA, with a paucity of research exploring unconscious (implicit) processes for the alleviation of this psychological condition.

Aims

The research aimed to expose to scientific scrutiny two psychodynamic therapies which target implicit processes: cognitive hypnotherapy (CH) and eye movement desensitisation and reprocessing (EMDR). The effects were assessed when applied to advanced pianists (Grade 8 or above) suffering from MPA. It further aimed to contribute to theories of optimal performance (in relation to assessment of performance quality) and the role of cognitive anxiety in relation to state/trait anxiety.

Methods

A repeated-measure design was adopted using mainly quantitative data supplemented by qualitative information on subjective cognitive anxiety. Participants were of mixed gender (27 females and 16 males aged 18-26 with three over 30), randomly assigned to a therapy or control group. Both state and trait levels of anxiety were collected at baseline. Both therapy groups received two interventions of either CH or EMDR during a two-week period between two concerts. Quantitative data were collected through performance assessment, the Spielberger State-Trait Anxiety Inventory and a self-report questionnaire (SRQ) which also allowed for qualitative assessment. The Control group also received two sessions of therapy post-main data collection, allowing the largest possible sample for longitudinal testing.

Results

Both therapy groups (but not the Control) experienced a significant reduction in state anxiety post therapy at the second performance and a significant improvement in performance quality. The EMDR group experienced a significant decrease in self-perceived anxiety (SRQ) and a significant reduction below baseline levels in trait anxiety which was not evident in the CH and Control groups. Longitudinal testing of trait anxiety at 4 months (n = 34) and at one year (n = 17) demonstrated

significant decreases below baseline levels in both the EMDR and CH groups, an unexpected result warranting further investigation.

Conclusions

The findings suggest that both CH and EMDR have an important contribution to make to the understanding and treatment of MPA in significantly enhancing performance quality and decreasing state anxiety; trait anxiety was also significantly reduced below baseline levels in the EMDR group. It has highlighted a number of important issues, particularly the longitudinal findings on trait anxiety; however additional validation is required through further studies as longitudinally the number of responses reduced over time. It has called into question the current literature in the field. Given the effectiveness of these therapies after two sessions, further comparative studies should now be conducted between interventions which focus on implicit processes and those that concentrate wholly on explicit processes and should include a comparison of cost effectiveness.

References

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Indian Validation of Healthy-Unhealthy Music Scale (HUMS)

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Background

Healthy-Unhealthy Music Scale (HUMS) is a compact 13-item instrument developed for assessing musical engagement strategies which has in turn found to be an indicator of proneness for depression in youth (Saarikallio, Gold, & Mcferran, 2015). The scale has been constructed, tested and validated with Australian adolescents. Its intelligibility and comprehensibility opens up prospects for testing its adoption as a screening tool for maladaptive musical engagement in a cross-cultural context.

Aims

The objective of this study is to validate the HUMS scale for Indian population by replicating the original study and analyzing its congruities and disparities with respect to its correlations to self-reported measures of depression, rumination, and mental well being and differences in its factorization of subscales.

Method

141 individuals (mean age = 24.32, sd = 3.83 years, 80 males) participated in an online survey comprising HUMS questionnaire, Kessler Psychological Distress Scale (K10), Mental Health Continuum-Short Form (MHC-SF), Rumination-Reflection Questionnaire (RRQ).

Results

The cronbach alpha for both healthy and unhealthy scores was found to be higher than those observed in the original study (0.82 and 0.83 respectively). T-tests revealed significantly higher K10 scores in females than males while males displayed significantly higher MHC-SF scores. Unlike the original study, females displayed higher healthy scores than males and males evidenced higher Rumination and Reflection scores. As expected, unhealthy scores correlated positively with K10 ($r = 0.55$, $p < 0.001$) and Rumination ($r = 0.44$, $p < 0.001$) scores, and negatively with MHC-SF ($r = -0.22$, $p<0.01$). The healthy scores correlated positively with MHC-SF($r = 0.19$, $p<0.01$) and unlike the original study, negatively with Rumination scores ($r = 0.36$, $p < 0.01$). Factor analysis on the individual scores was also performed on a larger data set which included 288 participants in total. Two-factor solution of HUMS revealed the similar distribution of loadings of the items into healthy and unhealthy dimensions whereas a three-factor solution evidenced a very different divisions of the unhealthy items into rumination and avoidance when compared to the original study. Stepwise-regression analysis to identify which of the 8 individual unhealthy items best explain K10 scores revealed that 35% of the variance was explained by items associated with avoidance (i.e., I hide in my music because nobody understands me, and it blocks people out; Music makes me feel bad about who I am; Music leads me to do things I shouldn't do) rather than rumination.

Conclusions

Overall, HUMS unhealthy appears to be valid and reliable for detecting proneness to depression in Indian population. However, the items of HUMS representing avoidance turn out to be better predictors of proneness to depression. Hence one can surmise that collective cultures being more persistent in extracting socially relevant behavior promote avoidance as an individual response to asocial/depressive tendencies.

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The influence of music-based interventions on the cognitive abilities of people with dementia as measured by the MMSE

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Background

The MMSE (Folstein, Folstein, & McHugh, 1975) is a test used frequently to measure the cognitive abilities in individuals with dementia. Based on the observation, the effects of music-based interventions—like instrumental lessons, music therapy, music programs, and listening to music—measured by the MMSE vary immensely in their outcomes, a literature review is conducted to find cues toward underlying factors that might influence the test results.

Aims

The purpose of this study is to examine the effect of music interventions on cognitive abilities in patients with dementia and therefore to find out the differences and possibly influencing factors in studies with significant and nonsignificant outcomes on the MMSE.

Methods

A literature review is conducted on the databases Cochrane, DIMDI, PubMed, Science Direct, Open Grey and Google Scholar, using the keywords “Dementia,” “Alzheimer's,” “Music Therapy,” “Cognitive,” and “MMSE” as well as their German translations. Eighteen studies (CTs, RCTs, exploratory studies and quasi-experimental trials) which use music-based interventions, work with a population of elderly with dementia and apply the MMSE were included. The results of the studies rage from “significant improvement,” “nonsignificant tendencies,” “no significant results,” to “significant decline” on the MMSE. These results are then compared with other aspects, like the type of music intervention, the severity of dementia, the musical material, and the duration/frequency of the interventions.

Results

A connection between the MMSE outcome and the frequency of interventions could be found. The analysis indicates a correlation between duration/frequency and MMSE result: significant results are most often reported in studies with one intervention per week (5 of 6), whereas no significant results are only found in studies with 2 to 3 interventions per week (6 of 6). However, because of methodical weaknesses within some of the studies, the significance of the results of this contribution must be discussed. The results suggest that the frequency of interventions might have a major effect on the cognitive abilities as measured by the MMSE and in consequence on the benefit that people with dementia might receive from music therapy and other music interventions. Tendencies in the impact of different types of music interventions can be carefully concluded. However, further research is needed.

Conclusions

The results might help understand how music therapy can maintain cognitive abilities or delay the decline of cognitive skills throughout the neurodegenerative process of dementia. However, based on the present review, it is not yet possible to conclude how music therapy significantly influences the cognitive decline in people with dementia. Still, this work might contribute to improving the quality of music therapy interventions, and music-based interventions in general, for people with dementia.

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Using voluntary musical imagery as an intervention for anxiety: how can this be studied?

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Background

Anxiety is a mental health problem occurring in one in four individuals in the UK. Different approaches have been taken to overcome anxiety, one of which includes imagery-based interventions. Despite the fact that this type of intervention can alleviate anxiety, there is a lack of emphasis on the use of auditory imagery (through music) in this way. Imagining music (musical imagery) in a voluntary manner may represent an effective intervention by targeting the focal element of anxiety, which is known to be an important factor. However, as this concept has not yet been tested, research into the potential application of voluntary musical imagery as an intervention for anxiety is needed. To do this, a musical imagery training programme was developed to explore the potential to train non-musicians to deliberately imagine music. Additionally, this study aimed to compare self-reports of well-being (including measurements of mood and anxiety) that accompany the exercise of musical imagery in everyday life, with the self-reports associated with a control task (verbal fluency task).

Aims

To train non-musicians to voluntarily imagine music, and to compare self-report measures of well-being associated with musical imagery tasks versus a control task in everyday life.

Methods

34 participants aged between 18 and 21 years old were trained to imagine self-selected music over a four-day training programme consisting of these activities: training, everyday practice and assessment.

Training:

Participants completed questionnaires concerning their musical imagery experience and trait anxiety. Next, they engaged in a chronometric task, tapping along to their self-selected piece of music whilst listening to and imagining it. Further to this, participants were trained to imagine music using a volume fader task, and then completed verbal fluency tasks.

Everyday Practice (experience sampling method):

Over the following two days, participants received six text messages at random points, prompting them to practise imagining music (day 1) or complete verbal fluency tasks (day 2), and subsequently answer questions about each attempt.

Assessment:

The participants' ability to voluntarily imagine music was assessed using a chronometric task and an imagination continuation paradigm, involving the presentation of music snippets interpolated with silent sections, and then deciding if the music was reintroduced at the correct position.

Results

Findings for the main activities are as follows: the results from the chronometric task showed that tapping accuracy improved after the training session, $t(33) = 4.19$, $p < .001$, the percentage of time spent listening to music in the volume fader task decreased across trials, $t(33) = 6.35$, $p < 001$, and the participants performed above chance at correctly identifying the position of the music when it was reintroduced in the spot task, $t(33)\ 6.48 =$, $p < .001$.

Conclusions

These results suggest that this training programme could improve the participants' ability to imagine music, thus providing a greater insight into training individuals to deliberately imagine music. Further analyses will be conducted to shed light on the possible effects voluntary musical imagery could have on variables such as mood and anxiety, compared to verbal fluency tasks.

P1S: Posters 1

Time: Thursday, 26/Jul/2018: 9:00 - 10:00 · *Location:* Sydney Poster Room
Session Chair: Roger T. Dean

Melody Recognition Patterns as a Window to Listeners' Similarity in Music Perception

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Background

Music is a cultural universal, yet the individual experience of music can strongly differ between listeners. Quantifying these perceptual differences can be elusive. A recent Regenerative Multiple Representations (RMR) conjecture may shed light on these differences by describing a crucial connection between prior experience, perception, and subsequent formation of memories (Herff, Olsen, & Dean, 2017; Herff, Olsen, Prince & Dean, 2017). The RMR conjecture asserts that perception directly influences memory. This suggests that differences in perceptual experience should translate to differences in memory representations. Consequently, similarities in memory representations are indicative of similarities in perceptual experience. This means that similarity in listeners' memory response patterns to a specific set of melodies may be seen as a window into similarities between listeners' perception of that specific set of melodies. Here, we investigate the similarity of listeners' response patterns in the context of memory for melody and argue that memory can indeed serve as a proxy to perception.

Aims

We aim to shed light on the question "how similar is music perception between listeners?" We use memory as a proxy to address this question and assume that if multiple listeners' perception of music is similar, then memory response patterns to particular melody corpora will be similar as well.

Methods

The data of 10 published melody recognition experiments was reanalyzed. Average interrater agreement was calculating by 1,000 random split-halve correlations per experiment. P-values and effect sizes were obtained by comparing the vector of actual split-half correlations with a vector of split-half correlations in which melody names were shuffled for one of the halves.

Each of the experiments comes with a unique set of stimuli, yet uses the same continuous recognition paradigm. Taken together, the composition of memory data allowed us to analyze how interrater agreement varies between (a) melody corpora within the same tuning system, (b) between melody corpora with different tuning systems, (c) between explicit and indirect measurements of memory, and (d) between melodies that consist of pitch-only sequences, rhythm-only sequences, or both pitch and rhythm.

Results

Findings indicate interrater agreement of up to r .70. However, interrater agreement was strongly dependent on whether explicit recognition or indirect recognition in the form of perceived familiarity was measured, with explicit recognition showing higher agreement among listeners. Present results also revealed high interrater agreement for highly familiar as well as highly unfamiliar stimuli with diverging memory patterns in between. Furthermore, we found a remarkable interaction between rhythm and pitch that increases listeners' similarity in music perception.

Conclusion

We show how memory for melody can be used as a proxy to music perception, and in the process, reveal factors that contribute to dissimilarity in music perception. Results can inform predictive models of melody recognition that use musical features as predictors.

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Using the Three-Component Model of the Musician Definition, A Musician is Someone Who Has Six Years of Musical Expertise

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Background

Researchers in behavioral, psychological and cognitive science investigate the apparent differences (usually 'advantages') musicians have over non-musicians. However, how to operationalize 'the musician' is unclear given the numerous and viscous definitions that are available.

Aims

The aim of this paper was to (i) analyse the many definitions concerning the musician, from which a generalised model could be developed for future research, and (ii) to investigate how this model is applied in music psychological literature, and if a general consensus exists.

Method

A range of literature covering the many definitions of 'musician' was consulted. A selection of music psychology literature was then studied to empirically identify if any consensus exists.

Results

The definitions were collated, and a 'three-component model of the musician definition' (3CMMD) was developed. The model proposes three broad, overlapping, quantifiable ways a musician can be defined, namely (1) expertise (e.g. years of formal music training), (2) self-identity (e.g. I am a musician), and (3) aptitude (e.g. musical potential). Thirty-nine journal articles were identified as comparing musicians and non-musicians in a recent study. The results demonstrated a dominance of the 'expertise' component in the 3CMMD for determining the category of musician. Overall, a general consensus regarding the musician definition was observed as someone with at least 6 years of musical expertise.

Conclusions

Based on a review of literature, the multiple definitions concerning a musician can be simplified into a three-component model. A general consensus amongst music psychologists was also observed, and the results were consistent enough to suggest an emergent '6-year' rule.

Music, language, and gesture: Oscillations and relations

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Background

Music, like language, involves the ability to flexibly combine sequences of discrete elements into hierarchical structures. Are there shared mechanisms for this in the brain? Patel hypothesised an overlap in processing regions for structural integration (Patel, 2003), however, recent work has questioned exact neural overlap (Fedorenko & Varley, 2016), leaving open the possibility for shared computations occurring in neighbouring regions. While work on neural or cognitive overlap has focused on hierarchical pitch-structure in music, and its overlap with linguistic syntax, there has been less work on the other structural hierarchy in music: meter. We suggest that meter has meaningful parallels to linguistic syntax, and plays a more cognitively rich role than that of general timing.

Aims

Using EEG, we test the prediction that neural activity entrains to perceived hierarchies in linguistic phrase structure, meter, and hierarchically organised action sequences. This replicates prior work finding such entrainment for language (Ding et al, 2016) and meter (Nozaradan et al, 2011), while showing novel entrainment to action-hierarchies in the form of hand-gestures and showing that the language effect is robust to modality, as we present words visually rather than as auditory speech.

Methods

Experiment 1 recorded EEG from 8 participants that listened to an auditory beat in conditions of 1) meter imagery, and 2) visual object imagery in binary or ternary patterns (which we predicted wouldn't result in entrainment at higher-level frequencies). In *experiment 2*, we recorded EEG from 12 participants as they listened to an isochronous auditory beat with conditions of 1) meter imagery, 2) word reading, and 3) hand-gesture, each in binary and ternary patterns. Steady-state evoked potentials (SSEPs) corresponding to frequencies of stimulus presentation, and corresponding binary and ternary hierarchies, were then analysed in both experiments.

Results

We found significant entrainment at the predicted frequencies in both experiments, except for the language conditions in the second experiment. For this condition, the effect was significant (and large) within some individual subjects but not others. Source localisation (using spatiospectral decomposition methods) for non-stimulus-rate frequencies was also different from stimulus-rate frequencies, suggesting different neural generators.

Conclusion

While neural activity at the rate of stimulus presentation is predicted by lower-level auditory processing, entrainment at the higher-level binary and ternary frequencies is not predicted by this. While one explanation is a more general dynamic attentional one, we end with comparisons to a computational framework called DORA (Doumas et al, 2008), which recently had success in modelling syntactical structure in language while internally functioning in a way that predicts this higher-level entrainment as part of structure-building (Doumas & Martin, 2017).

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T6P: Short Talks 6 - Performance

Time: Thursday, 26/Jul/2018: 12:00 - 13:00 · *Location:* La Plata

Session Chair: Luiz Naveda

Something to tell: musical work interpretations of the performer as narrator

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Background

The relationship between music and narrative has been extensively discussed since Nattiez (1990) onwards, establishing similarities between music and literary discourse, and its adequation to narratology. Beyond its literary form, narration is present in everyday life and is considered as a way of thinking, interpreting and creating a sense of the world and life, within the framework of one's own culture (Bruner, 1986). Narration and music are linked in intersubjective communication from early childhood, being together in time without the need for a grammatical discourse (Malloch & Trevarthen, 1999). However, there is little evidence in the literature about the performer musician as a teller or narrator, and, as a consequence little is known about the ways a musical piece expresses the narrator's point of view.

Aims

The current study aims to investigate the performers' descriptions of their musical performances, from the narrator's point of view.

Method

A semi-structured interview was designed and conducted with 11 performers (9 pianists, 2 guitarists). The musicians were asked about (i) the interpretation of musical works previously performed, (ii) the musical scores, (iii) the process of rehearsal, and (iv) the performance in a concert situation. In the pursuit for categories to develop an analytical guide for coding, and create nodes to organize and visualize the information, all interviews were transcribed and analyzed with NVivo 11 software.

Results

The most frequent categories identified were "to narrate", "personal", and "emotions", which describes how the musicians elaborate the interpretation. "To narrate" can describe performance as statements (speak, tell something), involve narrator-narratee communication with the audience, or consider performance as a creative activity. "Personal" emphasizes the performer's role in determining the interpretation of the score, making a division with the composer's intentionality. Finally, "emotions" brings together feelings, sensations, and moods that the performers experience, and allow communication with the audience. Another important category, "dynamic", includes processes that occur over time in relation to the work's transformation and performers' emotional states at each moment of the performance.

Conclusions

The evidence provided by the results of this study shows the musicians first person perspective on their performance as a creative or re-creative action. Despite that the grammatical content is not altered, the performer provides a new way to interpret the music in a personal manner, making sense of the musical work. From a constructivist perspective, the performance of the work can be understood as the performer's construction or transformation of a version by taking a given preceding version. Being that a narrative is the one expressed by the narrator's point of view or perspective (Bruner, 2002), we can understand the narration of a musical work from the performer's point of view.

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Expressive timing in choir: An interactive study between choristers and conductor

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Background

In traditional choral practice it would seem that the chorister's action is an embodied way of responding to the conductor's gestures and being with the other from a second-person perspective (Gomila, 2003). From a conductor-choir interactive perspective, the choir is understood as a set of individuals who are also in interaction and not as a uniform group subordinated to the conductor. Clayton (2013) proposes three levels of musical entrainment between individuals: intra-individual, intra-group and inter-group, to describe the temporal interactions between singers in choral practice. A multimodal analysis (conductor movement and choir members' asynchronies) is presented to investigate the role of inter- and intra-individual variability in supporting collective (choir) musical performance.

Aims

To identify temporal variability underlying an amateur choral practice through multimodal analysis.

Method

An audiovisual of an amateur choir performance (n=15) simulating a concert environment was recorded. Individual microphones were used to obtain each participant's voice in separate audio tracks. The capture and analysis of the conductor movement data -taken from the video recording in 2D- was carried out using Tracker software. Timing deviations profiles of each voice for intra-individual sound were obtained by manual detection onset over the sound signal by means of Sonic Visualiser software.

Results

The results showed that tempo is related to rhythmic density hence singers tend to synchronize coinciding with a decrease of rhythmic density. As expected, greater deviations were found at a slower tempo and fewer at a faster tempo. This is relevant because the measure of synchronization was biased by the tempo. Increased movement by the conductor which has to be ahead matched with most singers timing deviations. We observed temporal events that were related and compensated.

Conclusions

The study shows that being together in time is not a one-way linear relationship where the conductor performs an action and the choir responds. The synchrony of what is being sung, and the interaction with whom is conducting, are embodied attuning forms (Leman, 2008). We discuss variability in terms of features of differentiation-undifferentiation within the individual and the group rooted in the conception of social practice in the choir.

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Consonant length as expressive resource in sung Spanish

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Background

A review of 19th-century Spanish literature on vocal pedagogy (Guzmán, Shifres & Carranza, 2017) found that in classical singing the pronunciation of Spanish is subordinated to an aesthetic canon, which limits the expressive range of speech. According to this canon, vowels have a leading role since they can be sustained, while consonants must be articulated "clearly" but "marked". Due to these requirements, consonants must be shortened in classical singing (Miller, 1996), which ignores the variability of segmental length in spoken Spanish (Mendoza et al., 2003) and its identity effects on

communication (Carter & Wolford, 2016). Although recent studies compare the expressiveness in speaking and singing (Scherer et al., 2015), the scope of consonant length as expressive resource in sung Spanish is still unknown.

Aims

Study the imposition of the aesthetic canon of classical singing on the length of 3 consonants in sung Spanish and how they are articulated outside of that canon in a more spontaneous way.

Methods

Ten famous singers' recordings (5 classical and 5 folk) of a classical chamber song in Spanish ("La Tempranera" by Carlos Guastavino) were phonemically segmented. Since this song is composed in a zamba rhythm (an Argentinian folk dance), it is widely performed by both classical and folk singers. The length of the consonants /l m n/ (which were chosen because they can be sustained) was measured in all available consonant-vowel (CV) syllables, as well as the full syllables that contain them.

Results

The correlation between syllable length and consonant length was significant in all cases, which indicates that the consonants /l m n/ keep in proportion with the subsequent vowels. The /l m n/ absolute and relative lengths were higher in folk-style performances (means = .109 s 27.61%) than in classical ones (means = .090 s 21.86%). Nevertheless, the data showed a high length variability in both singing styles.

Conclusions

The results show that in Spanish folk singing the consonants /l m n/ in CV syllables tend to be longer than in classical singing. However, although the imposed aesthetic canon seems to have an effect on the classical performances' pronunciation, the evidence suggests that the length of the consonants /l m n/ is used in an expressive way in both singing styles.

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L4P: Long Talks 4 - Structure

Time: Thursday, 26/Jul/2018: 13:00 - 14:00 · *Location:* La Plata
Session Chair: Pablo Padilla

Expressive microstructures of timing in the style of Aníbal Troilo's tango orchestra

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Background

Musicologists and musicians tend to think that the organic features of a musical style are annotated in the musical score. However, musicians add innumerous types of variations during performance, accounting for a range of differences within the boundaries of the style itself. Tango musicians are aware of these features when they speak about the melodic phrasing during performance. In some music styles, such as jazz and samba, the systematic recurrence of rhythmic-melodic patterns became an idiosyncratic feature that supports the identification of the style itself (Benadon, 2006; Naveda et al, 2011). An expressive characteristic of melodic phrasing in tango would consist of the production of temporal recurrences in the peculiar elongation and shortening of rhythmic-melodic patterns embedded in the microstructure of the phrase.

Aims

To reveal the expressive stylistic identity of Aníbal Troilo's tango orchestra, identifying the recurrent microtiming temporal patterns associated to the melodic phrasing.

Method

We analysed a dataset of motifs and phrases contained in ten tango recordings, performed by Aníbal Troilo's orchestra between 1960 and 1978. The melodic motifs were segmented from each fragment. For each motif, we annotated a set of "target sequences", which are defined as a set of rhythm figures that are common to all motifs. Each motif was classified according to its compositional characteristic (original, varied, and repeated), and its metric position (thetic, anacrusic, and acephalous).

The timing and pitch information of motifs and target sequences were extracted from the sound signal by semi-manual annotation, and normalised according to the length of the target sequences. The organization of each compositional feature was analysed using a set of classification tests. Finally, we applied a clustering algorithm based in K-means, which determined the models of recurrent timing patterns present in Aníbal Troilo's style.

Results

Classification results showed how each compositional variation lead to differences in the microtiming structure. Rhythmic-melodic-temporal patterns were grouped according to their different modes of variation, mainly melodic contour, and timing characteristics. The sonic phrasing in Troilo's style prioritises an expressive temporal microstructure, in which the grouping of 4 onsets (four eighth notes) between beats 3 and 4 in the measure, lengthens the second onset and shortens the third and fourth, recurrently.

Conclusions

The stylistic performance in tango is understood as the outcome of the interaction between musical properties (pitch-rhythm) and the microstructure of temporal patterns, strongly rooted in perception and action over time. The study indicates that the communication of the stylistic identity in Aníbal Troilo's orchestra might involve the production and perception of microstructural pattern invariants between onsets 3 and 4 of each motif, both in ensemble and solo performance. We call this temporal-expressive feature a syncopated performative effect. Future studies could concentrate on how the perception of these subtle features occurs across acculturated and non-acculturated audiences.

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Expressive alignment with timbre: changes of sound-kinetic patterns during the break routine of an electronic dance music set

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Background

Expressive alignment (Leman, 2016) refers to the synchronization of human movement patterns with musical patterns. On the one hand, Solberg and Jensenius (2017) found that dancers share a movement pattern during the break routine (BR) of electronic dance music (EDM) tracks (sound pattern formed by breakdown-build up-drop sequence which constitutes a formal articulation of EDM set). On the other hand, although a number of timbral dimensions have been established which organize auditory perception (Alluri, 2012), expressive alignment with timbral patterns have not been studied yet. In this work we studied the timbral relevance of the acoustic changes during BRs of EDM's sets, and assume that these changes form musical patterns that, in turn, afford changes in human movement patterns.

Aims

To describe the changes of sound-kinetic patterns during the BRs on an EDM party video, resulting from the expressive alignment between human movement patterns and sonic patterns of music.

Methods

Stimulus: an EDM party audiovisual record. Sound analysis: (1) Aural identification, description and temporal location annotation on Elan 5.0 timeline of all the BRs of the EDM set. (2) Processing of its acoustic signal, and extraction of features related to timbre, rhythm and pitch with MIRToolbox. Movement analysis: (1) Detection of movement patterns formed by arms, head and shoulders of all people completely visible on the video during 15 BRs. (2) Laban Movement Analysis (Laban, 1950) video annotation on Elan 5.0 of effort-shape elements of each movement pattern. (3) Comparative analysis of the movement patterns of each person.

Results

Sound analysis results show that the BR is defined by an acoustical pattern, in which some timbral features play a relevant role. With regard to movement analysis; (1) we identified changes on movement patterns during BRs, especially at the drop moment ; (2) we noted that people develop personal movement patterns, differentiated from those of others by the organization of effort-shape elements; and (3) changes in the dancers´ personal style of movement patterns occur at the same time.

Conclusions

In this work we observed that EDM dancers develop expressive alignments during the BR. From a musical point of view, the changes in acoustical features related to timbre during the BR modify the sonic environmental conditions, and the consequent expressive alignment of the dancers. Although people keep their personal styles of movement, they all change their movement patterns in phase with the changes of music, producing a shared sound-kinetic pattern.

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L5M: Long Talks 5 - Performance

Time: Thursday, 26/Jul/2018: 13:00 - 14:30 · *Location:* Montreal_1

Session Chair: Stacey Davis

Do violinists' gestures and timing reflect melodic voice continuity? A motion capture study

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Background

In music, melodies can be perceived as continuous or discontinuous. Large pitch intervals tend to promote the perception of melodic discontinuity, though surrounding pitch contexts can promote or diminish this percept. Performer interpretation also plays a role. Particularly, performance timing can reflect local melodic groupings (Repp, 1992), and performers' nontechnical motions also reflect melodic groupings on the level of the phrase (MacRitchie, Buck, & Bailey, 2013), as well as local groupings (Huberth & Fujioka, 2018).

Aims

The present study aims to investigate the extent to which performers express local melodic grouping discontinuities in rubato and nontechnical motion, and if potential nontechnical motions reflecting discontinuities further affect audience judgments.

Method

In Experiment 1, audio and motion capture recordings were made of six violinists performing a piece in which three pairs of segments were manipulated to contain either strong or weak discontinuities. Specifically, a single interval in each segment was the same within each pair, with the surrounding pitch context changed to alter discontinuity strength according to the scoring method presented in Davis (2006). Principal component analysis was used to separate motion data into technical and nontechnical components. In Experiment 2, to examine whether these components influenced judgments of discontinuity in third-party audience, participants saw, heard, or both saw and heard the performed segments with either natural motion, or with nontechnical principal components removed.

Results

Violinists' rubato differentiated between discontinuity types, with greater time taken at the interval with a strong compared to weak discontinuity. Nontechnical whole-body motions also explained a significant amount of variance in discontinuity types, but the strength of the effect varied across analyzed segments. In Experiment 2, only when participants saw the violinists' natural motion did judgments of whether the violinists expressed one or two groups reflect the variation across segments observed in Experiment 1. However, the degree to which judgments matched the underlying discontinuity type was moderate.

Conclusions

Violinists' motions can subtlety and variably reflect local discontinuities above and beyond the extent to which the discontinuity is expressed in performer timing. Our results extend previous findings of the relationship between performer interpretation and motion by demonstrating observations across multiple performers with a previously less-studied instrument of violin. Investigation with a larger cohort of performances would answer in more detail how performers vary in the extent to which they express these local discontinuities.

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Exploring the Relationship between Physiological and Emotional Stress in Viola Players

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Background

Numerous studies have shown a correlation between baseline health characteristics and the rate of musician injury, with large-scale efforts such as the Musical Impact Project bringing attention to the links between a musicians' health and injury (see Williamon, Aufegger, Wasley, Looney, & Mandic, 2013). Currently, little is known regarding the cause and effect role specific physical and emotional stressors play in the development of injury in musicians.

Aims

To utilize quantitative clinical measurements of physical and emotional stressors, in both professional performers and student musicians, in order to understand the specific contribution of individual and combined stressors towards the development of musician injury.

Methods

This study directly assesses the psychological and physical wellness of study participants using diverse methodologies including haptic sensors, motion capture technology, EMG measures, and self-report questionnaires. The questionnaires include the mini-International Personality Item Pool (IPIP), Nordic Extended Musculoskeletal, International Stress management Association (ISMA) questionnaire, and a novel questionnaire about performance practices developed for this study. Participants performed a series of short excerpts as well as maximum voluntary contractions on a viola equipped with two haptic sensors, while also wearing EMG and kinematic markers. The participants then completed two static trials where they were asked to sit in "playing position". These objective physical measures were then analyzed in the context of stress and injury data from the questionnaires.

Conclusions

These data will provide one of the first comprehensive sets of findings from a study that includes both quantitative clinical data and self-reported measures of stress and injury in musicians. This presentation will focus on the interplay between the rates of musician injury with individual physical and psychological stressors, as well as interplay between the different stressors. The importance of these data will also be discussed in terms of future efforts designed to detect and prevent musician injury.

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The Audience's Breath: Collective Respiratory Coordination in Response to Music

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Background

Performers have used respiratory metaphors to describe the reactions of the audience's engagement with a performance. We refer to an audience holding their collective breath, or sighing with a release of tension. Significant regularities in respiratory phase have been measured in participants' responses over multiple listenings to some recorded music (Sato, Ohsuga, & Moriya, 2012), but this fleeting alignment has not yet been measured in audiences at live concerts.

Aim

With recordings of respiration from audience members at live performances, we aim to evaluate whether there is measurable respiratory alignment between them to some or all pieces. If there is coordination, we consider which phase of the respiratory cycle shows the highest degree of alignment and how this could relate to audience members' experience of the music performed.

Methods

Respiration data from two audiences were evaluated using new techniques in respiratory phase detection and measurement of coordination. From the first audience, 40 participants sat amongst a larger group in an experiment-led concert of chamber music including three pieces of contrasting genres. The second audience was composed of 48 participants who were presented solo flute music, some recorded and some played live. Half of this group continuously reported the unexpectedness of the music while the remaining half reported their felt emotional responses through handheld devices..

Five components of the respiratory phase were evaluated for coordination using activity analysis with parameters tuned to each: Inspiration Onset, High Inspiration Flow interval, Expiration Onset, High Expiration Flow interval, and Post-Expiration Pause. These phases relate to the mechanics of respiration and the sensory consequences of air exchange.

Results

Significant coordination in respiratory phase components were observed between audience members to most stimuli, but the most coordinated phases varied from piece to piece. High Inspiratory and Expiration Flow intervals were most often significantly coordinated, compared to onsets. Post Expiratory Pauses, which would count instances of breath holding, were only coordinated in one piece. Less than half of participants engage in phase alignment concurrently, however numerous instances relate well to developing theories of respiration/cognition interactions, including differences in the alignment patterns of participants per rating task.

Conclusion

Audiences engage in measurable collective respiratory coordination with live performance and recorded music through simultaneous inspirations and expirations. However, these behaviours are performed by only a subset of participants at a time. This inter-participant difference is consistent with the results from repeated response experiments, in which only some participants have shown respiratory coordination with their own previous listenings. The fact that different phases of respiration showed coordination underlines the possibility that multiple mechanisms like embodied listening, attention, and hearing facilitation may be encouraging adjustments in audience members' respiratory sequences for alignment.

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L6M: Long Talks 6 - Emotion and Musical Structure

Time: Thursday, 26/Jul/2018: 13:00 - 14:30 · *Location:* Montreal_2

Session Chair: Eve-Marie Quintin

Acetaminophen Blunts Emotional Responses to Music

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The capacity of listeners to perceive or experience emotions in response to music depends on many factors including dispositional traits, empathy, and musical enculturation. Emotional responses are also known to be mediated by pharmacological factors, including both legal and illegal drugs. Existing research has established that acetaminophen, a common over-the-counter pain medication, blunts emotional responses (e.g., Durso, Luttrell, & Way, 2015). The current study extends this research by examining possible effects of acetaminophen on both perceived and felt responses to emotionally-charged sound stimuli. Additionally, it tests whether acetaminophen effects are specific for particular emotions (e.g. sadness, fear) or whether acetaminophen blunts emotional responses in general. The experiment employs a randomized, double-blind, parallel-group, placebo-controlled design. Participants are randomly assigned to ingest acetaminophen or a placebo. Then, they are asked to complete two experimental blocks regarding musical and non-musical sounds. The first block asks participants to judge the extent to which a sound conveys a certain affect (on a Likert scale). The second block aims to examine a listener's emotional responses to sound stimuli. The study is currently in progress; here, preliminary results are reported for 19 participants of a planned 200 cohort. In light of the fact that some 50 million Americans take acetaminophen each week, if the final results prove consistent with existing research on the emotional blunting of acetaminophen, this suggests that future studies in music and emotion might consider controlling for the pharmacological state of participants.

Do Descending Bass Lines Signal Sadness?

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Background

Pitch declination in speech, which results from a decrease in subglottal pressure, has been shown to be negatively valenced (Huron, Yim & Chordia, 2010). In music, descending pitch patterns are prevalent, yet only some are associated with negative emotions. For example, the "lament bass" (Caplin, 2014) is a well-known a musical topic (i.e., social signifier) that employs incremental pitch declination in low-register instruments to express sadness or grief. Other instantiations, such as those in popular music, are more subtle or ambiguous. This study empirically examines the relationship between descending bass lines and the emotion of sadness, as conveyed by lyrics and musical characteristics.

Aims

First, a corpus study serves to test the hypothesis that descending bass lines are more closely associated with negatively valenced lyrics. Excerpts featuring a descending bass are then evaluated for the qualities of a sad sound (Huron, Anderson & Shanahan, 2014) in a follow-up behavioral study. The aim of the two studies is to show how the traditional compositional practice of writing descending bass lines parallels physiological and prosodic speech cues for expressing negative affect.

Methods

For the corpus study, musical works featuring descending bass lines were sampled from two stylistically contrasting corpora: 213 cantatas (~1500 movements) by J.S. Bach and 740 popular music songs from the McGill Billboard Corpus (Burgoyne, 2012). A matched sample of control pieces of non-descending bass lines were similarly compiled from the same respective corpora. Descending bass lines were operationalized as a descent in the lowest voice or instrument by generic step (i.e., no distinction between whole and half-steps). Similarly, these were tracked at multiple metric levels (e.g., every measure, half-measure, etc.). All lyrics were retrieved and analyzed for their emotive content using the Linguistic Inquiry and Word Count (Penebaker et al. 2015). For the behavioral study, participants rated excerpts under five criteria of a sad sound using a 7-point Likert scale. These criteria were defined as quietness, slowness, small pitch movements, "mumble-like" articulation, and dark timbre.

Results

Corpus results did not demonstrate a significant distinction between descending and non-descending bass excerpts in both repertoires. Two sad speech characteristics (articulation and timbre) were significantly effective predictors of descending bass patterns in the behavioral study.

Conclusions

This study needs methodological refinement. Two follow-up procedures will be discussed: evaluating lyrics based on a bass pattern's mode (corpus) and measuring arousal/valence explicitly (behavioral).

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Roll Over Beethoven: Uniform Information Density in Rock Music, Folk, and German Art Song

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Background

Temperley & Gildea (2015) proposed a uniform information density theory for language, wherein low-information syntactic constructions in one aspect of a sentence are counterbalanced by high information in other aspects. This study tests this hypothesis for melodies through examining the information entropy of rhythmic successions, pitch successions, and scale-degree successions. Specifically, our hypothesis is that the less probable rhythmic successions are, the more probable pitch successions will be, and vice versa. For this study, we examined both rock, folk, and art music.

Methodology

Because listener expectations are informed by genre, probabilities for first-order successions were derived for all corpora. 200 songs from the Rolling Stone 500 Greatest Songs of All Time (de Clerq & Temperley 2011), 6,215 from the Essen folksong corpus (Shaffrath 1995), and 1,164 German and French 19th-century art songs were used (Van Handel 2005). To determine rhythmic inter-onset transition probabilities and to avoid complications from differences in mode usage, only major mode songs in 4/4 were included, resulting in 95 rock songs, 1,408 folksongs, and 50 art songs.

Probabilities were derived in two ways. First, a global approach was taken such that successions in rhythm or pitch were treated as zeroth-order dyads, and thus rare dyads have low probability. Second, these dyads were treated as first-order successions in real time, in which the probability of each dyad’s consequent event is computed based on its antecedent state. In the first approach, for example, ^#1-^2 is rare and thus an improbable scale degree succession. In the second approach, ^2 is a near certainty to follow ^#1, and thus ^#1-^2 is a highly probable succession.

In both approaches, the resulting probabilities were used to assess information entropy for rhythm and pitch transitions in each respective dataset. Correlations were then calculated between rhythmic entropy and pitch entropy.

Results & Discussion

Using the first approach in generating probabilities, several significantly positive correlations exist between pitch and rhythm transitions ($p < .0001$), although the effect of this correlation is quite small (< +.1). It is possible that the effect is negligent for entropies that are not extreme. Therefore, we post-hoc re-operationalized 'high' and 'low' entropy as only those moments that were greater or less than 2 standard deviations above or below the mean entropy level. Even so, contrary to our hypothesis, no significant effect was found in some cases and small significantly positive correlations were found in others. In this view, composers seem to be correlating rhythm and pitch entropies across all corpora, suggesting that they punctuate a mostly predictable background with short, foreground moments that are highly unpredictable in multiple musical domains.

Analysis using the second method above was also conducted, but again resulted primarily in small positive correlations between pitch and rhythm transitions. The full results of this analysis will be included during the presentation along with comments on the different models of listening and expectation used above, and their methodological implications.

T11M: Short Talks 11 - Humanities

Time: Thursday, 26/Jul/2018: 15:00 - 16:00 · *Location:* Montreal_1

Session Chair: W. Jay Dowling

Music, space and body: the evolutionary history of vocal and instrumental music

Yong Jeon Cheong, Udo Will

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Background

Through music-making our everyday experience turns into something special. This transformative power has been considered as one of music universals. We distinguish two modes of music-making (singing vs. instrument-playing), and it is of interest to know whether these modes transform our experience differently. With regard to the origins of music, furthermore, it has been argued that co-evolution of vocal and instrumental music is a human-specific phenomenon.

As music has been claimed to be an art of time, space has been largely ignored and only temporal aspects of vocal and non-vocal sounds have been investigated. Studies show differential processing of vocal and non-vocal sounds and of vocal and instrumental rhythms. To the best of our knowledge, it has not been studied whether singing affects our spatial experience in a different way than instrument-playing. If there were any differences in spatial processing between these modes of music-making, that could be an additional feature of the evolutionary trajectory of human music-making.

Aims

We propose a new perspective on music evolution and hypothesize instrument-playing transforms our spatial experience differently from singing.

Main Contribution

We review different types of space relating to music-making bodies. Body space consists of postural and surface-related schemata that are associated with proprioception and touch respectively. Peripersonal space is characterized by 1)multisensory integration, 2)body-part centered specificity, 3)sensorimotor coupling and 4)plasticity.

The primary difference in two music-making bodies is the recruitment of touch and haptic perception. The singing body involves postural schema because we un- or subconsciously control our vocal organs. In contrast, the instrument-playing body not only requires postural and surface-related schemata due to direct tactile contact with, and haptic exploration of an instrument but also relies on an ensemble of all components of peripersonal space. Multisensory information is constantly integrated and hands plays an important in instrument-playing. The instrument-playing body interacts with an instrument in an action-perception feedback loop. Instrument-playing alters peripersonal space and involves motor knowledge that is combined with specific spatial information near and on an instrument. Some instruments (e.g. drum stick) extend peripersonal space.

Implication

This review indicates possible differences in spatial processing between singing and instrument-playing. Two modes may transform our experience of world differently and potentially explain some aspects of the origin of music.

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Affective Response to Leitmotifs from Wagner's Ring cycle

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Background

Musical leitmotifs have been known to condition the listener's expectation in shaping narrative. Hacohen and Wagner (1997) demonstrated that Wagnerian leitmotifs from The Ring of the Nibelungen bear inherent meaning for listening subjects, but confined their application to only 9 leitmotifs. Patel criticized their reliance on prescribed sets of bipolar adjectives as a weak test for semantic differential (2008, 329).

Aims

This study offers a dual approach to measuring affective response to leitmotifs from Richard Wagner's The Ring of the Nibelungen by adopting the circumplex model of affect (Posner et al, 2005) and the Geneva Emotional Music Scale (GEMS) (Zentner et al, 2008). Our hypothesis is that these two models will enable us to differentiate musical factors, e.g., rhythm, harmony, mode, and timbre, that undergird the participant's affective response.

Methods

We distinguished 16 leitmotifs based on modes (major/minor) and timbres (vocal/instrumental) and extracted audio files of around 40 sec. In the study, we expose the participants to the overall narrative of the Ring cycle, but refrain from giving out specific identifiers in listening to leitmotifs. Participants listen to 4 different leitmotifs (one of each mode and timbre) and rate them based on valence/arousal (circumplex) and the 34 scale of adjectives (GEMS). We collected results from music majors (N = 26) and we will distribute it to 200 additional participants through Amazon Mechanical Turk (MTurk). A larger sample will allow patterns of affective response ratings to be correlated with musician/non-musician status, years of musical training, and musical preference.

Results

We compared leitmotif ratings on the two-dimensional circumplex model with a multi-dimensional scaling (MDS) of the GEMS ratings, which yielded a two-dimensional solution. After rescaling each of results, we found overlap on both dimensions between the circumplex and GEMS MDS solution for only 7 (43.75%) of the 16 motifs. The other 9 (56.25%) of the leitmotifs only showed overlap in one or the other dimension. For instance, "Loge" and "Valhalla" motives both occupied moderately-pleasant and slightly-activating zones (circumplex), but their GEMS ratings identified bouncy and animated for "Loge" and serene and sentimental for "Valhalla," yielding a very different MDS solution.

Conclusions

Our preliminary results suggest that the GEMS ratings in combination with the circumplex model provide a more fine-grained measurement of musically-induced emotions than the bipolar adjectives used by Hacohen and Wagner. In the next phase, we will investigate the memorability of leitmotifs based on evaluative conditioning by subjecting participants to successive musical contexts with leitmotifs and discuss whether their affective responses remain consistent or inconsistent with their initial hearing.

References

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Detection of wrong notes in familiar Persian melodies.

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Background

Listeners use both schematic and veridical knowledge in detecting wrong notes in culturally familiar melodies. Dowling (1978) proposed that veridical knowledge (melodic contour) is combined with schematic knowledge (tonal scale) in forming memory representations. Previous studies found that nondiatonic notes are recognized quickly and accurately. Western participants' wrong-note detection in familiar Western melodies depended on key membership (diatonic/nondiatonic) and distance (1 or 2 semitones from the original note), with stronger effects of key (APCAM, 2008). South Indian classical (Carnātic) music teachers', students', and aficionados' detection of wrong notes in familiar Carnātic and Western music indicated that detection speed decreased with increasing expertise (SMPC, 2015), and all groups were faster with Western melodies. Again, key membership and distance influenced wrong-note detection: Participants were slowest when wrong notes were diatonic and 1 ST away, and fastest when nondiatonic at 2 ST. These results reflected the complexity of the Carnātic music system, with over 350 modes. Also, participants probably heard diatonic pitches 1 ST away as "choices" rather than as wrong notes. Only interval size was important in perception of wrong notes in Western music: Participants were slower when wrong notes were 1 ST away, and faster when they were 2 ST away.

Aims

Our aim was to explore detection of wrong notes in familiar melodies in a musical culture that uses quarter steps as anchor tones in tonal scales.

Methods

In this study, we presented listeners with 32 Persian familiar melodies. Native Persian listeners were musically untrained, minimally trained (1-5 years), or moderately trained (>5 years). Each session had 64 trials, in which each melody appeared twice, with different wrong notes. There were 8 types of wrong note based on key membership, interval size, and direction (up or down from the original note). Participants identified the wrong note in each melody by pressing a key as quickly as possible. We measured the proportion of correct detections and response times.

Results & Conclusions

The results showed that overall nondiatonic notes were detected more accurately. With response time, participants were much faster at identifying wrong notes 2 ST away from the original note. Also, the Key x Distance x Experience interaction was significant indicating that more experienced listeners were faster at detecting wrong notes that were nondiatonic and 2 ST away. Currently we are collecting and analyzing data from native Japanese and Western participants with both Persian and Japanese melodies. Initial results from the Japanese participants with the Japanese melodies were similar to that of the Persian participants.

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T12M: Short Talks 12 - Cognition

Time: Thursday, 26/Jul/2018: 15:00 - 16:00 · *Location:* Montreal_2

Session Chair: Peter Martens

Can you feel me now? Recognizing facial emotion during shared music listening experiences

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Background

Multiple sensory modalities have been shown to communicate emotion effectively. For example, recent work in film music has demonstrated the degree to which music can influence viewers' grasp of the emotional content of a visual scene. However, a direct comparison of aural (qua music) and visual (qua facial expression) cues in the communication of emotions has yet to be examined in an experimental setting. Thus, this study investigates the relationship between visually- and aurally-facilitated interpersonal emotion recognition in a person-to-person communication paradigm.

Aims

Our main hypothesis is that people are better at determining the felt emotion of another individual when listening to the same music as that other individual, versus listening to different music, white noise, or silence. Corollary research questions will be addressed using participants' background information: emotional intelligence (Goleman, 1995) and musical sophistication (Gold-MSI). Our hypotheses in these areas are that 1) high emotional intelligence scores will correlate positively with emotion recognition, regardless of condition, and 2) high musical sophistication scores will correlate negatively with emotion recognition, even if paired with high emotional intelligence.

Method

We composed five 20-second piano pieces as auditory stimuli that were designed to convey one of five specific emotional states (sadness, fear, anger, happiness, calmness) derived from Ekman's six basic emotions (Ekman, 1992). We then created source video recordings of nine "actors" who were coached to respond facially to the stimuli's intended emotion while listening. Four of these actors were identified as highly successful in communicating the desired emotion facially by pre-test participants, and their 20 videos were used in the main experiment.

Neurotypical participants in the main experiment viewed the video component of these source recordings under the following conditions:

- listening to the same music as person in recording

- listening to the music that expresses an emotional mismatch of the music that was used during the video recording session

- listening to white noise

- listening to silence

Participants then viewed each video under a mixture of the above conditions and performed three ratings tasks. First, they chose which of the five emotions they believed the video actor was expressing. They then rated separately the valence and physiological arousal of actor's facial expressions to be measured on a circumplex model of affect.

Results & Discussion

Data collection is ongoing; preliminary results show that neurotypical participants' emotion choice was highly accurate in the matched and silence conditions, and less accurate in the mismatched and white noise conditions. Further, the valence ratings were more variable in the matched condition in the expected direction of the emotion (e.g. happy = positive valence, anger = negative valence) compared with the other conditions. This result fits with our general hypothesis that matched music can improve the recognition of a facial emotion by making that perceived emotion more extreme. The second phase of this experiment will involve participants with Autism Spectrum Disorder (ASD), and our expectation is that these participants will perform significantly more accurately in both these areas under matched condition compared to the other conditions.

Activity Analysis on Psychophysiological Measures of Responses to Music

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Background

Continuous measurements of responses are particularly useful for music cognition as our experience develops during the presentation of this powerful stimulus. And yet, responses can vary substantially, and psychophysiological measurements are particularly noisy. Multiple studies have identified changes in psychophysiological states with the presentation of music, but identifying when changes are triggered is not a simple task, even with rapid changing signals like skin conductance, heart rate, and respiration.

Activity Analysis is a new analysis paradigm developed specifically for music research that focuses on response events and their co-occurrence across multiple listenings to the same stimulus, whether by different listeners to a live performance or repeated listenings by a single participant to recorded music. This approach accommodates the extraneous information in continuous measurements of response and leads to new results from these complex signals, including statistical assessment of coherence between responses at specific moments in music. It supports response-led exploration of the stimuli as well as addressing questions of whether and how individual pieces are coordinating the experiences of listeners.

Aims

To demonstrate the application of Activity Analysis with the MatLab toolbox on collections of psychophysiological responses from repeated response experiments.

Main Content

This demo will introduce Activity Analysis, demonstrate the visualisation capabilities of this approach to continuous responses, and apply tests of coordination to skin conductance, heart rate, and respiration belt measurements from audience response collections and repeated response collections. Particular attention will be paid to the local coordination test, which identifies when responses are in significant alignment with the music. All to be discussed is the process of determining appropriate parameters for coordination testing of response events such as orienting responses in skin conductance, along with the implications of a lack of measurable coordination in response activity.

Implications for practice

Activity Analysis may be very useful for the study of responses to music, allowing researchers to pin point when changes in responses occur and whether the timing of changes might be expected to replicate. With the MatLab toolbox, these techniques can be readily applied to existing data sets as well as future experiments.

Value for this conference

Activity Analysis can be applied to a number experiments reported at ICMPC and conducted in labs associated with many related organizations. The relationship between music and listeners bodily responses is a long-standing but still growing area of research and tools for the exploration of experimental data are needed along side methods for testing specific hypotheses.

References

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Engaging Enjoyment Mechanisms: Music, Words, and Narrative

Mark Shevy

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Background

The history of empirical research of music and multimedia, particularly that involving film and music, regularly acknowledges the concept of narrative and its primary components of characters and events (cf. Cohen, 2013). Entertainment psychology research also investigates the role of narrative in creating desired effects such as media users' enjoyment (Raney, 2017). Very little research investigates the influence of music in conjunction with narrative for creating enjoyment.

Aims

The present study used an experiment to examine the influence of background music on listeners' perception of a story character's emotions, listeners' emotions, and listeners' sense of enjoyment of a spoken narrative. Hypothesis testing examined whether each of these dependent variables were influenced by the independent variables of 1) the type of soundtrack music accompanying the narrative (negative/foreboding, positive/cheerful, or no music) and 2) the way in which the narrative ended (the main character getting punished or rewarded).

Methods

Undergraduate students (N=105) were randomly assigned to one of the six music/ending conditions (negative/punishment, negative/reward, etc.). Participants received a hyperlink to the study via email and participated online. After agreeing to the consent form, they listened to an audio recording spoken by a professional radio announcer. The presentation of the narrative (113 seconds) via words and music without visuals is unique in this field of study, which usually incorporates moving images for application to film scenarios. The purpose for using only audio was to isolate the construction of a working narrative (Cohen, 2013) without the influence of concrete imagery and intermodal perception. After listening to the narrative, participants completed an online questionnaire. Data from the questionnaire were analyzed for validity and reliability, and six hypotheses were tested using t-tests, General Linear Models, and bivariate correlations.

Results

Music and the story endings had significant main effects on perceived character emotion and participants' self-reported emotion. Significant interaction effects between the music and endings occurred as well. Participants' enjoyment of the narrative did not vary significantly across the experimental conditions. However, one particular combination of music and story ending – negative music and the reward ending - caused participants' enjoyment to become significantly correlated with perceived character emotion and participants' emotion. These correlations fit with the predictions of Affective Disposition Theory (Raney, 2017). Furthermore, in all of the conditions that presented music except for one, the presence of music strengthened the correlation between perceived character emotion and participants' emotion.

Conclusions

Music influences the construction of audiences' working narrative, sometimes achieving the ability to engage mechanisms of enjoyment. The nature of these mechanisms will be discussed.

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T1P: Short Talks 1 - Development

Time: Thursday, 26/Jul/2018: 15:00 - 16:00 · *Location:* La Plata
Session Chair: Matías Germán Tanco

Investigating the associations between Nonverbal skills and Musical Abilities in Children without musical training

Guilherme Alves Delmolin de Oliveira[1], Olga Valéria Campana dos Anjos Andrade[2], Paulo Estêvão Andrade[3], Patricia Maria Vanzella[4,5]

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Background

Musical practice in childhood is associated with significant gains in spatial-temporal reasoning abilities, even when controlling for socioeconomic status (SES) (Bilhartz, Bruhn, & Olson, 1999). This study investigated the relationship between simple music perception abilities and nonverbal reasoning in Brazilian children from public schools.

Aims

Investigate the association between simple melodic and rhythmic perceptual abilities, processing of musical sequences, nonverbal IQ, visual memory and SES in children from public schools without musical training in Brazil.

Method

73 students of public schools (M: 8.43, SD: 0.689), completed the Nonverbal Intelligence Test for Children (R-2) and visual and visuospatial memory tasks adapted from the Benton Visual Retention Test by the Cognitive-Linguistic protocol (Capellini et al., 2012) known to be an effective instrument to identify the cognitive-linguistic profile in the first stages of reading acquisition of Brazilian children. Montreal Battery for Evaluation of Musical Abilities (MBEMA) (Peretz et al., 2013) and the Music Sequence Transcription Task (MSTT) (Zuk et al., 2013) were chosen to measure the musical perception skills from musically untrained children given their simplified paradigm and because MSTT is a valid music-based tasks for classroom settings. Families that accepted to participate in the study answered a socioeconomic questionnaire.

Results

Both the MSTT ($r = .416$, $p < .001$) and the Rhythm task from MBEMA ($r = .385$, $p = .00275$, $p < .01$) were significantly correlated with the R-2. MSTT showed a correlation with Figure order ($r = .362$, $p < .01$). When controlling for SES and Sex, Rhythm task ($r = .370$, $p = .024376$) showed a correlation with the R-2 and MSTT ($r = .330$, $p = .046275$) showed a correlation with Figure order. A multiple regression was run to predict Figure order from MBEMA and MSTT scores. These variables significantly predicted Figure Order, $F(3, 73) = 4.786$, $p < .005$, $R^2 = .164$. Only MSTT was statistically significant to the prediction, $p < .05$.

Conclusions

Correlational analysis corroborate the notion that both the melodic and rhythmic dimensions may involve visuospatial mechanisms relevant to executive functions regardless of musical training, SES and LEM. Multiple regression analysis suggests that musical tasks such as MSTT may be relevant to predict visual memory in this population. Unlike MBEMA, MSTT does not require fine tonal discrimination and may involve sequential auditory processing relevant to executive functions.

References

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CORRESPONDENCE BETWEEN THE BODY MODALITY OF MUSIC STUDENTS DURING THE LISTENING TO A MELODIC FRAGMENT AND ITS SUBSEQUENT SUNG INTERPRETATION

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Background

For embodied music cognition, the human body plays a determining role in musical production, perception and understanding (Leman, 2008). When listening to music, people react with accompanying movements such as clapping, head swaying or imitating the instrumental performance. The latter, known as motor-mimetic sketching, is part of what is known as playing 'air instruments' (Godøy, Haga and Jensenius, 2006), an instrumental mimesis where the corporal actions of the instrumental performance are recreated without having physical contact with an instrument. In this manifest behavior, one can observe essential characteristics of the covert mental images associated with the musical experience. It would be expected then that such characteristics are reflected in a real sung rendition of the same piece

Aims

To analyze the correspondence between characteristics of the instrumental mimesis of music students, while listening to a melodic fragment, and those of its later sung reproduction.

Method

12 music students participated, performing the instrumental mimesis corresponding to their main instrument, during the audition of a fragment of Danzón No.2 (Arturo Márquez) and then performing a sung version of their melody. The mimesis was videorecorded, and microanalyzed with ELAN, applying the functional gestural typology (Cadoz, 1988) and LMA system. The audio recorded sung versions were transcribed aurally and analyzed with Sonic Visualizer, according to degree of adjustment with the model (pitches and rhythms), dynamic, articulation and temporality (expressive parameters).

Results

Mimesis analysis shows three mimesis types, according to the quantity and quality of movements: T1) precise movements focused on performance; T2) moderately precise movements, mainly linked to the attribution of meaning; and T3) scanty and imprecise movements. Two action-oriented modes were found: M1) as a process of extension of the mind and M2) as aerial performance in real time. When the mimesis corresponds to T1, the sung versions show a good recovery of the characteristics of the musical fragment, with low variability of the expressive parameters. When the mimesis corresponds to T2, the sung versions show a lower recovery of the model and a greater expressive variability.

Conclusions

The different types and modalities of the instrumental mimesis and their progress throughout the task, allowed to visualize which characteristics of the music the participants resonated with, and this was reflected in the sung versions. This practice could be considered as constituting a valuable resource in the formation of the musician because, on the one hand, it reveals aspects of the listener's experience, and on the other, it facilitates the conscious awareness of the meanings implied in his or her corporality, thus providing the student with more levels of analysis.

References

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The musical cognition of a child with deletion on the chromosome 8p23 as a strategy for global stimulation: a case study in music therapy.

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Background

The chromosome 8p23 deletion syndrome affects a small number of children, but this number may be higher because no karyotype studies are performed on all those with atypical development (Ferreira et al, 2013). The characteristics of a person with 8p23 deletion are: intellectual disability, general developmental delay, non-specific facial dimorphisms and secondary autism; those features vary according to its deletion extension or rupture point of genetic material (Ferreira et al., 2013). Music Centered Music therapy is a treatment of reference for global rehabilitation of people with neurodevelopmental disorders. Music centered techniques stimulate skills of cognition, emotion, perception, efficacy, self-regulation and identify the client's musical preferences. This is due to qualified music therapists working with musical improvisations as shared musical experiences with their clients. Initial assessment is fundamental to comprehend how the client's musicality is when he/ she interacts in the environment. Organized by the assessment results, clinical improvisations as musical games between music therapist and client target improvement of the client's neurodevelopment by musicality in action (Carpente, 2013). The Individual Music Centered Assessment Profile for Neurodevelopmental Disorders (IMCAP-ND) focuses on how a client perceives, interprets, and creates music with the music therapist as the first step in formulating goals and strategies. It's composed of three scales: I - Musical Emotional Assessment Rating Scale; II - Musical Cognitive / Perception Scale; and III - Musical Responsiveness Scale (Carpente, 2013). As it provides a global understanding of one's skills, the application of these scales improved our comprehension for treating clients with 8p23 chromosome deletion.

Aims

General: To describe the music therapy process of a 6-year-old patient with the chromosome 8p23. Specific: To apply the IMCAP-ND scales to music therapy sessions as a strategy for treatment improvement in the field of neurodevelopment.

Method

A case study with mixed methods for outcome measures—IMCAP-ND Scales are measured by numbers and by letters, which refer to the independence of the client (e.g. with our without external support). There were twenty-four (24) music therapy sessions for 6 months and the application of IMCAP-ND in the first, thirteenth and twenty-third sessions. IMCAP-ND application sessions were audio video recorded.

Results

Musicality demonstrates people's cognitive ability to relate to the music and to their environment. Shared musical experiences with a music therapist provided changes within targeted actions for the global development of the client. The analysis of Scales' results tables showed an improvement in the melodic curve of vocalizations and vowels "a", "e", "i"; there was also an increase in the attention and quality of interaction with the music therapist (musical attention, musical affect).

Conclusions

The analysis of recorded audio and videos with IMCAP-ND scales I and II targeted important features of the client´s process y. The therapist followed the musical emotional lead and preservatives behaviors of the client. The development of melodic curve and vowel emission was possible through the improvisation musical play aimed at empathy, structuring and conducting the client's experience. Therefore, the hypothesis of the research was confirmed through improvement of musical attention and musical affect according to IMCAP-ND scales.

L7M: Long Talks 7 - Neuroscience

Time: Thursday, 26/Jul/2018: 16:00 - 17:00 · *Location:* Montreal_1

Session Chair: Takako Fujioka

Resting-state functional connectivity to motor cortex shows top-down modulation in music-supported rehabilitation for upper-extremity in chronic stroke

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Background

Continuing recovery of motor function in the chronic state of a stroke requires persevering training efforts. Neuroplasticity in relearning lost skills is a key mediator of such rehabilitation. Music-supported rehabilitation (MSR) is considered to promote connections within and between sensorimotor, cognitive, and affective systems through playing music with the affected upper extremity, because such goal-oriented tasks would augment action-perception representation. While previous research showed enhanced connectivity between auditory and premotor areas after MSR in chronic stroke [1], it is unclear how the pattern of recovery in the spontaneous connectivity differs between MSR and conventional physical therapy.

Aims

The current study assesses resting-state connectivity across the brain to the contralesional primary motor cortex in chronic stroke, and compares its pattern of neuroplastic changes after intervention between patients assigned to MSR and physical therapy groups.

Methods

Twenty-eight adults with unilateral arm and hand impairment were randomly assigned to MSR (n=14) and conventional physical therapy using GRASP protocol [2] (n=14), and received 30 hours of training over a 10-week period. T1-weighted anatomical and resting-state-fMRI scans were obtained at baseline and post-10 week time points. Individual lesions were traced by an experienced neurologist and registered to standard MNI space. All images were flipped to align lesions in the same side. The seed for connectivity analysis was the contralesional primary motor cortex, representing arm/elbow and hand/finger [3]. After eliminating physiological and head motion artifacts, voxels with signals temporally correlated with the seed were submitted to statistical analysis, finding interactions between Group x within-subject Session differences, followed by spatial clustering (voxel size >100).

Results

Twelve clusters were obtained to represent significant differences between groups with respect to the pre-post connectivity changes. Eight clusters showed increased connectivity, which was larger with MSR than GRASP. These clusters showed peaks in medial and lateral Premotor Cortex (BA6) and Inferior Frontal Gyrus (BA44/45) as well as Middle Temporal Gyrus, Insula, Inferior Prietal Lobule, and Cingulate Gyrus across both contra and ipsi-lesional hemispheres. The remaining four clusters, indicating larger connectivity increase in the GRASP group, involved peaks in Cerebellum Lobule VI, VIIa and VIIb, and Inferior Temporal Gyrus all in the ipsi-lesional hemisphere. These brain connectivity differences were observed while behavioural motor assessment scores did not differ significantly between groups.

Conclusions

The connectivity patterns observed are in line with the concept of MSR to promote top-down processing related to sound-action association and musical timing. The physical therapy group may have improved cerebellum error correction in gross and fine movement controls and sensory feedback integration.

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Musicking as Emergent Ecological Behavior: Linking Cognition, Culture and Neuroscience

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Background

For musicians and students of human musicking, the advances in scientific and philosophical research and scholarship in recent years offer an opportunity to address some enduring questions about this universal human behavior and its role in our daily lives and the development of our species. While ethnomusicologists have amply demonstrated the diversity of specific functions attributed to music around the world, a meta-analysis of studies of traditional cultures reveals a common thread; we express the sense that musicking connects us to our environments – social, physical and/or metaphysical. To explore the significance of this seemingly abstract sense, we can draw on advances in neuroscience and cognition, beginning with the work of Maturana and Varela (the Santiago theory) (1998).

Aims

This paper will suggest an integrated perspective on musicking, specifically by employing and linking together insights from a range of disciplines, aimed at deepening understanding of the origins and value of musicking.

Main Contribution

There are a fairly small number of scholars (cf. Becker, 2004; van der Schyff and Schiavio, 2017) working on direct application of the Santiago theory to understanding music, although much has been done in the fields of embodied and enactive cognition. One of the several components of the Santiago theory important to this paper is the idea that with a sufficiently complex nervous system, we “bring forth” both inner and outer worlds, and connect them through structural coupling. From that foundation, we can draw on work from areas such as evolutionary musicology (Cross, 2012; Tomlinson, 2015), “4E cognition” (Varela et al, 2016; Chemero, 2011; Columbetti, 2014), and auditory neuroscience (Parncutt, 2009; Overy and Molnar-Szakacs, 2009).

Implications

Understanding musicking’s primary role as connective and thus essentially ecological suggests several areas for further research, including the potential of musical activity aimed at improving the state of our relationships with our various environments. This might include efforts in education, peace-building or fostering ecological awareness, for example.

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L8M: Long Talks 8 - Psychoacoustics

Time: Thursday, 26/Jul/2018: 16:00 - 17:00 · *Location:* Montreal_2

Session Chair: Christine Beckett

The Music-In-Noise Task: a tool for dissecting complex auditory perception

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Background

Recent research suggests that hearing-in-noise abilities, which are typically measured using speech tests, involve sub-skills that are applied according to task demand and information availability (Alain, Du, Bernstein, Barten, & Banai, 2018). Musical training has been shown to improve speech-in-noise performance (Coffey, Mogilever & Zatorre 2017) perhaps because musicians have developed some of these subskills. The exact nature of the reported training effect is not fully understood, however, and few tools exist to investigate the most relevant components of cognitive processes involved in stream segregation.

Aims

We have developed the Music-In-Noise Task (MINT) to address these research questions.

Method

The MINT uses a match-mismatch trial design and includes four conditions (Melody, Rhythm, Spatial, and Visual) in which subjects first hear a short instrumental musical excerpt embedded in “multi-music babble” at different signal-to-noise ratios, followed by either a matching or slightly altered repetition of the target presented in silence. In the spatial condition the target and distractor are separated by binaural cues; in the visual condition the target is accompanied by a visual depiction of the melody in real time. In the fifth, prediction condition, subjects hear the music as a target first, the memory of which helps to predict incoming information. Data were obtained from young adults with normal hearing who differed in their musical training (N=70). Relationships between MINT and speech-in-noise was also examined.

Results

Analysis of variance showed a main effect of group (musicians vs nonmusicians), indicating an overall enhancement in MINT performance associated with musical training. We also observed a main effect of subtask, with both groups benefiting from the addition of prediction, spatial and visual cues. As well, there was an interaction between group and MINT subtasks, which arose primarily from the largest music training effect appearing in the prediction, rhythm and visual subtasks. Finally, we observed a significant correlation ($r = .44$, $p < 0.01$, 2-tailed) between the speech-in-noise task scores and the overall MINT scores.

Conclusions

These results confirm a task sensitivity to musical training. With an absence of linguistic cues, the MINT is unlikely to be affected by native language, although familiarity with western music would likely affect the results. Our data show the importance of prediction, spatial and visual cues. The additional information provided by such cues is not considered in traditional hearing-in-noise tasks. Although there appears to be a general stream segregation ability common to the speech-in-noise and MINT tasks, only 20% of the variance could be accounted for, which indicates that the music task is also sensitive to additional factors in comparison to the speech task.

The MINT constitutes a useful tool to evaluate different aspects of stream segregation and thus provides a good complement to speech-based tests. Customizable version available soon.

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Perceiving Musical Intervals: a test case for categorical perception

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Background

Categorical perception is the phenomenon in which sounds that are along a continuous physical dimension are perceived as belonging to distinct categories (Patel, 2008). Previous studies performed with Western musicians reported that musical intervals (the ratio between two musical tones) are perceived as categories, in a pattern similar to categorical perception of speech phonemes (Siegel & Siegel, 1977; Burns & Ward, 1978). Most studies assessing categorical perception include categorical response delivery. In addition, most previous studies on categorical perception in the auditory domain used verbal stimuli, which does not permit precise measure of how expertise is related to categorical perception. We designed a novel continuous report task, which removes categorical aspects from the estimation response, and investigated the relationship between expertise and categorization.

Aims

The current study has two main goals. First, we examine the role of individual differences and stimulus properties in categorical perception, such as musical training, stimuli properties (higher or lower tones), and cultural background (Western or Arabic). Second, we utilized a continuous report task in order to assess categorical perception more accurately while minimizing possible task biases.

Method

The stimuli included two Western melodic intervals – major and minor thirds, and another eleven intervals of intermediate size differing from each other in steps of 12.5 cents (1/8 of a semitone). Participants heard a melodic interval and on the screen they saw a continuous scale ranging from “small” to “large”. Then they listened to other randomly presented intervals and estimated their relative sizes on the scale. According to the categorical perception hypothesis participants should use only two main locations on the scale, respective to the two intervals they are familiar with, while the others will fall into the nearest interval category.

Results

In a sample of forty-one participants, the interval-size estimation task revealed individual differences in categorical perception of musical intervals: participants that showed greater success in an interval recognition test (administered independently) were more categorical in their performance in the main task, and less sensitive to subtle intonation modifications. In addition, we found a significant interaction between pitch height and interval size estimation, which has not been previously regarded in categorical perception studies. We are currently in the process of collecting data on categorical perception among individuals with background in Arabic music.

Conclusion

Music cognition provides a unique opportunity to investigate categorical perception due to the fact that intervals can be related to via a size analogy familiar to musicians, and thus we expect to produce results that represent the auditory categorical perception phenomenon more accurately.

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T1S: Short Talks 1 - Absolute Pitch

Time: Friday, 27/Jul/2018: 0:00 - 1:00 · *Location:* Sydney

Session Chair: Dorien Herremans

The tip of the iceberg: redefining absolute pitch through the lens of synaesthesia

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Background

Synaesthesia and absolute pitch (AP) are two uncommon cognitive conditions that reflect increased neuronal connectivity and have been anecdotally reported to occur together in individuals (Gregersen et al., 2013; Hänggi et al., 2008; Loui, Zamm, & Schlaug, 2012; Mottron et al., 2013; Ward, Huckstep, & Tsakanikos, 2006). What both conditions require are involuntary and stable mappings between perceptual and verbal representations. While synaesthesia is systematically labelled as a neurological condition, with a strong focus on its possible genetic underpinnings, AP is referred to as an acquired ability. A systematic comparison of the two conditions has yet to be undertaken.

Aims

A comparison of the phenomenological features of both conditions is explored, with the aim of addressing two key questions: Is the phenomenology of synaesthesia and AP comparable, and if so, to what extent? Is there the opportunity to evoke the possibility of an integrated, singular phenomenon?

Method

This comparative analysis draws from established literature on the phenomenology of both conditions, while new insights from synesthetes and AP possessors collected during the author's PhD studies will also be referenced. Participants recruited for this study (n=35) comprise a self-identified sample across music students and staff of the Melbourne Conservatorium of Music, University of Melbourne. Three forms of data collection were used for this study: an online questionnaire, semi-structured interviews, and synaesthesia and AP battery tests.

Results

A phenomenological comparison of synaesthesia and AP reveals more similarities than differences. This is in contrast to how both conditions are commonly represented in the literature. Qualitative data obtained through case-study interviews demonstrate that the self-reports of AP possessors commonly match the diagnostic criteria for pitch-spacial location, pitch-tactile sensation, or a modified (auditory) form of ordinal linguistic personification types of synaesthesia.

Conclusions

The findings have implications for broader understandings of the specific features of synaesthesia and AP. Emphasising the 'submerged', but much larger and consequential influences of AP ability, such as the personal relationship and deep engagement with musical keys, enables a more profound understanding of the impact of these conditions on cognitive and affective processing of music.

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Defining the phenotype of absolute pitch

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Background

A growing body of research has supported the proposition that absolute pitch (AP) is influenced by genetics (Tan, McPherson, Peretz, Berkovic, & Wilson, 2014). Research in this area, however, is limited by conflicting definitions of AP and inconsistent methodologies. One concept in need of study is quasi-absolute pitch (QAP), an intermediate form of pitch-naming ability largely omitted from investigations. Preliminary research has suggested that QAP possessors may utilise relative-pitch strategies to compare presented pitches with internal reference tones (Wilson, Lusher, Wan, Dudgeon, & Reutens, 2009), but this is in need of more rigorous investigation in the pursuit of a systematic classification of ability.

Aims

This study aimed to clarify the phenotype of AP, with emphasis on QAP. A novel pitch identification paradigm was developed to examine relative-pitch strategy use, and a data-driven approach was used to determine the number of distinct groups within the distribution of pitch-namers.

Methods

Thirty-five musically-experienced participants were instructed to identify the second of a presented pair of pitches, with the first serving as a "priming" note. If a QAP participant's internal pitch template contained the prime chroma, this was hypothesised to enhance performance, and allow for the analysis of its influence on target accuracy. Latent profile analyses were conducted on both the priming task and a standard pitch-identification task to determine the levels of pitch-naming ability present in the sample. Some studies (for example, Baharloo, Johnston, Service, Gitschier, & Freimer, 1998) have assigned credit to semitone errors in these tasks rather than to raw scores alone. Latent profile analyses were also performed on the dataset with semitone errors given credit, to determine the effect on the distribution of pitch-namers.

Results

The priming task demonstrated that for musicians with intermediate pitch-naming ability, accuracy of pitch identification was predicted by the identity of both the target note and the prime. Latent profile analyses on raw accuracy scores revealed three groups of pitch-namers, corresponding with chance performance, QAP, and AP. When scoring semitone errors as correct, only two groups emerged - chance and AP.

Conclusions

This study represents a novel contribution to the AP literature, introducing a new approach for the study of QAP. Furthermore, the AP phenotype was shown to vary according to the methodology used to measure it, in that the number of categories of ability is dependent on chosen scoring protocols. These findings have the potential to underpin future investigations into the genetic basis of AP.

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L4S: Long Talks 4 - Preference

Time: Friday, 27/Jul/2018: 1:00 - 2:00 · *Location:* Sydney
Session Chair: Yanan Sun

The new U: Music preference is an inverted-U as a function of exposure by reinventing the Ebbinghaus memory retention curve

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The inverted-U curve has been used in psychological research as a model of preference for well over a century, with the zenith of its influence in the 1970s through the work of Daniel Berlyne. The model proposes that moderate levels of collative variables, such as familiarity/exposure will produce the highest levels of preference. Despite recent evidence of its continuing utility in music preference, representations of the curve have mostly been descriptive, or a schematic, concave-down parabola-based shape with no further justification, suggesting the need for a psychobiologically plausible, mathematical model of the desired shape. This paper explored the Ebbinghaus forgetting curve as one approach to remedy this need. The curve is a simple psychological model of memory based on an exponential function with negative index (a decaying function). We wanted to investigate if and how this curve may also have some way of explaining preference responses, in particular to see if an inverted-U trajectory could be recovered as a result of the manipulation of the function.

The forgetting curve in its simplest form traces out stimulus memory as decaying with time, with additional exposure to the stimulus creating memory 'boosts', which once again commences to decay with time. We suggest an adaptation, in which the boost in memory retention is re-labelled 'Freshness', and propose it as an individual output of a new function that can be expressed as a simple combination of two forgetting curve functions. As a result, we were able to produce a function in three-dimensional space (Freshness as a function of time and exposure number) that slowly decayed over time, but received a boost with each integer exposure increment. Importantly, we noticed that this function mapped out an inverted-U trajectory at several planar slices of the function across the time/exposure plane, making it a psychologically plausible instantiation of the inverted-U curve for preference as a function of exposure.

We believe this is the first mathematical model of the inverted-U curve that maps out preference as a function of exposure based on a psychologically plausible model of memory, and produces a result for which there is considerable empirical evidence. Future work based on identifying specific instances of the model with empirical data, and possible applications for automatic music recommendation systems are discussed.

Blurring the lines on melodic similarity: Copyright decisions are influenced by familiarity and liking for songs

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Background

Judgements of musical similarity are not objective, and may be affected by familiarity and expertise (Schubert & Stevens, 2006). Court cases involving music plagiarism commonly focus on similarity of two melodies (Müllensiefen & Pendzich, 2009), however, a melody integrates pitch, rhythm, contour, and tonal features to form a structure in time (Prince, 2014). Listeners use surface features (e.g., rhythm, contour) more than structural features (intervals and tonality) when determining melodic similarity (Prince, 2014). Decisions by experts, however, are more complex, and incorporate greater knowledge of tonality and musical structure (Halpern, 1984; Schubert & Stevens, 2006).

Aims

We investigated whether familiarity with and liking for a song predict judgements of similarity and copyright infringement in expert and non-expert listeners. Further, we investigated the contribution of individual musical features to perceived similarity.

Method

We recruited 374 participants (61 expert, 312 non-expert) to complete an online survey. Expert participants had received a mean of 14.4 years' musical training (SD = 4.5; Non-experts, M = 1.7 years, SD = 2.5). Participants listened to 60 pairs of songs from real-world copyright cases. For each pair of songs, participants rated their familiarity with, and liking for, the

plaintiff's and defendant's songs, how similar the songs were overall, and the similarity of the melody, contour, harmony, rhythm, accompaniment and arrangement. Finally, participants rated whether they believed the defendant's song constituted copyright infringement.

Results

Using mixed-effects models, we found that familiarity and liking for the plaintiff's song predicted guilt of copyright infringement, whereas familiarity and liking for the defendant's song predicted a not guilty decision. Melody was the most important predictor of perceived similarity, followed by rhythm, then contour, arrangement, accompaniment, and finally harmony. Expertise predicted increased similarity of all musical features, consistent with experts' increased knowledge facilitating more sophisticated decisions. Experts also used melody more, and contour less, in determining similarity. However, contrary to expectations, experts were as influenced by familiarity and liking as non-experts.

Conclusions

Perception of musical similarity is complex, and may be biased by liking for, as well as past knowledge of a song. Consistent with the literature, both expert and non-expert listeners used surface features in preference to structural features to determine similarity, although expert musicians were less reliant on contour. These findings have implications for jury decisions in copyright cases. Given that these biases were present in expert as well as non-expert musicians, this may explain discrepancies in judgements by expert witnesses for the prosecution and defense.

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T3S: Short Talks 3 - Rhythm and Performance

Time: Friday, 27/Jul/2018: 6:10 - 7:50 · *Location:* Sydney

Session Chair: Jia Hoong Ong

Misaligning the tonal and metric hierarchies in normal melodies decreases goodness and beat clarity

Jon Prince[1], Jeanelle Tan[1], Mark Schmuckler[2]

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Background

Tonally strong pitches occur at metrically strong points in time (Järvinen, 1995; Prince & Schmuckler, 2014), suggesting a link between pitch and temporal structure. But previous work is mixed: Palmer and Krumhansl (1987) found independent contributions of tonal and metric stability to probe tone ratings, whereas Boltz (1989) found that temporal accent structure influenced tonal resolution judgements. Rosenthal and Hannon (2016) found that listeners are sensitive to complex relationships between pitch and time in a novel musical system. We investigated if manipulating the alignment of the tonal and metric hierarchies influenced global melodic judgements (goodness, and beat clarity), and if this changes based on how typical the melodies are.

Aim

Our aim was to test if melodies with aligned tonal and metric hierarchies receive higher goodness ratings and higher beat clarity ratings than those with misaligned hierarchies, and if this pattern applies to both randomly-generated and composed melodies.

Methods

In Experiment 1, participants rated 200 melodies on a scale of 1-7 of how good they sounded (N=32) or how clear the beat was (N=41). Stimuli were generated offline by scrambling the order of a distribution of pitch classes (reflecting the major tonal hierarchy) and metric positions (reflecting 4/4 time), and selecting sequences that had either aligned or misaligned tonal and metric hierarchies. Experiment 2 used 60 composed melodies (in a major key and in 4/4 time), but phase-shifted the pitch pattern (leaving the duration pattern unchanged) to create versions with aligned or misaligned tonal and metric hierarchies. The original (unshifted) melody was not used. Participants rated either goodness (N=43) or beat clarity (N=32). All participant groups had a range of musical training, reflecting the average population.

Results

In Experiment 1, neither ratings of goodness nor beat clarity were affected by tonal-metric alignment (all F-scores <1). In Experiment 2, both goodness ratings and beat clarity ratings were higher for melodies with aligned tonal and metric hierarchies ($\eta p2$ = .17 and .30). Overall average ratings were similar across experiment, and there was no effect of musical training, nor starting/ending notes, nor number of pitch reversals, although average interval size predicted metric clarity in Experiment 2.

Conclusions

This is the first evidence of psychological reality of the tonal-metric hierarchy, a remarkably sophisticated statistical property of typical Western music. Interestingly, ratings were only affected when the melodies retained a normal pitch contour, underscoring the importance of contour in perceptual organisation – the alignment of tonal and metric hierarchies only mattered in the context of well-formed (i.e., intact contour) melodies.

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Visual cues in musical synchronisation: The influence of a virtual conductor and movements of a co-performer

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Background

Rhythm perception and production are guided by auditory (Repp & Su, 2013), and visual cues (Hove & Keller, 2010), particularly in interpersonal synchronisation. One example of this is an orchestra, where many musicians coordinate their actions, often under the direction of a conductor who provides a visual beat to guide the orchestra through tempo changes. However, little is known about the mechanisms through which a conductor facilitates synchrony. We hypothesised that participants would exhibit greater temporal prediction, synchronisation, and body sway while observing a conductor, as the conductor's velocity profile provides information about upcoming beats intervals (Luck & Sloboda, 2008), and contains biological motion to which participants might entrain(Schmidt, Richardson, Arsenault, & Galantucci, 2007). We expect these effects to be greater when synchronising with a skilled partner, as this provides further temporal information.

Aims

We wanted to understand how a conductor influences a musician's sense of time at two levels: instrumental movements (i.e. movements that produce sound) and ancillary movements (i.e. body sway). In a follow-up experiment we tested how instrumental and ancillary movements are influenced by the presence of a "co-performer."

Methods

We designed a virtual conductor, derived from morphed motion capture recordings of human conductors. In experiment 1, participants completed a synchronisation drumming task, in which they attempted to drum along to a tempo-changing beat sequence while observing one of three visual cues (virtual conductor, simple visual metronome, stationary circle). In Experiment 2, participants completed a similar task, but with a partner in different spatial arrangements to manipulate visual access. Drumming accuracy was recorded with a MIDI drum pad, and body sway was recorded using Vicon motion capture.

Results

For Experiment 1, the virtual conductor elicited more ordered body sway than the other two conditions, but not larger movements. The conductor also improved synchronisation, and predictive timing. Furthermore, individual changes in movements were predictive of improvements in synchronisation. For Experiment 2, interpersonal asynchrony between partners was lowest when both partners could see the conductor, regardless of whether they could see each other. Also, asynchrony correlated negatively with coherence of ancillary movements, as measured by motion capture.

Conclusions

Conductor patterns not only facilitate synchrony and prediction, but also have a small effect on ancillary movement. The effect on body sway could reflect a means of reinforcing one's sense of musical timing, or of conveying a sense of time to co-performers.

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Evaluating Individual Differences in Musical Performance: A Study of Stylistic Approach to Tempo Fluctuation in the Music of Chopin and Liszt by Contemporary Pianists

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Background

In performance studies, analysis of performances has primarily concerned with the understanding of what is in common to most performances as opposed to the differences between individual performances and differentiation between individual performers. Much of the research initiatives in this field have been directed towards searching for trends in performance styles in general and conventions of expressive features among performers. This analytic approach, which usually involves collecting, analysing and interpreting a large amount of data, inevitably undermines the search for the individuality of performers and individual differences in performance style. Most of the studies on individuality of eminent performers, on the other hand, lack either a systematic comparison between the performer in question and the performance convention, which in turn undermines our understanding of individual difference, or a musical context that is broad enough to claim individual difference. While we can recognise performers' difference in performance style, the question of 'how performers differ from each other', i.e. the individual difference, remains relatively unknown.

Aims

This paper develops a descriptive taxonomy of how performers differ in tempo fluctuations both in large-scale and small-scale levels. It investigates individual approaches to tempo fluctuation in recorded performances by mid-career contemporary pianists and establishes individuality in the performance through situating their tempo profile in the conventional range.

Methods

Four solo piano pieces, two by Chopin and two by Liszt, were selected for close analysis. They contain a wide range of musical contexts that can help examine stylistic consistency of pianists across contexts. For each piece, tempo data from recordings by 10 different pianists born between in the 1970s and 1980s were analysed and compared.

Results

Results show at the large scale level some pianists prefer to accentuate structural segmentation by contrasting tempos across sections and significant rallentandos at sectional divisions whereas others incline to emphasis structural continuity and long-range unity by more progressive tempo change across sections and relatively steadier tempo at structural points. At the small-scale level, different pianists may tend to highlight different aspects of expression, including melodic and harmonic cruxes, motivic groups and metrical organisation.

Conclusions

Individual difference is about whether people are more similar to themselves over time and across situations than they are to others, and whether the variation within a single person across time and situation is less than the variation between people. The systematic analysis of a variety of pianists' style of tempo fluctuation across musical pieces, which contain a range of musical contexts, provides extensive empirical presence for the differences in approaches to tempo fluctuation at the large-scale and small-scale levels. It deepens our understanding of individual difference in musical performance.

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Constructing, delivering, and perceiving emotion in Passion, Lament, Glory, a staged pasticcio oratorio

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Background

The representation of Christ's life, death, and resurrection in the form of a play or musical 'Passion' is a tradition which dates back a number of centuries, with the Baroque music settings by Bach being perhaps the most commonly known of these works that exists today (e.g., St. Matthew Passion). Passion, Lament, Glory draws on musical settings by influential Baroque composers Handel and Pergolesi and enacts music and text using art forms synonymous with opera including singing, acting and expressive movement. Passion, Lament, Glory was performed in St Paul's Cathedral, Melbourne, Australia in March/April 2017.

Aims

The present research considered how enacted emotions were developed and delivered in the creative work of the directors and cast and how these were then realised by the performance and perceived by the audience.

Method

The research drew on three data sources in order to consider how emotion was constructed and enacted as well as how it was perceived through the performance. The artistic director provided a detailed and self-reflective account of the production and rehearsal process. Interviews with the cast addressed decisions concerning the means used to enact emotion, and audience members were invited to complete a post-performance survey providing their response. The audience response questionnaire included measures of emotional contagion (Doherty, 1997), emotional reaction (adapted from Trondle, Kirchberg & Tschacher, 2014), and responding to an open-ended question to describe their emotional reaction to the performance.

Results

The artistic director's self-reflection indicated a purposeful historical and modern social justice agenda for the production: the Easter music and the historically-informed narrative of the Passion of Christ was purposely set within a religious site to explore racial and religious discrimination. The cast of 12 women, the artist playing Jesus and the director worked to understand loss and how this might feel in the historical setting of the work as well as in today's social and political climate.

Focus groups with cast members elucidated that while the cast members learned about their emotional embodiment during rehearsals, the performances in the cathedral brought about a different, and more intense, level of emotion. Many in the cast expressed how there was something special about this work and the performances.

Analysis of the audience data indicates that the audience experienced a range of emotional responses to the work. Some displayed an awareness of the parallel between the historical religious persecution and modern-day conflicts, with some experiencing strong religious/spiritual emotions. Analyses indicated that many were moved to think, an indication of the complex emotional responses experienced—while the music was deemed beautiful and enjoyed, the play's depiction of suffering stirred other emotions at the same time.

Conclusions

It was clear that the aim to create a highly emotive production influenced decisions and actions from the beginning to end. Indeed, the cast's decisions about character portrayal and singing brought about their own emotional involvement, which then influenced the audience's experience. The present study sets groundwork for future quantitative research that could specifically test mediation models based on these findings.

The investigation of practice and supportive activities in advanced classical singers

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Background

To understand how practice- and career-related activities are evolving in line with professional career demands, it is important to study current practicing singers and consider the unique professional requirements on them (Burwell, 2006).

Aims

This study aims to investigate how the definition and execution of practice evolves in line with the developing professional demands placed on classical singers after graduation. This research is driven by the following questions:

• How do classical singers at varying points in their emerging careers define practice and what do they include as part of their practice/extra-curricular activity?

• How has this evolved from their university training and how does it reflect perceived professional demands?

• What are their vocal priorities and how do these align with perceived professional demands?

Methods

This study adopts a focus group methodology to address the research questions. Australian-trained classical singers at varying ages and points from completion of undergraduate honours to middle career will participate one of the following semi-structured focus groups: 'Developing' (Graduating singers approximately 22-26 years of age); 'Young Artists' (approximately 25- 35 years of age); 'Middle Career' (approximately 33-40 years of age). The semi-structured focus groups will be transcribed for Interpretative Phenomenological Analysis.

Results

Results from the Analysis will be presented, and themes discussed in terms of psychological theories of practice and career motivation and theories of career focus. As data collection is currently underway, analysis has not yet occurred; however, it is expected to be completed in early 2018.

Conclusions

By targeting singers at points throughout the transitional period from university completion to middle-career, greater understanding of how singers navigate industry demands and their own practice during this period can begin. This is especially important as learning outcomes of training institutions may not necessarily coincide with professional demands and the musical, physical, and psychological characteristics required (Gembris, 2004; Langner, 2004). The response of singers will also provide further insight into the function of practice in professionally engaged singers and any additional skills they utilise. In summary, these findings will inform further research into the function, detail, and scope of practice in relation to performers and industry demands, as well as the design of education and industry interaction with singer development.

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T9G: Short Talks 9 - Aesthetics

Time: Friday, 27/Jul/2018: 6:30 - 7:30 · *Location:* Graz_1

Session Chair: László Pál Stachó

Absorption and Self-monitoring as Experiential Predictors for the Aesthetic Appreciation of Music: A Correlational Study

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Background

Many writers across all times have written about the potential aesthetic effects of music experiences known as absorption (i.e., an effortless type of heightened attentional involvement) as well as upholding one's meta-awareness (i.e., being a third-person observer 'objectively' monitoring onto one's experience). Despite a strong theoretical tradition linking these together, few coherent, successful attempts exist which demonstrate how these constructs can be investigated at the same time and in a sustained, empirical way – that is, understanding the aesthetic consequences and mechanisms of a savoring state of a coexisting attachment and detachment (Bryant & Veroff, 2007).

Aims

The first aim of the study was to simultaneously examine the state and trait influences of absorption and meta-awareness on three indicators of favourable response to music: hedonic pleasure, long-term impact, and behavioural intention towards the music. A second aim was to investigate whether and how state absorption, meta-awareness, and enjoyment interact by standing in a reciprocal relationship with each other.

Methods

A non-recursive model was employed with data from an online-study using structural equation modeling (n = 602). Based on a list of preselected musical pieces, participants listened to one piece and afterwards were requested to fill in relevant measures, including the Tellegen absorption scale, mindful attention awareness scale, attentional focus, altered awareness, visual imagery, meta-awareness (via volitional control, rationality, self-awareness, and memory of the previous event), and three gratification measures derived from Lacher and Mizerski (1994) and Oliver and Bartsch (2010).

Results

An absorbed state of mind – found to be best operationalized as a multidimensional bifactor model – completely mediated the effect of trait absorption, and was the best predictor for pleasure, lasting impression, and behavioral intention. Whereas absorption and pleasure were found to have a mutual positive effect on each other, absorption and meta-awareness were found to be unrelated to each other. This may point to parallel, independent processing. Finally, consistent with Schooler, Ariely, & Loewenstein (2003), meta-awareness had a maladaptive (albeit small) effect on aesthetic appreciation.

Conclusions

The results confirm the need for a dynamic approach to the relationship between state absorption and enjoyment; the one-directional approach common in many research reports does not seem to fully capture their relationship. Instead of conflating them, future research should distinguish between absorption and meta-awareness. Finally, monitoring one's ongoing musical experience can be counter-productive in benefiting from listening to music.

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Consider the Source: The Effects of Source Bias on Professional Assessment of Music Quality and Worth

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Background

Music in advertising is big business, with brands spending hundreds of millions of dollars a year to procure music for use in marketing campaigns, television and radio commercials, social media, and experiential events. Agency professionals are entrusted by their clients to make decisions about music that not only impact the advertising message but procurement costs as well. Given the importance of these decisions, there is a surprising lack of empirical research investigating the factors that can influence perceptions of music aesthetics and worth in the context of advertising. The present study focused on one of these factors: the source of the music (i.e., music from generic music libraries, commissioned by music agencies, or recorded and released by artists).

Aims

This study aims to investigate whether the source of the music influenced evaluations of music in the context of advertising, considering both a sample of advertising and marketing professionals and a sample of general consumers.

Method

In experiment 1, participants (N= 50) were professionals with an average of 16 years in synchronization revenues. In experiment 2, participants (N= 113) were general consumers with no expertise in the use of music in advertising, but similar in age and levels of musical training. Participants in the two experiments listened to and evaluated advertising music, which was presented as coming from three different sources (artist vs. commissioned vs. generic library). The music stimuli were provided by an audio branding agency, consisting of 30-second excerpts of music tracks commissioned specifically for TV commercials but never publicly released.

Results

In experiment 1, when evaluating music aesthetics, professionals provided significantly more positive ratings when they were told the music was coming from artists, compared to commissioned music ($p = .001$), and generic music libraries ($p = .04$). The marginal and conditional R2 of this model were .02 and .37, respectively. In addition, when the music was presented as coming from artists, professionals expected to pay the highest amount of money, followed by commissioned music, and generic music library (all p-values < .05). The marginal and the conditional R2 of this model were .02 and .77, respectively. In contrast, in the group of general consumers (experiment 2), the music source had no significant effects on any of the measured parameters.

Conclusions

The results from two experiments show that considering the source of the music only had a significant impact amongst industry professionals, whereas general consumers were unaffected by source cues. These results are consistent, at least partly, with the effects of contextual information on subjective judgments. We discuss the findings in terms of the anchoring heuristic, the role of expectations and prestige effects, and the so-called “expert problem”. Finally, we point out an important consideration for brands: the potential financial impact of source bias on their advertising cost. Thus, understanding source bias should encourage both brands and professionals alike to consider strategies that might mitigate this bias, avoiding costly choices that could otherwise result.

Aesthetic experience and musical pleasure in contemporary classical music – an interview study

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Background

Music listening has the potential to evoke strong experiences in listeners. Current models of musical aesthetic experience have emerged in the recent years capitalizing on evidence from psychology and neuroscience research [1,2]. A large part of research focusses on Western tonal music, being mostly consonant and providing a tonal hierarchical structure. However, music is highly diverse regarding features like meter, timbre and tonality. Hence, a corresponding focus may

have led to a one-sided view regarding the qualities underlying the aesthetic experience of music. Looking beyond this view to another form of Western music, contemporary classical music (CCM), listeners are exposed to music that is often dissonant and lacks a tonal hierarchical structure, as for example in pieces of serial music.

Aims

The current study aims at exploring the aesthetic dimensions of a CCM experience in order to complement the scope of musical styles that research has thus far addressed. Moreover, the study aims to differentiate aesthetic experiences with regard to classical music (CM) and CCM. Both aspects of the aesthetic experience of music and musical pleasure were investigated.

Methods

We conducted 16 exploratory semi-structured interviews with experts of both CCM (n = 8) and CM (n = 8). Participants were asked to report three favorite pieces from the corresponding genre. For this task, CM and CCM were not further specified. The interview guide consisted of questions deduced from models of aesthetic experience of music [3,4] and revolved around various aspects of music aesthetic experience including physiological, affective and cognitive dimensions. To account for musical pleasure questions addressed e.g. liking, beauty and absorption.

Results

Applying qualitative content analysis revealed preliminary results regarding differences in two main categories. With regard to ‘expectation’ towards an experience with the specific music subcategories 'intellect' and 'topicality' emerged in the CCM group. In contrast, in the CM group subcategories like 'contemplation' and 'interpretation' could be found. With regard to ‘beauty & pleasure’, CCM experts revealed a preference for aspects like 'novelty' and 'coherence' whereas in the CM group the experience of beauty was mainly linked to 'tonal organization' and to 'difference of interpretations' of classical pieces.

Conclusions

This study gives preliminary insights into the diversity of experiences humans may undergo when listening to music. Both expectations towards a listening experience and positive aesthetic values vary widely between the adressed musical styles. Therefore, we propose a research focus that delves into the experience of CCM and that uses this experience as a compelling way with which to enhance our understanding of the aesthetic appreciation of music.

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T10G: Short Talks 10 - Emotion

Time: Friday, 27/Jul/2018: 6:30 - 7:30 · *Location:* Graz_2

Session Chair: Juan Loaiza

Studying children's interaction with sounds: Behavioral and EEG results from a consonance vs dissonance perception study

Nicola Di Stefano[1], Valentina Focaroli[1], Giuseppe Curcio[2], Alessia Noccaro[1], Fabrizio Taffoni[1], Flavio Keller[1]

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Background

Literature on the role of the human motor system in music perception (see e.g. Leman & Maes, 2014) encourages the development of novel behavioural protocols based on auditory stimuli that are intrinsically related to participants' motor activity. In this line, we developed a behavioural method for investigating auditory preferences in children based on participants' interaction with a musical toy that emitted consonant/dissonant intervals according to its rotating degree (Di Stefano et al., 2017). Here we present a modified version of that protocol, that introduces an EEG headset in order to gather data on brain activity in an ecological setting.

Aims

Main objectives of the study were: i) modifying the stimuli; ii) assessing the effect of age on children interaction with the toy; iii) testing the EEG headset with children.

Method

The study involved 31 children aged between 17 and 40 months. The musical toy was a handle that produced different harmonic intervals. For rotations exceeding the [-20°/+20°] interval the toy produced dissonant and consonant sounds, respectively. Between -20° and +20°, the device was silent. The device emitted C4-G4 (from 20° to 50°), C4-E4-G4, (50° to 80°), and C4-E4-G4-C5 (for rotations exceeding 80°); while dissonances were C4-F#4 (from -20° to -50°), C4-Db4-F#4 (-50° to -80°), and C4-Db4-F#4-A4 (for rotations exceeding -80°).The experimental session was divided into three phases, which lasted 90 seconds each: two sounding phases (1 and 3) and a mute phase (2). During the three phases children freely interacted with the toy.

Results

Preliminary data analysis provided the following results: i) sound emission strongly stimulates children's use of the toy; ii) children manipulation of the toy increases with age; iii) finally, when considering consonance vs. dissonance durations, younger children (19-30 months-old) behave differently from older children (30 to 40 months-old).

Further analysis will focus on the different degrees of consonances and dissonances to verify if children show a specific preference for the perfect major chord over harsh dissonances but not over mild (or less harsh) dissonances. As far as EEG data is concerned, we gathered data only from 4 participants, as the others refused to wear the EEG headset. Data analysis is currently being performed on those 4 subjects.

Conclusions

Recruited children failed to show a generalized preference for producing consonant intervals, suggesting that sounds production depends on age (Group 1 or 2) and experimental phase (1 or 3). This finding waits for further empirical confirmation. More in general, research on auditory preferences in children will benefit from the development of novel behavioural methods.

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The role of audio and visual information in emotion during joint improvisation drum performance

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Background

Improvisation performance often causes an intensive emotional experience among performers. The effect of improvisation on emotional status seems very positive (Fancourt et al., 2016) and calls for a further investigation. Our research focuses on the idea that the effort to produce musical phrases are the key to the emotional experience. Next to this, we investigated the effect of communication channels: While the importance of visual information is repeatedly highlighted in musical communication (e.g., Davidson & Good, 2002, Tsay, 2003), its effect on affective status during a performance is not yet fully understood.

Aims

Using realistic musical materials, we tested the effect of audio, visual and audio-visual information on affective status of performers during a joint drum performance. The performance included two tasks: improvisation and imitation.

Method

27 participants performed short rhythmic sequence with the experimenter under Audio-only, Visual-only and Audio-Visual conditions. All participants formed a pair with the same performer (experimenter). The rhythmic sequence consisted of a unison part followed by an improvisation part of each 4 bars that were repeated 3 times. During the Audio-only condition, performers played the sequence back-to-back, while during the Visual-only and Audio-Visual conditions, performers played facing each other. The tempo was set to 120 bpm and the metronome beats were given through a pair of headphones. During Audio-only and Audio-Visual conditions, metronome, the sound of partner and own performance were transmitted through the headphones. During the visual-only condition, the sound of the partner nor own performance was not transmitted. Instead, the metronome and white noise was presented assuring that they will not hear the physical sound of hitting the pad. Next to this, they performed imitation (i.e., non-improvisation) task that consisted of a unison part followed by an imitation part of each 4 bars. During the imitation task, both Audio and Visual information were present. Shortly after each condition was performed, participants were asked to fill-in the emotion questionnaire that captures transient affective status concerning valance, excitements and calmness (Arai et al., 2003). They performed the four conditions for twice.

Results

The results indicated that Visual-only condition lead participants to the most negative, least exciting, and least calm affective status. Conversely, participants' response after the Audio-visual condition was the least negative, most exciting and most calm. Audio-only condition was always in between the two conditions. Response after the improvisation condition was more negative but more exciting and less calm than the imitation condition. Because the performed rhythmic patterns during the two conditions were quite similar, the results possibly capture the emotional status associated with the excitements and the nervousness involved in improvisation.

Conclusions

We showed that visual information has an additive value to audio information that leads performers to a more pleasant affective status during joint drum performance. Also, our results seem to capture characteristic affective status of improvisation performance.

T3G: Short Talks 3 - Performance

Time: Friday, 27/Jul/2018: 6:30 - 7:30 · *Location:* Graz_3

Session Chair: Tommi Himberg

The role of autonomy support from teachers and young children's self-regulation in music education: Introducing and validating an observational instrument

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Background

This research project, funded by the Society for Education, Music and Psychology Research (SEMPRE), brings together two currently under-researched areas: namely the work on autonomy supportive styles adopted by teachers, and the work on self-regulation by learners in early music education. It is believed that autonomy-supportive contexts tend to promote students' self-regulation (Reeve, Ryan, Deci, & Jang, 2007). Despite this, little research is available to support this link within the early years and music education contexts. It is hypothesised that the scarcity of research on autonomy support and self-regulation in early music education is due to the limitations of self-report measures, which cannot easily be employed with young children.

Aims

We adopt a novel, observational approach, which allows the investigation of autonomy support from teachers and self-regulation from pupils during music lessons with very young learners. As such, the primary aim of present research is to validate an observational measure of autonomy support and self-regulation for use in music lessons with young learners.

Method

This study takes a quantitative observational perspective and examines a sample of 30 music tutors and their 60 young pupils (aged 5-8 and in the first year of formal music tuition). The study's autonomy support measure is based on Whipple, Bernier and Mageau's (2011) observational measure for maternal autonomy support within infant-mother dyads. The autonomy support measure is validated against a questionnaire for teachers, which measures teachers' provision of autonomy support and control (Deci et al., 1989). The self-regulation measure is based on Zachariou and Whitebread's (2015) coding scheme on identifying positive self-regulatory behaviours in musical play, and Bryce and Whitebread's (2012) coding scheme on failures in regulation.

Results

The study is currently at data collection stage, and we will present the measurement tools and preliminary results at the conference. Given the limitations of self-report measures normally employed to research autonomy support and self-regulation, and their unsuitability for use with younger children, the validation of this observational measure is expected to have an important impact in the field.

Conclusions

This research will provide preliminary support for larger scale and longitudinal studies on the impact of autonomy support and self-regulation in early music education.

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The audience as performer: examining the effect of new music written for audience participation

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Background

With the ever-increasing availability of high quality musical performances online without travel or substantial cost, it is increasingly necessary understand what makes going to a live performance special, and to explore the parameters of experience that can only be obtained by “being in the room”. One such parameter is the opportunity for active participation by the audience. Such participation is a sought-after goal by music promoters and policy-makers, but its application to contemporary classical music has been infrequent, and remains under-theorised and under-researched. Additionally, practical Initiatives in this area generally fall short of involving audiences in the design or production of the musical sounds (Novak-Leonard and Brown, 2011; Burland and Pitts, 2014).

Aims

We document a recent project in which two professional contemporary composers were commissioned to write new pieces with parts for audience to play and sing. The commissioning organisation aimed to ‘inspire composers to experiment with the idea of shared curation, [to] encourage musicians to lead public participation, and [to] empower audiences to play their own role in great art.’ (Press release AMFL, Nov 2015 -https://www.ensemble-modern.com/download.php?itemID=145). Our research explored how audience members experienced this participation, and what needs/purposes such participation fulfilled.

Methods

We analysed observational and questionnaire data which interrogate the effects that participation had on audience members at three performances, and identify key emergent themes from participant responses. 273 audience members completed a post-concert questionnaire with a mixture of quantitative and qualitative (open-ended) questions.

Results

Overall rating of the experience of the two works was uniformly high, and these ratings did not generally vary with demographic factors, including musical training and prior experience with contemporary music, suggesting that, in general, enjoyment of and engagement in these performances did not require a particular background or level of musical experience. There was a tendency for regular attenders at classical concerts to be slightly more critical of aspects of the experience, illustrating elements of connoisiership. Content analysis of questions asking participants to describe positive and negative aspects of the experience yielded four main categories of response; special group experience, interactive musical experience, experiencing shifting power relationships, and assessed impact and consequences of the participatory elements. Examples of each category are discussed.

Conclusions

Participating in the performance of new music met substantial needs of an audience to construct meaning out of the concert situation. In this particular project, meaning was derived by, amongst other things, becoming involved, becoming active, being taken seriously and learning together with others. This should encourage artists and promoters to expand practical initiatives involving “the audience as performer”, and researchers to further clarify benefits and outcomes for audiences.

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Does level of expression and clarity of structure in performance influence perception of elapsed duration?

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Background

Studies have demonstrated that altering musical parameters may alter experience of how much time has passed (elapsed duration) during music listening. Dynamic attending theory (Jones & Boltz, 1989) posits that highly coherent events (e.g. those with a clear structure) may be processed differently to those which are less coherent. This suggests that structured events may be remembered more schematically then less coherent events. Models of psychological time suggest that a more skeletal representation of an event in working memory often leads to a shorter estimate of the amount of time that the event has taken. However, these theories have never been brought together to explore one of music performance's fundamental qualities: level of expression.

Aims

the current study aimed to investigate whether degree of expressive rubato included in musical performance influences experience of elapsed duration, and whether the expressive timing reinforces or contradicts the musical structure impacts on such estimates of time.

Methods

Study 1 invited 190 participants to listen to one of four 48-second stimuli: 1) no rubato, 2) logical rubato, 3) illogical rubato (increases and decreases in speed were the opposite of stimulus 2), 4) spoken text. Study 2 (N = 194) employed a different 51-second extract from the same piece as Study 1, and used the same conditions for stimuli 1 and 2. Stimulus 3 included more extreme illogical rubato than in Study 1. Stimulus 4 was an unstructured version of the same extract of music, which had been manipulated for increases and decreases in speed randomly using Audacity.

Results

Study 1 suggested that an extract of music with no rubato is perceived as statistically significantly longer than one with illogical rubato, and that spoken text is perceived as longer than an extract of music. In *Study 2*, the unstructured extract (i.e. low coherency) was rated (on a 7-point Likert scale) as having a less clear structure than the other extracts of music, as being less familiar, and less enjoyable. There were interactions between these factors and estimate of elapsed duration.

Conclusions

these studies provide evidence that spoken text (low structural coherency) may be perceived as longer in duration than musical extracts. The study also suggests that a level of expression in musical performance may reinforce the coherency of the structure, compared to a performance with no expressive rubato. Moreover, for a structure to become unclear, significant deviations in the logic of the decisions regarding where to place rubato are needed (i.e. in the current studies, the illogical rubato condition was not sufficiently illogical to yield lower ratings of clarity of structure than the no rubato and logical rubato conditions).

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T12G: Short Talks 12 - Musical Imagery

Time: Friday, 27/Jul/2018: 6:30 - 7:30 · *Location:* Graz_4

Session Chair: Nicola Pennill

Using Involuntary Musical Imagery to Investigate Spontaneous Cognitions Across the Lifespan

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Background

One of the most frequent forms of spontaneous cognition is involuntary musical imagery (INMI or “earworms”), i.e. when music comes to mind unintended and then repeats itself. Other common forms of spontaneous cognition include involuntary autobiographical memories (IAMs), involuntary semantic memories (ISMs) and mind wandering. Currently there is no agreement on how the characteristics of spontaneous cognitions (e.g., frequency, vividness, emotional valence) manifest across age groups. This knowledge gap motivated the current study, which is the first to explore many types of spontaneous cognition in relation to ageing.

Aims

The main aim of the current study was to investigate the relationship between ageing and the characteristics of INMI, IAMs, ISMs, and mind wandering as well as their voluntary counterparts. We hypothesised that frequency of spontaneous and voluntary cognitions would decrease whereas vividness would be enhanced in older adults. We also predicted that as age increased, emotional valence would remain stable for voluntary and increase for spontaneous cognitions. A secondary aim was to explore if reported attentional control and mental and physical activity mediated any of the observed effects.

Method

A sample of 679 individuals, aged from 18 to 90 years (M = 41.2, SD = 19.78), completed an online battery of validated questionnaires for spontaneous cognitions: for INMI, the Involuntary Musical Imagery Scale (Floridou et al., 2015), for IAMs, the Involuntary Autobiographical Memories Inventory (Berntsen et al., 2015), for ISMs, the Mind-Popping Questionnaire (Kvavilashvili & Mandler, 2004), and the spontaneous mind wandering scale (Carriere, Seli, & Smilek, 2013). To assess their voluntary counterparts, a mix of validated questionnaires was used along with others that were developed for the study.

Results

Preliminary results indicated that with increased age, frequency of spontaneous and voluntary thoughts decreased whereas vividness and emotional valence remained stable. Reported attentional control and mental and physical activity did not mediate any of the observed effects.

Conclusions

Findings suggest that the pattern of relation between age and INMI is similar to how ageing is related to other forms of spontaneous cognition. Results also confirm previous findings about the decrease in the frequency of spontaneous and voluntary cognition with increased age and the stability of other characteristics. Finally, our findings have implications for positive aspects of ageing in everyday life of older adults, as they might have developed coping mechanisms for controlling the ever-present stream of spontaneous and voluntary thoughts.

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An experimental investigation of the impact of emotional engagement with music on the experience of musical imagery

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Background

Involuntary musical imagery (INMI) studies have led to theories that feeling emotion when we hear music is significant for subsequently imagining it. Given that music associated with positive emotion is better recognized than emotionally neutral music (Eschrich et al., 2008), this experiment tests the hypothesis that 1) INMI is more likely, and more vivid, for music felt to be emotional than music that is not, and 2) that voluntary musical imagery is more accurate for music felt to be emotional than music that is not.

Aims

To experimentally investigate the impact of emotional engagement with music on imagining that music.

Method

An experiment was designed to test the above hypotheses by combining INMI induction and voluntary musical imagery accuracy checks, controlling for levels of emotional engagement and familiarity with the musical stimuli. Participants (52 psychology undergraduate students) were told that they were participating in a study of the suitability of music for film, and were asked to self-select familiar music that they found emotional (positive and negative) and neutral before participating. In addition, unfamiliar audiovisual stimuli were generated by the researchers, combining unfamiliar popular music from foreign music charts (pre-rated as highly catchy) with unknown emotional film clips (pre-rated as positive, neutral and negative with respect to felt emotion). The counterbalanced pairing of neutral music tracks with emotionally evocative video was designed to form an emotional association during an exposure phase.

Following the exposure phase, participants completed a silent filler task designed to induce INMI (cf. McCullough Campbell & Margulis, 2015), and were then asked whether they had imagined any music during this time, and if so what (their own nominated music, music from the exposure phase, or other), and how vivid.

Finally, participants completed an imagery accuracy test involving the deliberate mental continuation of the stimuli through a silent gap, with a key press judgement of the fit of the music at the point of re-entry (on/out of time).

Results

65% of participants reported imagining music from the exposure phase during the INMI induction task. 85% of these induced episodes related to music from the last video watched, regardless of its emotional category. Data analysis relating to the vividness of reported INMI episodes is underway, alongside analyses of participants' performance on the voluntary musical imagery accuracy test.

Conclusions

In line with Byron and Fowles (2015), the frequency at which music was involuntarily imagined was determined by a recency effect. We expect that music which is experienced as more emotional will be associated with more vivid INMI ratings; and will be more accurately recalled than emotionally neutral music.

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Ear to Mind's Eye: Imagery Routes in Piano Music Listening

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Background and Aims

To date, the precise process of visual imagery remains a mysterious phenomenon. Whilst research over the last two decades saw a renewed interest towards visual imagery and music listening—from theoretical models (Juslin, 2013) and therapeutic practices (Band, 2001), to investigations as 'listening tasks' over brief musical excerpts (Lewis, 2012; Tavernaro, 2016)—empirical insight in the field remains limited. The following two empirical studies focus on more spontaneous experiences of visual imagery during music listening, investigating its content and unfolding over integral musical works, and whether a correlation is present between visual imagery and musical engagement—feeling compelled, drawn in, connected to what is happening in the music (Schubert, Vincs & Stevens, 2013).

Method

34 participants provided self-report continuous measures of visual imagery and engagement in response to four complete piano works, through the use of a slider. The continuous data collected enabled an exploration of where in the music and at what levels these responses took place, whilst free annotations and interviews provided an insight on the content of such responses. A second, recently conducted empirical study includes the use of the works' programmatic details (title and accompanying poems) as a further variable.

Results

An overview of the qualitative data suggests that, when imagery was experienced, participants followed imagery routes related to nine broad categories: musical topics, emotions, aural associations, visual associations, memory or personal experiences, performance perspectives, material abstraction, narratives and 'arbitrary'—seemingly random responses. Furthermore, examinations of cross-correlation functions between participants' continuous responses of visual imagery and engagement in time series analysis (Bailes & Dean, 2012) revealed a statistical significance. Surprisingly, the inclusion of programmatic details was not necessarily an influence on the imagery experienced. At times, participants preferred to deviate from the illustrative content provided and assign their own 'meaning' to the music.

Conclusion

The empirical findings in the following paper provide an exploratory insight into music listeners' varied experiences of visual imagery, whilst suggesting potential avenues for further research and advancement in the topic.

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P3G: Posters 3

Time: Friday, 27/Jul/2018: 7:30 - 8:30 · *Location:* Graz Poster Room

Mind-Wandering During Music Listening: Familiarity and Emotion

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Background

Mind-wandering is a ubiquitous mental activity – it occurs up to 50% of our waking time (Killingsworth & Gilbert, 2010) - and is characterized by the spontaneous emergence of internally-oriented thoughts and images, which are minimally constrained by external events or task demands. While there is growing evidence that music can trigger mind-wandering episodes (especially in the form of visual images; Taruffi et al., 2017) and that visual imagery is a frequent phenomenon of music listening (Küssner & Eerola, 2017), it is yet to be determined what factors, such as familiarity with the music, modulate the relation between music and mind-wandering. Another outstanding issue concerns the link between mind-wandering and emotion: Is there a correspondence between music-evoked emotions and visual images elicited during music (e.g., in terms of valence)?

Aims

The first goal of this study is to elucidate the effects of familiarity with the music on mind-wandering and the second consists in mapping how emotions and images evoked during music relate to each other.

Method

Participants were asked to listen to 40 instrumental music pieces from different genres (i.e., soundtrack, electronic, post rock, classical, and ambient), while keeping their eyes closed. After each piece, participants had to report the extent to which their mind wandered during the music. In addition, they provided ratings about the content/valence of their thoughts (positive or negative), and meta-awareness during the music (i.e., the capability of being aware of the current content of their thoughts). Moreover, they had to report whether they were familiar with each music piece. To measure the subjective emotional experience evoked by the music, participants completed the Geneva Emotional Music Scale (Zentner, Grandjean & Scherer, 2008).

Results

Initial results from the analysis of a data set of 50 participants will be presented.

Conclusions

Overall, the results of this study will provide important insights into an under-investigated, but frequent phenomenon of music listening. The current study will advance the scientific understanding of visual imagery (how it is modulated by music), of musical emotions (specifically, how they shape images), and of the effects of familiarity (how familiar/unfamiliar music affect images). Moreover, the results will contribute to mind-wandering research by clarifying the role of familiarity and emotional valence of stimuli in triggering spontaneous cognition.

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Music Engagement with Infants and Toddlers among Orthodox Haredi Jews in Israel

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Background

Parents and caregivers are in a unique position of having the first opportunities to observe music development and interact musically with children. Previous studies have shown that parents believe their use of music with their young children may achieve developmental value helping them accelerate their children's emotional, sensorimotor, and cognitive development, as well as pass along cultural traditions, and encourage social bonding. Fundamentally, music engagement can promote young children's self-regulation, language acquisition, and of course music achievement (Custodero, 2006; de l'Etoile, 2006). While it seems that such conceptions relate mainly to research efforts conducted with parents of secular-based Western industrialized societies, we question if such parental believes and engagement also exist in other societies outside of liberal-minded cultural traditions? Namely, do parents and caregivers in the Haredi Orthodox Jewish community engage in music activity during their everyday care of their infants and toddlers, and if so, does musical exchange widen their relationship?

Aims

The present study examined the musical behaviors and interactions of parents with their young children among Haredi Orthodox Jews in Israel. Haredi Orthodox Jews are considered a separate cultural group than secular Western liberal-minded Israelis from the general population; they live in distinct separate communities, according to strict religious beliefs that dictate specific customs and practices as well as social behaviors.

Method

The study recruited 66 parents of children between 1-54 months of age; 33 parents were Haredi Orthodox Jews and 33 parents were Israelis from the general population; the families were matched for child's age, sex, and parents gender. Each parent completed the Hebrew version of the Children's Music Behavior Inventory (Valerio et al., 2012).

Results

No significant differences surfaced between General Population and Haredi Orthodox subgroups. That is, both subgroups of parents reported to utilize the same musical activities with their infants and toddlers, and shared similar attitudes and beliefs about the benefits of using music with their children.

Conclusions

Music use of parents with their young children may be considered a human common denominator that unite people from different cultures, religions, and beliefs. The similarities that seem to surface in the current study may imply and reveal the natural evolutionary origins of music that parents use as a platform to support young children's development.

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In Further Search of Tonal Grounds in Short Term Memory of Melodies

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Background

Taylor and Pembrook (1983) proposed several factors to affect short-term memory for melodies. They found better recall for (1) melodies that had fewer melodic direction changes (e. g., melodies with up-up-down-down contours were better recalled than melodies with up-down-up-down contours); (2) ascending than descending sequences; (3) notes that were immediately preceded by skips (pitch intervals of 3 or more semitones); and (4) notes in the final position (which was not

an meaningful finding since all 5-tone sequences started and ended on a C hence recalling the ending C could have been a simple knowledge-based inference rather than a unique act of remembering).

Aims

Our goal, in turn, was threefold. Firstly, we wondered how much Taylor and Pembrook's findings would replicate in a short-term recognition test setting. Secondly, we wanted to see how well musically untrained listeners would detect one-diatonic-tone deviations in same-contour lures, which are known to be harder to detect compared to contour-violating lures (e. g., Dowling, 1991). This would also provide us with some clues about the "resolution" of the representation immediately formed after listening to a short isochronous tone sequence. Thirdly, we were curious whether type of intervening stimuli would affect short-term recognition performances as predicted by Baddeley's (2000) working memory model as opposed to Berz' (1995) model.

Methods

Materials. We used 158 five-tone target-lure melody pairs. All melodies started with C4 or C5. Lures were constructed by moving one of the notes in the target melody up or down by one diatonic note while strictly retaining target contour. The retention interval was filled with either silence, five nonsense syllables or a diatonic or nondiatonic five-tone sequence. The target, interfering, and test stimuli were all of 1.25 sec duration. Experiment 1 used a two-alternative forced choice (2AFC) test whereas Experiment 2 used a same/different test setup.

Procedure. In each trial, musically untrained participants listened to a five-tone sequence followed by a retention interval filled with silence, nonsense syllables or intervening notes. Following the retention interval, participants either received a 2AFC test (Experiment 1) or a same/different test where they had to decide whether the upcoming tune was the one they heard right before the retention interval or not (Experiment 2). Participants provided 3-point confidence ratings for their recognition judgments.

Results

We replicated some but not all of Taylor & Pembrook's findings. Participants performed above chance both in Experiment 1 and 2. Recognition performances revealed a J-shaped serial position curve. Tone sequences that had no melodic direction changes (i. e., were either fully ascending or descending) were better recognized than those with one or more direction changes. When using a 2AFC test setup, we observed a stepwise worsening of performance when going from a silent retention interval to one filled with a diatonic tone sequence. When using a same/different test set up, intervening diatonic or nondiatonic sequences had a more detrimental effect on performance compared to intervening silence or nonsense syllables.

Music mat, embodiment and collaborative learning

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Background

Music mat is based on a philosophy which emphasizes the role of embodiment in understanding abstract concepts. In addition to that the architecture of music mat encourages children to collaborative problem solving.

Aims

The purpose of the workshop is to teach the participants to use a new music educational tool, music mat. The mat as a midi controller can be of benefit for music educators in motivating and helping pupils to understand in a concrete and embodied way the key concepts used of music, music theory, improvisation, instrumentation etc.

Implications for practice

The new tool has been developed to make possible for teachers to teach complex musical topics in a way which keeps pupils to be motivated. The mat is a tool for integration of many school subjects, for example music and sports, geography, mathematics, languages, and the arts (music painting).

Specific value of the workshop for the conference

Music mat is an example of applied music technology for music education. Technology used in the mat is based on capacitance, which is a challenging technology in environment like a music mat. The workshop shows in a concreate way how instability of capacitance based sensor can be stabilized and be used for example in midi controller in the format of mat.

From the point of view of technology the mat is made out of fourteen sensitive capacitance based sensors. The size, form and position of sensors can vary according to the specific pedagogical goal and school subject. The sound is created by computer, tablet or smartphone into which the electronic unit of the mat is connected.

The mat has been tested in Finland in several primary, secondary and higher secondary schools and at the university level as well. In addition to music lessons the mat is tested in some dance institutions and in special education. The key findings of experiments and observations of tests will be reported.

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Exploring the effects of an innovative collective music training on inhibitory control and hyperactivity in early adolescents

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Background

In adolescence there is a period of peak susceptibility to rewards and minimal cognitive control, namely of high impulsivity (Whelan et al., 2012). Some researchers showed a positive effect of music training on cognitive control, involved in supporting goal-directed actions by checking impulses and providing for thoughtful deliberation (Degé et al., 2011). However, these studies have examined only individual music lessons. Survey studies have shown benefits, such as discipline, cooperation and responsibility from participating in music groups and needing to work together towards a common goal (Hallam et al, 2000). In the last few years there is a growing number of studies that is focusing on the effect of collective music training in children, showing improved prosocial and musical skills (Schallenberg et al., 2015; Ilari et al., 2016).

Aims

In this study we want to extend the investigation of the effects of collective music training in children, focusing on inhibitory control and hyperactivity.

Methods

We recruited 90 Italian children 9-11 years old. 53 of them attended 3 months of an innovative collective music training inspired by El Sistema approach that was implemented in the school. The 37 children that were part of the control group didn't have any collective music training. The training included two hours lessons per week during the afternoon and a final concert. All children were administered tests of inhibitory control and hyperactivity near the beginning and end of the 3-month period of collective music training.

Results

Compared to the control group, children in the music group had larger improvement in inhibitory control. Moreover, in the second measurement the control group showed an increase of hyperactivity that was not found in the group that underwent the music training.

Conclusions

The results suggest that collective music training facilitates the development of inhibitory control modulating the levels of hyperactivity. This research has implications for music pedagogy and education. Future investigations will test whether the findings can be extended to ADHD children.

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Edwin E. Gordon's Advanced Measures of Music Audiation: Are they measuring music aptitude or also short-term memory?

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Background

Several aptitude tests have been developed so far to measure "music audiation", an innate capacity essential for music aptitude (Gordon, 1989). However, Schellenberg and Weiss (2013) posit that all audiation tests – including the Advanced Measures of Music Audiation (AMMA; Gordon, 1989) – show only low correlations among each other, although they purport to measure the same capacity. From the point of view of construct validity, these conflicting results might generally be explainable due to tests' low validities. Moreover, according to external validity, the AMMA are intended to solely measure audiation and not "memorization, or the discrimination of musically isolated pitches or durations" (Gordon, 1989, p. 16). Yet, the item construction of the AMMA corresponds basically to the one used by Seashore to measure tonal memory (Butsch & Fischer, 1966), except that the silent time between both melodies of an item was set to four seconds, which "were found to be optimal for a student to be able to audiate, but not to imitate or memorize" (Gordon, 1989, p. 19).

Aims

We wanted to conduct a study of discriminant validation comparing participants' performances on both tests to investigate whether an optimized, internally valid version of the AMMA (Platz et al., 2015) measures only music audiation or also tonal memory. Due to the similar item construction, we would expect a high correlation between participants' performances on both tests (H1) that however should indeed capture distinguishable latent traits as Gordon (1989) claimed (H0).

Methods

Following a concurrent validation design, N = 87 participants (M=16.17 yrs. [SD=2.5], 48 female) were tested in a session lasting no longer than 20 minutes performing both tests, the optimized version of the AMMA (Platz et al., 2015) and a short version of the tonal memory subscale of the Seashore test battery (Butsch & Fischer, 1966).

Results

A Bayesian correlation analysis was conducted using JASP (JASP Team, 2017). The results show a strong correlation between both measurements, corrected for attenuation (Median r = .557 [.415; .697]). Moreover, our data is 2.177E+12 times more likely under the alternative hypothesis of a positive correlation between both scores when compared to the null hypothesis as predicted by Gordon (1989).

Conclusions

We conclude that the AMMA also determine participants' (short-term) tonal memory instead of audiation only. Thus, participants' test scores on the AMMA can – at least partly explained – with tonal memory capacity.

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Songs In Preschoolers TV Shows: A Developmental Approach

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Background

Songs are an ecological platform to enhance children's abilities and skills. Parents and educators use songs frequently to achieve cognitive, academic, sensory-motor, and cultural social skills (de l'Etoile, 2006). However, the contemporary media-oriented reality is changing the developmental and educational landscape. TV shows and mobile streaming have become a major part of pre-schoolers everyday experiences. Many broadcasting agencies claim they provide children with content which has both developmental and educational qualities, often described as 'edutainment", by which producers allude to the shows offering more than entertainment (i.e., contribute to cognitive abilities and academic skills) (Sulkin, & Brodsky, 2015). A majority of the shows directed at preschools integrate songs into the content since songs are seen as salient formal features that help attain children's attention to screen. Further, songs are features that boost children's reproduction of screen content. Though one may assume the creators and producers would use songs as a vehicle to reinforce pro-social and educational values through the use of developmentally appropriate musical and textual features, the characteristic features of songs in pre-school TV shows has not yet been investigated. While previous studies have demonstrated that when the broadcasted content matches specific criteria pre-school children can imitate, reproduce, and internalise the message they see on screen (Barr et al., 2009), we ask if the songs heard on popular pre-school directed TV shows are meeting these demands? Namely, do the songs serve to widen developmental schema, or do they function solely as entertainment? Surprisingly, no research has yet addressed these questions

Aims

The current study aimed to fill the above-mentioned gap by implementing song analysis of pre-school children-directed TV shows broadcasted internationally.

Method

Three channels directed at preschool children were chosen as a source for songs analyses: Disney Junior, Nick JR, and HopTV! All three channels broadcast internationally and declare their commitment to produce and supply high quality screen content with developmental, educational, and social values. To map the songs appearing in the shows we employed measures to appraise the music and linguistic features of the soundscape (Soundscape Appraisal of Broadcast Shows), and the song materials were examined for age-appropriateness and developmental fitting using a criterion-based checklist (Sulkin Infant Song Inventory).

Results

Preliminary findings indicate that music and linguistic features are mainly employed as a strategy to entertain preschool children as viewers. For the most part, the use of songs is developmentally inappropriate, albeit the lyrics aim to deliver educational values.

Conclusions

The urge for co-operation between media content creators and music education specialists is warranted. Such collaboration will make screen viewing a more appropriate platform for early childhood development.

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Discovering Children's Musical Interests Through a Call-and-Response Singing Repertoire

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Background

Each preschool and kindergarten in Japan has its own activity plans for musical activities. In Japan, children's music is placed in the same category as two other forms of expression: drawing and physical movement. This category—"Lifestyle and Expression"—incorporates children's music into everyday play activities rather than keeping them entirely separate.

In this paper, I analyze the behavior of children observed in "Musical Interests of Children Through Call and Response Music Activities" through the lens of cooperative learning. I also investigate the aforementioned project's effectiveness, posit that call-and-response music may form the basis for imagination and improvisation in future "Lifestyle and Expression" activities, and offer more thoughts on the subject. This project explores methods that allow children to enjoy expressing themselves cooperatively and imaginatively, using participatory musical activities that involve problem-solving and communication between children.

Objective

My goal in this paper is to answer the following questions.

1. What do we need to consider in order to

2. develop a continuous initiative, focused on children, of musical activities that motivate children and are linked to non-musical play?

3. What do we need to consider in order to create more collaborative musical activities that allow children to relate to each other?

Method

To answer these questions, I used a qualitative research methodology that involved classroom observation and interviews. I found that when call-and-response semantics were intentionally added to a class's everyday musical activities for some fixed period of time, children in that class talked about new musical activities more often than children in a class that was not exposed to more call-and-response activities. Children who had more experience with solo musical performances and call-and-response musical activities were more motivated and less shy to speak out.

In summary:

1. Instructors should use non-verbal communication and actively engage in call-and-response activities with children rather than simply evaluate individual performances. For example, instructors could ask children to respond to onomatopeia with onomatopeia or to respond to rhythm with rhythm; instructors and children could also "talk" to each other in animal voices. This project clearly showed that it is important for instructors to repeat call-and-response musical activities. Moreover, this project clearly showed that in order to incorporate musical play into everyday life, it is also important to always leave musical instruments in large open spaces and to set up multiple pairs of mallets so that more than one child can play with them at the same time.

In this project, I asked instructors to increase participation in everyday musical activities and to continue to give evaluations on individual performances. By nurturing children's collaborative natures and encouraging that collaborative spirit in this project's activities, it became clear that collaborative learning will take place naturally. There are three essential elements that children need to be more interested in music: the time to repeat musical activities, the space to freely express themselves through music, and a community with whom they can sing.

Modeling Aural Skills Dictation

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Despite its abundance in curricula in music conservatory settings, research on topics pertaining to aural skills is currently limited at best. While anthologies of materials for sight singing and dictation exist, the ways in which people learn melodies are not well understood. This problem is difficult to tackle given the amount of factors that may contribute to the process, such as the complexity of the melody, the degree of exposure needed to commit a melody to long-term memory, and individual differences in cognitive ability that have been shown to contribute to an individual's performance on musical tasks. Fortunately, literature exists in related areas that serve to inform which parameters might contribute to an individual's

performance in a melodic dictation setting. This paper presents findings from an experiment (N=39) modeling performance on melodic dictation tasks using both individual and musical features. Results suggest tools from computational musicology as well as individual difference measures need further exploration in order to assess the degree to which various features contribute to melodic dictation performance and inform pedagogical practices.

Imagery of music instructors and the effects of the student's well-being

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Background

ISO 2990 was issued in 2010 and Akaike (2017) conducted a survey on the possibility of quality assurance based on it for a non-formal music school in Japan. Notably, they characterized the significance of student-centred learning. As a result, it can be said to be challenging for small businesses which have only three employees on average unless the issues of capital and human resources are resolved. Yano Research (2015) conducted a consumer survey in Japan regarding the choices of learnings. As a result, the quality of lecturers is ranked after rates, places and times. However, in the presence of information asymmetry, it might be unsuitable for them to evaluate it honestly.

Aims

From the aspect of the index of quality service, we clarify that what imagery will be related to the quality, of a favorite music instructor. After the use the extracted imagery, we also focus on the inside of the learner and what influenced it. Especially the learning goals and the differences of well-being will also clarify the impact on the preference.

Method

First, we carried out a questionnaire survey to identify the imagery of the music instructors. The participants were 199 Japanese. We used a questionnaire form which made by Inoue & Kobayashi (1985). The data was measured based on the five levels of the Likert scale and factor analysis. After the first analysis, we conducted a questionnaire survey again to clarify the relation of the student's well-being and imagery. The participants were 163 Japanese. We used the questionnaire form which was made by Clarke et al. (2011) and Hayamizu et al. (1989). The data was measured as described above.

Results

The result of the factor analysis, we extracted four factors namely: familiar & thoughtfulness (FT), active & extrovert (AE), happiness & fulfillment (HF), rational & sedate (RS). We used gender, age, and experience of music lesson as a dependent variable. As a result of T-Test, women and experienced people appreciated all imageries. The results from non-experienced people varied. Older people were more inclined to like RS. The second survey was analyzed using Regression Analysis. We used gender, age, occupation, well-being, and purpose of learning as a dependent variable. The order of preference was one pattern regardless of independent variables. That was FT > RS > HF > AE. Learning purpose significantly affected imageries. For example, those who tend to enjoy the learning process like RS and AE.

Conclusions

The result of this research shows that it is possible to deduce which type of music instructor is the most desirable based on the student 's attributes and well-being. Moreover, it is necessary to obtain students' demands and suggest the learning strategies. These studies are consistent with the requirements of ISO 29909. Also, not only in higher education but even in non-formal music school, we insist that learner-centered service design might be required.

Empirical findings on the influence of artist image in music evaluation

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Background

In musicological theory of artist image it is maintained that a coherent artist image, along a display of authenticity and authorship, will aid to a positive evaluation of an artist's music by listeners (Mäkelä, 2004; Ahonen, 2008). This idea has been developed through case study analyses of the images of popular artists, and the reactions of their fans on those as found on music magazines and internet forums.

Aims

The present work seeked to test the artist image theory empirically, namely whether the presentation of a fine-tuned image, authenticity and authorship can influence the evaluation of music positively. A derivative aim was to test if the music listeners are actually sensitive to clues related to the projection of the image parameters of authenticity and authorship.

Methods

The study used a survey-based experiment that presented 8 different fictional artist images (specifically: artist name, picture, short biography) and 8 corresponding music clips. After the presentation of an image, the survey asked the responders to answer questions related to authenticity and authorship clues presented in the image, and to rate the artist's music clip. The

music clips were studio recordings that were edited in order to sound like live recordings acquired through a handheld device, in order to control for the sound quality variable which is confound in the context of comparing professional artists (image and sound handled by experts) with non-professional artists (image and sound potentially handled by individual or non-experts).

Results

The signed rank test of differences between aggregate ratings of each responder (N=32) for each tested variable showed that whether or not an image was of a "professional artist" did not influence the corresponding music rating (>.05 significance of differences). Through the analysis of N=256 individual answers for the 8 artists, and the fact that the experiment's design (order of questions) allowed the notion of correlation to be treated as an indicator of causal relationships, it was found that both authenticity and authorship did influence positively the music ratings (.01 sig. level weak to moderate positive correlation). Lastly, the responders managed to identify authenticity and authorship clues correctly.

Conclusions

The results indicate that explicit mention of the "success" of an artist does not influence the evaluations of the music, which seems to contrast the common conception of the literature that presenting achievements and maintaining a polished image benefits the judgments of an artist's output. If such an effect exists, the study suggests that it is to be found in a confounding variable (e.g. superior sound quality and production compared to non-professional output) and not at the presented image per se. On the other hand, the results seem to confirm what has been suggested by the musicological research about the positive effect of presented authenticity and authorship.

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HOW DO GUITARISTS READ SCORES FROM CLASSICAL REPERTOIRE?

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Background

In order to acquire an artistic image, expert performers frequently begin to learn a new piece by sight-reading the score. That allows them to organise practice using the formal structure of music and to have in mind interpretive aspects from de beginning (Chaffin et al. 2003). Reading scores for classical guitar is an extremely complex task and in fact guitarists are said to be poor readers when compared to other instrumentalists. With respect to professional guitarists, it has been observed that the visual image of the score is converted in an auditory representation that activates the production of sound (Holmes, 2005).

Aims

The goal of this study is to observe which reading strategies are employed by guitar students when they begin to learn a new piece of music.

Method

10 guitar students (7 at university level) have participated in a multiple case study when learning a piece from their respective academic repertoire. The first practice session was video-recorded and Initial 30 minutes of practice were transcribed by identifying on the score where practice segments started and stopped. Descriptive data were statistically analysed. We identified significant correlations with variables related with technical, interpretive and structural aspects of music, which were obtained from scores and self-reports made on score in four different moments of the learning process. Finally, results were contrasted with qualitative information on learning process and self-reports extracted from interviews.

Results

Despite very significant differences, none of the students have sight-read the score at the beginning of the session and their practice segments are on average very short. Stops are frequently due to mistakes, but in some cases segment briefness is strategic. Significant correlations point out that technical dimensions of music require in general a higher degree of attention than suggested by self-reports. Although eight participants have already in mind structural dimensions, interpretive aspects are present in a more uneven way and that is independent from academic level, but seems to be related with an expressed ability to audiate music.

Conclusions

As pointed out by Alexander and Henry (2012), reading difficulty of guitar scores could be due to an accumulation of difficulties, even though guitarists are not always aware of them. But, in agreement with Kopiez and Lee (2008), the ability to audiate the score seems to make easier reading, taking into account that basic left-hand gestures match with intervallic relationships between tones.

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A study comparing two brief measures of personality to investigate whether formal-informal musical learning and gender are associated with personality traits in contemporary musicians in the UK.

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Background

Although musicians have been associated with personality traits such as Openness to Experience, some differences may be linked to types of musical learning and/or gender (Green, 2002). For example, classical musicians have been associated with Introversion, whereas popular musicians, and females, seem more Extroverted (Dyce & O’Connor, 1994; Kemp, 1996).

Aims

This study investigated whether how people learn music (formal tuition, or self-taught/informal learning) is associated with particular personality traits, and whether these associations differ according to gender.

Method

An online survey recruited musicians from popular music colleges, conservatoires and other musician networks. Participants were asked: a) what their instrument were, and how they learned them; b) to describe their gender; and c) to complete the Ten Item Personality Inventory (TIPI; Gosling, Rentfrow & Swann, 2003) and the 10-item Big Five Inventory (BFI-10; Rammstedt & John, 2007).

Results

As a group, musicians (N = 275, mean age = 40.2 years, range 19-81, learning duration > 6 years) rated themselves significantl differently from population norms for all personality traits except Extroversion. Forced choice questions delineated whether musicians were self-taught (ST, n = 74), formally taught (FT, n = 62), or partially self/partially formally taught (PT, n = 139). For gender, 87 participants identified as female, 136 male, 49 preferred not to say and three wrote alternative descriptions. Between inventories, all traits correlated positively significantly except Emotional Stability/Neuroticism, which correlated negatively r = -.69, p < .001. ANOVA revealed a significant difference between musical learning groups only for TIPI Conscientiousness F(2, 222) = 5.78, p = .004, ηp2 = .050. Planned post hoc tests revealed that formally taught musicians scoring significantly higher than those who were self-taught. There was also a difference between gender groups on the choice of primary instrument X2 (6, N = 223) = 45.94, p < .001. There were no gender differences in self-reports of personality traits.

Conclusions

In contrast to previous studies, no statistically significant difference from the population was found for females for the personality trait of Extraversion. Making a novel contribution, this study suggests that Conscientiousness is higher in formally taught musicians compared to musicians who had learned informally. Type of musical learning did not affect the higher than population norms for the traits of Openness to Experience and Agreeableness found in musicians, widening support for this finding in previous research.

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"tAPP": The Development and Calibration of a Mobile App for the Measurement of Handedness

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Background

In the domain of music, the development of an objective classification as being right- or left-handed is of high relevance for the practitioner as well as for empirical music research. The measurement of hand performance differences by a speed-tapping task applied to both hands has been shown as the best method to measure the degree of lateral asymmetry (see Kopiez, Galley, & Lehmann, 2010; Peters & Durding, 1978). However, this procedure often requires the use of hardware equipment in a laboratory, which might be a reason for its reduced acceptance as a diagnosis of handedness.

Aims

Using the methods suggested by Annett (1985) and Peters & Durding (1978), we will present a technical solution for the straightforward measurement of hand performance differences. The measurement is based on two devices: (a) a smartphone app called “tAPP” and (b) a morse key as the standard laboratory device.

Methods

Participants (music students, N = 24) were instructed to tap on the surface of a smartphone display and on a morse key, as fast as possible over a duration of 30 seconds each. The main indicator of handedness, the LC value for tapping speed, was

calculated on the basis of the median of inter-onset intervals for both hands and for each device (LC = (L - R) / (L + R) / *100).

LC values of two trials were averaged.

Results

The convergent validity between both methods (as measured by the correlation of LC values obtained from the app and a morse key) was rc(24) = .79, p = .004 (disattenuation correction according to Hunter & Schmidt, 2004). Absolute LC values between both devices did not reach statistical significance (t = 0.32, p = .76). Tapping speed was slightly slower for the morse key (M = 165.2 ms, SD = 14.4) than for the app (M = 163.3 ms, SD = 17.7, t = 0.82, p = .42).

Conclusions

Although LC values from both devices were similar, the correlation of rc= .79 also shows the requirement of separate LC thresholds for handedness classification. Thus, future work has to focus on the standardization and calibration of LC values to make them similar to those calculated for the morse key (see Kopiez, Galley, & Lee, 2010). In the long run, the app will be useful for the music teacher (e.g., for the consultation of his or her students' objective handedness) as well as for the empirical music researcher who can control for the handedness of participants by a simple procedure.

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Identifying individualities of unconscious movements while music performance, based on a directional tendency of neural transmission of the pelvic plexus

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Background

The concept of "bodily tendency" was first proposed by Haruchika Noguchi who was the founder of Seitai kyokai in Japan(Noguchi, H. 1985). He believes major parts of our personality including musical tastes are significantly affected by our unconscious habitual patterns of bodily movements. More specifically he believes it is beneficial to categorise these patterns by a directional tendency of neural transmission of the pelvic plexus. Although music-related motion analyses have been gaining increasing attentions (Burger, B., Saarikallio, S., Luck, G., Thompson, M. R., & Toiviainen, P., 2013), there have been few empirical research studies focusing on a directional tendency of neural transmission of the pelvic plexus. We believe that our unconscious bodily movements induced by musical performance contain multifaceted information, which has huge potential to shed light on our musical perception.

Aims

The aim of this research is to classify unconscious movements while performing music by a directional tendency of neural transmission of the pelvic plexus, and to investigate their effects on types of musical experiences.

Methods

Our bodily movements are manipulated by a directional tendency of neural transmission of the pelvic plexus and they can be estimated from foot weight distributions. We have developed a method to extract effective features which encode our bodily tendency from foot weight distributions, using insoles with 198 pressure sensors. 5 basic movements were

designed to check a directional tendency of the pelvic plexus. By comparing foot weight distributions of multiple subjects while performing the same piece of music, we aim to clarify the existence of personalities in bodily movements.

Furthermore, by analysing how the foot weight distribution of the induce subject changes while performing the differentpieces of music and its relation to a directional tendency of neural transmission of the pelvic plexus, we aim to clarify whether“music-invariant” personalities exist in our unconscious movements induced by musical performances.

Results

Experimental results implied that each subject has the unique foot weight distribution even when performing identical music, and it can be effectively categorised by a directional tendency of neural transmission of the pelvic plexus. It was also shown that these personalities stay while performing different types of music. Moreover, by using the proposed features, each foot weight distribution was classified into each subject at 80% accuracy rate.

Conclusions

We have shown the movements induced by performances of the same piece of music differ by individuals, and they are relatedwith a directional tendency of a nervous system of the pelvic plexus. We hypothesise this individuality significantly affectsthe emotions induced by them. These relationships should be further investigated. We aim to enlarge the scale of experiments by increasing the number of subjects and the type of music to be performed.

Analysis of Intonation in Unison Choir Singing

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Background

Singers synchronize their pitch and timing when performing together in a choir. Ternström (2003) mentions that some studies characterize the dispersion in fundamental frequency (f0), measured as the bandwidth of partial tones in audio recordings. They typically report the average of f0 dispersion in the range of 20-30 cents. Intonation is a complex phenomenon (Devaney, 2011) that describes how a pitch is sung in tune (Dai and Dixon, 2017). Dai and Dixon (2017) found that choir singers interact with each other and that this interaction influences their intonation.

Aims

The aim of our work is to study several expressive characteristics of choir singing, with special emphasis on unison performances, to study how singers blend together and interact with each other in terms of f0 dispersion, intonation, and vibrato.

Methods

We built a dataset of 3 choral pieces performed by 16 singers from a choir. They sang together but were recorded individually using directional microphones. We studied the characteristics of f0 dispersion for the different choir sections; then, we analyzed the correlation between the singers of the unison in terms of intonation using the Pearson correlation; finally, in the last part of this research, we focused on describing vibrato in unison for singing.

Results

We found the f0 dispersion to lie in the range between 16 and 30 cents, being especially large in the bass section of the choir. We used the Pearson correlation coefficient to estimate how singers’ intonation is affected by other singers when performing together, and our results showed that the intonation correlation fluctuates a lot. Although we observed that a few pairs of singers had high correlation values in a few examples, the average was around 0.32 in all cases. With more data, we would be able to extract more relevant information. We finally used a vibrato extractor to compute its presence in our dataset and compare it between different singers and found the slowest piece to have the highest percentage of vibrato.

Conclusions

This study confirms previous studies and provides additional insights on unison choir singing in terms of fundamental frequency dispersion and distribution for different frequency ranges and voices. Although we obtained some interesting results regarding the intonation correlation that suggests that singers interact with each other, we might need more data to corroborate our first findings. The synchronization of the vibrato rate is a characteristic we would expect from more professional singers that have a much higher control of their voices. We presented a new choir singing annotated dataset which can be used for further research on the topic.

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A Computational Study of the Role of Tonal Tension in Expressive Piano Performance

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Background

Expressive variations of tempo and dynamics are an important aspect of music performances, involving a variety of underlying factors. Previous work has showed a relation between such expressive variations (in particular expressive tempo) and perceptual characteristics derived from the musical score, such as musical expectations, and perceived tension.

Aims

In this work we use a computational approach to study the role of three measures of tonal tension proposed by Herremans and Chew (2016) in the prediction of expressive performances of classical piano music.

Method

Three features characterizing tonal tension are computed using the method proposed by Herremans and Chew (2016). These features capture tonal relationships of the music represented in Chew's spiral array model, a three dimensional representation of pitch classes, chords and keys constructed in such a way that spatial proximity represents close tonal relationships. We use non-linear sequential models (recurrent neural networks) to assess the contribution of these features to the prediction of expressive dynamics and expressive tempo using a dataset of Mozart piano sonatas performed by a professional concert pianist.

Results

A preliminary cross validation experiment using recurrent neural networks trained with and without tonal tension features shows that tonal tension helps predict change of tempo and dynamics more than absolute tempo and dynamics values. Furthermore, the improvement is stronger for dynamics than for tempo.

Conclusions

In this work we have empirically investigated the role of tonal tension in shaping musical expression in classical piano performances. Our experimental results show that using tonal tension information improves predictions of change of tempo and dynamics, but not predictions of absolute tempo and dynamics. Future work may focus on a more explicit testing of the hypothesis that recurrent neural network models may learn features describing tonal characteristics from low-level pitch information as a side effect of learning to predict expressive tempo and dynamics.

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Impacts of movements, imaginations and vocal warm ups on development of 10-12 years old children's singing voice

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Background

Children's singing voices are unique in their own way, differing from adult singing voices in terms of vocal timbre, range and expression. Young voices have less volume, less endurance, and naturally higher ranges than adult voices. The harmonious relationship between hearing, brain function, and the development of the vocal organs plays a central role in voice production. If proper coordination is not established between these three areas, there are errors and disturbances in voice production. The development of the ability to sing comes to an end around the age of 8 years. This ability remains at this level unless music instruction and practice follow. The singing abilities of untrained adults are not much different from those of 8 to 10-years-old children.

Aims

The purpose of this paper is to present which are the most common children' singing voice production problems and to demonstrate what role it is the posture, articulation, breathing, movements, imaginations and vocal warm ups in correction of children's singing voice production problems.

Methods

The research methods employed were observations and action research. 80 school children (10-12 years) participated in the observation phase of this study. The observation phase lasted for five years. Observation criteria were the children's posture, breathing, articulation, and vocal sound production while singing. Aim of the observations were to reveal, observe and examine 10-12 years old children's vocal production problems. Further, 12 school children (10-12 years) participated in the longitudinal action research. The longitudinal action research lasted for 2 years. Aims of the action research phase were to work out how we can correct the children singing voice problems and testing of developmental exercises. Data were analyzed using qualitative analysis protocols.

Results

I observed three various types of children's singing voice production problems: 1. „too airy" or „veiled" voice; 2. „compressed" singing voice; 3. singing exclusively in the chest register. The body and head posture, articulation, breathing, movements, imaginations and vocal warm ups together greatly influence the development of children's singing voice.

Conclusion

A well-planned and efficiently executed exercises are essential for developing a good singing habit. Bescause the vocal cord is an extremely sensitive organ, it needs special care and trainig in order to have good voice production.

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What Influences a Musician's Sound Imagery? The Role of Working Memory, Aural Skills, Absolute Pitch and Other Proficiencies

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Background

Aside from the skills required to play their respective instruments, all musicians share particular aural skills, depending on their instrument, genre and their musical intrepretations. Such aural skills include, but are not limited to, analytical hearing, sound imagery, intonation or playing by ear. In this study, the former two skills are investigated in more depth and connected to other skills of interest.

Aims

Using path analysis, we investigated how various skills are connected and causally affect each other. For example, we hypothesized that working memory skills would predict performance in musical imagery because both tasks rely on the encoding, retaining and comparing of melodies. Mental rotation was hypothesized to predict musical imagery and analytical hearing as the two latter skills often rely on a kind of "musical mental rotation" when the musical material is transformed in one's mind.

Method

Participants were 55 music students (30 female, M(age) = 23.1 years). Eight participants possessed absolute pitch. Participants had played their main instrument for M = 13.5 years and showed a large variety in instruments.

The following tests were included in the path analysis: the Notation-Evoked Sound Imagery test (NESI; Wolf, Kopiez, & Platz, in prep.), the Musical Ear Training Assessment (META; Wolf & Kopiez, in press), the Gold-MSI Melodic Memory Test (MMT; Harrison, Musil, & Müllensiefen, 2016), a Working Memory test (WM; Sander, 2005) and the Mental Rotation Test (MRT; Peters et al., 1995).

Results

Good fit indices were achieved (Chi^2 was n.s., CFI = 1.00, SRMR = .03). The three most relevant standardized paths were identified between NESI and META (0.69), from MMT to META (0.44) and from WM to META (0.36). Surprisingly, the direct path from WM to NESI was smaller than anticipated (0.16), and the MRT influenced META and NESI negatively (–0.13 and –0.16, respectively). Men showed better MRT, NESI and META skills than women (Cohen's d = 0.51, 0.40, 0.26, respectively).

Absolute pitch was more helpful for NESI (d = 0.98) than for META (d = 0.28) as was a higher semester (NESI r = .29, META r = .13).

Conclusions

First, these data provide an initial model of musicians' aural skills, their connection to other skills, and their relevance. As expected, both aural skills (NESI and META) directly covariate to a high degree but are not redundant. Second, the WM skill was not a relevant predictor for NESI. Music-specific skills within sound imagery might be more relevant and compensate for a smaller WM capacity. A deeper understanding for the relationship between sound imagery skills and other proficiencies might encourage the future optimization of teaching methods.

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COMPARISON OF EXPRESSED ON CHINESE PIPA PERFORMANCE MOTION

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Background

We examined motion of emotional expression of keyboard instrument performance.

In our previous studies, we examined the performance motion of six emotions (Juslin, 2001) of a professional pianist using a motion capture system (Mito, 2013a, 2013b).

Utilizing that experience, we also tried to measure the performance motion of Chinese pipa (2017).

Aims

Our goal is to clarify the relationship between emotions and motion by the performance of Chinese Pipa.

From that result, we are comparing the music of Europe and China, in terms of the motion on players.

At this time, we create a performance analysis system of Chinese Pipa to clearly represent relation between emotion and motion on performance.

Method

The performer was a professional Chinese pipa's player. Her performance motion was measured using a motion capture system. She performed a melody by expressing of each five emotions (happiness, tenderness, anger, sadness, fear) used by Juslin or emotionless. We have created a performance motion analysis system. We clarified the characteristics of the performance motion when expressing emotion by creating an exaggerated motion on display.

Results

This time, we succeeded in creating a performance motion analysis system.

This system was able to display the performance by exaggerating the performance motion of each emotion, and it became possible to express the Chinese pipa’s feature.

Conclusions

In the future, we would like to utilize the system created this time in various instruments.

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EXPLORING MUSICAL FLOW IN ENSEMBLE PERFORMANCE

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Exploring musical Flow in ensemble performance

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Background

Flow is a psychological state characterized by intense focus, creative engagement, and absolute absorption in an activity (Csíkszentmihályi, 1990). Research suggests that performers may experience musical Flow when performing as soloists. However, very little research investigates whether similar experiences of musical Flow occur during ensemble performance.

Aims

The research aimed to explore firstly whether performers experience musical Flow during an ensemble performance and secondly whether any comparisons between musical Flow experienced in ensemble and solo performance could be drawn.

Method

This research project was a qualitative study, using interpretative phenomenological analysis. The research participants consisted of five student performers (flute, clarinet, violin, and two pianists) from Rhodes University, all of whom participated in four performances of the musical suite Carnival of the Animals by Camille Saint-Saëns in 2015. The participants were interviewed individually after the final performance by means of semi-structured, in-depth interviews.

Results

Two broad categories of results emerged. 1) Experiences of musical Flow in ensemble setting: Participants experienced musical Flow only when performing their parts. As soon as participants completed a movement and were not required to play in a subsequent movement, Flow was interrupted as the participants' focus and concentration lapsed. Flow was experienced more intensely during some performances. Participants were unconsciously aware of other performers' state of Flow while playing together. 2) Comparisons between musical Flow in solo and ensemble setting: Unlike soloists who focus solely on their own musical scores, ensemble performers focus on musical input in addition to their own scores. Ensemble performers are also challenged by a range of performance variables which do not occur in solo performances e.g. conductor, group intonation, other performers' errors in notes or entries. Most performers found it harder to achieve and sustain musical Flow in ensemble performance than in solo performances. Musical Flow experienced in an ensemble performance is less intense than solo performance.

Conclusions

Performers may experience musical Flow during ensemble performances. Solo and ensemble performance settings have unique musical and non-musical criteria with which performers must engage in order to experience musical Flow. Different performance contexts affect the intensity of musical Flow experiences. Solo and ensemble musical Flow experiences are not synonymous.

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The Paradoxes of Jazz Improvisation: A Philosophical Appraisal

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Background

The perspective offered by the ethnographic literature and pedagogical material portray jazz improvisation as a creative process whereby the products of musical imagination are translated into music-producing actions (Berliner,1994; Coker, Casale, Campbell, & Greene, 1970. Accordingly, validation of musical improvisation as a creative activity is seen to depend on prospective auditory imagery, that is, pre-hearing in the mind's ear what is to be played. Alternatively, a cognitive-scientific approach offers a more complex account of the process, involving multi-modal forward and inverse modelling, over timescales which raise questions about the viability of privileging prospective auditory imagery (Berkowitz, 2010; Fidlon, 2011; Keller, 2012).

Aims

The main aim of this poster is to offer a coherent framework within which the contrasting nature of these different perspectives on improvisation can be elucidated, in order to explore the possible resolution of some of apparent paradoxes faced by the improvising musician.

Main Contribution

There is perhaps an inevitable tension between the technical demands of tonal jazz improvisation and the imperative for novelty, which is necessary for creativity. The emphasis on imagining the sound of what is to be played is an attempt to resolve this tension and validate improvisation as a creative endeavour. This strategy is rooted in Post-Romantic ideals of creativity which are dualist in nature, and evinces a moral perfectionism (Day, 2000). In this paper I argue that there are ontological and epistemic problems with this view in terms of what constitutes novelty and how the timing and causal role of imagery could be known. Questions on the nature of free will and agency versus automaticity in improvising are considered. In conclusion, I make a case that a philosophical re-appraisal of jazz improvisation drawing on the paradigm of grounded cognition offers a way to interpret the notions of agency and creativity which is compatible with the current evidence from neuroscience and cognitive psychology. The rejection of dualist conceptions of creativity in favour of seeing the improviser within the context of situated and distributed cognition removes the need to privilege prospective auditory imagery in this creative process, and resolves some apparent paradoxes of jazz improvisation.

Implications

The ongoing consideration of the philosophical issues in improvisation offers an opportunity to align current evidence with improvisers' experience and thereby enhance improvisation practice and pedagogy.

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Visualizing Music Psychology: Who, What, When, and Where?

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Background

Established in the middle of the 19th century, music psychology has grown exponentially as a discipline, establishing programs, labs, and journals covering different research interests, geographical areas, and research groups. This interest in music psychology has led to the creation of three prominent journals, Psychology of Music in 1973, Music Perception in 1983, and Musicae Scientiae in 1997. However, up to this date, no large-scale bibliometric analysis of the scientific literature published in music psychology had been carried out. Exploring research trends, citation analysis, authorship, and global contributions is crucial to understand music psychology and identify future directions within the field.

Aims

This study aims to analyze, through visualization and bibliometric techniques, all published literature from Psychology of Music, Music Perception, and Musicae Scientiae.

Method

SCOPUS was used to retrieve all available peer-reviewed articles (N= 2,089) in these three journals. Network visualization maps and bibliometric indicators were conducted to investigate four aspects of the retrieved literature: (i) grow of publications, (ii) citation analysis, (iii) authorship and country analysis, and (iv) main conceptual language used.

Results

(i) From 1973 to 2017, there was a significant overall growth in the number of publications, with a mean of 46 articles per year. (ii) The retrieved documents received a total of 33,771 citations, with an average of 16 citations per article. The relationship between citations and year of publication followed an inverted-U shape, with its peak in 2007 with 2,059 citations. Top 10 cited articles and authors are presented. (iii) A total of 2,632 authors and 49 countries participated in the retrieved literature. The mean number of authors per document increased significantly over time, as well as the number of multi-authored papers and the number of authors in multi-authored papers. US (28%) and UK (20%) received the largest number of citations. Network visualization maps, productivity analysis and collaboration indexes are also presented. (iv) A network visualization map shows how the most relevant author keywords relate to each other and cluster in 5 different groups.

Conclusions

These findings allow for a greater understanding of the breadth of research within three prominent journals in music psychology. Overall, there is a clear growth of music psychology research, which is consistent with the general growth observed in science. Different bibliometric indicators define the most relevant authors and countries in the field as well as how they connect and collaborate. This type of analysis helps us to investigate more objectively trends within the field. Visualizing and understanding the who, what, when and where of the past and present can also lead to surprising observations and conclusions, opening many interesting avenues for future collaborations and research in the field.

The Origin and Powers of Music according to the 11th Century Islamic Philosopher Ibn Sīnā

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Background

The question of the origin of music and its powers has always fascinated philosophers and scientists (Shiloah, 2007).

Aims

Here we present a close reading of the view offered by the Persian Muslim philosopher and scientist Ibn Sīnā known also as Avicenna (b. 980 –d. 1037) in his introduction to his introduction to his chapter on the science of music within his philosophical and scientific encyclopedia, Kitāb al-Shifā' (Book of Healing).

Contribution

We draw a parallel between Ibn Sīnā's hierarchical account of the senses and mental capacities and his hierarchical, indeed evolutionary, view of the perception of sound in its various communicative roles. We show how Ibn Sīnā positions music at the top of the hierarchy of sound organization while drawing a connecting line between the sensory and cognitive, the natural and conventional, and the biological and aesthetic. Although mostly drawing on ideas previously expounded by Aristotle and al-Fārābī, he goes way beyond his predecessors in positioning music within the communicative systems and highlights music's special ability to create a flux of joy and sadness (tension and relaxation) based on the ephemeral character of sound that serves as a connecting thread through all levels of sound's communicative roles.

Implications

This view, is not only interesting on account of representing an exemplar of the writings of one of the most important philosophers of this age and culture, but it is also extremely original, diverging in many aspects from other views on the origins of music of his time pointing to the relevance of this literature to a fuller account of the history of ideas related to the origins of music and its powers.

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The consumption of music by homeless young people in the UK

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Background

Homeless young people face considerable challenges in terms of finding physical, financial and emotional stability. This study sought to explore the role of music listening in the context of these challenges. The music listening of this group are under-explored and the challenges faced in their lives mean that the music listening behaviours exhibited may be different to the young people of a similar age that are usually studied (students) and therefore provide further and potentially different evidence of the roles and functions of music listening.

Aims

The project aimed to understand how homeless young people access music and how frequently. It also sought to measure the importance of music to young people and the role of music in the lives of homeless young people give for listening to music.

Methods

For this exploratory study a number of people were approached through the charity Depaul UK. Participants were drawn from three groups: homeless young people supported in supported accommodation, young people in emergency accommodation, and a group of staff and volunteers.

40 young people completed the survey whilst in supported lodgings or on the morning after a stay in emergency accommodation. In addition, semi-structured interviews were carried out with 17 young people, staff and volunteers in various locations. The survey and interviews both explored how young people access music, how often and what their reasons are for doing so. Whilst survey contained primarily closed questions, the interviews allowed for more in depth questioning.

Results

Music was found to be very important in homeless young people's lives with 83% rating music's importance to them as four or five out of five. Music was identified as a tool in the management of mood as well as a form of distraction. Other emerging themes included the accessing of music via smartphones and in particular using YouTube. Young people demonstrated a preference for a wide range of genres, including identifying different uses for different types of music. 73% listened to music all or most of the day. Interestingly, many also identified reasons that the chose not to listen to music.

Conclusions

Music was found to be of great importance to homeless young people in the management of emotion and as a coping skill when dealing with their environment. Several implications were identified for service delivery including the possibility of managing music listening within the creation of psychologically informed environments in accommodation for homeless young people. In addition, the study identified the possibilities of using music listening in the development of emotion management skills.

How do you listen? Music listeners' habits and purchasing strategies

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Background

Critical reviews of classical music recordings are published daily on paper and in digital formats. One of their presumed aims is to influence the classical music market. However, no research to date has confirmed whether they impact listeners' opinions or choices (Alessandri et al., 2014). In particular, we need to understand who is consuming music reviews and what makes for a convincing argument when it comes to deciding "to listen or not to listen".

Aims

Our first aim was to document current consumption of classical music reviews amongst the broad range of offerings from professionals, peers and online rating systems. Our second aim was to analyse the listeners who consume these reviews; their listening habits and their opinions about professional music reviews and what about them, if anything, people found informative/influential.

Method

We ran a large-scale online survey for regular listeners of classical music recordings. The survey (Qualtrics) was available in English and German between May and December 2017. It was structured in three parts: demographics; listening habits and music purchase strategies; and opinions and expectations about music criticism, with a final section about professional critique.

Results

1200 regular classical music listeners (mean age 44yrs, range 17-53) from 62 countries completed the survey. Digital audio files (e.g. mp3) and YouTube were the most popular platforms due to usability, music selection, and familiarity. About half our participants (45%) never pay to listen to music. The majority (72.31%) rely on word-of-mouth, however, detailed and extended critical reviews were perceived as the most useful form of opinion, followed by short written commentaries and lastly by cumulative ratings.

About two thirds of listeners (62%) had recently engaged with professional review. These consumers were older with a higher musical sophistication index (GoldMSI) than the overall sample. According to these listeners, music reviews should provide an informed verdict on quality and value, guide listeners on purchasing and help them appreciate the recording. Reviews should focus on sound quality, the composer and work, and performance. They should be characterized by clear reasoning, comparative judgements, and a clear and engaging narrative structure. The ideal critic emerged as constructive, open-minded, respectful, and well-informed; training and experience as musician were less relevant.

Conclusions

It comes as no surprise that digital platforms are the most utilised for classical music, as has been found in other musical genres. Classical music listeners reported being more drawn to peer reviews when making purchasing decisions, likely reflecting the low cost (if any) of music in these platforms. However, extended professional review was still popular. This new finding indicates that consumers refer to expert review less when choosing a recording to buy and more to enrich listening experiences through learning about a recording and its place in the canon from an informed and skilled writer.

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"Beamer, Benz, or Bentley": Mentions of products in hip hop music

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Background

Many hip hop lyrics, like those in this abstract's title, are packed with mentions of products. So far, we know a lot about the effectiveness of product placements in general (Karrh, 1998) but little about the effects of placements in songs (Ferguson, & Burkhalter, 2014). We do not know how common placements are in popular songs, especially in specific genres like hip hop. Since these songs reach millions of people every day through radio, music streaming and personal music collections, the investigation of mentioned products is a promising topic for research on the effects of popular music.

Aims

The primary aim was to follow up the results of Ruth and Spangardt (2017), investigating product mentions in popular songs, but this time with a specific focus on English-language hip hop music.

Secondarily, the study aimed to assemble a database of hip hop lyrics, for potential use by future researchers in popular music. Lastly, the study presents an exciting, exploratory approach to the presentation of the research. The obtained results will be combined with a machine learning approach in order to produce prototypical lyrics with and without product mentions.

Method

A quantitative content analysis was conducted, incorporating hip hop songs from Billboard year-end charts from 1990-2017. Lyrics were obtained via genius.com, using a Python application. In total, over 2,500 song lyrics were analysed.line-by-line, and every instance of a commercial product being mentioned was noted, along with the type of product and framing thereof (positive, negative, neutral). Additional metadata were recorded regarding the artist, release date, and chart position.

Using the data, a Markov chain process combined with a recurrent neural network will be used to generate prototypical songs with and without product mentions, and the resulting 'songs' will be recorded by a hip hop musician.

Results

Data analysis is ongoing, but over 1,000 product mentions have already been identified. Preliminary examination of the data suggests a strong increase in the prevalence of product mentions over time. As found previously (Ruth & Spangardt, 2017), the vast majority of product mentions (~ 95%) appear to be framed in a neutral way .

So far, three product types have emerged as most prevalently mentioned: automobiles (29% of all mentions), fashion (22%), and alcohol (10%).

Conclusions

Further analysis is being conducted in order to contextualize the large increase observed in product mentions over time – for example, in terms of wider cultural changes during this period.

In agreement with the previous study, the large amount of neutrally-framed product mentions suggest that they constitute mere 'narrative details', as opposed to explicit company endorsements. However, preliminary analysis also suggests a prevalent portrayal of 'luxury'.

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Only Good Vibes. Investigation of the production and reception of mood playlists on music streaming services

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Background

In 2017, 112 million users pay for streaming subscription services and the digital income of the music industry accounts for 50% of global revenues. Krause, North, and Hewitt (2013) showed that already 20% of the everyday music use in 2012 was via mobile devices.

Wired magazine revealed that some number one hit singles owe their success to playlists from streaming services. Like radio shows, editor-curated playlists attract listeners and help musicians to present their music to a larger audience. So-called mood playlists like the eponymous playlist for this article “Only Good Vibes” are often labeled like moods or situations. These playlists are heavily frequented and covered by media. But what are important factors that determine if listeners use mood playlists? And are those playlists relevant for the music industry?

Aims

In this paper, I explore how individual factors determine if a person listens to mood playlists. Furthermore, the view of streaming service professionals on mood playlists will be outlined.

Methods

An online-based survey was conducted in September 2017. The sample consists of 172 German music streaming users (55.2% female, age: M = 25.52, SD = 8.75).

Gratifications of mood playlists were accessed: relaxation (2 items, $\alpha = .81$); entertainment (3 items, $\alpha = .85$); diversion (3 items, $\alpha = .78$); self-awareness (3 items, $\alpha = .79$); information seeking (2 items, $\alpha = .94$). Appraisal of mood playlists was accessed with three items ($\alpha = .89$).

Additionally, two guided expert interviews were conducted. One manager of Napster and one of Spotify answered questions on how mood playlists are curated and what their purposes are.

Results

A multiple regression yielded that the gratifications relaxation ($\beta = 0.31$, $p < .001$), entertainment ($\beta = 0.30$, $p < .01$), and diversion ($\beta = 0.26$, $p < .01$) predict a positive appraisal of mood playlists, $R2 = .56$, $\Delta R2 = .55$, $F = 35.34$, $p < .001$.

The interviewed experts agreed that mood playlists are not made for larger audiences but for those that are in certain situations. Additionally, they agreed that they rely on estimated personality traits when curating mood.

Conclusions

Based on the results, the major predictors for a positive appraisal are the gratifications relaxation, entertainment, and diversion. Those are the major reasons to music which fits the aspiration to regulate the personal mood (Lonsdale & North, 2011).

Eventually, it can be said that there are personal factors that explain why people listen to mood playlists but there are much more to be found. Those are necessary to know for professionals and musicians who aim to advertise their music via mood playlists.

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From Expert Model to Novice Performance - Can Experts Adapt to Novices' Suboptimal Timing in Joint Music Performance?

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Background

Joint music performance has increasingly been the focus of joint action research in the cognitive sciences. Joint actions often require temporal coordination; joint music performance is an excellent example of this insofar as it demands particularly precise temporal coordination. Representing the outcome of a joint action can drive internal models to predict timing and thereby facilitate temporal coordination (Wolpert, Doya & Kawato, 2003). In previous studies on expert-expert interactions, familiarity with a partner's playing style led to better temporal coordination (Ragert, Schroeder & Keller, 2013). However, in expert-novice interactions, experts must adjust their internal models to predict the non-optimal timing of novices.

Aims

In the current study, we pose the following questions: Are expert pianists able to adjust their temporal predictions to the faulty timing of a novice? What kind of information about the novice's contribution helps experts to do so?

Methods

Experts (more than 10 years of piano lessons) were asked to coordinate with performances of novice pianists (more than 5 years on a different instrument). Before the coordination phase experts received information about the novice's contribution along the following two factors. In the Perception condition experts heard the novice perform her melody. This performance included the idiosyncratic timing of the novice. In the Knowledge condition experts saw the prescribed outcome and prescribed movements of the novice in the form of sheet music. These two factors were implemented in a within-subjects two-by-two design.

Results

The data show that perception as well as knowledge led to better temporal coordination in the coordination phase. However, depending on the current difficulty of the novice's contribution, experts were able to use different kinds of information. When the novice did not have to shift her hand position, experts produced lower asynchronies when they had previously perceived the novice's performance than when they had not. When the novice did have to change her hand position, experts produced lower asynchronies when they had previously seen the sheet music of the novice than when they had not had access to this information.

Conclusions

We conclude that experts are able to adjust their predictions to the faulty timing of a novice. As all manipulations were implemented in a phase in which the expert was not playing along, we can also conclude that experts were able to update their internal models outside of the interaction, in an offline manner.

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Investigating the auditory effects of neighbor tones

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Background

The theory of tonal harmony has been one of the most important aspects of western music theories. In particular the usage of non-harmonic tones characterizes compositional styles, thus being a key to the successful analysis of the auditory impression of certain musical patterns. There has been a number of publications concerning the auditory impression of chords and chord progressions (Cho, Y., Lim, H., Kim, D., & Lee, I., 2016). However, the effect of non-harmonic tones has not been evaluated sufficiently.

Aims

This research aims to investigate how non-harmonic tones change the auditory impressions of underlying chord progression.

Method

Subjective experiments were conducted using Hevner's emotion expression words circle (Hevner, K., 1936). To specify which aspect of neighbor tones, passing tones and appoggiaturas change the auditory impression, six stimulus sounds were prepared for them: ① chord progression without non-harmonic tones; ② chord progression with the soprano part embellished with non-harmonic tones which resolve upwards to a chord tone; ③ chord progression with the soprano part embellished with non-harmonic tones which resolve downwards to a chord tone; ④-⑥ the minor version of ①-③. In the experiment, 20 subjects were asked to listen to the stimulus sounds described above, and to select one of the most relevant impression groups from Hevner's 8 adjective groups. They were asked to grade each impression group as an integer from 1 to 9 with the most relevant impression group being 10. In the case they feel no impression, they were asked to grade "0".

Results

The experimental result showed that there exists significant difference between the impression given by non-harmonic tones which resolve upwards to a chord tone and that given by non-harmonic tones which resolve downwards to a chord tone. It was observed that underlying tonality and the direction to which non-harmonic tones resolve, change the auditory effect of non-harmonic tones. In the case of minor modality, ascending passing tone significantly increase the impression of the brightness and significantly decreased that of the darkness. While, descending passing tone hardly give the difference in auditory impression. Besides this, we conduct multidimensional scaling to know the similarity between each non-harmonic tones. The result tells us that the impression of appoggiaturas is almost the same regardless of the type of them, and that of neighbor tones depends on major, or minor and upper, or minor and lower.

Conclusions

This paper has addressed how neighbor tones, passing tones and appoggiaturas change the auditory impression of identical chord progression. It is shown that the auditory impression given by them differ by its direction and underlying modality. We intend to conduct the experiment with other types of non-harmonic tones such as escape tones, and to investigate the effect of the embellishment by multiple non-harmonic tones.

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Sell-out or a new way of promotion? How musical endorsement in advertisement influences the attitude toward the artist

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Background

A commonly held belief is that commercial use diminishes the authenticity of a musician. However, research in advertising music usually concerns the marketing effectiveness, neglecting the attitudes toward the song and artist (Craton & Lantos, 2011).

The perception of artist's authenticity affects the attitude toward the artist (Moulard et al., 2014).

Aims

The aim of this study was to check whether musical endorsement in a commercial can influence the image of the musician by diminishing her / his authenticity in the eyes of consumers. The attitude toward the artist was a dependent variable and the attitude toward the aesthetic value was a hypothesized moderator.

Method

The experiment was conducted with the use of Computer-Assisted Web Interview, with random assignment to experimental / control group. The participants were 120 students (81 female, 39 male), aged 17-52 years (M=23,61, SD=5,31).

The procedure consisted of three steps. The participants filled out the adapted Scale of Attitude Toward The Aesthetic Value (Cohen, 1941; M=4,80; SD=0,90; α=.82). Then they watched a 30 seconds long movie - different for each condition. Participants in the control group watched an excerpt of the original videoclip to "I feel it all" by Feist; while those in the experimental group watched the commercial of Jacobs coffee from 2010 featuring exactly the same soundtrack. Finally, the participants filled out the adapted Scale of Attitude Toward The Artist (Moulard et al., 2014; M=4,80; SD=0,90; α=.93).

Results

The results of the regression analysis indicated that the participants in the advertisement condition perceived the artist as less authentic compared to those in the music video condition. The attitude toward music as an aesthetic value positively predicted the attitude toward the artist. Thus, the more one valued music as an aesthetical value, the better he / she evaluated the artist, regardless of the experimental condition (there was no significant interaction between the assigned group and attitude toward music as an aesthetical value). This factor may play a role in protecting the image of the artists who allow the use of their music in advertisment.

Conclusions

Results shed a new light on the matter of musical endorsement. The type of product will be considered in the following study.

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S8G/S8S: Symposium 8 - Music listening, music preference, emotion and everyday life: exploring the effects of engaging with music

Time: Friday, 27/Jul/2018: 8:30 - 10:30 · *Location:* Graz_1
Session Chair: Alexandra Lamont, Suvi Saarikallio

"I Want It All": The Positive Associations of Enjoying a Wide Range of Music

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Background

In the past, access to a variety of cultural artefacts, including music, was reserved for individuals of a higher socioeconomic status. This is no longer the case. As a result of recent technological advancements, people are listening to more music than at any other time in human history, capable of listening to a variety of musical styles via leading music streaming services' vast databases. Research finds that music preferences are capable of communicating information about one's personality (Rentfrow & Gosling, 2006); however, such findings focus on preference for particular musical styles. Little is known about preference for a range of different musical styles.

Aims

This study aimed to establish if knowledge of a fictitious person indicating a preference for wide or narrow music preferences would impact on judgments made about that person. Specifically, the perceived personality of this fictitious person was of interest.

Method

Adopting mixed-methodology, the research included two studies. Experimentally, study one (n = 165) presented participants with a list of seven traits (i.e. travels regularly) describing a fictitious person, one of which either 'listens to a wide range of music' or 'listens to a narrow range of music' (depending on condition). Participants were asked to write a description of the person described based on the list of traits provided and to complete the Ten-Item Personality Inventory (Gosling, Rentfrow & Swann, 2003). Study two utilised a sub-set of 50 of the descriptions created by participants in study one. The descriptions (25 per condition) were presented randomly to a separate sample of participants (n = 57), who were asked to identify whether each description depicted someone who listens to a wide or narrow range of music.

Results

The results of study one revealed statistically significant differences on personality scores between conditions such that knowledge of someone's preference for a wide range of musical styles led to them being thought of as being more extraverted, more agreeable, and more open. Qualitative analysis of the free-written descriptions is ongoing to better understand the impressions gained by participants. In study two, participants guessed if the descriptions were of someone who listens to a wide variety of music or a narrow variety of music and they did so to a level well beyond chance.

Conclusions

This study provides preliminary evidence that people make favourable assumptions about others based on knowledge of them enjoying a wide-range of musical styles. Furthermore, findings suggest that people are capable of inferring that someone enjoys a wide or narrow range of musical styles based on a brief description of that person. The collective findings inform future research that will consider associations between personality and omnivorous music behaviours.

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Cultural factors in the constitution of emotions in meaningful music listening experiences

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Background

Everyday music listening experiences consist of a broad range of emotions (Juslin & Laukka, 2004). Since these experiences are rooted in meanings and contextual factors, it has been suggested that the experiential palette of emotional nuances differs across cultures, one explanatory factor being the individualist-collectivist dimension (Juslin, Barradas, Ovsiannikow, Limmo, & Thompson, 2016). However, at the level of fundamental underlying functions and psychological meanings, music has been argued to serve relatively similar purposes across cultures (Clayton, 2009).

Aims

The current study aimed to clarify the role of cultural background (Finnish/Western vs. Indian/Asian) in explaining the emotional experiences evoked by particularly meaningful everyday experiences of music.

Method

An online survey was conducted with participants comprising 66 Asians, mostly Indians (M = 32.5 years, SD = 8.9, 47 females) and 157 Finns (M = 29.4 years, SD = 10, 109 females). Participants were asked to select a single piece of music that was meaningful and evoked emotions in their daily life. To assess the strength of emotions evoked by it, 41 emotion terms (selected based on prior music and emotion research) were rated on a 7-point Likert scale in addition to providing free descriptions about the personal meanings of the same.

Results

Parallel Analysis revealed an underlying dimensionality of 5 for both groups. Principal Component (PC) analyses revealed that the common component for both groups, that is, the first PC, encompassed emotions related to Excitement. The remaining 4 PCs for the Asian sample represented Vulnerability, Spiritual/Transcendental Relaxation, Longing, and Stress. The remaining 4 PCs for the Finnish sample depicted Longing, Relaxation, Stress, and Spirituality/Transendence. While the factor compositions were generally quite similar, Sadness and Empathy were associated with Longing for the Finns but with Vulnerability (lack of Freedom) and Spiritual/Transcendental Relaxation for the Asians. Qualitative descriptions reflected similar topics and provided further explanation. For instance, a particularly prevalent theme for the Finns was that of the sad personal memories becoming transformed into life appreciation through meaningful music.

Conclusions

The results provide support for general, underlying cross-cultural similarity for the types of emotions experienced with music listening. However, culture-specific meaning-making processes may result in differences in how the emotional experiences are constituted. For instance, Finnish/Western listeners may be more likely to gain emotional gratification of empathic comfort and solace through the reflection of personal experiences while the Indian/Asian listeners would search for emotional gratification from spiritual relaxation.

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How do different people talk about music? An exploration of the Desert Island Discs archive by occupation type

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Background

Much research has explored the links between people's musical preferences and other aspects of their lives, such as personality (Rentfrow, McDonald & Oldmeadow, 2009), occupation and lifestyle (North & Hargreaves, 2007a, 2007b, 2007c). Knox and MacDonald (2017) examined music choices of interviewees on the BBC Radio 4 programme Desert Island Discs over 72 years, classifying interviewees by occupation category and music preferences using the MUSIC model, and finding associations between them. For example, people having an Artistic occupation chose more Sophisticated music. Research has also explored how people make sense of their favourite music and the emotions it evokes, and link it to life events, significant moments or relationships (e.g. Gabrielsson, 2011), but no studies have yet combined these two areas.

Aims

We explore favourite music chosen by well-known people from different occupational categories, and investigate how they connect this to their lives.

Methods

10 recent interviews (2012-2014) from the Desert Island Discs archive were chosen for transcription and in-depth thematic analysis (one male and one female from each of five occupation types: Realistic, Investigative, Artistic, Social, and Enterprising; participants' ages from 26 to 82). Music preferences across the different occupation types were explored in more depth, focusing on piece and artist as well as style, and the ways in which music was placed in autobiographical narrative was teased out.

Results

There were no observable differences in the styles of music chosen by people from the different occupational types. Thematic analysis revealed three main themes - love, identity, and support – which transcended occupation type and were common across all the interviews, showing the intimate connection between core human values and music. The only main difference was that the two Artistic interviewees, both classical performers, prioritised discussion of the details of the music over personal stories. A further finding was that women talked about empowerment in relation to their music choices and personal stories attached to music.

Conclusions

This paper sheds important light on the role of music in the everyday life of well-known people, furthering understanding of how music works as a powerful reminder of significant life events and how people from all walks of life are affected, even in the context of a public setting such as a radio interview, by their own favourite music.

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Music-Evoked Episodic Autobiographical Memories in Depressed Individuals

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Background

Listening to music frequently evokes strong episodic memories (i.e., Music-evoked Episodic Autobiographical Memories: MEAMs). MEAMs often act as a motive to engage in music listening and as a mechanism underlying the induction of emotions with music, influencing affective experiences when we listen to music. Depressed individuals consistently show memory impairments, such as negative bias (Mathews & MacLeod, 2005) and overgeneral autobiographical memory (OAM; Williams et al., 2007). While studies have investigated MEAMs in healthy populations (e.g., Janata, Tomic, & Rakowski, 2007) and in individuals with memory disorders (e.g., El Haj, Postal, & Allain, 2012), no study to date has investigated MEAMs in depression.

Aims

The aim of this study was to examine the quality of MEAMs in depressed individuals in comparison to non-depressed controls, in terms of valence and specificity.

Method

Thirty-nine individuals (18 depressed and 21 controls) participated in a music-listening test conducted on the Internet. Participants were recruited via advertisements posted at the university campus and on the Internet and distributed to healthcare professionals. Each participant listened to an individually designed musical stimulus, aiming to maximize the probability of spontaneous MEAM retrieval. Each stimulus featured five “experimental” pieces, corresponding to popular “hits” from participants’ youth, and five “personal” pieces, provided by participants themselves. These 10 pieces were segmented into 30-sec excerpts and compiled into one 5-min stimulus. Participants were asked to listen to the compilation stimulus, describe their memory (if they had any), and rate the memory’s specificity and valence and their induced affect.

Results

Results indicate that depressed participants, compared to controls, had significantly more negative memories with music. Similarly, the valence of induced affect was more negative for depressed compared to controls. On the other hand, no significant difference between groups was found in terms of memory specificity.

Conclusions

These results suggest that depressed individuals’ MEAMs are negatively biased but not overgeneral, which may be due to the spontaneous nature of memories induced by music. Similarly to the study of Garrido (2018), our findings indicate that depressed people may experience negative affect when listening to music associated with memories. Finally, the ability to access vivid negative autobiographical memories with music suggests that personal music may be a useful aid in psychotherapy for depression, a disorder typically characterized by OAM.

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L15G: Long Talks 15 - Musical Skill

Time: Friday, 27/Jul/2018: 8:30 - 10:30 · *Location:* Graz_2

Session Chair: Massimo Lumaca

Cognitive control disengagement during a music learning task

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Background

Cognitive control is more important at some times than others. For example, heightened cognitive control is required for the initial stages of learning a skill, but may not be necessary at a later stage (once the skill has been mastered). This proposition is supported by activity in the prefrontal cortex (PFC), which supports cognitive control, decreasing as adults practice a new task (Kelly & Garavan, 2005). However, recent evidence suggests that children do not engage control as efficiently as adults, with young children often engaging control even when it is no longer necessary (Chevalier, 2015).

In this study we investigate the dynamics of control engagement and disengagement while learning a new skill. We focus on how these dynamics change with age, and relate to individual differences in specific components of cognitive control (i.e., inhibition, shifting, and working memory). We address these questions using a music learning task, recording neural activity while adult and child participants learn to play a short melody on the piano.

Aims

1) To examine developmental differences in cognitive control engagement and disengagement during skill learning

2) To investigate how individual differences in specific components of cognitive control relate to the efficiency of control disengagement during learning

Method

29 non-musician adult participants and 26 non-musician child participants (aged 6-8y) took part in this study. Non-musician was defined as less than 1 year of piano training. Functional Near-Infrared Spectroscopy (fNIRS) was used to measure PFC activity while they learnt to play a simple (12 note) piano piece. In each trial, participants saw a video of a short musical performance and then attempted to perform it themselves on a MIDI keyboard. Participants learnt to play the piece over 30 minutes, and then took part in three cognitive control tasks tapping inhibition (flanker), working memory (digit span), and task switching (cued task switching).

Results

We analysed the timecourse of PFC activity change by comparing levels of oxygenated hemoglobin from before participants had learnt the piece to those after participants had learnt the piece. The time at which the piece was learnt was defined as the third (consecutive) time that the participant played the right notes in the right order.

We found that adults with greater working memory learnt the piece faster (i.e. took fewer trials to perform the melody correctly), and those with greater inhibition skill (i.e. ability to withhold prepotent responses) disengaged control faster once they had learnt the piece (i.e., greater decrease in PFC activity). Preliminary analyses suggest this pattern wasn't as pronounced in children.

Conclusions

Adults are able to reduce cognitive control when they move from learning to automatising a musical piece, and this reduction of control relates to their ability to inhibit prepotent responses. The way children and adults learn a piece differ.

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Mental Memorization of Tonal and Non-Tonal Music: A Mixed-Methods Study with Pianists

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Background

Performing solo repertoire from memory is a norm in the tradition of western classical music. Alongside physical practice, musicians often use additional silent strategies to enhance their memorization. Good aural skills and structural analysis are known to assist musical memorization (Bernardi & al., 2013). In tonal music, hierarchical and conventionalized pitch and metrical structures help memorizing in larger chunks, while much of this structural support is lacking in non-tonal music. It would thus seem possible that memorization in tonal and non-tonal music are supported by different sorts of cognitive skills and strategies.

Aims

This study addressed individual differences in memorizing tonal and non-tonal music from notated scores. In particular, we asked what roles musicians' aural skills, expertise, cognitive style, working memory and individual ways of processing music play in these two contexts of memorization.

Methods

30 professional pianists performed ten short musical excerpts from memory after studying the score silently for one minute. In two conditions, the music represented tonal and non-tonal piano repertoires, respectively. After the performances, the participants were interviewed about their memorization strategies. The pianists' aural skills as well as their verbal and spatial working memory were tested. Further, they filled out the OSIVQ questionnaire for cognitive style, and a questionnaire concerning their regular ways of processing music.

The performances were recorded and analyzed by counting the "recall rate", meaning the percentage of correctly performed melodic units. In addition, the "overall impression" of the performances was aurally analyzed and rated by two judges. The pianists' self-described memorizing strategies were categorized into aural, conceptual, stylistic, embodied, score visualization, and keyboard visualization strategies. The music-processing questionnaire was analyzed by principal component analysis, yielding two components: "imagery" (extra-musical imagery and creative processes) and "analysis" (rational processes).

Results

Analyses of recall rate and overall impression were carried out by generalized estimating equations (in R). Better recall rates were associated with aural skills, study years, and verbal cognitive style. However, aural skills were related with recall rate only in tonal music. Overall impression was associated with all of these three variables in both conditions. Further, recall rate was negatively associated with spatial cognitive style, as was also overall impression with keyboard visualization strategies. There was a positive correlation between overall impression and a regular habit of analyzing music.

The interviews revealed that compared to tonal music, in the non-tonal condition the pianists described more of conceptual strategies. There were also qualitative differences in aural and conceptual strategies between the conditions. Expertise was found to affect some of the strategy choices.

Conclusions

Cognitive style, aural skills, and expertise affect pianists' memorized performances after silent study of the score. In tonal and non-tonal music, memorization happens using partly different strategies, and it is supported by different skills, especially in terms of aural imagery. The study also highlights the importance of verbal conceptualization in memorizing music.

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A new test of rhythm memory in children and adults: Age, musical sophistication and Kolmogorov complexity predict individual success

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Background

The ability to perceive and memorize rhythms is a fundamental musical skill. However, there are very few tests in the academic literature assessing the ability to process a rhythm directly, not relying on a same-different discrimination paradigm. An exception is the Musical Sequence Transcription Task (MSTT, Zuk et al., 2013) originally designed for the use with primary school children. The MSTT requires the transcription of a rhythm generated from two different sound events by using two graphical symbols. While MSTT scores can be predictive of reading and writing impairments in children, it is still unclear how the ability to process rhythmic patterns is related to other musical skills.

Aims

The aim of this study was to trial different variants of a new rhythm test based on the original MSTT with children and adults as well as for online administration. The validity and comparability of the rhythm test was assessed by comparing the predictive power of the person- and participant-wise predictors across different datasets.

Method

Two samples were used. Sample 1 comprised 91 secondary school children (58% female; mean age=12.59, SD=1.06). Sample 2 comprised 560 adults (53% female; mean age=41.43, SD=16.86). School children took a variant of the MSTT with 30 items that varied in length from 4 to 8 rhythmic events. In addition, their general musical sophistication (GMS) was assessed using the corresponding Gold-MSI subscale. Adults took a 12-item variant of the rhythm test that used a visual 6-alternative forced choice response paradigm. All sequences had a length of 8 events. Musical background was assessed with the musical training (MT) scale from the Gold-MSI. Periodicity and redundancy of the items on both variants of the test were measured using an approximation to Kolmogorov complexity (K) for short strings.

Results

Data from both sample were analysed using random effects logistic regression models. For both samples, age, MT/GMS and K were significant predictors. In the children sample, K was the most important predictor as indicated by the models' standardized beta weights followed by age and GMS. For the adult sample MT was the most important predictor followed by age and K which had very similar beta weights. Older children performed better on the task while for adults' task performance declined with age.

Conclusions

Despite the clear differences in terms of sample demographics and response paradigms, Kolmogorov complexity proved to be a robust predictor of item difficulty in both datasets which implies that this measure can be a suitable tool for the calibration of difficulty of a larger item bank in the future. The fact that musical sophistication in different forms predicts performance significantly indicates the validity of the task as a test of musical skill. The differential contribution of age in the two models suggests that rhythmic processing ability might increase during childhood and then decrease slowly across adulthood, similar to working memory and other cognitive abilities associated with fluid intelligence.

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A Cognitive Model of Sight-reading as the Ear-Eye-Hand Collaborative Processes

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Background

Researchers have argued that expert and novice sight-readers have the different length of the eye-hand span (EHS), i.e., the distance between performers' eye and hand position on the score. The EHS is known to be relevant to working memory capacity (Furneaux & Land, 1999) and has been measured in notes, beats, or in time units. However, it should be examined whether the EHS is proportional to sight-reading accuracy because only a slight correlation between the EHS and sight-reading performance was found in professional pianists (Rosemann et al., 2015). Furthermore, the influence of

characteristics of music on the EHS needs to be investigated, since the musical variables were not controlled in both quantitative and qualitative manners in past studies (Cara, 2017; Wurtz et al., 2009).

Aims

The present study aimed to scrutinize correlations between the EHS and sight-reading performance and investigate the effect of musical complexity and playing tempo on the length of the EHS and performance accuracy.

Methods

Thirty-five professional pianists played four musical pieces with two different complexities (simple and complex) and tempi (slow and fast) by sight-reading, and their eye movements were measured every twenty milliseconds. Participants' EHS was calculated in note, beat, and time index and the accuracy of their sight-reading performance was evaluated by the Dynamic Time Warping algorithm.

Results

The main findings of this study are: (1) the EHS was consistent in the number of notes; (2) there was no correlation between sight-reading performances and any of the EHS indexes. The mean EHS followed the constant number of notes regardless of musical complexity and playing tempo, whereas the EHS in beat and time varied with the two variables. Also, the accuracy of participants' sight-reading performance did not proportional to the length of the EHS in all of the indexes.

Conclusions

The note-consistent EHS suggests that when it comes to unfamiliar musical patterns, the sight-reading strategy of professional pianists seems to accurately press the piano keyboard as soon as the musical notes are encoded into their buffer. Despite the note-consistent EHS, however, no significant correlation between the EHS and sight-reading accuracy suggests an insignificance of working memory capacity on skilled sight-reading performance, supporting Kopiez & Lee (2008), which demonstrated the importance of psychomotor speed rather than working memory on sight-reading achievement.

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L16G: Long Talks 16 - Neuroscience

Time: Friday, 27/Jul/2018: 8:30 - 10:30 · *Location:* Graz_3

Session Chair: Renee Timmers

Application of nonlinear signal processing technique to analyze the brain correlates of happy and sad music conditions during listening to raga elaboration phases of Indian classical music

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Background

There have been increased attempts by cognitive neuroscientists to study the role of music in the modulation of emotional experience and its neurobiological basis. Power spectral analysis of EEG has shown that the frontal and fronto-temporal regions are active during music processing. Application of signal processing algorithms to investigate neuronal correlates of various features of music like timbre, rhythm etc., have shown better results than the conventional spectral analysis and behavioural studies. As brain is a nonlinear system producing complex behaviours, it would be interesting to analyze the effects of music on the brain using advanced nonlinear signal processing algorithms.

Methods

Continuous EEG signals were recorded from 20 musically untrained subjects while listening to excerpts of six ragas of North Indian Classical Music (NICM). The ragas were classified as happy and sad emotion elicitors based on Indian music theory. Behavioural ratings from the participants showed that the ragas were happy and sad emotion excerpts. Analysis was performed to compare the effects of happy and sad musical stimuli on same region of the brain and across hemispheres. The recurrence plot, a graph representing the times at which a nonlinear system recurs to a former state, was used to investigate the m-dimensional phase space trajectory through a two dimensional representation of its recurrences. Recurrence Quantification Analysis (RQA) was applied to quantify the number and duration of recurrences. RQA parameters such as recurrence rate, divergence, entropy etc. were extracted.

Aim

This research aims to analyze the brain correlates of happy and sad musical emotions induced during listening to ragas of NICM by using nonlinear processing of EEG signals.

Results and **Discussion**

The results show an increase in the average entropy in the left frontal region during happy musical conditions. Right frontal region showed an increase in average entropy and decrease in average divergence during sad musical conditions. During sad musical stimuli, there was a significant decrease in average divergence and a similar increase in average entropy in the right hemisphere when compared to the left hemisphere in both frontal and fronto-temporal regions. These results endorse the fact that the emotions elicited by happy musical conditions are processed in the left frontal regions of the brain. The significant changes in divergence and entropy in the frontal and fronto-temporal regions indicate active emotional processing in those regions.

Conclusion

This paper is concerned with determining the brain correlates of listening to happy and sad excerpts of NICM. Nonlinear signal processing technique has been used instead of the conventional linear techniques since brain is inherently a nonlinear system. Results indicate that the emotions induced by happy and sad music stimuli are processed differently by the brain in different regions. The left and right frontal regions are found active when processing happy and sad emotions respectively and the frontal regions are active in overall emotional processing. As music processing involves coordination between different regions of the brain, it may be useful to extend the study for analyzing the effects of NICM on brain networks to determine connectivity.

MMN amplitude correlates with temporal and inferior-frontal cortex in musicians

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Background

The mismatch negativity (MMN) is a component of the event-related potential (ERP) generated within the temporal and inferior-frontal cortex by a deviant stimulus inserted in a sequence of coherent ones. Its amplitude is modulated by musical training and it is higher for music sound in the right compared to left hemisphere (Vuust, Brattico, Seppänen, Näätänen, & Tervaniemi, 2012). Several studies demonstrated that brain structures and their functionality are strongly interrelated, showing that functions of cortical areas are determined by their extrinsic connections and intrinsic properties (Schneider et al., 2002).

Aims

We aimed to explore the relation between MMN and brain volumes, with a main focus on the temporal and inferior-frontal cortex in the right hemisphere. Since MMN is considered a neurophysiological evidence of the predictive coding theory, here we aim to provide evidence of the relation between this theory and brain structure volume. Furthermore, we investigated this relation according to the participants' musicianship.

Methods

Magnetoencephalography (MEG) was recorded from a sample of 40 non-musicians and 21 musicians. The subjects were presented with a melodic multi-feature MMN paradigm (Tervaniemi, Huotilainen, & Brattico, 2014), which consists of short melodies including deviants in timbre, tuning, rhythm, melody transposition, and melody contour. Volumetric segmentation with FreeSurfer software was performed on the subjects' structural brain images obtained with magnetic resonance imaging (MRI).

Results

In the musician group, we revealed a positive correlation (.49) between the right hemisphere MMN amplitude, recorded at sensor level, to all deviants and the volume of the right temporal and inferior-frontal cortex. The relation appeared particularly robust (.74) for the melody transposition. Furthermore, the mean of the MMNs to melody transposition, melody contour and tuning deviants was positively related to the total volume of white and grey matter (respectively, .46 and .52). We did not find any association between MMN amplitude and brain structures in non-musicians.

Conclusions

Our results suggest that a long-term musical training is able to affect the relation between the predictive coding of sound deviants, as indexed by MMN, and brain cortical anatomy. This study is in line with previous literature showing brain structural and functional changes induced by music learning. Moreover, here we obtain evidence for the link between brain function and structure for predictive coding mechanisms related to musical pitch.

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Expertise-dependent sensitivity to mistuning and melody transposition: MEG study with melodic multi-feature MMN paradigm

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Background

Previous research suggests that individuals without systematic musical education or with only few years of formal training exhibit enhanced cortical mechanisms for encoding and discrimination of music-relevant auditory information (Koelsch et al., 2007; Tervaniemi et al., 2006). However, it is not known whether the neural auditory processing skills of amateur music players distinguish them from non-musicians and professional musicians when assessed in realistic musical settings.

Aims

We aimed to describe an auditory profile of amateur musicians as compared to professional musicians and non-musicians using melodic multi-feature MMN paradigm (Putkinen et al., 2014, Tervaniemi et al., 2014; 2016).

Methods

We recorded 306-sensors magnetoencephalography (MEG) from 99 participants presented with a melodic multi-feature MMN paradigm while watching a silent movie. The paradigm included six types of deviants embedded in short melodies. Melody modulation, rhythm modulation, and transposition deviants, once introduced, changed the melodic structure. Timing delay, mistuning and timbre deviants were single events and did not modify the successive melody. The amplitudes of MMN response to each deviant as well as of consecutive P3a were compared between a priori defined groups of non-musicians, amateur musicians, and professional musicians.

Results

MMN was elicited for all deviants in each subject group. Musicians had overall larger MMN than non-musicians and amateur musicians. The MMN amplitude to mistuning and melody transposition deviants was modulated as a function of musical expertise, with the smallest MMN in non-musicians and highest in professional musicians, while amateur musicians showed an intermediate response. P3a that followed MMN after melody transposition was significantly larger in professional musicians than in non-musicians, but it was not different in amateur musicians vs. non-musicians.

Conclusions

The MEG results confirm findings of previous EEG studies on enhanced music-sound encoding in musicians as compared to non-musicians in the melodic MMN paradigm (Tervaniemi et al., 2014; 2016). Moreover, results suggest that amateur musicians have advantages over non-musicians in neural processing of essential music features, such as mistuned sounds and change of a musical key. However, the latter becomes more salient for professional musicians (as compared to the other groups) as evidenced by their enhanced P3a, reflecting involuntary shifts of attention.

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Effects of meter on brainstem and cortical encoding of sound

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Background

According to dynamic attending theory (Jones & Boltz, 1989), attention allocated to metrically strong beats facilitates auditory perception of sounds. Enhanced cortical auditory processing at times of high metric strength was evidenced by heightened N1 and P2 peaks in ERP research. However, very little is known about how the subcortical processing of sounds is influenced by rhythm and meter perception.

Aims

This study was aimed to examine how subcortical and cortical responses to sounds are modulated by the metrical hierarchy.

Methods and Results

We measured 13 non-musicians' brainstem and cortical responses to four different beats of the quadruple meter. In the first experiment, we primed the quadruple meter by repeatedly playing a sinusoidal four-tone sequence composed of A7 (3520Hz), A6 (1760Hz), A6 (1760Hz), and A6 (1760Hz) (500ms IOI), while a short speech sound, /da/, was simultaneously presented every 500ms. The auditory brainstem responses (Skoe & Kraus, 2010) and P1 responses to the speech sound, /da/, were measured and compared among four different beat positions. The result showed that the onset latencies and amplitudes of the auditory brainstem responses (ABRs) to /da/ were not significantly different among four beats, whereas P1 was significantly reduced on the strong beat. It is indicated that the metrical hierarchy changes only the cortical responses to sounds on the strong beat. However, it is also possible that the salient pitch change from A6 to A7 on the strong beat results in the reduced P1. To see whether the reduced P1 is attributed to the salient pitch change or not, we designed the second experiment. In a strong meter condition, the meter was primed by a repeating quadruple rhythmic pattern without pitch changes. To see the effect of meter in depth, we also added a weak meter condition, in which a syncopated rhythmic pattern was repeated. The result showed that P1 on the strong beat was significantly reduced only in the strong meter condition, not in the weak meter condition. We can know that the reduced P1 on the strong beat was not the effect of the pitch change, but the effect of meter. The ABRs were not significantly different among four beats in both conditions.

Conclusions

The results indicate that the effects of temporal attention guided by the quadruple meter is robust only on the cortical level and the details of metric strength is not reflected on the subcortical processing of sounds.

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S3G/S3S: Symposium 3 - Music, emotion, and visual imagery

Time: Friday, 27/Jul/2018: 8:30 - 10:30 · *Location:* Graz_4

Session Chair: Mats Küssner

This symposium is happening in Sydney and Graz simultaneously.

Background

Juslin and Västfjäll (2008) propose that visual imagery is one of several mechanisms by which music induces emotions in the listener – a claim that is supported by recent evidence (see also Juslin et al., 2008). Vuoskoski and Eerola (2015) found that up to 80% of their participants reported visual imagery when music was combined with a narrative. Koelsch et al. (2013) showed that music-induced emotions are associated with increased activity between the amygdala and the visual cortex. More recently, Taruffi et al. (2017) provided evidence that spontaneous thoughts occur more significantly in the form of inner images compared with words when listening to both sad and happy music. Although these findings suggest that visual imagery plays an important role for music-induced emotions, relatively little is known about the nature, role and functions of visual imagery during music listening and how visual imagery might give rise to emotional responses.

Aims

The aim of this symposium is to shed light on the mechanisms, content and functions of visual imagery during music listening and to scrutinize its role in music-induced emotions.

Contributors

Küssner, M. B. Moving images before the mind's eye: how visual mental imagery affects emotional responses to music.

Schaerlaeken, S. Visual Imagery, Metaphors, and Emotions Evoked by the Sound of Classical Music: Characterization, Classification, and Measurement.

Day, R. The Timing of Musically Elicited Emotions and Visual Imagery Responses.

Taruffi, L. Sad Music, Empathy, and Visual Mental Imagery: An fMRI Study.

Main Contribution

It is envisaged that this symposium will highlight the important role visual imagery plays for many (though not all) when listening to a piece of music. The first two papers by Küssner and Schaerlaeken et al. will provide insights into the prevalence and different categories of visual imagery during music listening and its relation to induced emotions, using a mix of qualitative and quantitative methods. Questioning the appropriateness of Juslin and Västfjäll's 'visual imagery' mechanism, the paper by Day and Thompson will show empirical evidence that individuals experience emotional responses to music before they see images in their mind's eye. Finally, Taruffi et al. will emphasize the role of visual imagery for emotions experienced by highly empathic individuals by identifying the visual cortex as a key area within a brain network that is active when listening to sad music. Implications of all these findings will be discussed in relation to Juslin and Västfjäll's framework and other accounts of music-induced emotions and visual imagery.

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Vuoskoski, J. K., & Eerola, T. (2015). Extramusical information contributes to emotions induced by music. Psychology of Music, 43(2), 262-274.

Moving images before the mind's eye: how visual mental imagery affects emotional responses to music

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Background

Visual mental imagery is supposed to be one of several mechanisms inducing emotions during music listening (Juslin, 2013). Although it has been repeatedly reported that people see images before their mind's eye when listening to music (Juslin, Liljeström, Västfjäll, Barradas, & Silva, 2008; Taruffi, Pehrs, Skouras, & Koelsch, 2017; Vuoskoski & Eerola, 2015), it is still unclear how common this phenomenon is and whether the content of such images gives rise to emotional responses. On the other hand, there seems to be a broad consensus that music is capable of inducing emotions as well as eliciting a sense of motion in the listener (Eitan & Granot, 2006). It is thus possible that "moving" visual mental images play an important role for musically induced emotions.

Aims

This study aims to investigate whether individuals experience visual mental imagery during music listening, and if so, what types of inner images people conjure up and how these images might affect emotional responses to music.

Methods

Participants (N = 669, M = 30.0 years, SD = 9.6 years, age range: 18-79 years; 57% female) were obtained from two sources; 169 respondents were a result of a convenience sample recruited via mailing lists and social media. A representative sample (N=500) of people living in the UK was obtained from Dalia Research. Besides two open-ended questions about the content and emotional quality of visual mental images during music listening, several standardized questionnaires (e.g. VVIQ, Gold-MSI) were used. The open-ended questions were analysed using thematic analysis (Braun & Clarke, 2006) to identify a limited number of types of visual mental imagery and their relation to emotional responses.

Results

Of the representative sample, 77% reported having experienced visual mental imagery during music listening. Results suggest that movement plays an important role in concrete and abstract types of visual mental imagery that may lead to emotional responses. Regarding the former category, autobiographical episodes, landscapes, musical performances and fictive narratives belong to the most commonly reported visual mental images that involve descriptions of movement. Similarly, animated geometric shapes, colours and shades show a distinct involvement of motion within the abstract category of visual mental images.

Conclusions

Results will be discussed with a particular focus on the role of visual and kinaesthetic mental images during music listening and their relation to induced emotions. Juslin's BRECVEMA framework—and specifically the mechanism 'visual imagery'—will be scrutinized in light of the present empirical findings.

References

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Visual Imagery,Metaphors, and Emotions Evoked by the Sound of Classical Music: Characterization, Classification, and Measurement

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Visual imagery is one of the mechanisms by which music induces emotions. It consists in the more or less vivid images or visual dynamics that are conjured to one's mind when listening to music, e.g. a beautiful landscape or a sense of visual motion. Three successive studies involving 540 participants in total were carried out to explore the possibility of narrowing down the infinity of possible images or visual representations to thematic categories. Study 1 was based on a list of terms judged and collected at a concert and was asking participants to rate these in accordance with their own personal experience of music. Study 2 provided the participants with a smaller subset of terms based on the study 1 results and asked them to rate them after listening to classical excerpts. An exploratory factorial analysis extracted 5 factors out of the ratings, combining imagery expressions together. These expressions saturating on these factors were used in our third study with a confirmatory factorial analysis in order to test the obtained model resulting from the previous steps. A model using five factors, named Flow, Movement, Force, Interior, and Wandering, was retained as best fitting our data. A fourth study with 160 participants was carried out to compare the evoked emotions and metaphors in response to classical music, using respectively Geneva Emotional Music Scales and the newly created scales for metaphorical expressions. The results showed relatively strong correlations between items of the two scales such as Force and Power, Flow and Peacefulness. It also highlighted the impact of mid-level features such as dissonance and entrainement questionnaire on such models. This research might provide music education, musicians, and Guided Imagery and Music (GIM) practitioners with scientific grounds to improve communication and teaching. It also creates a new way to label musical excerpts and classify them. This research offers a basis for studying the important role of visual imagery in music communication and expressivity in classical music.

Sad Music, Empathy, and Visual Mental Imagery: An fMRI Study

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Background

Although empathy has become an increasingly popular subject in neuroscience, little is known about the neural processes underlying empathic responses to music. A number of behavioral studies showed that sad music engages empathic listeners to affectively resonate with the emotions conveyed by the music (Taruffi & Koelsch, 2014; Vuoskoski et al., 2012) and to fantasize about various mental images related to the music, enhancing spontaneous, internally-oriented mental processes known as mind-wandering (Taruffi et al., 2017).

Aims

The present study investigates the neural networks underlying listening to music evoking different emotional experiences (sadness and happiness) and their relation with the personality trait empathy.

Method

24 subjects underwent fMRI while listening to 4 min blocks of instrumental sad- and happy-sounding music and completed a self-report measure of empathy (Interpersonal Reactivity Index; Davis, 1980) afterwards. Functional data were analyzed using Eigenvector Centrality Mapping (ECM; Lohmann et al., 2010) and functional connectivity (FC). First, eigenvector centrality maps were correlated with the empathy scores. The identified computational hub was then used for FC analysis to reveal a functional network of brain regions underlying empathic responses to music.

Results

ECM results showed that high levels of empathy were associated with high centrality values in the ventromedial prefrontal cortex (vmPFC) during listening to sad compared with happy music. FC results showed that the vmPFC was functionally connected to the dorsomedial prefrontal cortex, primary visual cortex (V1), bilateral claustrum, and cerebellum during sad music. Of the observed functionally connected structures, V1 exhibited the highest centrality values and was by far the largest region, suggesting that visual mental imagery is a central mechanism underlying empathic responses to sad music.

Moreover, visual mental imagery might have facilitated participants with high scores on empathy to transpose themselves into the feelings and thoughts of their imagined characters during the music.

Conclusions

Our findings provide the first evidence that trait empathy critically defines the distribution of brain areas that are spontaneously recruited during listening to sad music. Importantly, our findings indicate that, when listening to instrumental sad music, individuals with a predisposition to empathize engage in highly dense fantasies and mental simulations, pointing to a strong involvement of visual mental imagery (V1) and mentalizing (mPFC) in empathic responses to sad music.

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The Timing of Musically Elicited Emotions and Visual Imagery Responses

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Background

Research suggests that many individuals experience a range of emotions when they listen to music however the processes that underlie such emotional experiences are still not well understood. One theory proposes that visual imagery may be one of a number of mechanisms involved in the induction of emotions through music (Juslin & Västfjäll, 2008). Thompson and Coltheart (2008) further suggested that these proposed mechanisms could be classified as unmediated mechanisms such as expectancy, that describe how music directly induces emotion and mediated mechanisms including visual imagery, which describe how music may trigger a secondary experience that is also emotional in nature.

Aims

The aim of this project is to investigate the relationship between visual imagery and emotional responses to music by exploring questions raised about the time course of emotions and visual imagery responses experienced by individuals when listening to music.

Methods

In Experiment 1, we investigated this proposal, by conducting a questionnaire and listening task (N=53) designed to collect information about participants' emotional and visual imagery responses to one classical and one popular piece. Participants who reported 'yes' to experiencing imagery during the listening task were asked whether their imagery occurred prior to feeling an emotion or afterwards. Results indicated that 47.5% of participants reported feeling emotion prior to experiencing imagery while 18.5% experienced imagery before feeling an emotion. In Experiment 2 we conducted a response-time study (N=49) in which participants listened to 30 short musical items and made a key-press response as soon as they: perceived the emotional connotation; experienced a change in their own emotional state; and experienced visual imagery; in three counterbalanced conditions.

In Experiment 3 (N=29) participants listened to 20 randomised musical items, again completing a key press when they experienced an emotion and when they experienced visual imagery, in two counterbalanced conditions. Pieces were also rated for familiarity, liking as well as for valence, arousal and imagery vividness.

Results

Among those who experienced imagery, it took significantly longer to feel an emotion than to recognise an emotion, and significantly longer again to experience a visual image than to feel an emotion. Additional correlations between self-report measures of valence, arousal, imagery vividness and response times support the possibility that visual imagery 'emerges'

from emotional experience. A similar pattern was observed in Experiment 3 (N=29) in which mean response times for experiencing an image were again significantly longer than for experiencing a change in emotional state.

Conclusions

We conclude that emotional states may increase the likelihood of visual imagery occurring rather than imagery being a trigger of emotional states. We will discuss the implications of these results in relation to Juslin and Västfjäll's (2008) multiple mechanisms model.

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S1G/S1M: Symposium 1 - The mind of the improviser: Brain, body, culture, instruments

Time: Friday, 27/Jul/2018: 13:00 - 14:30 · *Location:* Graz_1, Montreal_1
Session Chair: Andrew Goldman

This symposium is happening in Montreal and Graz simultaneously.

Background

Improvisation is a challenging topic not only because it is difficult to measure, but also because it is difficult to know what to measure and why. Making scientific sense of improvisation—and sense that is compatible with broader humanistic discourses—requires communicating across methods and theories in order to scrutinize, synthesize, and improve the work. Improvisation can be studied through its cultural conception and associated aesthetics (Nooshin, 2003), the constraints of the mind and body (Ashley, 2009), the formalized products of improvisations (Pfleiderer & Frieler, 2010), the organization of knowledge in the improviser's mind (Goldman, 2016), and by considering improvisers' first-person reports of their process (Norgaard, 2011), among other perspectives. These topics are diverse, but they all in some sense aim to characterize the improviser's mind, especially if one endorses embodied and distributed theories of cognition.

Aims

To this end, this symposium will synthesize research from neuroscience, cognitive science, informatics, and ethnomusicology in order to communicate and discuss characteristics of the improvising mind. Our discussion will focus on where different theories can be unified in this regard, where they are divergent, and how future work could advance this research program.

Contributors

Goldman, A. Improvisation experience predicts how musicians categorize musical structures.
Norgaard, M. Descriptions of improvisational thinking by expert musicians trained in different cultural traditions.
Frieler, K. On the influence of instrument specifics and cognitive load on walking bass improvisation.

Main Contribution

This symposium will help codify recent innovations in psychological and other scientific approaches to research on improvisation. It will also provide an opportunity for the ICMPC community to critique this work in order to find productive ways to move forward together with this research area.

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Improvisation experience predicts how musicians categorize musical structures

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Background

Western music improvisers learn to realize chord symbols (like those found on lead sheets or in figured bass notation) in multiple ways according to functional classifications, and practice making substitutions of these realizations accordingly. In contrast, Western classical musicians read music that specifies particular realizations; they rarely make such functional substitutions.

Aims

We test the theory that experienced improvisers are more prone to perceive musical structures with similar functions as sounding similar by virtue of this categorization and that this partly enables the ability to improvise by providing performers with a flexible repertoire of functionally appropriate motor behaviors.

Methods

We designed an oddball task. A repeating standard 3-chord progression was randomly interspersed with two kinds of deviants: one in which the middle chord was substituted with a different realization of that functional harmony (“exemplar deviant”), and one in which it was substituted with a chord from a different functional class ("function deviant”). We collected behavioral and EEG data to determine how easy it was for the participants to detect each kind of deviant. We hypothesized that those with more improvisation experience, due to differences we theorized in how they categorize musical structures, would perceive exemplar deviants as relatively more similar to standards than function deviants, thus making function deviants relatively easier to detect. Improvisation experience was assessed with a self-report questionnaire following Pinho et al. (2014). The ability to detect each kind of deviant was assessed through analyzing behavioral data (response time and accuracy) and the discriminability of the N2c and P3b ERP components, which are indexes of deviance detection, quantified through the performance of linear discriminant analysis classifiers used to discriminate each set of deviant EEG epochs against the standard epochs (Parra et al., 2005).

Results

Participants (n = 40) with more improvisation experience (hours per week spent improvising) responded more quickly and accurately and had more discriminable N2c and P3b ERP components for function deviants compared to exemplar deviants. Further, N2c and P3b signal discriminability predicted participants’ behavioral ability to discriminate the stimuli. A supplementary analysis confirmed that the effects could not be explained by the deviations in intervallic expectation that was necessarily present between conditions when we substituted different chords.

Conclusions

Our research contributes to the cognitive science of creativity through identifying differences in knowledge organization as a trait that facilitates creative ability. Our empirical findings that improvisers categorize more according to function can be used to theorize about improvisation in other domains where practitioners also make functional substitutions (e.g., a chef substituting ingredients). We also provide a platform to ask other questions about improvisers' knowledge organization and how it relates to performance.

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Descriptions of improvisational thinking by expert musicians trained in different cultural traditions

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Background

Musical improvisation is an extraordinary cognitive feat, in which the performer creates novel, idiomatic, and culturally acceptable musical “utterances” in real time. Improvisation has been studied from ethnographic, empirical, music-theoretical, cognitive, and neuroscientific perspectives but cross-cultural investigations are rare. Based on this literature and our previous qualitative investigations with artist-level (Norgaard, 2011) and developing (Norgaard, 2017) jazz musicians, we expect to identify universal generative factors and competencies in music, despite dissimilarities in surface structure.

Aims

We aim to identify common themes in improvisers’ descriptions of their thinking that are shared across cultural contexts.

Method

We will record musical improvisations and interviews with eight improvisers from different traditions who are recognized as experts. We will limit our choice of musical traditions to those in which a solo instrumental improvisation is culturally valid in performance. The improvisers will perform a solo instrumental improvisation from their tradition. Immediately after completing the improvisation, each participant will listen to a recording and look at its visual representation, while describing his or her underlying thinking. The visual representation shows pitch contour and note length without reference to any notational system. The prompt initiating the interview and the follow-up questions are free of culture-specific musical terminology. The improvisations will be transcribed into Western music notation. The verbal data will also be transcribed and analyzed through standard qualitative thematic analysis. We aim to code primarily with labels that are cross-culturally neutral, so that we may use the same codes with participants from different traditions. However, some culture specific codes may also be necessary to preserve the richness of the data.

Results

To date, we have completed six interviews with improvisers from four different traditions—South Indian, old-time fiddling, Greek, and Arab musics. Preliminary analysis of the interviews reveals recurrent themes: the use of prefabricated patterns (akin to fixed “prefabs” in language), the significance of rules in improvisation, the influence of teachers and prominent performers, long-range planning or lack thereof, ethos frameworks that encourage some actions while discouraging others, and monitoring of the improvised output.

Conclusions

Confirming our expectations, the identified themes are strikingly similar to results of previous qualitative research with jazz musicians listed above and improvisers in the Western classical tradition (Despres, Burnard, Dube, & Stevance, 2017). One obvious limitation of the interview process is that only some aspects of the generative process may be available to conscious introspection. Another limitation is the possibility that the investigators’ pre-conceptions of improvisation bias the interpretation of the data. To our knowledge, this is the first research that compares verbal accounts by improvisers from different cultures using one qualitative coding scheme.

References

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On the influence of instrument specifics and cognitive load on walking bass improvisation

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Background

Jazz musicians use several strategies to cope with the often highly demanding task of improvisation. This is specifically true for bass players in jazz who are assigned to provide a solid foundation – rhythmically and harmonically – in form of walking bass lines, which consists mostly of one pitch per beat. Most importantly, the bassist must convey given chord changes, though a certain amount of freedom is allowed. Even if the task is rather well-defined, the clumsiness of the double-bass, an expectation to create not only correct but also interesting lines in conjunction with often fast tempos and complex chord changes poses considerable physiological and cognitive challenges. Hence, walking bass improvisation seems to be a good example to study real-time creative problem solving behavior under well-defined constraints in highly demanding contexts. Presumably, bass players use a variety of strategies to meet the technical issues of the instrument itself as well as the cognitive challenges of constructing interesting lines along given chord changes. We conjecture that they prefer easier to play tone sequences and that they will rely on preconceived patterns. Furthermore, contexts that are less demanding or more common will result in more variable lines.

Aims

Using real-world data, we want to explore strategies to cope with high-demanding real-time problem solving at the intersection of cognitive and physiological demands.

Method

Based on the beat annotations provided in the Weimar Jazz Database, walking bass lines in form of beat-wise bass pitches were automatically extracted from audio files of solos with walking bass accompaniment (Abeßer, Balke, Frieler, Pfleiderer, & Müller, 2017). The resulting over 100,000 single bass tones were analyzed along with the available metric and chord annotations.

Results

Preliminary results show that the four empty strings of the double bass are the most frequent pitches even if they do not align well with the predominant flat keys in jazz. The tone produced with the least effort on a double bass, the empty G string, was the most frequent pitch. Roots, fifths, and thirds of the chords are the most common pitch classes. The less common a chord, the more frequently bass players rely on the root and fifth of the chord. Conversely, the more common a chord, the more diversified and flexible are the tonal choices. These trends are more pronounced for major than for minor chords. More in-depth analyses of typical patterns and conditioning factors such as tempo and key are underway and will be ready at time of the conference.

Conclusions

The preliminary results already indicate that instrument specifics and cognitive constraints influence the real-time creation of walking bass lines.

References

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S2G/S2M: Symposium 2 - Music perception, hearing impairment, and hearing aids

Time: Friday, 27/Jul/2018: 13:00 - 14:30 · *Location:* Graz_2, Montreal_2
Session Chair: Kai Siedenburg

This symposium is happening in Montreal and Graz simultaneously.

Outline

Despite advances in hearing technology, music listening can be problematic for individuals with impaired hearing (Madsen & Moore, 2014; Fulford et al., 2016). With every second person above age 65 being affected by clinically-relevant hearing loss (Lin et al., 2011) and an even higher prevalence among musicians (Schink et al., 2014), there is a need to better understand the consequences of hearing impairment in music listening and to optimize hearing aids not only for the perception of speech—the traditional focal point of hearing science and technology—but also for music. This symposium brings together three complementary approaches to the emerging topic of music perception and hearing impairment: Greasley and colleagues present findings from an extensive online survey, yielding new insights on problems associated to music listening with hearing aids. Russo and colleagues present a study that compared the performance of hearing impaired listeners with and without hearing aids, using the previously developed Adaptive Music Perception test (Kirchberger & Russo, 2015). Siedenburg and colleagues present an experiment comparing musical scene analysis abilities of unaided hearing impaired listeners and normal hearing listeners.

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Outcomes of an online survey examining challenges and strategies for music listening with hearing aids

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Background

This paper describes an online survey which asks how hearing impairments and the use of hearing aid (HA) technology affect music listening behaviour. Music perception with a hearing aid is challenging since it must occur through a device that has been optimised for speech perception (Chasin & Russo, 2004).

Aims

By providing evidence of the issues currently affecting HA users with regard to music listening, the study aims to explore how music listening experiences are affected by hearing loss and by the use of current hearing aid technologies.

Methods

The survey investigates hearing level, use of HA technology, music listening in live and recorded settings, and music-related discussions with audiologists. The survey questions were designed using data collected from almost 200 HA users comprising a pilot survey (n=176) and in-depth interviews (n=22) (Greasley et al., 2015). The resulting online survey was advertised widely via UK and international networks, and a snapshot of almost a thousand responses is reported in the current paper (n=1098; age range 21-95, mean 58.34; 54% female). British Sign Language translations were provided and used by around 5% (n=57) of respondents. Around 8% of respondents (n=83) submitted their latest audiogram, however, there was limited agreement between self-reported hearing loss and pure tone audiometry (< 50% agreement with the 5-band average hearing threshold, BSA 2011).

Results

For many listeners, particularly non-musicians and those with a mild hearing loss, HAs enabled music appreciation. HAs were rated most often as 'fairly' or 'very' helpful for hearing the melody, bassline, singer, lyrics and individual instruments in recorded music (n=824). Recorded music allowed listeners to exercise control over what they were hearing, e.g. by selecting familiar music and adjusting the volume. Live contexts were generally reported to be more problematic, with HAs now rated most often as 'somewhat useful' for hearing lyrics and individual instruments (n=701). In live settings, people reported distortion and discomfort from loud sounds more frequently, and found alternations between speech and music particularly challenging. For some, these problems had seriously impacted their ability to enjoy music, and resulted in them disengaging with musical activities. However, many people had not explored strategies to improve listening such as removing HAs altogether (for a mild loss), adjusting the volume or changing the program, moving in relation to the sound source, and using assistive listening devices.

Conclusions

This study provides wide-scale evidence of the challenges of listening to music through hearing aids, and the adoption of strategies to improve listening experiences. It leads us to suggest the development of a set of resources to improve communication and knowledge sharing between and among hearing aid users, audiologists, and manufacturers of this technology.

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Performance of listeners with and without hearing aids on the Adaptive Music Perception test

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Background

Hearing loss affects many aspects of listening beyond speech perception. Compared to speech perception, there are far fewer standardized tests for evaluating the effects of hearing loss on music perception. The Adaptive Music Perception (AMP) test (Kirchberger & Russo, 2015) was designed to adaptively measure a listener's discrimination thresholds for the following basic dimensions of music: F0, level, duration, dissonance, intonation, spectral brightness, attack time, and spectral irregularity, using a two-alternative forced choice paradigm and adaptive threshold testing. A previous study found that participants with hearing loss had worse thresholds for discriminating changes in frequency, harmony, spectral brightness and spectral irregularity, compared to participants with normal hearing (Kirchberger & Russo, 2015). However, it is not yet known how hearing aids would affect listeners' performance on the AMP test.

Aims

The goal of this study was to investigate the effects of hearing aids on listeners' discrimination thresholds for basic dimensions involved in the perception of meter, harmony and timbre.

Method

Listeners were 31 healthy older adults recruited from the community, who had an average age of 71.7 years (SD = 9.4). They had moderate to severe bilateral sloping hearing loss, and wore hearing aids in both ears. Listeners had a range of music training: 45% had no training at all, and those with formal training had an average of 9.6 years of music lessons (SD = 9.5). Listeners were tested on the meter, harmony and timbre subtests of the AMP test with and without their own hearing aids in separate sessions.

Results

Hearing aids led to worse discrimination thresholds for changes in level and attack time, but did not significantly alter other basic dimensions of music perception.

Conclusions

Hearing aids do not improve listeners' perception of basic musical dimensions of meter, harmony and timbre, and may in fact adversely affect some dimensions. The findings from this study add to our knowledge on how hearing loss affects music perception and which music processing strategies may be better for hearing aids.

References

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Musical scene analysis of normal and hearing-impaired listeners: Instrument identification with concurrent context tones

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Background

Despite rapid advances in hearing aid technology, music listening can be problematic for hearing-impaired individuals (Madsen & Moore, 2014). This problem is likely related to poor auditory scene analysis (ASA) abilities. The fundamental importance of ASA in shaping the perceptual experience of music has been acknowledged for a long time (McAdams & Bregman, 1979). It has even been argued that a key component of musical pleasure derives from the successful parsing of musical scenes (Huron, 2001). At the same time, musical scene perception of listeners with moderate to severe hearing loss has not been studied in any depth (although see Kirchberger and Russo, 2015). Therefore, the extent to which hearing impairment affects the parsing of polyphonic musical scenes remains unclear. For instance, can hearing-impaired listeners discriminate instruments or melodies in the midst of an accompaniment?

Aims

The goal of this study is to test musical scene perception of hearing-impaired (HI) and normal hearing (NH) listeners. Specifically, this experiment tests the effects of hearing loss and properties of musical masking tones on an instrument and melody discrimination task.

Methods

Participants are groups of ten HI listeners (ca. 50 dB HL) and twelve NH listeners (< 10 dB HL).

The experimental stimuli comprise signals (S) that consist of isochronous (250 ms inter-onset interval, IOI) four-note melodies from a diatonic scale. Maskers (M) consist of two triadic tones (500 ms IOI) from the i) piano, ii) cello, or iii) spectrally matched stationary noise. Each trial consists of the mixture (S+M), followed by two alternatives of the signal (S or S'), and listeners decide which one of the two signals was part of the mixture.

In the instrument task, listeners discriminate melodies played by the flute or the trumpet. In the melody task, listeners discriminate between different (order-wise) permutations of sets of tones. For each combination of task and masker, a 2down-1up procedure adapts the signal level to estimate the 71%-correct discrimination threshold, expressed in terms of the signal-to-masker ratio (SMR).

Results

Preliminary results indicate that HI listeners have drastically higher SMRs than NH listeners in all conditions, reflecting worsened musical ASA. NH listeners yield lowest SMRs for the piano masker, suggesting NH listeners' potential to "listen in the gaps" of the quickly decaying temporal envelope of the piano.

Conclusions

This experiment demonstrates HI listeners' general difficulty with ASA in musical scenes. Furthermore, it reveals how the properties of masker sounds affect NH listeners' musical scene perception, deepening our general understanding of musical ASA. The role of the age and musical training of participants is critically discussed.

References

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L18G: Long Talks 18 - Performance

Time: Friday, 27/Jul/2018: 13:00 - 14:30 · *Location:* Graz_3

Session Chair: Olivier Lartillot

What musical features influence perception of section boundaries in contemporary music? A live audience study with a bespoke data capture app.

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Background

Research regarding perception of musical form has suggested that listeners are more sensitive to cues in the musical surface than to musical structure (Deliège, Melen, Stammers, & Cross, 1996), and that local structures may be perceived over global (Tillmann & Bigand, 2004). Little is known about how listeners form judgements of musical segments, although there is some evidence that altering the order of sections of music may not change aesthetic judgements of musicians and non-musicians (Eitan & Granot, 2008). It is not known how listeners segment music when typical section markers, such as cadences (e.g Sears, Caolin & McAdams) and fermatas, are absent. Contemporary music is often non-tonal, and may not prioritize the musical phrase or notion of melody. There is a need for research that examines which musical characteristics influence sense of musical sections in contemporary music.

Aims

The current study aimed to examine which musical features influence listeners' decisions regarding section endings in a piece of contemporary music, Ligeti's 'Fanfares', from his second book of 'Etudes' (solo piano). Methods: The iOS/Android PRiSM Perception App was designed by PRiSM and Oxford e-Research Centre, funded by EPSRC FAST. 244 audience members used this app during a live concert performance of 'Fanfares' at the Royal Northern College of Music. Audience participants were asked to 'tap' when they felt that a section had ended. Personal data was also captured (age, level of musical training), along with subjective responses (rating of enjoyment, familiarity, qualitative data regarding how decisions regarding section ends were made).

Results

1,902 individual taps were recorded during the 3.5-minute performance (average = 7.8 taps). Audience members demonstrated high levels of agreement regarding where sections were considered to have ended, regardless of musical training. Musical features which influenced decisions included changes in dynamic, change of material played in either or both hands (e.g. ostinato figure, horn 5ths motif), and changes in register in which motifs were played. Qualitative data analysis suggested that listeners were not always aware of how they made these decisions. Conclusions: This study suggests that factors which may influence judgement of musical segmentation are similar to those identified by music analysis (Steinitz, 1996). Trained and untrained listeners exhibit a high degree of agreement, even when listening to a piece of music that is unfamiliar to them. This study is part of a larger ongoing project examining perception of patterns in music.

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The communication of timbral intentions between pianists and listeners and its dependence on audio-visual listening conditions

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Background

Studies on the audio-visual presentation of musical performance have investigated its impact on perceived expressiveness (Davidson, 2005) and musical appreciation/evaluation (Platz & Kopiez, 2012). Little is known about whether a precise timbral intention by a pianist can be communicated to listeners. An interview study (Li & Timmers, 2017) on the conceptualization of piano timbre revealed pianists' extensive utilization of timbral intentions in piano performance; the findings also suggested that the timbre concept of a pianist is enriched by embodied experience such as bodily preparations, indicating the relevance of visual cues.

Aims

A listening experiment was conducted to examine the accuracy of communication of timbral intentions to listeners and its dependence on visual and aural component of musical performance.

Methods

Thirty musical excerpts that were played by three pianists using ten timbres (bright/dark, heavy/light, relax/tense, round/sharp, velvety/dry) were recorded both aurally and visually. The musical excerpts were chosen from Bernay and Traube's study (2014) because of the various music genres and the confirmed possibility of expressing different timbres for pianists. Twenty-one undergraduate music students took part in the listening experiment using a within-subject design, and were presented all the musical performances either in audio only, visual only, or both audio and visual. They were required to rate to what extent each ten timbres were expressed in each music excerpt on 1-9 Likert scales. The dependent variable was the ratings of each timbre evaluation; while independent variables were the factor of performer/piece and the mode of audio-visual presentation.

Results

The preliminary results showed that all the ten timbres were communicated with an accuracy above chance level, although the average percentage correct was considerably higher for some timbres (sharp, relaxed, light) than for others. Dark and round were the most difficult ones to communicate. Additionally, the three pianists performing different pieces differed from each other in their capacity to communicate timbral intentions to listeners and relied differently on audio-visual presentation modes. For example, pianist/piece 3 communicated dark and heavy timbre better than others when the performance was presented with visual information, while pianist/piece 1 communicated the heavy timbre better through sound. The study also found that several timbres like relaxation and tension were mainly communicated by visual information; in contrast, the velvety timbre is communicated relying on sound.

Conclusion

This study demonstrated that it is possible for pianists to reliably communicate abstract timbral intentions to (musically trained) listeners; It also showed that both visual and auditory information contribute to this communication. The exact mode of communication and its success depends to a degree on the pianists and piece that is performed.

Evaluating Music Performance: Processes and Criteria

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Background

Performance evaluations at music education institutions have a long tradition of offering students feedback and promoting their artistic development. However, we still lack a comprehensive understanding of the processes and criteria behind the assessment of performance [1] and recent calls have been made for inductive qualitative research to explore evaluation by experts in educational contexts [2].

Aims

Our aim was to explore and document university music teachers' view on the nature, purpose and impact of the performance assessment process in the context of Bachelor and Master final exams at university schools of music.

Methods

We run in-depth, semi-structured interviews with ten classical instrumental teachers at the Lucerne School of Music. The ten musicians had an average period of 29 years teaching experience and 18 years professional activity as academic staff at higher education institutions. We analysed the ten interviews using an inductive thematic analysis with double-coder protocol. This led to a model that describes how expert teachers experience the assessment process and how they come to their final judgement.

Results

The model that emerged from the ten interviews captures teachers' experience of the assessment process in terms of its nature and scope (meta-reflection) as well as the aspects that are perceived as challenges. It also distinguishes between eight core principles and twenty criteria linked to the performance itself, the musician, the listener, and the performance context that drive teachers' assessment. Finally, the model highlights practical strategies and tools that are employed at single teacher, exam commission, or institution level to help evaluators remaining true to their principles and criteria while dealing with the challenges that the exam situation poses.

Conclusions

The findings offer an overview of the performance evaluation process in educational contexts from the psychological perspective of the evaluating teachers. A detailed description of the evaluation criteria used builds the core of the model. This is set in a wider reflective context encompassing overarching principles, practical strategies, and reflections on the purposes and challenges of a music exam.

By looking at evaluation from a broader psychological perspective, these findings add a new dimension to the performance assessment literature, which is usually more narrowly focused on the applied criteria. They build an empirical basis for a more comprehensive understanding of the assessment process and offer inputs for the implementation of ad hoc guidelines and protocols at higher education institutions.

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L19G: Long Talks 19 - Pitch

Time: Friday, 27/Jul/2018: 13:00 - 14:30 · *Location:* Graz_4
Session Chair: Anders Friberg

Tonal space, perceived: Associations of tonal stability and visual space

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Background

Musicians have long associated Western tonality with non-auditory features. In particular, tonal scale-degrees and progressions are associated with spatial features, including spatial position, direction and distance or physical size. Earlier (Maimon et al., ESCOM, 2017) we presented two experimental paradigms examining explicit and implicit associations of tonality, revealing associations of tonal stability with non-auditory dimensions such as visual brightness. This study applies similar measures to investigate associations of tonal stability with spatial features.

Aims

We examine (1) whether tonal stability systematically associates with three spatial features: location on the vertical and horizontal axes, and physical size (2) whether these associations are contingent upon participants' conceptual knowledge of tonal structures (3) whether they are expressed both explicitly and implicitly.

Methods

Forty participants (20 musicians) took part in each of the 4 experiments. For each dimension (vertical/ horizontal location, size) we applied two experimental paradigms: a matching paradigm, adapting Krumhansl's probe-tone method, and a cross-modal Implicit Association Test (IAT), based on Parise & Spence (2012). In the matching experiments, participants heard in each trial a tonality-establishing context followed by a probe tone, and matched each probe to one of several circles, varying in diameter (Exp1a) or to a location on a two-dimensional space (Exp3). In IAT experiments, participants were presented in each trial with one of 4 stimuli: a tonally stable (As) or instable (Ai) auditory stimulus, or one of two contrasting visual stimuli, Va or Vb (Exp2: large/small circle; Exp4: high/low circle). Stimuli were presented in a block design. In half of the blocks, participants were asked to rapidly press a specified key (e.g., K) when As or Va were presented, and another key (e.g., D) when Au or Vb were presented. In the other blocks, that audio-visual match was reversed, matching Au with Va, As with Vb. We hypothesized faster RTs and higher accuracy for (theoretically) congruent blocks (e.g., stable tones and lower circles, instable tones and higher circles).

Results

Size: In Exp1 (size matching), only musicians matched stabler probes with larger size. Surprisingly, this effect interacts with lateral direction, emerging mainly when larger circles are positioned to the left (an interaction replicated by two additional experiments Exp1b, 1c). Exp. 2, however, revealed no corresponding implicit association.

Spatial location: In Exp3, nonmusicians, but not musicians, locate stabler tones spatially higher (rather than lower, as hypothesized); no effect was found for the horizontal axis. In Exp4, however, both musicians and nonmusicians implicitly associated tonal stability with higher spatial position.

Conclusions

Spatial mappings of tonality, prevalent in music theory discourse, also underlie non-verbal associations of tonal stability among musicians and nonmusicians alike. These associations, however, differ from those of conventional music discourse. Stable tones are higher, rather than lower in space; they are also larger (for musicians) – but only when positioned leftwards. Furthermore, it seems that explicit and implicit spatial associations of tonality may differ, suggesting that some such associations are independent of conscious, conceptual processing.

Dissociating sensory and cognitive theories of harmony perception through computational modeling

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Background

Harmonic expectation describes the sensitivity of listeners to the structure of chord sequences. Sensory theories describe harmonic expectation as a low-level process driven by sensory responses to musical sounds, whereas cognitive theories describe it as a high-level phenomenon akin to linguistic syntax processing. Many empirical studies argue for cognitive theories of harmonic expectation, but recently Bigand et al. (2014) explained away much of their supporting evidence using a sensory model of auditory short-term memory (ASTM). The tension between sensory and cognitive theories therefore remains unresolved.

Comparing computational models could be a powerful way of dissociating sensory and cognitive theories. Here we consider two model types with particular support in recent literature: ASTM models and statistical-learning models. ASTM models are predominantly sensory, explaining expectation through the retention and comparison of auditory images in short-term memory. Statistical-learning models are primarily cognitive, interpreting expectation as probabilistic predictions made by listeners on the basis of prior learning.

Aims

• Compile prominent ASTM models from the literature.

• Construct a new statistical-learning model of harmonic expectation.

• Collect listener responses to a large dataset of chord sequences.

• Compare how well the models predict listener responses.

Methods

300 8-chord sequences were randomly sampled from the McGill Billboard popular music corpus. 50 participants were each played 150 randomly selected sequences and rated the surprisingness of the sixth chord in each sequence.

For ASTM models, we evaluated Leman's (2000) periodicity-pitch model, Milne et al.'s (2011) spectral distance model, and Collins et al.'s (2014) sensory-cognitive model. For a statistical-learning model we created and evaluated a harmonic extension of the Information Dynamics Of Music (IDyOM) model (Pearce, 2005).

Results

Participant ratings were standardized to z-scores and averaged by stimulus. The resulting ratings did not exhibit significant positive correlations with any of the ASTM models. However, they correlated significantly and positively with the statistical-learning model, $r(298) = .641$, $p < .001$.

Conclusions

These results strongly corroborate cognitive statistical-learning theories of harmonic expectation over sensory ASTM theories. Future work should investigate the generalizability of these findings to different musical genres, and test the explanatory power of alternative sensory features such as roughness and voice-leading distance.

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The Perceptual Similarity of Tone Clusters: An Experimental Approach to the Listening of Avant-Garde Music

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Background

The musical tone-cluster is a prototypical sound of avant-garde music in the 20th and 21st centuries. Tone-clusters mark the boundary between pitch-related techniques in earlier epochs to the use of sound-based materials in avant-garde music. The composer Henry Cowell offered the first theoretical reflection on the structure of tone-clusters with a focus on tone density, which relies on the number of tones and the ambitus of a cluster (Cowell, 1930).

Aim

We investigated whether participants were able to discriminate between various types of tone-clusters and how they evaluated their similarities. We also questioned whether a timbre-based approach using psychoacoustical methods of analysis could be used to explain the perception of avant-garde music sounds.

Method

Ten different prototypical tone-cluster-chords varying in density were presented in two studies. Additionally, the relation between similarity ratings and psychoacoustic features was examined. The design of the first study was based on an adaption of the Multi Stimulus with Hidden Reference and Anchor (MUSHRA) paradigm (International Telecommunication Union, 2014). Exploratory factor analysis and multiple regression analysis were used to reveal further variables influencing the perception of musical cluster-chords associated with concepts in composition and music theory. The second study used a paired comparison approach in combination with multidimensional scaling (MDS; Borg & Groenen, 2005; Handel, 1989). Additionally, a statistical cluster analysis was performed for grouping the 45 non-identical paired comparisons.

Results

The results of the timbre feature analysis (based on the MIR toolbox; Lartillot, Toiviainen, & Eerola, 2008) and perceptual evaluation of stimuli were congruent with the theoretical features of the tone-cluster structure. The correlation between tone-cluster density and psychoacoustical roughness was r = .95. In the first study, polynomial regression between roughness and similarity ratings showed a determination coefficient of R2 =. 39. The most stable solution of the MDS analysis showed a two-dimensional Cartesian representation related to the similarity ratings of the ten tone-clusters stimuli. As a result of the MDS analysis, the tone-clusters could be grouped into two classes of sounds: (a) those tone-clusters with a high grade of perceptual discrimination depending on the tone-cluster density (e.g. pentatonic tone-clusters) and (b) those tone-clusters of a more aurally saturated structure, making it difficult to separate and evaluate them (e.g. chromatic tone-clusters or tone-clusters with more than 7 tones per octave).

Conclusion

The findings can provide valuable insights into aural training methods for avant-garde music. A timbre-based approach can be one possibility, but it is not the only way to a perceptual theory of avant-garde music. In future research, there will be a need to identify more variables influencing the aural perception of musical sounds to aid in listening to and understanding avant-garde music.

W1P: Workshop 1

Time: Friday, 27/Jul/2018: 13:30 - 14:30 · *Location:* La Plata

Possible innovations in concert formats of classical music

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Background

In the nineteenth century a conception of music emerged that in part continues to signify the meaning practices of some current musical performance (Kingsbury, 1988). The fine arts concept of art as an object created by human beings for the rejoicing of individuals, something to be contemplated, as opposed to the minor arts called decorative because they produced objects to be used. This ontology of the sublime in art and music as an idea dissociates the latter from other meaning sources. Music will be the contemplation object: hence the idea of the museum as a creation of the Illuminist thought of gathering art as an object. This perspective includes the concert hall as the place for the music to be contemplated who will define the concert situation with the format that is reproduced nowadays. We consider that traditional concert forms require renewal, so as to stimulate the musicians and regain impact in the audience, which has decreased quantitatively, lacking a generational renewal (Sloboda, 2017).

Aims

To explain ways to modernize the stereotype of a classical music concert.

Audience Activities

I would need the active participation of choir members and at least some instrumentalists, as I would use the approach to one of Mozart's masses as an example.

Implications for practice

Changes will be made to: (i) the spatial placement on the stage allowing for musicians to mix among themselves, and also with the audience; (ii) including attractive theatrical elements like stories and small dramatizations; (iii) musicians bodily behavior, outside the usual traditional orthodox cliché; (iv) variations which show, by didactic means of subtle irony, the many different possible approaches to the same composition, with the same conductor changing personality; (v) the Mirror Version of the same music transforming and decanting musical styles. Finally, so as to exploit the possibility of future audiences (vi) massive classical concerts, teaching classical pieces through television and/or the web, to converge ending in a mega-concert and; (vii) fusion situations like amateur choirs and orchestras that study one brief section of a symphonic-choral piece, and then perform it with the professional musicians.

Value for this conference

The psychology of music and embodied music cognition theories have opened the field of research towards the problem of human movement and its importance for our understanding of music and musical development. The growing relevance of these ideas in musical performance implies a revision of one's own ideas about musical practice in the planning of a concert nowadays. The inclusion of new concert formats that would not conform to the Central European western classical music canons in this conference allows an interesting point of view on the relationships between text and vocal-instrumental music, spatiality and the interpretative stylistic content that communicates the performance.

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T7M: Short Talks 7 - Entrainment

Time: Friday, 27/Jul/2018: 16:00 - 17:00 · *Location:* Montreal_1

Session Chair: Marc R. Thompson

A Dynamical-Systems Model for Synchronized Music Making with Acoustic Transmission Latency

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Background

Humans precisely time their actions to synchronize with external rhythmic signals and effectively carry out tasks like dancing or music performance. Behavioral data show that, when synchronizing with a periodic stimulus, humans often tap before stimulus onsets, resulting in a negative phase relationship known as the negative mean asynchrony (NMA). The NMA increases with longer stimulus periods between 300ms and 3500ms (Mates et al., 1994), but to a lesser extent in musicians compared to non-musicians (Repp and Doggett, 2007). Previous research shows that external factors influence the timing of tapping, such as presence of auditory feedback for one's own taps or presence of a partner who coordinates during joint tapping (Nowicki et al., 2013), and transmission latencies (TL) between coordinating partners (Chafe et al., 2010). The strong anticipation hypothesis suggests that anticipatory human behavior is supported by delays inherent to the human sensorimotor system (Stepp & Turvey, 2010; Washburn et al., 2015).

Aims

Here we tested whether adding delayed feedback to the oscillatory mathematical model described by Large and colleagues (2010) can explain the NMA size when tapping with isochronous stimuli at different frequencies. Further, we examined whether the model could explain the NMA size in two-person alternating tapping with and without auditory feedback, and the lagging dynamics caused by external delays (TLs) during alternating rhythm-tapping.

Methods

We built a dynamical system that receives its own delayed activity, and oscillates at a frequency learned from a stimulus via adaptive Hebbian learning (Righetti et al., 2006). Using previously published behavioral data we carried out three experiments to simulate 1) simple tapping (data presented in Repp and Doggett, 2007), 2) two-person alternating beat-tapping (Nowicki et al., 2013), and 3) two-person alternating rhythm-tapping in the presence of a TL (Chafe et al., 2010).

Results

In Experiment 1, our system was able to replicate the larger NMA for longer stimulus intervals. Moreover, when parameters were adjusted, it differentiated the NMA patterns in musicians and non-musicians. In Experiment 2, the alternating tapping was simulated with two systems alternatingly receiving each other's SMS activity as input. This revealed the same pattern as the behavioral data where the smaller NMA and larger lag1 correlation occurred for joint tapping compared to a solo tapping condition without auditory feedback. In Experiment 3, TLs between two systems alternatingly receiving each other's SMS activity resulted in reciprocal lags at the points of alternation found in the behavioral data.

Conclusions

Our model explains that the NMA becomes shorter when the feedback delay length is shortened, and that changing parameters in the system results in different NMA sizes that mimick actual data observed in musicians and non-musicians. This model is also useful in explaining jointly coordination. Overall, our model consists of a parsimonious architecture in which a delay feedback causes simple but organized and synchronized oscillatory behaviors. Extending this model would have a potential to account for a variety of anticipatory timing patterns in human coordination, and offers a useful tool for theorizing about the adaptive nature of human synchronization and its neural underpinnings.

Mutual synchronization and predictability in entraining walking to a musical beat

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Background

Mere presence of a predictable stimulus is not sufficient for auditory-motor entrainment. Two persons walking side by side spontaneously synchronize their steps on some occasions but not on others (van Ulzen et al., 2008). Predictive processing suggests that saliency factors such as predictability and interaction modulate sensory-motor coupling (Clark, 2015). These factors also have practical implications. Musical cueing helps patients with gait impairment due to Parkinson's disease (PD) (Spaulding et al., 2013) but with a few exceptions has been studied only in its non-adaptive (pre-recorded) forms.

Aims

How to incorporate principles of mutual synchronization in a paradigm for the cueing of gait, and how to do so in a way that can be applied in real-world circumstances? We designed an adaptive musical stimulus that changed its tempo in real-time in response to the walker's step timing. It was based on a theoretical model of mutual synchronization in biological and social systems (Kuramoto system).

Method

A weakly adaptive model-based stimulus was compared to a stimulus that mirrored footfalls without inducing mutual synchronization and two non-adaptive predictable stimuli. Participants (healthy, n=20 and PD, n=20) walked along with a musical stimulus without being instructed to synchronize. In weakly adaptive trials the stimulus increased or decreased its tempo by a small amount if its beat was lagging or leading the footfalls, respectively. Its preferred tempo was higher than the participant's preferred cadence (determined at pre-test). In a strongly adaptive condition the beat effectively shadowed footfalls. In two non-adaptive conditions the tempo was again higher than preferred cadence. The first was isochronous, hence perfectly predictable. The beat in the second was variable and statistically matched to typical parameters of gait.

Results

Cadence and speed, in both patients and healthy participants, were higher with weakly adaptive than with predictable non-adaptive or strongly adaptive stimuli. The weakly adaptive beat responded to gait but maintained a consistent phase lead, hence it embodied all three saliency factors: predictable, interactive, and consistent difference. Surprisingly, there were no differences in the way patients and healthy participants responded to cueing although patients' performance was worse at baseline.

Conclusions

Stimulus predictability is not sufficient for auditory-motor entrainment. The effect of rhythmic stimuli is increased by interactivity, provided that interaction takes the right form. Conditions fostering mutual synchronization are more effective than ones enforcing synchronization, potentially informing the design of cueing paradigms not only for PD but also for other conditions that benefit from sensorimotor synchrony with a stimulus.

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Music and Mirroring: The Effects of Musical Interventions on the Mirror Game

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Background

Social bonding and intersubjectivity are basic human necessities but have been notoriously difficult to measure. Recently, there has been interest in using mirroring activities (where two participants mirror each other's movements) as a possible measure for these phenomena. Mirror games (MG) contain highly synchronized movements, which can inform about emergent properties similar to those found in improvised music-making such as shared intentionality, creativity and assumed leader/follower dynamics.

Aims

We studied intersubjectivity and coordination by analyzing the effects of improvised musical activities on mirroring activities. Music has been shown to facilitate feelings of closeness and synchrony. Assuming that the MG indexes intersubjectivity, musical interaction should induce a shared focus and coordination within a pair that would carry over to the MG.

Method

64 participants (68% female, 29.8% male, 1.8% other; age: M = 25.4, SD = 3.91) were paired with a stranger of similar musical background. In an optical motion capture lab, the pairs engaged in musical improvisation tasks, preceded and followed by a dyadic MG in which each participant led, followed, and completed a leaderless condition. The participants were instructed to mirror each other's finger movement for two minutes. The musical improvisation tasks acted as interventions to the mirroring tasks, with pairs randomly selected to one of the following musical activities performed on pentatonic xylophones: i) improvised duets with simultaneous playing ii) improvised duets with turn-taking structure, and iii) a solo improvisation in which the pair performed separately. Social bonding was assessed through a continuous measure of physical proximity and the Inclusion of Other in Self scale (IOS; Aron, et al., 1992). Intersubjectivity was analysed computationally by extracting features from the finger trajectories, such as combined movement complexity and jitter (Noy, Dekel & Alon, 2011).

Results

The findings of this study provide some support for the MG as a measure of human interaction. Participants in the paired musical improvisations reported more enjoyment in the experiment than those in the solo condition, but this was not statistically significantly reflected in the kinematic measures at the experiment level. However, there were some kinematic and coordination patterns that suggest MG might be able to capture behavioural changes caused by interventions: we found some correlations between kinematic patterns and the IOS, but only for some tasks or groups, so while MG can perhaps track some intersubjectivity-related changes, our current measures of it do not seem to provide us a tool that could easily replace IOS or other measures of intersubjectivity.

Conclusions

We found that different musical interventions produced different, quantifiable effects on the mirror game performance. The MG produces interesting dyadic data for studying interpersonal coordination and synchronisation, but further analysis is needed to see how these are related to intersubjectivity and togetherness. Our study also produced a dyadic musical improvisations data set that can be studied, and thus it contributes in multiple ways to our understanding of the social effects of musical interactions.

T8M: Short Talks 8 - Expression

Time: Friday, 27/Jul/2018: 16:00 - 17:00 · *Location:* Montreal_2

Session Chair: Emma Moore

Vicarious cues in portraying emotion: Musicians' self-appraisal

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Background

Cue utilization in the musical communication of emotion has been studied recently from the standpoint of the listener (e.g. Juslin, 2000; Eerola, Friberg & Bresin 2013), with the focus on the performer's ability to communicate emotional content to an audience. While these studies involve an analysis of performers' musico-expressive and gestural techniques, they have not sought to understand what the performers themselves take as their focus during these acts of musical communication.

Aims

The present study seeks to discover attitudinal commonalities and differences within a musician population relative to the communication of emotion via music. We hypothesized that instrument type, as well as age and gender, would bear significantly on musicians' opinions.

Method

A survey was administered to 178 participants; 152 were current music majors (mean age 20.3 years, 62 female) and 26 were adult participants in a community choir (mean age 54.0 years, 12 female). The adult participants were all vocalists, while student participants represented the full range of orchestral instruments. The students were grouped by degree program (Performance, Music Education, or Other) and instrument type (Voice, Brass, Woodwinds, Strings, Percussion).

The survey asked "How important are each of the following areas to YOU for portraying emotion in music?" Participants were asked to rate each of 15 items on a scale of 1 (not at all important) to 10 (very important). Participants were also instructed to leave blank any item that they did not understand. The 15 items were: dynamic contrast, overall volume, phrasing, facial expression, staging (placement), pitch accuracy, tempo changes, bodily movement, your mood, your attitude, vibrato, rubato, stage/room lighting, clothing type, and clothing color.

Results & Discussion

Contrary to our hypothesis, there was no overall effect of gender or age, and neither did any single response item show a significant difference due to these subject parameters. Among the student participants, however, one-way ANOVA revealed a significant effect of degree program on the rated importance of four items: dynamic contrast, tempo changes, vibrato, and rubato. Significant effects of instrument type were found in the responses to eight items: facial expression, staging, body movement, vibrato, rubato, lighting, clothing type, and clothing color.

Post hoc comparisons (Tukey) show that some variation follows from obvious differences between instrument types (e.g. string players are more concerned with vibrato than everyone but woodwind players; vocalists are significantly more concerned with facial expression than everyone but string players), but other differences could point to communal mindsets toward vicarious cues within instrument type. These mindsets could be global (e.g. brass players deeming body movement significantly less important than string players since they are less often featured as soloists and appearing less often at the front of the stage) or local (e.g. string players being significantly more concerned than all other groups about both clothing color and type, perhaps due to the strongly-expressed opinions of specific teachers). Future work will attempt to identify the source of these self-appraisals, whether enculturated via explicit pedagogy, or whether absorbed from individuals' observations and performance experience.

Expressive Intonation and Tuning Variability in Music Performance: intentionality and skill

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Expressive Intonation and Tuning Variability in Music Performance: intentionality and skill

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Background

Subtle variations in intonation are not only typical but also desired in performances with non-fixed-tuned musical instruments. Some of those may be intentional, since performers accentuate melodic and harmonic contexts in order to convey meaning, and can portray emotions and affects through the use of expressive intonation. Nevertheless, intonation variability also depends on the ability of the performer to master different instrument registers at distinct dynamic levels.

Aims

This paper presents two studies. The first focuses on comparing intonation variability in different musical instruments and tests whether differences in tuning variability may be caused by register and dynamics. The second focuses of identifying tendencies to overall intonation deviation, such as high sharp, and expressive intonation that could arise from harmonic and melodic contexts.

Method

Computer software has been specially developed for comparing different methods for frequency estimation as well as analyzing intonation tendencies. Two sets of recordings have been studies. The first set of recordings has been used for identifying the intonation variability of held tones recorded in three different dynamic levels, across the range of 15 musical instruments. The second set contains musical excerpts from CD recordings by different professional performers.

Results

Results demonstrate highly different tendencies in intonation deviation in both studies. The paper reports three sets of results: an overall representation of intonation variability according to each instrument, register, and dynamic level; an intonation-space for each excerpt that represents groups of performances; and overall results for each kind of expressive intonation.

Conclusions

This paper presents an intonation-space within which different instrument deviation tendencies as well as individual performers can be compared. It can be inferred whether deviations could be intentional. Even though the ability to play in tune across registers and dynamic levels may not be the same for all performers, the actual knowledge about the performer's own ability may help as a guide for practicing. The knowledge of those different tendencies may help chamber musicians and ensemble conductors to understand how deviations on overall intonation occur within each family of instruments, as well as their interaction.

T5P: Short Talks 5 - Perception

Time: Friday, 27/Jul/2018: 16:00 - 17:00 · *Location:* La Plata

Session Chair: Favio Shifres

A multimodal analysis of vitality forms in the play Krapp's Last Tape

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Background

Forms of vitality, proposed by Stern (1985, 2010), are ways in which the human mind deals with dynamic experiences, crucial both to interpersonal encounters and the performing arts. They are Gestalts created by the integration of movement, force, space, time and direction/intentionality. There are few previous empirical studies based on this concept (Rochat, et.al. 2013, Español y Shifres 2015). Forms of vitality in theatre have been explored by Stern (2010); empirical studies in this field commencing recently (Weeks 2013).

Aims

To describe and analyze forms of vitality displayed in various sensory modalities in an excerpt from the play Krapp's Last Tape.

Method

Samuel Beckett´s play Krapp´s Last Tape features one character, an old man obsessed with the tapes he has been recording for many years, reflecting the changes in his life. The play therefore deals strongly with the issue of time.

One section from the play – as Krapp first speaks, while looking for a particular tape – was chosen. Three performances of it, each by a renowned actor, was subjected to an ELAN program. A comparative analysis was made using an ad-hoc observational code containing four categories: forms of vitality in actor´s movements, voice, other scene sounds, and lighting. Subcategories were created based on attributes described by Stern (i.e. sudden, gentle), assigned along a temporal line. Prevalent forms of vitality per category were identified in each case, plus a comparison between categories.

Results

Wilson´s version is particularly refined in all four categories, his movements being slow and gentle, occasionally abrupt, his voice strong, sometimes oscillating, his use of lighting displaying crescendo, fade and sudden cutting. Sometimes forms of vitality coincided in lighting, body movement and sound, that coincidence being emphasized; occasionally they displayed marked contrasts.

In the more naturalistic versions by Hurt and Bidonde, forms of vitality are revealed in the actor´s movements, but less so in the other three categories. Hurt´s version is characterized by heaviness, brusqueness and effort, while Bidonde´s version displays acceleration, clumsiness, and moments of fragmentation. There are few contrasts between forms of vitality in either version.

These differences between versions create quite diverse effects in the spectator, outlined in the presentation.

Conclusions

This work opens up new understanding about forms of vitality in the performing arts, advancing the enquiry started by Stern, contributing to theatre reception theory, and to wider discussions on the role of sensory, non-verbal dynamic events in the time-based arts.

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Intervallic Awareness: the definition of a musical construct

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Background

Dowling (1986) and Goldemberg (2015) described, in previous endeavors, certain cognitive aspects that may be related to the processing of melodic scales and intervals. In his work, Dowling suggests that individuals who reach success in certain melodic perception tasks are able to combine scale-step representations with interval-representations. In a similar manner, Goldemberg suggests that the integration of bottom-up and top-down strategies may result in some cognitive advantages for performing sight-singing tasks. In other words, both researchers suggest that certain musical abilities may arise from the capacity to perceive and to manipulate either intervals and scales within tonal contexts. Those concepts served as background for the development of a new scientific construct called Intervallic Awareness Construct (IAC).

Aims

Definition of the IAC.

Operationalization and validation of an instrument that enables assessment of the IAC.

Methods

The Intervallic Awareness Test (IAT) has been administered to 21 college level music students. Psychometric concepts, such as criterion validity, internal consistency and inter-rater reliability have been used to assess the instrument's quality. The scoring system adopted has been based upon the criteria of interval accuracy, steadiness of pulse and number of trials. As a way to evaluate the strength of the scoring system adopted, a music Ph.D. and college professor scored the performance of 5 subjects according to his own criteria.

Results

The IAC has been defined as the ability to recognize and to manipulate melodic intervals within different melodic contexts. The IAT was composed by tasks of comparison, addition, inversion and substitution of melodic intervals, which were designed to assess trained musicians.

Addition tasks, for instance, asked for subjects to sing a tonal melody. Afterwards, a specific interval should be sung from the last note of that melody. For instance, subjects heard an ''C-E-G-E'' excerpt and sung an ascending Major Second from the note E, thus forming ''C-E-G-E-F#''.

Pearson's r has been estimated at 0,983 (P<0,001) between the professor's criteria and the criteria previously adopted by the author of this study. Cronbach's alpha indicated a coefficient of 0,864, and the Spearman's rho showed a moderate to strong correlation between the scores subjects reached at the IAT and at a semester of Ear Training (0,744, P<0,01).

Conclusions

The IAC might fulfill some research needs on music learning and performance. For instance, would high coefficients on the IAT be predictive of success on tasks such as sight-singing and melodic dictation? Would musicians be able to perform such tasks using cognitive strategies that are unrelated to the ones required by the IAT test?

On the future, a version of the IAT should be developed in order to enable assessment of non-musicians. Also, larger sample sizes would allow for deeper evaluations of the IAT's construct validity. Factor Analysis, for instance, could be used to evaluate the suitability of Item Response Theory, which assumes that the instrument is unidimensional.

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Analysing the impact of music on wine perception via temporal dominance of sensations

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Background

Several recent studies have examined the impact of music on the food/drink evaluation, but none have relied on time-based methods. A common method of time-based sensory evaluation of food products is temporal dominance of sensations (TDS), a relatively new technique used to record several sensory attributes simultaneously over time. In the present investigation, we conducted a study using TDS to examine how the same red wine might be experienced differently when tasted with soundtracks that have been shown, in a preliminary informal test, to enhance/detract tannin perception.

Aims

We used TDS as a way of assessing whether music can draw participants' attention to different aspects of a wine. If music does direct one's attention to different tastes/flavours, we should observe different patterns of attended flavours with different auditory conditions.

Methods

Participants: A total of 21 participants took part in the study. They had no professional experience in wine tasting and different levels of musical education.

Auditory stimuli: Two 45 seconds fragments of pieces of music, Brian Eno's "Discreet Music" and Mussorgsky's "Night on Bald Mountain".

Wine: Manos Negras Pinot Noir.

Design and Procedure: There were 3 randomized conditions for all participants: silent, listening to Eno piece and listening to Mussorgsky piece. For each trial, participants were given a sample of wine by the experimenter. They were instructed to start the trial as soon as they tasted the wine without drinking. During the trial, the TDS computerised system [1] showed the participant a list of 8 adjectives in two columns in a randomized order (red fruit, astringency, alcohol, woody, sweet, acidic, spicy, bitter). Participants were instructed to consider which attribute is perceived as the most dominant. Each time they feel like the perception has changed, they click on a new attribute which they perceive to be most dominant.

Results

Different soundtracks revealed different patterns of attended flavours. Overall, the attack of acidity is earlier in the silence condition compared to either of the soundtrack conditions, and astringency is less noticeable when there is music playing. Bitterness is more prominent in the attack of the wine for the Mussorgsky piece, whereas for the Brian Eno piece bitterness comes after the initial registration of acidity.

We segmented the music with an algorithm based on changes in timbric novelty [2]. The Mussorgsky piece shows close matches between the segment boundaries and the change in the region of prominent taste.

Also we computed Spearman cross-correlation between dominant taste curves and psychoacoustical curves in time, as roughness, brightness, intensity, and others, obtaining significant results for bitter taste in the case of Eno and sour taste in the case of Mussorgsky.

Conclusions

We showed evidence that music structure and specific musical and acoustic parameters modifies patterns of attended wine flavors.

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T7P: Short Talks 7 - Acoustics and Philosphy

Time: Friday, 27/Jul/2018: 20:00 - 22:00 · *Location:* La Plata
Session Chair: Bruno Alejandro Mesz
Session Chair: Luiz Naveda

Study of timbral modulation processes applied to saxophone multiphonic tones

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Background

In previous works, we studied the timbral qualities of the saxophone multiphonics from a musical, acoustical and psychoacoustical point of view, establishing a timbric categorization for these sounds intro four main classes (Proscia 2011, Riera 2014). This allowed us to establish a framework including spectral attributes of sound, and its application to musical composition and performance. However, these studies were limited to three-seconds long recordings of static segments of multiphonics. A more recent work (Proscia 2017), extended this study to simple morphing trajectories between different multiphonic classes.

Aims

In this work we further extend our study to more general dynamical evolutions of multiphonic tones from the point of view of performance. In contrast to static tones or morphing trajectories, that were conceived with the multiphonic categorization in mind, in this case we start from the broader concept of timbral modulation and attempt to establish some systematics for these evolutions.

Method

The study was developed from recordings made by one of the authors of this work (MP). Taking as a reference procedures in the field of electroacoustic music (Smalley, 1997), we addressed the study of modulation processes that develop from the modification of some of the parameters of the sound: dynamic and spectral envelope, size and type of the grain of the sound, and number of elicited pitches. We also studied the possibility of determining different processes of modulatory periodicity from a periodic element (such as vibrato, tremolo, etc.). Finally, we considered the possibility of establishing timbric-melodic movements between different multiphonics, and its correlation with timbral modulation.

Results

As the main result of this work, we proposed four types of timbral modulation: modulation by modification of the size and type of grain, modulation by the number of pitches produced, modulation by modification of the spectral height, and modulation by modification of the dynamic envelope (ADSR). As a complement, examples of periodic modulation processes were presented, such as bisbigliando, tremolo and vibrato.

Conclusions

Saxophone multiphonics give rise to a complex timbric space difficult to chart due to the multiplicity of sonorities that they can cover, and their inherent dynamical quality. The present work delves into the study of the possibilities of timbral modulation, based on the hypothesis that it is possible to think of trajectories in the aforementioned timbric space. This allows not only to clarify aspects of the timbral perception related to these sounds, but also stimulates the creation of new trajectories or modulatory processes in this space.

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Two Organological Innovations in the Colombian Andean Bandola. An Acoustic Study

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Background

The typical Colombian Andean trio ─consisting of bandola, tiple and guitar─ has from its beginnings used the bandola as the main melodic instrument. In 1960, Diego Estrada modified the tuning parameters of the bandola from Bb to C and since 1980, Fernando "El Chino" León, proposed the subtraction of strings from 16 to 12. Both organological innovations ─worked in conjunction with their master luthiers─ opened the way to generate reflections inside the study of Colombian Andean Music (CAM). The present work arises, first, as a result of the controversies and discussions generated between bandola players and other musicians in the field of CAM after these innovations -thought of, as a social practice within the musical culture of the region- started to take place and ended in the development of a division inside the field in which both organological innovations are defended as the most convenient by different groups.

Aims

Thus, the aim is to characterize and compare three bandolas, two 16 strings bandolas accordingly tuned in Bb and C and the remaining one a 12 strings tuned in C, which altogether display the bandola before and after these two innovations were introduced by Estrada and León.

Methods

The methodology proposed is based on performing an acoustic analysis. The sound emitted by these instruments is analyzed from a physical perspective, taking into account their structural qualities (dimensions, types of wood and construction techniques), the characteristic pick for each bandola, strings and the technique used during performance, all with the objective of obtaining an acoustic overview of the impact of these organological transformations.

Additionally thanks to the conditions of absolute silence and the absorption qualities of the sound energy of an anechoic chamber used in this investigation provided us the opportunity to present an spectral and evolutionary analysis of the harmonics of the versions of the instrument over time.

Results

The results of this acoustic analysis allow us to discuss and analyze the relationships between these results and the discourses about sounds and music made with bandolas as proposed by musicians inside the CAM.

Conclusions

This work propose a different approach and view of the processes of transformation and innovation within this musical culture. The results of the analysis show that the acoustic differences between the mentioned bandolas are not significant enough in terms of sound quality. Therefore, these differences are determined by performatic questions of the musicians and not by the organological and morphological differences of the bandolas.

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Applied Concepts about Objects, Processes and Recursive Representation in Computer Music

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Background

The notions of musical material and procedure, as used in music practice, are vague and relative to the knowledge system within composers develop his or her style. They may rely on basic acoustic or instrumental features, performance actions, higher level style abstractions, symbolisms or even extra-musical ideas. Thus, the definition of what a musical material is and how a procedure behaves varies according to the applied system. Taking the notions of musical material at instrumental level and procedures as processes over those materials and transposing them to the computer music domain

this work addresses a coherent an general conceptual mapping of basic data structures and algorithmic processes as musical materials used to create music (Samaruga 2016). The technical background of this work is based on the analysis of software designed for computer music through the past few decades (e.g. Roads et al. 1997; Agon 1998; Puckette 2007; McCartney 2002). For this framework, processes and objects are considered dual entities on the intersection of two fields, as computational resources and grammatical elements for composing music. This approach is based on the assumption that combinatorial elements that define musical grammars aren't at traditional musical level but algorithmic representation elements level and thus addresses the problem of conceptual and perceptive ambiguity related to the object of knowledge.

Aims

This work aims to provide systematic basis to develop a conceptual frameworks that can be applied to software design and computer music composition and analysis.

Main Contribution

This work discerns many musical concepts structurally represented by 'sub-symbolic' (Bresson & Agon 2007) computational abstractions and combine them in a coherent and systematic framework to be applied to software development and design of learning techniques and general compositional knowledge about computer music despite concrete needs and foreign software engineering concepts of particular environments idiosyncrasy.

Implications

Learning programming as a tool for composing and studying music is still a challenging task for most musicians which can be discouraging depending on their field of interest. A theoretical articulation of computer science concepts with music theory can be used to develop not only domain specific software but new curricula adaptable to musicians working with new media.

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Genre indication as a tool for musical signification

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Background

Musical genre is a form of categorization that groups musical entities, such as musical works, which share affinity criteria. However, when we listen to music or we think of it, we can categorize it in many different ways depending on the context and the background of our experiences. One way to stabilize the categorization of music is through a genre indication: a textual information that explicitly states a category that refers to a particular musical entity. Genre indications can work as a form of hermeneutic guide to music: it guides toward attitudes, conjectures and expectations around the cultural artefact or the musical fact as social phenomena.

Aims

This study analyzes the function of genre indication as a sign in music and its possibilities as a tool for musical signification. It aims to explain the implications of relating a particular musical entity with a certain genre. To achieve this, it is necessary to understand the structure of genres as musical categories; to identify the possible representations of the genre by means of paratexts, and to recognize the function of this sign of music in the pragmatic context of music listening.

Method

The model presented in this paper gives an account of the way genre indications influence the perception of music by creating expectations and meanings.

Implications

The analysis of genre indications is useful to evaluate its function as a hermeneutic guide to music. These analytical tools provide arguments that composers, musicologists, producers, or critics can use to think about the way they want the listeners to perceive the music they share.

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Music as ludic behavior

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Background

Based on the works of Cross (2007), Merker (2000), Dissanayake (Wallin et al., 2000), Brown (2000), Fitch (2006), Spencer (1890) and Darwin (1871), I will point out that all of these theories on the origin of music, from sexual selection to group coercion, do not exclude the others. They do not answer the question “where does music come from?” but offer partial views of the behavior, as music would not be exclusively due to reproductive pressure neither would it be due to the behavior's groupal factor, but always a combination of both and more. This work is influenced by Dario Martinelli’s (2008) work on zoomusicology and the understanding that if other animals have the cognitive capacities to create imaginary scenarios, to manipulate real elements into the virtual world of play, and have the capacity to understand sound as an object, then they are able to produce music in their own means. It is not intended to delimit which would be the art of non-human animals, but to understand each non-human animal's epistemology and search for what would be its art. I will work with the definitions of animal play presented by Gordon Burghardt (2004), and his criteria to identify the behavior on other animals outside the scope of our epistemology.

Aim

This study deals with the origin of the musical behavior as artistic, with the function of stimulating the imagination and exercising the emotional faculties of the being; based on the pleasure felt by the stimulus of the five senses; all this included in the five base criteria for the identification of a play behavior, by Burghardt (2004) (limited immediate function, endogenous component, structural or temporal difference, repeated performance and relaxed field). Music then would be the extension of what we understand as animal play behavior.

Main contribution

With this work, I hope to elucidate the epistemology towards non-human animals and bring forward the idea that art is not exclusive to humans, but a complex non-species-specific behavior.

Implication

I argue art as the product of manipulating ordinary elements to invoke virtual emotions, therefore establishing imagination and make-believe behavior as the core of art, and possible to any other species.

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Epistemological misrepresentation and Coloniality of Knowledge in Music Psychology

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Background

One central problem of music psychology is to explain the nature and content of musical experience (Sloboda, 1998). Nowadays, music psychology funnels a number of questions about how human beings connect themselves with and within music that thinkers from all latitudes have put since ancient times (Deutsch, 2001). In this search, psychology has been nourished by systematic musicology. However, this disciplinary encounter is problematic when its findings are intended to be generalized due to the abyssal characteristics that both disciplines have shown since their origins (Dussel, 2014). The Abyssal Thinking (Santos, 2007) is developed when people define, unilaterally, radical lines that divide human experiences. Such lines make visible and valorize their own experiences, and make unintelligible and invisible the experiences at the other side of the line. Particularly, in music psychology, this thinking is mainly expressed while developing models based on an epistemic framework identified with the categories that Western music theory developed over centuries laying the foundations of the hegemonic musical thinking. This dominant episteme makes the nature of the subalternized cultures musical experience invisible (Shifres, 2017).

Aims

This paper aims to explore some mechanisms by which the abyssal perspective in music psychology studies is consolidated. It intends to show how the dominant episteme misrepresent or directly obscure the nature of the musical experience of cultures that are subalternized.

Main contribution

Two mechanisms of epistemological subalternization, commonly observed in studies in music psychology, are presented. On the one hand, the mythification mechanism (Martínez Garnica, 1985) produce observable realities based on theoretical categories generated a priori by the observer, which have the paradoxical effect of making the genuine prior realities invisible. Secondly, the concealment of the locus of enunciation (Grosfoguel, 2014), proposes a non-situated and omniscient researcher. Thus, the local character of the validity criteria of knowledge is misrepresented and universalized. Such a concealment also relegates other criteria and forms of knowledge that may be locally more relevant. Some examples from recent and classical research in music psychology are discussed according to both concepts.

Implications

Both presented mechanisms, when associated, reinforce coloniality of knowledge (Maldonado Torres, 2007) within the psychology of music. Within the framework of this granted coloniality, cross-cultural studies imply the impossibility of the Other for postulating his own theoretical categories and methodologies to answer their own questions (Zemelman, 2006). Through this form of epistemic racism (Maldonado Torres, 2014), the psychology of music runs the risk of collaborating with cognitive injustice, adopting an "extractive" perspective and denying the Other's epistemic sovereignty (Santos, 2009).

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T9M: Short Talks 9 - Personality

Time: Friday, 27/Jul/2018: 21:00 - 22:00 · *Location:* Montreal_1

Session Chair: Mara Elizabeth Breen

The role of personality in brain activity during perception of emotions in music

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Background

Individual differences in personality are related to emotional tendencies, and emotion is an important part of musical experiences. In particular, the personality traits Extraversion and Neuroticism have been related to reward sensitivity and propensities to experience positive and negative emotional states, respectively (Larsen & Ketelar, 1991). In line with this, functional brain imaging has related these traits to limbic activity during perception of emotionally-valenced non-musical stimuli (e.g., Canli et al., 2002). While behavioral music research suggests that individual differences play a role in the perception of emotions in music (Vuoskoski & Eerola, 2011), to our knowledge the role of personality in brain activity during perception of emotions in music has not been investigated.

Aims

To investigate the role of individual differences in personality in brain activity during perception of music portraying different emotions.

Methods

Fifty-six participants were scanned using functional magnetic resonance imaging (fMRI) while they listened to 30, 4-second film-music excerpts portraying happiness, sadness, or fear. Additionally, participants completed the Big Five Questionnaire as a measure of personality traits.

In order to narrow the voxel search space for the analysis of the neuroimaging data, regions of interest (ROIs) will be selected using a thresholded variance map (Omura, Aron, & Canli, 2005) for each emotional contrast. A summary statistics approach will then be used to relate the personality traits to stimulus-related activation in the ROIs. Additionally, this ongoing study will implement a novel data-driven clustering method for investigating individual differences in neuroimaging.

Results

The analyses are underway, and the results will be presented at the conference. However, based on previous neuroimaging research with non-musical stimuli, it is predicted that Extraversion and Neuroticism will be related to brain activity during perception of positively- and negatively-valenced musical stimuli, respectively.

Conclusions

This research has potential implications in several areas. In personality research, it may further support the relationship between personality traits and emotional processing. In music research, it may indicate a similarity between music-evoked and everyday emotions, and it may suggest that personality ought to be considered in studies of music and the brain. There may also be therapeutic applications, as this study could help elucidate the link between personality and emotional outcomes. Finally, this study has methodological implications, as it may show the usefulness of variance maps and the novel clustering approach for studying individual differences in neuroimaging research.

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Variations in music appreciation: The relationship between musical expertise and musical empathizing and systemizing traits

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Background

A primary interest for the study of music psychology is the way individuals experience and appreciate music in everyday life. To investigate this complex phenomenon, the influence of individual differences (e.g., gender, culture, personality, and musical expertise) on music listening is commonly explored. Two general cognitive traits, empathizing and systemizing, are also found to affect music listening and these traits have musical equivalents: musical empathizing and systemizing, respectively (Kreutz et al., 2008). General empathizing is the ability to respond in accordance to others' emotions, while musical empathizing is the ability to respond to the emotional content of a musical piece. General systemizing is the ability to respond to regular patterns in objects and events, while musical systemizing is the ability to understand the structure and organization of a musical piece. Although individual differences in engagement with and response to music are well documented, little is known about variations in musical empathizing and systemizing (E-S) traits and their relation to musical expertise.

Aims

This study aims to investigate the influence of music expertise on musical E-S traits and the relationship between musical and general (non-musical) E-S traits. The objective of the current study is three-fold: 1) To assess the relationship between musical and general E-S traits; 2) to examine the overall relationship between musical expertise and musical E-S traits; and 3) to specify the types of music training, particularly number of instruments played, years of formal instrumental training, and years of formal music theory training, that may be associated with musical E-S traits.

Methods

81 respondents aged 12-33 were included in this survey and reported on their level of musical expertise and endorsement of musical and general (non-musical) E-S traits. The participants were asked to complete the Goldsmiths Musical Sophistication Index (musical expertise), the Empathizing and Systemizing quotients (general/non-musical E-S traits), and the Musical Empathizing and Systemizing inventory (musical E-S traits).

Results

The results confirm that general E-S traits are related to musical E-S traits. Findings also reveal that musical expertise, including but not limited to formal training, is positively associated with musical E-S traits. Musical training was positively associated with musical E-S traits, such that people who played several instruments and reported several years of formal instrumental training endorsed high E-S traits; while music theory training differentially impacted musical E-S traits.

Conclusions

Findings confirm and expand previous work showing individual differences in musical appreciation. General musical expertise, that extends beyond training, such as engagement in music related activities, is positively related to musical E-S traits. Receiving instrumental or theoretical training in music strengthens musical E-S traits. Implications of findings will be discussed in relation to E-S traits of individuals with autism spectrum disorder given that they present with stronger systemizing than empathizing traits.

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Personality correlates of musical engagement and experience

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Background

Musical preferences and ability have been shown to be related to individual personality characteristics in the general population (Rentfrow & Gosling, 2003; Dunn et al., 2012). However, less is known about the relationship between specific aspects of musical sophistication (e.g., musical engagement, training, and ability) and individual differences in personality.

Aims

The aim of the current study was to explore the relationship between general musical sophistication and other musicality variables, as measured by the newly developed Goldsmiths Musical Sophistication Index (Müllensiefen et al., 2014) and the 5-factor model of personality, as measured by the NEO-FFI-3 (Costa & McCrae, 2010).

Methods

117 students (79 female) aged 18-35 (M=21, SD=3.29) from various programs studying at a large Canadian university completed the NEO-FFI-3 Personality Inventory and the Goldsmiths Musical Sophistication Index (GMSI), as part of a larger study.

Results

Linear regression analyses revealed significant positive correlations between self-reported openness to experience (NEO-O) and GMSI factors of musical engagement, music perception, appreciation of music-evoked emotion, and general musical sophistication ($p < 0.05$), but not singing ability. Extraversion (NEO-E) was positively correlated with GMSI factors of musical engagement, singing ability, appreciation of music-evoked emotion, and general musical sophistication ($p < 0.05$), but not music perception. Further, greater musical training is significantly associated with higher levels of musical engagement, music perception, singing ability, and appreciation of music-evoked emotion ($p < 0.05$), but not with personality characteristics.

Conclusions

This work builds on previous findings on associations between openness to experience and extraversion and musical preferences (Dollinger, 1993; Greenberg et al., 2016), suggesting that these particular personality characteristics may also have multiple and differential impacts on specific aspects of musical sophistication and ability.

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T10M: Short Talks 10 - Neuroscience

Time: Friday, 27/Jul/2018: 21:00 - 22:00 · *Location:* Montreal_2

Induced Beta Power Modulations Reflect Active Prediction During and After Gradual Tempo Changes in Auditory Beats

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Background

In order to process time when performing music, musicians must actively track the beat. Such tracking is particularly important in small ensembles when the group members must stay together during tempo changes or start a passage together after rests. To understand the neural processes involved in temporal tracking, we targeted beta power changes (13-30 Hz) which can reflect numerous top-down processes in time (Kilavik et al., 2013). Recently, beta-band activities were found to distinguish active temporal anticipation before accelerating and decelerating beats, and power changes in the auditory and motor systems reflected aspects of anticipation like imagery (Fujioka et al., 2015) and uncertainty (Tzagarakis et al., 2010). Whether the same networks and neural responses can reflect active tracking during tempo changes and during silence is unknown.

Aims

We hypothesized that beta power changes would reflect the mental processes related to tracking a beat during tempo changes and during silence. Therefore, after contextual beats, we examined whether power modulations revealed temporal predictions about where a beat should fall during a tempo change or during silence.

Method

Using previously recorded EEG data from 13 musicians, we examined beta power modulations during tempo changes and subsequent inter-trial silences. Participants attended to smoothly accelerating, decelerating, or steady beats for eight intervals while detecting rare targets of sudden, shifted beats. The beat-based neural responses to the beginning and end of the tempo changes were compared within the three conditions. Additionally, neural activity in the silence following each trial, in which no explicit task was given, was analyzed for any systematic effects related to beat imagery across all three conditions.

Results

Beta oscillations projected onto an auditory-related principal component tended to show larger power decreases as tempo changes progressed. In the steady condition, the reverse trend occurred. These effects, however, were not significant when examined by ANOVA.

Significant beta power decreases in the same component were found across all three conditions at the time when another beat would have occurred if the trial continued. This coincided with a large evoked response as well.

Conclusions

Beat-based changes in beta oscillations were not clearly observed. In contrast, a power decrease was still observed after the trials, but it was weaker compared to the omission evoked response. These results demonstrate that the beta-band oscillatory neural circuit is not ‘automatically’ entrained to changing beats and during missing beats, which indicates the importance of actively engaging attention during tempo tracking in music performance.

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The Impact of Physical Exercise on Music Appreciation

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Background

Music's ability to influence exercise performance is well known (e.g., Karageorghis, 2016); but the converse, how exercise influences music listening, remains unknown. Exercise can elevate mood and neurotransmitters such as dopamine (Heijnen et al., 2016). Mood and dopamine/reward circuitry are implicated in musical appreciation (e.g., Salimpoor et al., 2013). Therefore, exercise could presumably influence music appreciation.

Aims

We examine the effects of exercise on music appreciation, and test for a modulatory role of dopamine levels by measuring eye-blink rates.

Method

Participants (n=20) rated unfamiliar music clips on enjoyment before and after two sessions: an exercise day and a rest day (counterbalanced in order). On the exercise day, participants ran on a treadmill for 12 minutes—6 minutes at a comfortable pace followed by 6 minutes at increasingly vigorous pace (Winter et al., 2007). On the rest day, participants sat and listened to a 12-minute podcast. Before and after each session, we collected measures of positive and negative affect (PANAS questionnaire) and eye-blink rates, an established method to measure dopamine level (Jongkees & Colzato, 2016). Participants were asked "How much did you enjoy that song?" and responded on a horizontal slider quantized on a 100-point scale.

Results

Participants' ratings of musical enjoyment increased significantly after running ($p = .004$), but not after the rest control condition ($p=.79$). On the running day, the change in enjoyment positively correlated with a change in eye-blink rates, $r=.359$, $p=.08$. On the control day, music ratings did not correlate with eye-blinks. Positive affect scores increased on the exercise day ($p<.001$). The change in positive affect correlated positively with a change in music enjoyment, $r=.44$, $p=.03$.

Conclusions

Here we show that exercise lead to an increase in music appreciation, and music appreciation was related to mood and dopamine levels.

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How consonant is Bach's C Major Prelude? Listener's ratings, neural correlates, and some mathematics

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Background

The topic of musical consonance and dissonance has interested many researchers. One reason for such interest is understanding the relationship between tonal (relationship between tone frequencies) and perceptual consonance (i.e. related to hearing sensation) in music, which helps elucidate brain mechanisms linking sensory perception with higher cognition (Koelsch & Siebel, 2005). Previous studies feature investigations of single chord/interval perception (Pallesen et al., 2005), and extended melodies (Green et al., 2008).

Aims

The main aim is to explore the link between sensory (including neural) and tonal consonance. An additional aim is to combine advantages of single chord/interval approach with those of extended pieces (little short-term memory load and high ecological validity, respectively).

Methods

Study 1 involved an online questionnaire with 12 excerpts representing individual bars from Prelude in C major by J.S. Bach (The Well-Tempered Clavier), requested to be ranked from most dissonant to most consonant. To provide an objective estimate of consonance for each excerpt, we used the metric called Percentage Similarity (PS) to harmonic series (Gill & Purves, 2009). Study 2, involving electroencephalography (EEG) acquisition (BioSemi, 64 scalp electrodes), had a similar design, albeit the subjects were asked to rate the excerpts using continuous sliders instead of discrete ranks. From the EEG data in study 2, we obtained the P300 event-related potentials (ERP) time-locked to excerpt playback, from 20 subjects, and subjected them to partial least squares (PLS) analysis (McIntosh & Lobaugh, 2004), using each excerpt as a separate group to find optimal contrast in P300 responses.

Results

In study 1, 91 out of 129 respondents provided complete results; quality control retained responses from 71 subjects. Subjective ratings in study 1 had strong association with PS ($r=.84$, $p<.0001$) and with an established roughness model as a test case (Vassilakis, 2007). The slider-based approach in study 2 had a close correspondence in rankings to study 1 ($r=.94$, $p=0$). The first two latent variables (LV1 and LV2) in the PLS analysis of ERP data in study 2 were significant, LV1 showing interhemispheric difference wherein the left hemisphere featured generally greater P300 response to dissonant excerpts ($p<.001$, permutation test). LV2 showed a scalp pattern with a greater P300 response around F1 and F2 channels, indicating either anterior cingulate or central frontal amplitude increase pattern, or a combination thereof, for more dissonant excerpts ($p<.02$, permutation test). Remarkably, LV1 and LV2 featured additive effect in relation to perceived consonance, such that the sum of their respective contrast vectors showed a strong correlation with excerpt ratings across studies 1 and 2 ($r=.73$, $p<.01$).

Conclusions

Studies 1 and 2 feature high ecological validity of the stimuli, and show relations between tonal and sensory consonance, including neural representations of the latter, supporting and extending previous findings (Green, 2008).

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P2M: Posters 2

Time: Friday, 27/Jul/2018: 22:00 - 23:00 · *Location:* Montreal Poster Room

Are Rhythm and Pitch Processed Independently?

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Background

Numerous studies suggest pitch and rhythm are processed independently (Krumhansl, 2000). These studies are also supported by many brain lesion studies (Peretz & Zatorre, 2005). Other accounts argue that allocating attention in time influences pitch perception (Jones et al., 1982) and that pitch expectation can vary depending on rhythmic contrast. (Boltz, 1993). These studies indicate that rhythm influences pitch perception and imply processing interdependence.

Aims

This study aimed to investigate the relationship between pitch and rhythm processing in melodic memory and recall.

Method

All participants completed a demographic questionnaire, an exposure phase, and a test phase. The experiment had three conditions, melody to rhythm (MtR), Rhythm to Melody (RtM), and melody to melody (control). In the exposure phase, participants heard five novel melodies or their unpitched rhythmic content (URC)—a tapped, unpitched version of each melody. Each excerpt was repeated ten times. In the test phase, participants heard ten melodies or URCs. Each excerpt was repeated three times and participants reported if they heard that excerpt in the exposure phase through a “yes-no” response and ranked their confidence in their answer on a 7-point Likert scale. This task was used in each condition.

Results

To determine participant sensitivity in the “yes-no” responses, d prime values were calculated for each condition and used in all analyses. A single sample ANOVA and post-hoc t-tests indicated that there was a significant difference between MtR/RtM and control, but not between MtR and RtM. A logistic regression was performed to determine the significance of performance variance in the “yes-no” responses. When comparing MtR/RtM to control, participants were more likely to choose correctly in the control than the other two conditions. When comparing RtM to MtR, participants were no more likely to choose correctly in either condition. A single-sample t-test was performed to compare participants’ discrimination performance against chance. Participants did not discriminate better than chance in the MtR and RtM conditions but did discriminate better in the control.

Conclusions

The data suggests the task in the MtR and RtM conditions was too difficult for participants to complete. This could be attributed to a lack of stimuli repetitions in the test phase, use of memory recognition rather than predictive judgement, or the presence of a tonal context (Prince et al., 2009). Addressing these factors in further research is needed before making conclusions.

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Auditory Imagery Stability and Musical Training

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Background

Auditory imagery—hearing sound in one's head without external input—is often cited in music pedagogy as an important skill in advanced musicianship (Gordon, 2004). Despite extensive pedagogical work discussing approaches for developing auditory imagery (Karpinski, 2000), research to date has not examined if current pedagogical approaches impact auditory imagery as measured by modern psychometrics. Research has surprisingly demonstrated moderately weak relationships between musical training and auditory imagery ability (Halpern, 2015), suggesting that musical training may only account for a small proportion of measured differences.

Aims

The purpose of the current study was to examine whether auditory imagery (as measured by the BAIS, Halpern, 2015) is stable or plastic over time in a population of musicians receiving differing amounts of aural skills training using a pretest-posttest design.

Method

The pretest (Fall 2017) established a baseline of auditory imagery ability, and the posttest (Spring 2018) examined auditory ability following completion of Northwestern University's First-Year Aural Skills Curriculum. Two primary evaluation methods were used: 1) the BAIS (Vividness and Control) to measure auditory imagery ability, and 2) the melodic reversal task, a behavioral component of the BAIS. Two participant groups were tested: the experimental group consisting of students required to take full-year aural skills (n = 5), and the control group of students exempted from first-year curriculum entirely (n = 2).

Results

A repeated measures ANOVA on both melodic reversal and BAIS scores yielded no main effect of melody reversal accuracy, $F(1,5) = .993$, $p = .365$, $\eta 2 = .166$, MPre = .771, SE = .029, MPost = .799, SE = .025, nor BAIS scores, $F(1,5) = .763$, $p = .422$, $\eta 2 = .132$, MPre = 5.3, SE = .345, MPost = 5.72, SE = .313. Due to the small participant sample, no between-subject factors were examined.

Conclusions

These results suggest that auditory imagery as measured by the BAIS may be stable over time musicians undergoing their first year of post-secondary musical training. That no change to melodic reversal scores was found from pre- to posttest may indicate that imagery skills recruited for performing melodic reversal may not be utilized and developed by musicians in their first year of post-secondary study. Future work will endeavor to examine the relationship between BAIS scores and success on aural-skills specific tasks.

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The Relationships Between Genre Preference, Aural Skills, and Tonal Working Memory

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Musical training and cognitive abilities appear to be related to one another, but why? Recent research has used measures of musical sophistication to predict measures of working memory capacity, especially tonal working memory capacity, and vice versa, but definitive mediators of the relationship have yet to be identified. Musicians may have an advantage over non-musicians due to their likely enrollment in aural skills courses, in which they learn strategies for melodic dictation, a complex tonal working memory task. They may also have an advantage due to an accruement of aural skills implicitly learned through more meaningful engagement with music, or due to engagement with specific types of music. The aim of

this paper is to investigate the role of explicitly and implicitly learned aural skills as potential mediators of the relationship between musicianship and working memory capacity. Results suggest that musicians are more likely to engage strategies that encourage deeper levels of processing for tonal working memory tasks than non-musicians and that musicianship and aural skills achievement help predict tonal working memory capacity. Exploratory analysis of genre preference suggests listening to classical music, jazz, or heavy metal correlates to higher tonal WMC, which encourages further research into genre preference. Considering these findings, we suggest that the "musician advantage" in working memory tasks may be found in the acquisition of valuable strategies for decreasing working memory load gained through the pursuit of musical mastery.

Predictive processing in music liking and arousal: influences of syntactic and explicit music predictability

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Background

Music consistently ranks among the greatest human pleasures (Dubé and Le Bel, 2003), and its manipulation of expectations seems fundamental to its power (Huron, 2006). Prediction confirmations and violations are both crucial to understanding the environment via the predictive-coding framework (Friston et al., 2009), and multilevel musical structures offer many of each. Accordingly, liking can arise from both surprising and unsurprising musical events (Sloboda, 1991; Egermann et al., 2013). Some evidence suggests an inverted-U-shaped "Wundt" effect (Berlyne, 1971), such that the most pleasurable music is that which optimally balances prediction confirmations and errors (Zald and Zatorre, 2011), but there are few systematic manipulations of musical predictability and their results are mixed (reviewed in Pearce, 2015).

Aims

We sought to better understand the relationship between music predictability and liking by analyzing liking and arousal for melodies of varying music-syntactic complexity across multiple repetitions.

Method

We generated controlled MIDI files of 12 real Western musical excerpts across a wide spectrum of objective musical predictability as computed via an information-theoretic model of note-by-note transition probabilities (Pearce, 2005), and presented these seven times each, as a randomized but fixed sequence, to 27 participants with a range of musical backgrounds. Listeners rated their liking, arousal, and familiarity. We evaluated the effects with mixed-effects regression models.

Results

A linear effect significantly accounted for 31.60% of the variance between music complexity and liking, but adding a negative quadratic term explained 10.91% more and performed significantly better [$F(1,2180) = 7.43$, $p = 0.0065$]. We also observed positive linear and negative quadratic relationships between music complexity and arousal (ps ≤ 0.04). Repetition increased familiarity ($p < 0.001$), and decreased arousal (ps < 0.001) and liking ($p = 0.0015$).

Conclusions

These results evince a "Wundt" effect of syntactic predictability, as listeners preferred melodies with medium probabilities. Familiarity decreased liking, contrary to other findings but perhaps related to the amount and type of stimuli involved. This systematic, computational approach clarifies an ambiguous phenomenon and underscores the role of predictive processing in music liking.

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Human Perception of Melodic Similarity in Theme and Variation Pieces

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Background

The generation of musical forms relies heavily on a listener's ability to hear and understand repetition of and similarity between musical ideas. Since music is a temporal art in which listeners cannot go back to rehear a section repetition has been used by composers for centuries to give listeners a sense of order and understanding. Due to its importance in comprehending music, this research project intends to investigate how listeners perceive melodic similarity in varied repetitions of musical ideas. Providing insight to the similarity processes in the brain could be applied to our understanding of theme and variation compositions as well as the human perception of similarity outside the musical realm.

Aims

The goal of the present research was to examine theme and variation pieces to determine which musical factors affect a listener's ability to perceive melodic similarity. The first study examined three factors: harmonic differences, change in timbre, and change of ornamentation. The second study attempted to unpack this issue further by asking participants to rate how similar variations from different pieces are to a given theme, and focused on three ornamentation techniques (16th note rhythms, triplet rhythms, octave leaps in the left hand) and minor mode harmonizations.

Method

For the first study, participants were presented with pairs of themes and permutations of variations based on Beethoven's WoO 64 and WoO 77 and asked to rank their similarity on a scale of 1-7. Although two pieces were used, each pair consisted of a theme and variation from the same piece. In the second study, themes and variations from two different works were compared: Mozart K. 354 and Beethoven Op. 35. Participants heard a theme and then 4 variations from each piece and were asked to rank how similar each variation was to the given theme. The process was then repeated with the second theme.

Results

The results showed that a change in harmony or in timbre were not considered to be variations on the theme. However, varying degrees of ornamentation did affect the participants' ability to recognize the variation as being similar to the theme. In the second study, no difference was observed by participants when listening to a variation that belonged to the theme and ones that did not. This study also revealed a significant difference when listening to variations with a change in mode compared to other variation techniques.

Conclusions

Since participants were more likely to rate the variations as less similar if the ornamentation was changed, it is likely that listeners are focusing on surface elements rather than structural elements. The results of the second study also suggest this conclusion.

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Talking about Timbre: Words Used by Musicians to Describe Characteristic Sounds of Instruments and Voice

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Background

Researchers have attempted to relate perceptual dimensions of timbre to acoustical determinants. Approaches have included the use of semantic differentials, verbal attribute magnitude estimation, and combining dissimilarity ratings with multidimensional scaling. More recent study has queried pianists and vocalists regarding their use of timbre descriptors (e.g., Bellemare &Traube, 2005; Prem & Parncutt, 2007).

Aims

This initial study attempted to ascertain the vocabulary used by college music majors to describe timbres of their instrument or voice. How do student musicians representing different instrument families describe the “characteristic sound” of their own instrument? What are the commonalities and differences between instrument types?

Method

Participants were students attending a large music school in the southeastern United States. We gathered responses from music majors representing four instrument families: strings, woodwinds, brass, and voice. Undergraduate and graduate students completed a written form requesting them to respond to the following open-ended prompt: “Please list words or short phrases you would use in describing the ‘characteristic sound’ (tone quality) of your instrument /voice when talking with a high school music student (not a beginner).”

Results

We obtained 168 responses: 48 string players, and 40 each from voice, woodwind, and brass instrument students. Many adjectives were common to lists (dark, warm, full, resonant, and bright were listed at least 30 times), however, only two were cited frequently (at least 10 times) by all four groups: dark and warm. Resonant was among the most frequent for strings, voice, and brasses, but not woodwinds. Bright was identified frequently by string and voice students, not by brass and woodwind musicians. Full was listed commonly among woodwind and brass players but not by string and voice students.

Conclusions

Adjectives used to describe characteristic timbres have different citation frequencies between instrument families. For example, a string instrument or voice quality may be described characteristically as “bright”, however, that adjective may not be considered a positive aspect of woodwind or brass tone. Musicians often use the term “characteristic tone quality” perhaps to avoid the use of adjectives with little precise meaning, and teachers often provide an aural model rather than verbal description. Furthermore, there are a number of different timbres for a given instrument depending upon register and context, particularly with advanced level performers or when comparing various “schools,” such as a French or German tone. What is considered “good” or “characteristic” appears to be a set of learned behaviors in music studios and schools that involve judgment and preference and is not entirely a matter of perceptual discrimination or acoustical invariance.

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Acoustic Correlates of Identification and Confusion Rates Among Speakers, Musical Timbres and Environmental Sounds

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Background

Research into musical timbre has identified a number of acoustic dimensions that support the perception of different instrument sounds, such as spectral centroid, log-attack-time, and spectral variability (Caclin, McAdams, Smith, & Winsberg, 2005; Iverson & Krumhansl, 1995; McAdams, Winsberg, Donnadieu, De Soete, & Krimphoff, 1995). However, musical instruments represent a subset of the auditory objects and events relevant to typical human listeners who must also navigate environments made up of sounds from everyday objects and conspecifics.

Aims

Can a wider range of auditory objects and events be characterized along similar acoustic dimensions as musical timbre? Or, are other acoustic features important for the identification of auditory objects and events outside of musical timbre, and if so, which are they?

Method

We conducted a sound identification study using a broad set of 36 sounds (12 speech utterances from different speakers, 12 instrument timbres, and 12 everyday object sounds from a typical human environment) that took advantage of the acoustic variability both within and between different sound categories. We analyzed confusion rates between pairs of stimuli as a function of how they differed in terms of their acoustic features.

Results

Overall, identification for individual items was well above chance, and was most accurate for environmental sounds. Accuracy got progressively worse for speech and instrument sounds. Confusions typically occurred within categories, and more specifically within instrument families (strings, brass etc.) and within vowels and genders. Linear mixed-effect regression analyses of confusion and identification rates indicated that responses were related to acoustic features pertaining to the sounds' spectral envelopes (Euclidean distance of median power across ERB filter channels) and noisiness (spectral flatness), as well as spectrotemporal modulation rates (Euclidean distance of modulation power spectra) and temporal envelopes (temporal centroid and log-attack-time). These identification responses also appear to closely parallel dissimilarity ratings ($r = -.39$, $p < 0.05$).

Conclusions

The acoustic dimensions identified in timbre research, such as spectral envelope characteristics and log-attack-time, are useful for identifying a wider variety of auditory objects and events. However spectrotemporal modulation rates and the noisiness of the signals plays an especially important role among more diverse sets of sounds.

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Beyond the Effect: The Perceptual Effects of Reverberation

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Background

Written for amplified solo triangle, Silver Streetcar for the Orchestra explores the resonance of the common percussion instrument. Alvin Lucier asks the performer to repeatedly strike the triangle for no more than 20 minutes while muting the triangle between the thumb and forefinger (1988). Throughout this performance, the performer manipulates five performance parameters. Manipulating only one parameter at a time, the performer alters each parameter gradually and

imperceptibly. This process of slow change allows the triangle to emit variations of its unique harmonic structure. Moreover, the increased level of reverberation caused by amplification results in easier accessibility to the overtones of the triangle, subsequently creating an increase in arousal (interest) for the listener.

Aims

The presence of reverberation focuses the listener's attention from the repeated sounds of the triangle to the increased presence of overtones. To better understand what listeners are hearing with the presence of reverberation, I designed a focus group that features multiple open-ended questions geared towards the perception and discrimination of the two excerpts of the same musical material—one with the absence of reverberation and one with reverberation.

Method

This hypothesis was tested with a qualitative study using a recording of Silver Streetcar for the Performer in an anechoic chamber. A five-minute passage of this recording was extracted and duplicated keeping one dry and adding reverberation to the duplicate. The recordings were played in succession—first the dry recording, then the reverberant recording with a five-second pause between excerpts.

Main Contribution

Out of 34 participants, 17 agreed that the second recording (reverberant) felt shorter, 2 felt the first excerpt (dry) was shorter, and 15 either were not paying attention to the length or felt that the excerpts were similar in length. Testing this hypothesis with open ended questions in a qualitative setting led to additional reverberation affects: 19 students stated that the speed of articulations increased with the presence of the reverberation. Additionally, 2 students (without prompt) commented that the pitch of the triangle shifted with the presence of reverberation.

Implications

The results of this study show a myriad of perceptual changes in response to the addition of reverberation to an auditory signal. These findings can reveal new creative strategies for composers to utilize the effect of reverberation as more of a compositional tool rather than a blanket effect applied to the final mix of a recording. Moreover, these findings open additional analytical avenues for theorists when approaching works with mixed-media.

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The neural correlates of somatosensory beat perception

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Background

Musical rhythms with a strong sense of a beat have a tendency to elicit a perception of a beat (or pulse) which is often wedded with motor synchronization (Repp & Su, 2013). Electroencephalography (EEG) measurement has revealed that endogenous neural oscillations dynamically entrain to beat frequencies of musical rhythms providing a neurological marker for beat perception (Nozaradan, Peretz, Missal, & Mouraux, 2011). Although beat perception has been shown to be bias to auditory rhythms (McAuley & Henry, 2010), recent research suggests that rhythms presented through vibro-tactile stimulation of the skin can also elicit motor synchronization, albeit to simple rhythms only (Ammirante, Patel, & Russo, 2016). There is also some evidence of information processing enhancements with regards to visual processing being enhanced by auditory rhythms (Escoffier, Herrmann, & Schirmer, 2015; Escoffier, Sheng, & Schirmer, 2010).

Aims

The current research purposes to explore the neural correlates of vibro-tactile beat perception with the aim of providing further evidence for rhythm perception from a vibro-tactile modality. This research is exploratory in nature but the results may provide evidence that informs best-practices regarding vibro-tactile music, as well as providing a broader understanding of the auditory advantage for beat perception. Finally, the results will inform ideas regarding multimodal enhancements of beat perception.

Methods

Participants will be asked to tap to the beat of rhythms that vary in complexity (isochronous, simple) and modality (auditory, vitro-tactile, multimodal). Mean asynchronies will be measured (tap onset - beat onset) to determine the extent of beat synchronization. In conjunction with a synchronization task, participants will also be passively exposed to isochronous and simple rhythms from auditory, vibro-tactile, and multi-modal sources while EEG data is collected. Neural entrainment to the beat will be measured by comparing the distribution of spectral energy in the EEG signal to that in the stimulus envelope onsets. Synchronization and Entrainment will be compared across modalities and rhythm complexity.

Felt It My Way: Idiosyncratic Psychophysiological Response Patterns to Recorded Music

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Background

Psychophysiological responses to music have been studied from decades, but the focus has typically been on common response patterns across listeners. The Repeated Response paradigm, recording a participant's responses to a set playlist of stimuli over multiple listenings, allows for more in depth considerations of responses typical of individual listeners. Repeated exposures to the same stimuli have been associated with desensitization (Grewe, Nagel, Kopiez, & Altenmüller, 2007) as well as sensitization in increased coordination (Sato, Ohsuga, & Moriya, 2012). Either way, there is an opportunity to capture consistencies tied to individual participants musical histories and inclinations that can easily be lost when looking for agreement across a population or audience.

Aims

Identify consistency and coordination in individual participants psychophysiological responses to music and consider the contrasts between participants' responses to pieces of music.

Method

Five participants heard the same six pieces of music 12 times over several weeks. During these listenings, skin conductance, finger temperature, heart rate, respiration, and facial muscle sEMG (Zygomaticus, Corrugator) were recorded continuously. Using activity analysis, we evaluated first which responses showed significantly coordinated in music relevant response events per participant. When participants showed coordination, their moments of consistency were compared to see whether they aligned or contrasted.

Results

Preliminary results show that participants vary how well their responses are coordinated between listenings and which response measures show the most coordination. For example, two participants showed very high respiratory coordination but different patterns of consistency in finger temperature decreases. Besides the overall pattern of disagreement, specific results will be shared on responses to specific works, including a late Beethoven String Quartet excerpt and a Dubstep track.

Conclusions

Listeners can show some shared patterns of behaviour to music, but they also develop idiosyncratic response sequences to pieces they come to know. This is not only measurable in post-stimulus ratings and preference but also in the sensitivity, reliability, and timing of changes in their psychophysiological responses.

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Cortical and Subcortical Responses to Missing Pulse Rhythms

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Background

Many rhythm perception experiments employ simple isochronous rhythms, in which synchronous neural or behavioral responses are observed. However, neural responses at the stimulus frequency do not allow one to distinguish whether synchrony occurs as a response to a common input, or as the result of an emergent population oscillation that entrains at a particular frequency. We used rhythms with no spectral energy at the pulse frequency ("missing pulse" rhythms) by manipulating the number of events that occur anti-phase (180°) versus in-phase (0°) with the basic rhythmic cycle. Dynamical analysis predicts neural oscillation will emerge at such a missing pulse frequency. ¬Previous studies have shown that most listeners tap to these complex rhythms at the missing pulse frequency – a finding that supports the prediction.

Aims

This study aimed to investigate whether the sensorimotor system, as measured by 32-channel cortical EEG, would entrain to a complex rhythm at the pulse frequency even when the complex rhythm contained no spectral power at that frequency.

Methods

The experiment utilized four different rhythms of varying complexity (1 simple, 2 complex, and 1 random rhythm) created from 100ms tones with a 200 Hz fundamental frequency (F0). EEG was decomposed offline into the cortical-steady state response (SS-EP) and the subcortical frequency following response (FFR). Fast Fourier Transform (FFT) of the Hilbert envelope showed energy at the repetition frequency (2Hz) for the simple rhythm, but no spectral energy at the missing pulse frequency (2Hz) for the complex rhythms of the random rhythm. EEG responses to these stimuli were examined for evidence of neural oscillations and power modulations at the missing pulse frequency, as predicted by dynamical analysis. Additional analyses examined the FFR to the 200 Hz tones that made up the rhythms.

Results

We found cortical responses at the missing pulse frequency for the listeners who were able to tap the pulse of these rhythms. We also found strong correlations between the predictions of the dynamical model and the cortical responses. Interestingly, the perceived phase of the pulse varied between listeners and trials. Therefore, we analyzed the subcortical responses based on their relationship to the perceived phase of the pulse in the rhythmic context. We describe the extent to which the FFR depends of the phase of the perceived pulse.

Conclusions

These data support the theory that rhythmic synchrony occurs as the result of an emergent population oscillation that entrains at this particular frequency.

Now you like it, now you don't: Modulation of musical reward sensitivity with TMS and associated changes in reward-system BOLD activity.

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Background

Humans have the unique capacity to experience pleasure from aesthetic stimuli, such as music. Neuroimaging findings with music have led to a model whereby mesolimbic striatal circuits interact with cortical systems to generate expectancies leading to pleasure (Salimpoor et al., 2013). Recently (Mas-Herrero et al., 2017), we have provided causal evidence for the model using transcranial magnetic stimulation (TMS) over the left dorsolateral prefrontal (DLPFC) cortex—a procedure that is known to modulate fronto-striatal function (Strafella et al., 2001). Excitatory and inhibitory stimulation of the fronto-striatal pathways led to increases and decreases, respectively, of both musical pleasure and motivation. However, the exact neural mechanisms underlying these changes are still unknown. Here, we provide novel insights into this topic by combining functional magnetic resonance imaging (fMRI) and TMS while participants listen to pleasurable music.

Aims

Our goal was to identify which particular brain regions and networks are responsible of the changes found in musical pleasure and motivation following TMS over the left DLPFC.

Methods

Seventeen participants performed three sessions in which intermittent TBS (iTBS), continuous TBS (cTBS) and sham were applied over the left DLPFC. Following the stimulation, the participants entered into the MRI, where they listened to a set of musical excerpts while providing real-time rating of pleasure. Additionally, to assess their motivation to seek music, individuals could purchase the music with their own money.

Results

Notably, we replicated our previous behavioral findings, that is, enhancement and disruption of the fronto-striatal circuit by means of TMS modulated up and down music reward sensitivity, respectively. Additionally, our fMRI data indicate that changes in pleasure and motivation across sessions were accompanied by changes in striatal engagement and connectivity. Specifically, the degree to which subjective pleasure responses scaled with brain activity was modulated by TMS, such that pleasure-related responses elicited greater striatal activity and increased connectivity strength among reward-related regions for iTBS compared to cTBS.

Conclusion

These findings further demonstrate that musical reward can be causally modulated bidirectionally by applying TMS over the left DLPFC. In addition, our fMRI results point out that these changes are driven by alteration of fronto-striatal function. These results indicate that the engagement of fronto-striatal paths may be an indispensable step to produce an emotional reaction and induce pleasure with music. These findings may provide new insights in understanding the neural mechanism underlying musical pleasure and more broadly, it opens new avenues for research into how affective processes may be modulated by extrinsic stimulation of fronto-striatal circuits.

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Effects of pitch expectancy violations on timing of motor actions

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Background

Tapping in synchrony with an isochronous sequence of metronome beats requires anticipatory mechanisms. The ability to predict when an event will occur allows the motor system to prepare an appropriate response in advance so that actions coincide with a target event. A continuous process of refining actions based on feedback also allows the system to generate increasingly more accurate predictions of the behavioral effects of a movement (van der Steen & Keller, 2013). According to the internal models theory (Wolpert & Flanagan, 2001), forward models represent the causal relationship between the input and output of the action control system, where expectancies related to motor and perceptual outcomes are tethered to motor commands. This investigation considered the implications of the forward model for motor actions that generate strong expectancies for the resultant pitch outcomes.

Aims

To test whether pitch expectancy violations affect timing accuracy of motor actions that generate strong expectancies for the resultant pitch outcomes.

Method

A synchronization and continuation paradigm was adopted whereby each tap in the continuation phase triggered a piano tone. In Condition 1, taps generated a combination of four tones (G4 C4 C4 C4) which was repeated five times, ensuring the sequence was highly expected. In Condition 2, the same feedback tones were presented, but one of the expected pitch changes (to G4) was unexpectedly displaced upward by 1 semitone (to G#4). In Condition 3, one of the expected pitch changes of the sequence (to G4) unexpectedly did not occur, remaining at C4. In Condition 4, all piano feedback tones presented were identical (C4), except for one unexpected pitch change (to G#4). Participants (n = 25) were instructed to tap the index finger on a drum-pad in synchrony with the metronome clicks (IOI = 600 ms) and maintain the pace in the continuation phase. Data analysis compared the timing variability of 3 intertap intervals (ITIs) before the feedback tone manipulations with 3 ITIs after the unexpected pitches.

Results

Unexpected pitches significantly affected the timing accuracy of motor actions. More specifically, the ITI immediately after a pitch violation was significantly shortened and the next ITI was significantly overcompensated. The effect was observed in all conditions where pitch expectancy violations occurred (Conditions 2-4). However, timing accuracy was not affected in Condition 1, where a highly predictable and expected sequence of pitch changes was maintained.

Conclusions

This study demonstrated that pitch expectancy violations interfere with motor timing accuracy, supporting the internal models theory that expectancies related to motor and perceptual outcomes are tethered to motor commands. Future research is needed to validate this protocol with tasks involving more complex motor sequences and to further understand the implications of the internal models theory for music performance.

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Modeling Rhythmic Complexity in a Corpus of Polyrhythm Examples from Europe and America, 1900-1950

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Modeling Rhythmic Complexity in a Corpus of Polyrhythm Examples from Europe and America, 1900-1950

Background

Rhythmic complexity, and particularly the use of “polyrhythm” (the simultaneous presence of two or more contrasting rhythmic layers, meters or speeds), is often identified as one central feature of twentieth-century Western art music. Close reading and generalization from a small number of representative examples have resulted in several competing ideas to explain the increased prevalence and scale of polyrhythm in this period (e.g., Krebs, 1999; Poudrier, 2009), but these remain to be tested.

Aims

The current project uses computational analysis to explore the development of polyrhythm in a corpus of 719 examples extracted from 450 works by composers from Europe and North America from 1900 to 1950 (Suter, 1980). Corpus examples and associated metadata have been processed to be analyzed using the Humdrum Toolkit (Huron, 1995). The primary research objectives are to: (1) identify structural features and associated musical parameters; (2) develop complexity measures for metrically dissonant rhythmic strands; and (3) identify trends in the development of polyrhythm in that period.

Main Contribution

Computational modeling and exploratory analysis were conducted using a stratified sample dataset (N = 80) that includes four randomly selected examples for each composer (N = 20). Exploratory analysis found no significant differences in terms of global complexity measures, i.e., entropy, nPVI, event density applied to the resultant composite rhythms, either of each example as a whole or based on a division of the texture into two contrasting rhythmic groups. Thus, prior claims of increasing complexity over the focus period have not been substantiated, at least from the perspective of polyrhythm and

global complexity measures. However, some trends based on national origin and genre have been identified, and the wide variance observed in measures of rhythmic regularity based on composer, nationality, genre, and pre- vs. post-war composition year suggests that there are other factors at play, which future analytical work will address. Hypotheses derived from the exploratory analysis will be tested using the remainder of the corpus (N = 639).

Implication

This project seeks to provide a framework for the computational analysis of musical excerpts that features a wide range of polyrhythmic structures. Specifically, it provides complexity metrics to examine the use of polyrhythm in 20th-century music, test competing claims about its development, and explore aspects of the cognitive processing of complex rhythms within a culturally-situated musical practice.

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Hearing (and seeing) the beat of a different drummer: Event-related desynchronization in the action observation network

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Background

The action observation network (AON) is a fronto-parietal network activated during the execution and observation of intentional movement. Activation of this network has primarily been observed using visual stimuli but some limited evidence exists for activation by auditory stimuli (e.g., McGarry et al., 2012). Even less is known about the extent to which the AON is activated during music listening (but see Leveque & Schon, 2013; McGarry, Pineda & Russo, 2015). Event-related desynchronization of the sensorimotor rhythm (8-13 Hz) is a temporally-sensitive method for assessing AON activation.

Aims

The purpose of our experiment was to explore the role that motor simulation plays in perception of percussion by experts and novices under unimodal and multimodal presentation conditions.

Method

Expert percussionists and novices viewed the principal percussionist of the Toronto Symphony play excerpts from Rimsky-Korsakov's Scheherazade (mvt IV). The high familiarity of this piece among expert percussionists allowed us to investigate the role that experience/familiarity plays in AON activation. To explore the effects of modality, we presented the excerpts in A (audio), V (visual), and AV (audiovisual) modalities. To explore the role of stimuli richness, we presented the excerpts in rich (human) and impoverished (point light and sine tones) conditions. Neuro-electric recordings were obtained using a 64 channel BioSemi ActiveTwo EEG system. Analyses were performed using custom MATLAB 7.12.0 (R2011a) scripts and EEGLAB 13.0.1b, a freely available MATLAB toolbox (DeLorme & Makeig, 2004). An independent components analysis (ICA) was run on the data using the RUNICA algorithm to separate sources of activity. The sources were localized using DIPFIT(an EEGLAB plug-in). Two theoretically-expected sources of activity in premotor and parietal regions were analysed. Event-related desynchronization (ERD) was the dependent variable used to measure AON activation for all conditions. An analysis on electrodes CZ, C3, and C4 yielded an overall pattern of results that was similar to that obtained through the component analysis.

Results

Visual presentations consistently elicited more ERD than auditory presentations, and multimodal stimuli did not lead to greater ERD than unimodal stimuli. ERD was comparable for experts and novices, and the extent of ERD in the audio condition differed significantly from zero.

Conclusions

Although visual information was dominant, we found evidence of ERD in the audio-alone condition. Richness of stimuli as manipulated here does not appear to be an important moderator for AON activation. Future work will further probe familiarity-based effects by manipulating rehearsal of musical excerpts in a within-subject paradigm.

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Horses do not spontaneously engage in tempo-flexible synchronization to a musical beat

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Background

Spontaneous, predictive, tempo-flexible synchronization to external rhythms is a unique phenomenon that has been observed in humans and only a handful of parrot species, all of whom display a capacity for vocal learning. According to the vocal learning hypothesis (Patel, 2006), the ability to synchronize movements to an external auditory beat in a predictive and tempo-flexible way is linked to vocal learning, i.e. the capacity to learn complex vocalization patterns based on an auditory model. Horses (Equus ferus caballus) may present an interesting challenge to this hypothesis. They are not vocal learners, yet there are many anecdotal reports of horses displaying beat synchronization-like behavior. This claim however has not been empirically investigated; the purpose of the present study is to do so.

Aims

To determine whether horses spontaneously synchronize movement to an external beat in a predictive, tempo-flexible manner.

Methods

Eight horses stabled at the Mount Holyoke College Equestrian Center were tested using the circular trotting to music paradigm described by Bregman, et al. (2013). Horses were held on a lead line and lunged at a trot in a circle while musical excerpts were played over arena loudspeakers. Excerpts from two songs (“Happy” and “Shake It Off”) were played at their canonical tempo (160 bpm) and four shifted tempi (144, 152, 168, 176 bpm); these tempi were selected due to prior report of 152 bpm as a typical trotting rate (Gallo, 2007). Each horse trotted to twenty 45-second excerpts, grouped into two ten-excerpt blocks. Before each block, horses trotted in silence for 60 seconds. Horses changed direction between blocks. The lunger wore earplugs and listened to a dense, arrhythmic audio mixture over noise-cancelling headphones to avoid delivering rhythmic cues to the horses. A second researcher delivered visual cues to the lunger when excerpts started and stopped, but otherwise remained out of sight. Horse gait was recorded using high-speed video and accelerometers mounted to forelimb boots. Forelimb hooffalls were identified, and inter-hooffall intervals (IHIs) were calculated to assess trotting synchronization to the musical beat.

Results

A range of preferred inter-hooffall intervals was observed across horses (preferred IHI: 343 – 411 ms; 146 – 175 bpm). However, IHIs were not modulated by musical excerpt tempo ($p > .7$), demonstrating that horses do not spontaneously engage in predictive, tempo-flexible synchronization to a musical beat.

Conclusions

Despite anecdotal claims to the contrary, horses do not spontaneously synchronize their trotting to musical beats in a predictive, tempo-flexible manner. This finding is consistent with the claims of the vocal learning hypothesis that such synchronization is linked to neural structures underlying vocal learning.

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Keys to the Origin of Entrainment

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Background

The number of hypotheses concerning the original function of music is not much smaller than the number of music-origin theorists. Sexual selection, social bonding, social amusement, mood synchronization, safe haven for childhood exploration of social behaviour, mother-child bonding, the link between grooming and language to enable social communication, and tribal defence through territorial boundary delimitation are all defensible. This wide variety of hypotheses stems from differing concepts of music, the several disciplines of the theorists, and the paucity of the pre-historical record.

Aims

Musical entrainment – the universally shared capacity of homo sapiens to synchronize our movements to an external beat – is a capacity critical to the creation, performance and participation of and in music. Without it there would be no concept of rhythm. It is a narrower and more clearly defined phenomenon, so its study can be usefully focussed. Its roots are as deep and probably deeper than our melodic and harmonic capacities, so its study can yield important insights into the origin and purposes of music, and as well into the implications of those origins in our modern daily lives.

Main Contribution

The theory I would like to present is that entrainment developed as an adaptive trait over tens of thousands of years as our ancestors gradually came to live in communal groups, and came to associate the sounds of communal living with the evolutionary success of communal living. Those sounds – marching, pounding, scraping – either became sequentially uniform and then abstracted or abstracted and then uniform. Either way, abstracted rhythmic sound associated with the positive emotion of communal living forms the heart of musical entrainment.

Implications

Today we continue to associate rhythmic music with the general positive emotion that it is better to be in a group than not. By understanding how entrainment works, we better understand the effects of church hymns, national anthems, music accompanying commercials, music joining people of different cultures, music binding protest marchers. Entrainment's evolutionary origin also provides a structure on which many of the music origin hypotheses may be considered.

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Effect of melody and rhythm on the perception of nonadjacent harmonic relationships

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Background

Temporally nonadjacent key relationships are ubiquitous in tonal-harmonic music. However, the degree to which they are perceived beyond relatively short durations is uncertain. Using a stimulus-matching paradigm, Woolhouse et al. (2016) maintained the memory of the original, nonadjacent key by increasing the duration of an intervening key to ca 12s. Farbood (2016) similarly found that the memory for a key remains active for 20s after modulation. These findings support previous work by Cook (1987) who carried out conceptually similar experiments using repertoire pieces; in this case, the perception of large-scale tonal structures did not surpass a minute.

Aims

The stimuli of Woolhouse and Farbood were limited to the harmonic domain: in Woolhouse et al. (2016), the textures were homophonic, while in Farbood (2016) participants listened to repeated arpeggios. Yet the use of real excerpts by Cook (1987) and the extended effects he obtained suggests that musical features—in addition to harmony—may be important in maintaining nonadjacent key relationships. The current study aims to investigate this in a controlled manner by manipulating specific features of the musical surface and testing the effects of these manipulations on global harmonic perceptions. Two music-theoretically defined features were tested: melodic figurations (e.g. chordal skips and passing tones) and rhythmic figurations (e.g. anticipations and suspensions).

Method

We replicated the stimulus-matching paradigm of Woolhouse et al. (2016) in which influence the of a particular manipulation (in this case, the musical surface) is observed by pairing two stimuli, identically matched except for the feature under investigation. Concluding each stimulus is a probe cadence, rated by participants for goodness-of-closure. The overall form of the stimuli is segmented into three parts: X1 (key establishing sequence), Y (second key), and X2 (probe cadence having a tonic relationship to X1). We investigate the effects of the musical surface from three perspectives: (1) whether the presence of melodic and rhythmic figurations increases the global effect of X1; (2) whether the type of harmonic progression at X1 itself affects global retention; and (3) whether the probe cadence needs to be melodically and rhythmically similar in order to maintain this global retention.

Results

Stimuli with rhythmic or melodic figurations were rated significantly higher than unembellished control stimuli ($p < 0.001$). Similarly, stimuli in which the probe cadence was stylistically similar to X1 were rated higher than when it was different ($p < 0.0001$). No significant effect was found for type of harmonic progression ($p = 0.25$).

Conclusions

Our results are consistent with the notion that surface musical features contribute to the establishment and maintenance of temporally nonadjacent key relationships within tonal harmonic music. However, ‘deeper’ structures, such as type of harmonic progression (for example, cycle of fifths), seem not to be crucial.

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The effect of harmony on the activation of phrase schemata in twelve-bar blues progressions

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Background

Harmonic expectation has been shown to reflect syntactical rules for chord-to-chord connections in both short and long musical contexts (Bharucha and Stoeckig 1986; Bigand et al. 1999). These expectations may derive from the activation of specific schemata which provide context for identifying syntactical errors (Gjerdingen 1988). Few empirical studies address the connection between low-level and high-level structure, such as phrases or form. The twelve-bar blues, with its three unique phrases, offers an opportunity to investigate this relationship.

Aims

This research investigates whether listeners expect chord successions presented in the context of the twelve-bar blues idiom to adhere to common-practice syntax. Additionally, it addresses how harmony affects the activation of phrase schemata.

Method

Participants (N=21, mean age=18.7 years) listened to 16-second synthesized excerpts that represented four-measure phrases from the twelve-bar blues. Excerpts were designed to harmonically resemble one of the three standard phrases from the twelve-bar blues, with one chord per measure: I-I-I-I, IV-IV-I-I, or V-IV-I-I. Each excerpt included a single variable chord, drawn from the set of 24 major and minor triads, in one of eight possible locations. Redundant progressions were excluded, yielding 160 unique trials. For each trial, participants provided a goodness rating on a six-point scale and indicated whether they thought the excerpt came from first, second, or third phrase of a twelve-bar blues.

Results

Listeners preferred harmonic successions reflective of common-practice syntax; however, two instances of idiomatic blues root motion also received high ratings: modally-inflected ascending minor thirds (e.g. I-bIII), and descending major seconds (e.g. V-IV). Both the location and content of the variable chord significantly affected phrase labelling. Successions with a consensus phrase label received significantly higher ratings. Some ratings and phrase labels combined to reveal that specific chord successions can invoke different expectations depending on the presently active phrase schema.

Conclusions

Harmonic expectation in blues includes a wider range of acceptable root motion. Phrase schemata are defined both by their harmonic content and by the order in which that content is presented. Single chords can affect the strength of an active schema and can suppress the activation of other viable schemata. Listeners have stronger expectations for phrases that can be identified as part of the larger musical context.

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Conceptual rather than perceptual: Cross-modal correspondences of musical scales are based on an abstract schematic structure

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Background

Literature proposes at least three origins of musical cross-modal correspondences: natural-scene statistics, neurophysiological binding, and abstract, structural connections. The dilemma is relevant to linguistics, as well: e.g. if a musical scale “moves upward” in one language, but becomes “thinner” in another, the difference may be motivated by the lexicalization from the mother tongue, but also by an abstract underlying schema (Antović et al, 2013).

Aims

We hypothesize that five apparently different conceptualizations of musical scales (vertical movement, shrinking in size, thinning in width, rotating, and changing hue) are based on a single underlying structure consisting of three progressively specific conceptual primitives: DISCRETE DISTANCE, temporal alignment between tones heard and steps in the animations presented, SCALAR CHANGE, the progressive, unidirectional spatial transformation of the animations, and OVERT MOVEMENT, favoring actual transformation of the shapes to static parameter change (as in color).

Methods

In three experiments totaling 184 participants, children and adults were asked to rate the congruence of a total of 52 animations to accompanying tonal (major diatonic) and nontonal (Pierce-Bohlean) musical scales. The scales were visually presented as squares moving vertically, shrinking/expanding in size, narrowing/thickening in width, rotating clockwise/counterclockwise, and changing in hue from pure red to pure blue and back. In each animation type, we varied the underlying structure by systematically including or excluding DISCRETE DISTANCE and SCALAR CHANGE. For instance, the excluded discrete distance and included scalar change meant the squares moved or transformed smoothly form initial to final position; the opposite case involved stepwise movement, yet not all the way through to the final tone – rather, the square went in one direction and then started "going back" in the middle of the scale. Both parameters turned on meant the scale went stepwise all the way.

Results

Scores generally increased as one and then two primitives were added in adult musicians and nonmusicians, but less markedly in children. However, the scores did not differ across animation type ("pitch/height", "pitch/size", "pitch/width", "pitch/rotation", "pitch/hue") if the same number of primitives was present, in any population. The only exception was that both adults and children similarly (highly) rated one primitive DISCRETE DISTANCE and two primitives with hue change. This may suggest that overt musical movement is favored over more general scalar change in conceptualizing scales.

Conclusions

Results indicate that in conceptualizing pitch movement people rely on abstract schematic structure rather than lexicalizations from the mother tongue or lower-level perceptual clues. This supports positions in linguistic semantics and cognitive psychology on the need for an abstract mental representation underlying apparently disparate conceptual options available cross-culturally and cross-linguistically (e.g. Jackendoff, 2002; Walker, 2016).

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How embodiment and enactivism theory can help musicians perform pieces requiring electroacoustic fixed media

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Background

Music for instrument and fixed electroacoustic media (IFEM) presents a peculiar set of challenges for performers, especially with regards to temporal concerns such as the maintenance of precise tempi, the incorporation of accelerandi and decelerandi to fixed arrival points, and moment-to-moment synchronization. But beyond such practical timing issues, many practitioners and listeners of music for IFEM criticize electroacoustic soundtracks for their lack of "liveness." Recent research in embodiment and enactivism (Varela, Thompson, Rosch, and Kabat-Zinn 2017), and a close reading of literature of acousmatic music (Windsor 2007), can enable performing musicians to interact with the fixed media track more meaningfully.

Aims

This project has two primary aims. First, the paper explains philosophically why music for IFEM should be understood primarily as an embodied phenomenon. An embodied and enactivist understanding of music for IFEM allows theorists and

analysts to focus on sonorous gesture rather than pitch and rhythm. Core embodiment ideals of enacted perception, sensorimotor feedback, and ecological affordances are invoked as appropriate for the music. Second, the project draws upon theories of metaphor and sonorous gesture to better articulate how a musician might choreograph the fixed media track to visibly impart gestural meaning to the electronic track. This "auto-choreography" can be kept private as a practicing tool, or displayed on video and presented to the audience as a multimedia exhibition as a way of engendering embodied meaning into the performance (MacCallum and Naccarato 2016).

Main Contribution

Using compositions from the literature (Lin(1), Davidovsky, Lin(2) and others) this poster will examine how performers' understanding of embodied gestures within fixed media tracks can assist the learning of music for IFEM. The author, also a pianist/performer, will choreograph an electronic part used in a recent performance of music for IFEM. All pieces are scored for piano and fixed media electronic sound. A taxonomy of gestures and metaphors centered around the concepts of percussive, environmental, and stretching, is also proposed and applied to the sample works.

Implications

Musicians can utilize research in embodied cognition to better prepare and perform IFEM works. Embodiment theory allows us to evaluate how the electroacoustic music's perceived status as fixed, and music for IFEM in particular, might be challenged. To mediate between liveness and the acousmatic of the IFM genre, a performer should envision embodied versions of the acousmatic track, focusing on the three gestural categories listed above.

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Influence of prior knowledge on statistical learning of music

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Background

Musical stimuli present a unique opportunity to examine the influence of prior knowledge on statistical learning. Knowledge of pitch distributions of music may be acquired through past informal exposure (Cui, Diercks, Troje, & Cuddy, 2016) or formal music training (Cuddy & Badertscher, 1987). Using the latter's variance in the population we can ask whether it corresponds to variance in statistical learning ability (Siegelman, Bogaerts, Christiansen, & Frost, 2017).

Aims

Here, we examine the influence on statistical learning of participants' prior music exposure to pitch distributional information.

Method

Thirty-four participants listened to 160 tone sequences each followed by a probe-tone, judging each probe-tone's fit with the prior sequence. In one block, sequences were generated from an unfamiliar tone distribution. In the other, sequences were generated from a distribution typical for a piece written in C-major, considered a distribution familiar to participants exposed to Western music. The four probe-tones either occurred (congruent) or did not occur (incongruent) in the sequence. Probe-tones were identical for both blocks but differed in their congruency to the distributions. Concurrently we recorded EEG data using EGI HydroCel Nets. We analysed the mean amplitude of a 40 ms time window centred around the maximal peak 380-450 ms post probe-tone onset, corresponding to the time window of the P3b component.

Results

An ANOVA on the proportion of times each probe-tone was judged "fitting", with factors distribution, probe-tone, and block order, revealed an interaction between distribution and probe-tone, $F(3, 78) = 79.28$, $p < .001$. Congruent probe-tones were judged "fitting" more often. Hits and false alarm rates corresponding to the judged fit of congruent and incongruent tones, respectively, were converted to measures of sensitivity d', higher for the familiar than the unfamiliar distribution, $t(33) =$

5.62, p < .001, and response bias C, more conservative for the familiar than the unfamiliar distribution, t(33) = 2.97, p = .005. Years of music training and sensitivity correlated positively for the familiar distribution, r(32) = .40, p = .018, but not for the unfamiliar, or with C for either distribution, ps > .05. Analysis of the EEG data found a significant effect of congruency at frontal electrodes for the familiar, F(1, 33) = 8.83, p = .006, but not for the unfamiliar distribution, p > .05.

Conclusions

Participants were sensitive to the distributional information in the tone sequences. The difference in sensitivity between distributions supports our hypothesis that prior knowledge influences responses. Moreover, the association with music training for the familiar and lack thereof for the unfamiliar distribution shows that prior knowledge and music training influence responses in specific cases but not statistical learning itself.

The exaggerated P3b component for incongruent tones in the familiar distribution suggests that this component represents a violation of knowledge represented in long-term memory, as it was absent when participants listened to the unfamiliar distribution. This allows us to analyse the P3b component in participants exposed to an unfamiliar distribution for a period of time in order to examine the trajectory of musical knowledge in future studies.

It's Only Rock 'n Roll, But I Like It: Computer Simulation Based on an Auditory Short-Term Memory Model Helps Explain Chord Rating Data

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Background

How do people determine whether a chord fits with a musical passage? Do they first need to learn tonal regularities through enculturation, or can bottom-up processes compute goodness-of-fit from the auditory signal alone? Computational modeling can help test these competing accounts (Bigand et al., 2014; Collins et al., 2014). For instance, Bigand et al. (2014) showed that Leman's (2000) bottom-up auditory short-term memory (ASTM) model simulates many behavioral and neurophysiological findings from empirical studies of chord processing. To our knowledge, the ASTM model has not yet been used to simulate chord rating data. Experiments from our laboratory provide a novel opportunity to do so (Craton et al., 2016); these have documented high fitness ratings for rock chords lying outside the traditional harmonic hierarchy (II, bIII, III, bVI, VI, bVII).

Aims

We assessed whether chord ratings from an online replication experiment (N = 188; Craton et al., in preparation) are approximated by simulation with the ASTM model.

Methods

Twenty musical sequences served as input to the model (6 s key-establishing context + 2s target chord). The 20 targets were major triads presented in root position, built off every chromatic root from IV (descending from context) to I (ascending). The model computed representations at four stages: 1) peripheral auditory system, 2) pitch periodicity analysis, 3) echoic memory (local = 0.1 s, global = 1.5 s), and 4) tonal contextuality (TC). For each sequence, the mean TC value for the 2 s time window corresponding to the target chord was taken as the "fitness rating" for that target.

Results

A comparison plot of TC values from the simulation (where TC = 1 indicates highest possible rating) and listeners' mean fitness ratings (1 = fits poorly; 10 = fits well) showed striking similarity. Kendall's W revealed statistically significant agreement between the model and listeners' ratings, W = .899, p = .018.

Conclusions

Listeners may judge chord fitness without abstract knowledge of tonal regularities acquired through enculturation. We propose that bottom-up processes create a perceptual ranking of chord fitness which provides the harmonic palette from which composers/improvisers in different musical systems may conservatively (common-practice) or liberally (rock) choose.

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The Functional Nature of Theoretically Non-Functional Diminished Seventh Chords

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Background

A goal of music theory is to classify patterns in music in order to understand the structure of music. While these principles quite often coincide with perception, as is arguably the case with mixture and applied dominants, complex cases require more nuanced explanations. The non-dominant diminished seventh, or common-tone diminished seventh (CT o 7), is such an example, being typically interpreted as non-functional decorative harmony (Piston, 1978), despite its use within otherwise well-formed musical phrases. More generally, the ambiguous nature of diminished seventh chords presents an obstacle for theoretical classification.

Aims

Through the principal of "tritone substitution" of tones belonging to the subdominant harmony, we identify the CT o 7 as a predominant chord, relative to the key region of the common tone. In the same way that the subdominant can approach the dominant or return to the tonic, this theory relates CT o 7 to its dominant enharmonic equivalents. In order to test this theoretical notion, this study aims to connect the CT o 7 with its related subdominant harmony through a psychological experiment, testing the validity of the theory against perception. If our conjecture is correct, results will indicate how the three

identities of diminished seventh chords (tonic, dominant, subdominant) behave functionally despite their ambiguous nature.

Methods

The three possible (enharmonically spelt) diminished seventh chords are related to simple diatonic tonic-predominant and tonic-dominant structures using a two alternative forced choice paradigm. Participants select one of two diminished seventh chord progressions, which they deem to be most similar to the presented stimulus. For instance, when presented a tonic-predominant progression, we hypothesize the participant will select CT o 7 over CT o 7/V due to its tritone relationship with the subdominant. The effect of mode and voicing are controlled for due to their potential confounding nature.

Results

Data analysis is currently underway.

Conclusions

We expect participants to choose the CT o 7 over CT o 7/V or the dominant diminished seventh (vii o 7) when the stimulus presented is tonic-subdominant. This would confirm that the CT o 7 is indeed perceptually and therefore functionally related to the subdominant harmony by tritone substitution, in addition to sharing a greater number of chord tones.

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The Role of Structural Tones in Establishing Mode in Renaissance Two-part Counterpoint

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Background

This project investigates mode through an empirical examination of two-part counterpoint. Music theorists have claimed that it is not simply the finalis (i.e., final note) that determines mode, but that "structural tones" within a melody are responsible for establishing the mode (e.g., Tinctoris, 1476; Aron, 1525; Zarlino, 1558). Specifically, these theorists have pointed to notes forming "turning points" (outlines), and leaps, as key "ingredients" for the careful construction of a melody in a given mode. However, to the authors' knowledge no empirical investigation has been made of this claim.

Aims

Taking as an assumption that endpoints of melodic leaps and outlines will carry greater structural significance, we hypothesize that these structural features will be predictive of a piece's modal label. In addition, we hypothesize a correlation between pitches creating perfect vertical intervals and modal labels (Schubert, 1993).

Methods

To carry out this analysis, we assembled a corpus of 44 Renaissance contrapuntal duos considered to be "exemplars" of a given mode. Of these, 32 are classified according to the theoretical treatises in which they appear, and 12 come from a collection shown to be modally ordered (Powers, 1981). Thus the size of our corpus was restricted to the limited set of data with reliable ground truth.

Using the music analysis toolkits VIS (v.3.0.5) and music21 (v2.1.2), the relevant melodic and harmonic features are tallied and tabled for each piece. We use multinomial regression modelling as well as behavioural experiments to evaluate the predictive power of leaps, outlines, and vertical intervals to predict mode.

Results

While our results are tentative due to our small sample size, we propose that the authentic/plagal distinction is not clearly marked in polyphonic music. Vertical intervals appear the best predictor of mode compared with melodic leaps and outlines, however, simple pitch class distributions predict mode best while using a simpler model.

Conclusions

This corpus study provided some surprising information about mode in the Renaissance. Using both statistical regression and behavioural experiments allowed us to compare the value of both exercises. The converging evidence from both approaches suggests that composers "writing in the modes" were primarily thinking in terms of mode family (e.g., Dorian). Our reluctant conclusion is that the plagal-authentic distinction was maintained by theorists because of the authority of the system of modes for chant, but that it has relatively little relevance for polyphonic music.

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The Perception of Stable Tones in Polytonal Structures

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Background

Textbooks on twentieth-century techniques place a differing emphasis on the aural distinguishability of two tonal centers in polychords. Krumhansel and Schmuckler (1986) found that probe tone ratings from polytonal structures in Stravinsky's Petroushka fit Van den Toorn's (1983) hierarchy of priorities better than the major key profiles. Thompson and Mor (1991) found that listeners were sensitive to two key centers and that when one key predominates in a polytonal context, other keys may not contribute to the overall tonal structure. These studies demonstrate that post-tonal music is perceived to have different tonal hierarchies than music from the common-practice period, and they raise the question of how other polytonal combinations are perceived by listeners.

Aims

This research examined polychords drawn from Milhaud's Saudades do Brasil Op. 6 to determine if listeners can perceive two simultaneous tonal centers and if the composer's orchestration of the individual chords has an effect on perception.

Method

In the first study, participants were presented with three polychords and their transformations as stimuli. Participants sang or the most stable tone in the structure and used a piano to determine the name of the pitch. For the second study, two polychords and their transformations were used in conjunction with probe tones. The subjects were asked to evaluate how well the probe tone fit with the polychord.

Results

Results from the first study showed that participants selected the tone present in both triads of the polychord as the most stable. The first study demonstrated that extreme registral placement of one triad in the polychord resulted in a preference for the other triad. The second study confirmed the preference of doubled tones, showed a significant difference in the treatment of doubled tones compared to other tones, and revealed a significant difference in the treatment of non-chord tones compared to chord tones. The results suggest that listeners favor the C4-C5 register in polychords to determine the goodness of fit for probe-tones.

Conclusions

Overall results show a significant difference in the treatment of doubled tones compared to other tones in the polychords and demonstrate that non-chord tones were treated differently than chord members of the polychords. These findings reinforce the idea that the compositional choice of writing music with polychords does impact the listener's perception of stability in a piece.

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What sounds right? Categorization of correctness in music.

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Background

People have a good appraisal of the correctness of music performances. Indeed, we develop correctness categories with regard to pitch (Larrouy-Maestri, under review) and rhythm (Larrouy-Maestri et al., ESCOM 2016), and rely on them to decide if a musical excerpt/a melody sounds right or not. However, little is known about the process underlying correctness categorization and its specificity/generality across music dimensions.

Aim

In the present study, we examine and compare the categorization processes underlying correctness judgments for two important dimensions in music, namely pitch and time.

Methods

Sixty-three participants (38 women) with various degree of musical expertise, from 20 to 34 years old (M = 24.17, SD = 3.69), were submitted to pitch and rhythm correctness tasks. In the pitch task, we presented 6-tone melodies in which an interval was gradually manipulated (increased progressively by 10-cent steps, with a deviation ranging from 0 to 60 cents). In the rhythm task, the material consisted in a computer-generated 2-bar except of Bach's "Badinerie" BWV 1067, taken from a previous study (Dalla Bella et al., 2017). The excerpt beats were either regular (i.e., isochronous) or included a time shift: the 1st beat in the second bar was delayed from 0 to 42% of the inter-onset interval (IOI), in 6% steps. In both tasks, participants were asked to identify each sequence as in- vs. out-of-tune or on- vs. off-beat, and rated the confidence of their rating on a 4-point scale (0 = not confident, 3 = very confident).

Results

Correctness thresholds stand around 25 cents of interval deviation (for pitch) and around 22% IOI deviation (for rhythm). The psychometric curves of the identification task revealed that most participants (86%) could categorize music sequences as correct or not. However, imporant individual differences appeared and only half of the participants showed categorization abilities in both tasks. Surprisingly, the correctness thresholds as well as the categorization slopes for pitch and rhythm dimensions were uncorrelated.

Conclusions

By examining the correctness judgments with regard to pitch and rhythm deviations, this study confirms the presence of a categorization process but also highlights a dissociation between pitch and rhythm dimensions . Further studies in which the two manipulations are combined will certainly shed light on this dissociation. Furthermore, our results demonstrate a wide range of individual differences that are currently investigated to gain a better understanding of the mechanisms underlying correctness judgments.

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Cognition of South Indian Percussion

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Background

The mridangam is a double-headed pitched drum prominently featured in South Indian (Carnatic) music. Carnatic music utilizes a series of looped percussive patterns that often feature rhythmic accents between pulses. While previous studies in rhythmic memory have dealt with Western rhythms (Iversen, Repp, & Patel, 2009), few have focused on perception of rhythm cross-culturally. Studies on the cognitive representation of rhythm suggest that listeners' attention is directed toward the downbeat of a rhythm, then organizes other parts of the rhythm in reference to the downbeat in a "hierarchical" sequence (Fitch, 2013): Does this representational schema apply to rhythmic structures that are unfamiliar?

Aims

We wanted to determine the recognition accuracy of non-Indian listeners in encoding rhythms in memory.

Methods

Our study reports results from two experiments. In Experiment 1, we evaluated participants' (N = 36) memory for 27 natural and mechanical (computer generated) versions of mridangam rhythmic patterns, with a "target" rhythm memorized in contrast to two lure patterns, designated as "similar" and "different", separated by three delay times. Results of repeated-measures ANOVA suggested that there was not a significant difference in listeners' ability to distinguish between natural and mechanical versions. Difference between "similar" and "different" lures was significant, delay time also appeared to have an effect on identification.

In Experiment 2, naïve listeners (N = 24) heard a series of 20 rhythmic trials. Each trial began with a "target" rhythm, followed by a pool of three answer choices comprised of a random ordering of the "target" and the lure types. Listeners were instructed to identify the "target," from among the options then rate their confidence using a 6-point Likert scale. Results indicated a significant effect of answer choice position on accuracy. Confidence ratings and accurate responses were not significantly different, indicating that post-hoc performance evaluations strongly reflected accuracy on the task.

Conclusions

From these experiments, we can conclude that low degree of musical congruence and shortest delay time between samples are most conducive to recognition accuracy. Musical unfamiliarity combined with the isochrony of the stimuli could have served as a strong memory aid for listeners (Hannon & Trehub, 2005), indicated by a ceiling effect in both cases. We are currently testing a similar protocol using a set of "experienced" listeners possessing at least 7 years of training in Carnatic music. We anticipate a more even distribution of accuracy rates across position and lure type. We also hope to determine what specific ordering of stimuli was most conducive to high recognition accuracy, as well as analyze what salient rhythmic features were most memorable.

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P2P: Posters 2

Time: Friday, 27/Jul/2018: 22:00 - 23:00 · *Location:* La Plata Poster Room

From play to gesture: exploring the intrinsic relations between body and mind in the pedagogy of musical performance

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Background

The refinement of a sound-producing gesture, which occurs through the vitality of this action and depends on the perfection of skills common to every moving body (balance, flexibility, distribution of forces, and the imagery of trajectories guiding the movement) walks alongside the refinement of sonority and expression. Gestures are not merely conventions or instrumental for performance, but emerge from spontaneous acts of vitality. Understanding the role of the body in musical performance as strictly bound to sound production mechanics stems from a partial view of musical technique, one that disconnects intention and musical meaning from the concrete action producing them. By disconnecting means and intention, it ultimately disconnects body and mind.

Aims

The paper presents a theoretical reflection on the construction of sound production gestures and its association with play and metaphor.

Main Contribution

The expression of musical ideas and intentions may only gain materiality through the construction and expansion of a repertoire of actions. Our hypothesis is that the behavior existent in play allows for the exchange between different domains of experience, as it happens in metaphorical thinking, and that play configures itself as an experiential field that facilitates the development of creativity and comprehension, enabling the transformation and development of actions and behaviors. A cognitive process is metaphorical when the duality present in the activation of distinct domains of experience integrates the process of construction of meaning. Such process is always constructive and creative. We believe that play, gesture, and metaphor, three central concepts in this article, are found in “seeing-as” – a specific mode of seeing and constructing meanings. The activation process enabling the construction of metaphorical inferences is selective and dependent on the encyclopedia of the subjects’ experiences. Gadamer (2012) uses the concept of play (spiel) as the guiding thread for his model of understanding since he considers that, as a game, the entire process of constructing meanings is an open act and an interpretive and interactive action. It is circumscribed to a context and dependent upon the encounter and interaction with alterity. The understanding and experience of metaphoricity are not mere products of consciousness, but a negotiation process between myself and another, as a game.

Implications

Play creates a framework for action, establishing a field that allows for interpretive flexibility and engagement – you play when aware of what you do at the moment you do it. It is a key concept for the development of intentional actions and may contribute to the construction of cognitive models to explain our musical experience from a human-centered and embodied perspective. It is my belief that a next step should be taken in understanding how gestural experiences may be suggested by images and metaphors to develop teaching and learning actions motivated by the creation of a favorable pedagogical environment for the development of creativity and engagement in instrumental practice.

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The role of motivation to the quality of attention in deliberate practice

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Background

Researchers into musical performance and expertise have emphasized the importance of motivation and attention for the so-called deliberate practice, neglecting, however, the discussion about the conditions that favor that state of primacy. Understanding this to be such an essential condition for the quality of deliberate practice, why not discuss it with greater depth?

Aims

Demonstrate the relations between the performer's motivational states and the attentional capacity. According to the current theoretical framework, the evidence suggests that the quality of attention is, at least in part, regulated by the subjects' levels of motivation. My theoretical references considered authors as Reeve (2009), Deci & Ryan (1985), Csikszentmihaly (1997), Araújo (2013), Styles (2005), Eysenck & Keane (2010), Cohen (2014), Baddeley, Anderson & Eysenck (2015), Parncutt & McPherson (2002), Ericsson, Krampe & Tesch-Römer (1993), among others.

Methods

To test my proposition, I developed a small experimental program executed with piano students of different levels so that I could observe, among other things, their routines of study, habits, tastes, personal and professional histories, aspirations, from where it was possible to testify some statements.

Results

The results showed that there is a clear relationship between the individuals' motivational states and their respective attentional abilities. Besides, certain levels of motivation induce a higher capacity for focus, suggesting that there is a need to broaden discussions about updating curricula of the formation of instrumentalists, particularly of pianists.

Conclusions

It is essential to the pedagogy of the instrument to prepare the students to overcome the difficulties related to the inefficacy of attention, aiming at higher quality in the deliberate practice.

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EXPRESSIVE ALIGNMENT IN ORCHESTRA ROW´ SESSION REHEARSAL

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Background

Body movement in accompaniment to music can refer to and express different degrees of empathic relationships, from the alignment and the simple physical synchrony (Clayton et al, 2005) to the emotional involvement (Stern, 2010) of the participants with the sonic forms in movement (Leman, 2008). Its origin is found in the biological and cultural bodily commitment that underlies the configuration of those intermodal energetic forms expressed through time (Hatten, 2006). Likewise, the evidence suggests that the observation of the movements of others in interactive situations interferes with the execution of a similar concordant action, leading to an intensification and greater coherence of the gestures and actions of the group (Leman, 2010). Therefore, and according to the concept of expressive musical alignment (Leman, 2016) as a dynamic arrangement of sound and movement gestural patterns that involves the processing of predictive, energetic and affective states, this work assumes that the way in which the performers of orchestra build the musical ensemble responds to the features of the above-mentioned concept. The alignment is observed both in relation to the matching of outgoing temporal marks fundamentally associated with the learning of predictive models, as well as the sound-kinetic coupling of the continuous flow, with respect to which the identification of keys of spontaneous leadership among the performers is hypothesized.

Aims

The work aims to identify sound-kinetic indicators of expressive alignment between musicians of the same orchestra rank.

Method

3 professional violists were summoned for a first ensemble of the initial measures of the third movement of Sehr Langsam, frei im Zeitmaß from Paul Hindemith's "Mathis der Maler". The performance was recorded initially on an individual basis and then during the first group rehearsal, using individual microphones and a video camera. The synchronic analysis of sound and body movement was carried out with the Sonic Visualiser and ELAN programs, respectively.

Results

The data is currently being analyzed. Preliminary observations identify the presence of performers' gaze as indicator of a predictive behavior, and of leadership spontaneous alternation among performers during rehearsal, suggesting the emergence of temporal constructions of sound-and-movement forms.

Conclusions

The results are discussed in relation to the concept of expressive alignment as a bio-social signal built on the basis of learned expressive codes and continuous response schemes. The observations support the hypothesis that body movement is an expression of intentional coordination that results in the co-modeling of the form in real time.

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Towards the concept of the embodied voice.

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Background

During classes, singing teachers have to address the interaction of the physiological, somatic, proprioceptive, psychological and cognitive processes. Only adopting this holistic pedagogical point of view (Porges, 2017; Beltramone, 2016; Torres Gallardo, 2016; Gilman, 2015; Chapman, 2014) can lead to the balance of that complex interaction.

Within this paradigm, the teacher approaches the student with a broad background of technical and scientific knowledge . The student approaches the teacher to learn, often with limited knowledge, and physical and psychological experience. The challenge to the teacher is to facilitate the act of singing while avoiding conceptual entropy (Alessandroni, 2014).

Our own extensive experience as teachers, in individual classes, master classes and group workshops, has evidenced that the correct application of these pedagogical techniques invariably produces improvements in performance and in psychological positivity, both in the short term (classes) and in the long term (extended courses), which, by thus unifying the technical, articulatory and stylistic requirements, ultimately materialises in the true objective of all singers, artistic expression (Caligaris and Salmon, 2016, 2017, 2018).

Aims

To assess the degree of association between the perception of changes teachers and students experience in the context of singing classes.

Method

We put a group of 36 students in a master class, by turns as individual participants and as observers. Each individual was asked to rate, anonymously, from 0 to 10 their perception of changes (technical or physical, and psychological) as participants, and perception of changes (physical and aural) as observers, inviting brief personal comments. We then compared information to see if there were any association between the two categories, and in relation to our own perceptions.

Results

The results demonstrated an overall consistency in perceived improvement of varying degrees in 100% of cases, and a notable correlation between the perceptions of participants and of observers, consistent with our own empirical findings.

Conclusions

The results emphasise the importance of establishing parameters that contribute to a holistic (as defined above) pedagogical process of optimizing results in the singing studio and in performance.

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Parse Trees from “Lua Branca” and “Naquele Tempo”: Generative Theory and Reharmonizations

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Background

Regarding communication amidst composer and listener, tonal harmonic syntax plays an important role in a wide range of genres and styles. This is a topic much discussed in music theory but has been improved and formalized through its link with generative theories from linguistics (Chomsky, 1965). There are, for instance, works such as Generative Theory of Tonal Music (GTTM; Lerdahl & Jackendoff, 1983) and Generative Syntax Model (GSM; Rohrmeier, 2011). The latter provides us an interesting tool for the present work in order to understand the hierarchical structure underlying the long-standing harmonic functions. The GSM sets two ways to understand chord sequences within tonal music: a bottom-up strategy which is parsing a sequence of chords (roughly, what the listener does); and a top-down strategy with which one can generate the sequences of chords from subject’s implicit and explicit knowledge (roughly, what the composer does).

Regarding the objectives of the current work, in musical practices of many genres and styles, reharmonization is a fundamental part to give the audience different perspectives and inquisitiveness of old pieces (Levine, 1995). Moreover, it is an opportunity to show idiosyncrasies and competences of an arranger or composer. Hence, I single out two reinterpretations of traditional Brazilian pieces (from the beginning of 20th century) made by the pianist and arranger Leandro Braga (1955) to compare the harmonic changes by using the analytical framework of the GSM.

Aims

Here I seek to demonstrate through parse trees the differences between “traditional” harmonies of pieces from 20th century and “reinterpreted” contemporary arrangements. It makes explicit the strategies applied by the arranger in terms of prolongation, substitution and modulation rules, and which parts of this reinterpretation are ambiguous.

Main Contribution

One of the premises of generative approaches for music is that these rules and hierarchical features express cognitive operations. Parsing (or analysis) musical elements from pieces allow an approximation amidst composer and listener in order to infer some processes of mind. Still, this work deepens interdisciplinary approaches by linking music theory, psychology and linguistics.

Implications

Stemmed from the contribution, the current work sheds light into how the composer or arranger generates a sequence of chords with a formal approach. The next step of this project is to collate the parses with the protocol stemmed from a psychological method called think aloud in order to investigate how these rules and hierarchical features work in the act of composition. Through introspection, this collating will bring information about the relationships mainly of the harmony into the black box and from the mind. In a foreseeable future it can be applied to help composers to elicit the mind processes of generating and manipulating tonal harmony by referring stylistic norms.

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Limitations of the study of harmony as tension

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Background

Currently, one of the main approaches to investigating how music and harmony communicate what might be called "expressive meaning" (Larson, 2012) is through the study of musical expectations and tension. This approach has one origin in the work of Meyer (1956), which was partly responsible for making the element of tension one of the main focuses of investigation in studies in music cognition, as, according to the author, expectation, tension, and affect are intimately linked. As a consequence, there have been several empirical studies which have attempted to measure listener's experience of musical and/or harmonic tension, such as Bigand & Parncutt (1999), Lerdahl & Krumhansl (2007) and Farbood (2016).

Aims

I intend to point out some limitations of this approach. First, I argue that this research is based on a conceptual metaphor of harmony as tension. Then, I suggest aspects of this experience that cannot be fully explained by this metaphor, based on evidence from research in music and emotion (Juslin & Västfjäll, 2008, Lahdelma & Eerola, 2016), such as the emotional qualities conveyed by single chords.

Main Contribution

With this work, I intend to contribute to the study of expressive meaning in music by suggesting that research in the field investigate harmony in terms of different metaphors such as color (Isbilen & Krumhansl, 2016), forces (Larson, 2012) and gesture (Godøy, 2011), all of which have their own limitations, but might help explain some of the expressive meanings of harmony that aren't accounted for by the metaphor of tension.

Implications

This work implies that new research on the expressive meaning of harmony be carried out focussing other of its aspects, beyond tension and expectation. While the metaphor of tension does account for some aspects of the musical experience, it does not completely explain the expressive meaning of music and harmony, and other approaches are necessary to improve our understanding of this experience.

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A reversible musicological design for analyzing songs written in traditional western notation.

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Theoretical frame

The learning of songs is one of the most frequent activities in the field of formal, not formal, academic or popular music. From our work of teaching songs for more than two decades to adult students of different Institutes of Teaching Formation or Professorships of Argentina, We design an analytical model in which theory and musical practice are reversible during the process of teaching-learning songs. We understand by reversible in the learning of a song, that it can be analyzed as a score from the theory, or as an interpretation of that score from practice. We use the seven principles of David Perkins ' full Learning ' (2009) as a theoretical framework for our design related to musical practices of scores.

Objective

1. Analyze in scores and in musical performances sung of those scores, eight elements of musical morphology: pulse, accent, rhythm, type of compass, type of start, type of finish, movement and musical phrases.

2. Demonstrate the reversibility between theory and musical practice that have the eight morphological aspects analyzed in songs and its pedagogic utility for the field of the music education.

Method

The methodology for the conduct of this investigation was the corresponding to a case study of cognition and musical theory of performances, sustained in the musicology as unified discipline and in music as theoretical-practical discipline, according to eight aspects morphological musicals specific. We analyzed eight musical elements from the theory and from the musical practice in a reversible constructivist posture between theory and musical practice. After defining each analysis item and to write in scores the analytical results, we sang the songs analyzed marking and verifying in the musical practice the results of our theoretical analyses.

Results

This musicological research conducted annually for more than twenty consecutive years with different groups of students of higher level in Argentina, It has allowed us to make this analytical design musicological to teach songs. The double possibility of checking the analytical results of our design facilitates the coherence between the written music of songs and the interpretive orality of these scores.

The conclusion

We could verify the efficacy of the application of this reversible design between theory and musical practice for musical education. Moreover, we demonstrate the importance of considering musicology as a unified discipline field and music as a theoretical-practical discipline, to continue advancing in the field of musical perception and cognition.

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Igor Stravinsky and György Ligeti Strings Music Textural Similarities

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Background

The text compares two string music excerpts which denote some similarities perceived through hearing experience. The first one is in Igor Stravinsky's Firebird Suite finished in 1910; the second is in György Ligeti's String Quartet nº 2 which was written in 1968. A segment of both pieces presents a similar sounding structure that is to be compared using music parameters such as rhythmic direction evolvement; chromatic voicing; harmony and texture.

Aims

The study intends to bring up the importance of the hearing perception in music cognition and how it might be useful in the fields of musical analysis; ear training study; music performance and general music education.

Methods

The method develops a comparison between two string music excerpts which denote some sounding similarities. The first in Igor Stravinsky's Firebird Suite finished in 1910 and the second in György Ligeti's String Quartet nº 2 written in 1968. The resulting sound in both pieces was traced using parameters such as rhythmic evolvement; chromatic voicing; harmony and texture, all based on the auditory process. The analytical approach is based on the fact that they both present a specific sonoric texture. Both use same instruments but in different number but show a very close sounding result. What is interesting here besides the similarities is that: 1) Both use different compositional technics; 2) The music pieces are fifty years apart in time and 3) The instrumentation is also much different in number (while Stravinsky's Firebird performs a string section of a large orchestra, Ligeti's piece uses a string quartet). The development of the analysis suggests that music cognition through auditory process might reveal subjective musical, psychological and emotional issues that are not written on the music score and can be part of a deeper process of analysis.

Results

György Ligeti achieved a kind of continuous sound texture out of the string quartet with this timewise odd note attacks. Different than that, Igor Stravinsky wrote similarly in direction but with a parallel rhythmic evolvement. Although separate in time for over 50 years and presenting much different compositional procedures both segments end up resulting a very similar sound effect.

The analysis testifies that the sounding similarities perceived by the hearing perception may be demonstrated positively. This might be useful as a possibility of bringing the hearing cognition to a deeper level in the study of music.

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Stockhausen's Struktur und Erlebniszeit: conceptual implications in late-twentieth century music

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Stockhausen's Struktur und Erlebniszeit: conceptual implications in post-tonal music

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Background

This research evaluates Stockhausen's concepts concerning time perception presented in Struktur und Erlebniszeit (1955) using definitions by Todorovic (2008), Deutsch (2013) and Mesquita (2016) of Gestalt grouping theories. Through processes of alteration in sound structure, the research aims to highlight aspects of superposition of temporal articulations in order to attest its applicability in post-tonal music. This poster is a partial result of a master dissertation developed under guidance of Prof. PhD Marcos Mesquita in the research group Cogmus.

Aims

The research aims to evaluate Stockhausen's proposal to analysis according to Gestalt principles concerning perception of alterations in order to investigate structural devices and to distinguish different temporal occurrences in simultaneity.

Main contribution

The evaluation of Stockhausen´s theories may provide a valid tool for analysis of the distribution of sound material in time and stimulate further researches on Gestalt theory applied to post-tonal repertoire.

Implication

In Stockhausen's example the superposition of modes of attack, offers the most dissimilar sound in this context. Thanks to changes in one parameter while others remains unchangeable, there is a superposition of temporal articulations, where on remains constant while the other alters. Figure 1 illustrates Stockhausen's schema of analysis. As a theoretical and analytical tool, Stockhausen's definitions can be understood after Gestalt principles and offer multiple senses of time in post-tonal tendencies according to concepts of similarity and dissimilarity of parameters, superposing different time structures.

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Embodied metaphors of gender in the culture of samba dance and music.

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Background

The recurrence of dance cultures in the contexts of musical cultures is a strong evidence that the body performs an essential role in the development of musical cultures. Major differences between bodies in the musical cultures are often related to sex and gender, which respond to important idiosyncrasies between music agencies. Music studies often approach music as a danceless-genderless musical phenomenon. From XVI's century Sarabandes to XXI century pop-music videos, musicology insist that the objects of the music studies are just sound, subjected to acousmatic listening and isolated from woman and men performing specific roles. Approaches to music and gender such as McClary (2002) attempted to uncover relationships between the music and gender by looking at the discourses in the culture. Cultural and ethnomusicological studies found that the acousmatic tradition of Western musicology can be imprecise and the body is present in a great part of non-Western musical traditions. Both fields of inquiry fail in providing a concrete rationale for the influence of the body and to the musical culture, without relying upon the representation or discourses about the body (Desmond,2004). In this study, we directly approach the movements of dancers evaluated as feminine, masculine or neutral in the attempt to describe metaphors related to gender.

Aims

The aim of the study is to indicate what are the characteristics of the movement of dancers that could lend the constructions of feminine and masculine to the musical texture.

Methods

The dataset used in this study involves 15 sequences of dances represented as stick-figure representations of the moving body (thus, isolated from noticeable visual characteristics of gender). In a previous study (XXXX, 2017), the perception of gender in the dance sequences accompanied by music were evaluated 28 acculturated subjects. The evaluations have shown how dances are perceived as a map of gender associations. The dances evaluated as masculine, feminine and undetermined were then analyzed in relation to velocity profiles, amplitude, synchronization, shape and grouped using machine learning techniques.

Results

The results show how groups of movement and spatiotemporal features are correlated to dances labeled as feminine or masculine. The relationship between variability and gender seem to be associated with feminine characteristics of dances. Profiles of dance masculinity are less ambiguous.

Conclusion

Associations between music, dance, and gender are difficult to identify. Ethnomusicological literature and local cosmologies of Afro-Brazilian cultures suggest that ambiguity might be valued as a key element in a culture of racial resistance. In short, variability as a condition for adaptation might play an important role in the salience of feminine characteristics of movements.

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Invidual movement and intercorporality in collective jazz improvisation: exploring the differences between live playing and playing alone with recordings

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Background

Group improvisation in jazz refers to a practice in which more than one musician is soloing with others. Musicians co-generate meanings giving rise to a common inter-corporality and experience of sound and movement (Fuchs & De Jaegher 2009). For enactive cognition, meaning emerges from a coordinated coupling of agents that can be defined as participatory sense-making (PSM) (De Jaegher& Di Paolo, 2007). According to this, only co-regulated coordination of mutual influence could be considered as truly interactive. However, sometimes jazz improvisers play and record over previous recordings. This type of action could be in some way 'participatory' thanks to the intrinsic agenciality of music. To differentiate these two conditions, movement and sound will be explored in a 'live musical interaction' and in a simulated interaction with a ‘virtual other’ in recorded music.

Aims

To describe aspects of corporeity and sound in improvisation that will help us to differentiate between inter-acting together and the individual act with recordings.

Methods

Two ad hoc professional jazz trios (1-2) with 2 tenor saxophones A-B and 1 piano each were video-recorded playing “There is no greater love” standard (Jones-Symes). Saxophonist –A(1) was asked to play with Trio-1 videorecording with his own performance removed and with Trio-2 videorecording with Saxophonist-A(2) removed.

Analysis: Repeated observations of body movements in Saxophonist –A(1) were registered in three conditions (i) ‘live playing’; (ii) playing along with own trio videorecording and; (iii) playing along with Trio-2 videorecording. 32 measure audio-video segments were analyzed in ELAN video annotation software at a macro-level (2-4 measures); and (ii) at a micro-level (beat-to-beat) to identify interactive gestures. Score transcriptions were produced for musicological descriptions that give support to movement analysis.

Results

Macro-level analyses showed interactive movement linked to temporality, coordination and thematicity (embodied sonic gestures). Movements with interactive intentionality were evident in beginnings and endings of musical phrases in condition i.Dynamics of textural roles and length of musical phrases in the other´s improvisation can´t be anticipated entirely in condions ii and iii. Despite this, some aspects that account for participatory intentionality are observed, even in this conditions.

Conclusions

In live performances an organized embodied discourse is co-generated based on dialogical alternation of musical phrases and textural roles. In contrast, action with the recording generates the illusion of interaction. By not being able to anticipate, or modify what will happen in the recording, the improviser can’t sustain any type of non-rehearsed alternation. This situation produces a high degree of uncertainty that is evidenced in the corporality of the improviser. But even in these conditions the musician maintains a communicative and interactive intentionality.It would not be appropriate to use the concept of inter-corporality for interactions with a recording. Finally, we will discuss to what extent these performances could be considered interactive or participatory.

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The musical gesture and the interpretative construction of contemporary Brazilian musical works

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Background

The level of the performer musical understanding, and consequently of the performance quality, will depend on the familiarity, the experience, the knowledge acquired by the musician about the expressive intentions and stylistic tendencies of the work (Meyer, 2000; Silverman, 2008). The pianistic performance of a musical idea is carried out by body conscious movements as a reaction to the symbols written in the score. The inner imagination of sound becomes, then, the signal that causes the motor reaction. Therefore, when performing a musical idea, the sound image must always come before the motor reaction (Kochevitsky, 1967). Brazilian contemporary piano music contains a vast, growing repertoire that presents different tendencies which demand from the interpreter different attitudes than those he/she is used to do and for which the traditional formation did not prepare him/her. The perception of great part of the music of the XX and XXI centuries, wich is not conditioned to a set of conventions pre-established by a traditional interpretative practice, happens through sound blocks and by the way these blocks relate or transform themselves in the course of the composition (Souza, 2004). As a result interpreters do not initially have a cognitive plan, a repertoire of problem-solving specific to the issues that come to light from the work.

Aims

The visual stimulus of a musical piece induces a mental elaboration of a previous sound image, which in turn leads to the choice of the adequate gesture to produce the requested sound. The aim of this study is to expose the difficulties to recognize the musical gesture within a network of elements of unconventional interactions, which structure the production of the musical gesture itself.

Main Contribution

When we speak of instrumental performance, how to do it, it is of paramount importance the way of playing it and how we plan to play it. The awareness of the gestures used in the instrumental execution, interferes in the quality of the interpretation because the sound imagination will allow the performer to choose the suitable movements that will produce the differentiated imagined sounds through the definition of the different musical gestures.

Implications

The creative process aims to resolve problems presented in each new piece and it defines itself cognitively as the formation of new paths, new solutions to the difficulties that come to light in order to reach a final product. Greater experience will generate more subsidies to the performer creative imagination activity, therefore enabling the interpreter to acquire the means for the interpretative construction of the music with a contemporary aesthetics.

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The functional and "non functional" thing in teaching music ¿There's a functional harmony and a non functional one?

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Background

"Individuals elaborate concepts and comparisons, not because they satisfy basic biological needs (not because they serve to eat, as functionalists might argue), but because they satisfy cognitive requirements (they serve to think)" (Gardner, 2011, p. 63). From the moment we are born, we constantly face situations that generate learning, to which we react instinctively or because we recognize them as pleasant or unpleasant. In this process, the concepts of relationship and function are essential to appropriate the necessary knowledge, and thus, understand the processes of things. These two conceptual devices interact in each functional system, which is a set of properties, things or elements, that are related to each other and contribute to a specific objective.

"There are no isolated properties, to put it categorically: all properties belong to some functional system" (Bunge and Ardila, 1988, p. 111). Therefore, both the concept of functional system and the theory of sets, are indispensable instruments and tools for the acquisition of knowledge in any discipline. The relationship between the concept of functional system and musical harmony implies that "musical harmony" is part of a functional musical system with its specific properties, so that harmony will be functional, regardless of the culture to which it belongs.

Aims

By developing the concept of system and its characteristics from the scientific point of view, as well as the concept of functional system, aims to demonstrate what is wrong in the idea of a "functional harmony". This one, like other concepts, are questioned because generate confusion.

Method

Research and historical and current revision of the existing musical literature. Evaluation of teaching practices of the specialty in official and private institutions.

Results

From the understanding of the processes that go from the general to the particular, linked to the functionality of the elements within a musical context, the anachronistic ideas are demystified preventing the development of the analytical and creative thinking of the individual. This work emphasizes conceptualization that has a profound impact on teaching-learning situations.

Conclusions

A functional system is a set of interrelated properties that lead to a particular objective. Therefore, any musical system, whatever the culture to which it belongs, is a functional system with its specific properties. Then, each system is functional and, therefore, all musical system. So, there is not a functional harmony and a non-functional one: it's just Harmony. The sounds, chords and any element of that system interact in the set Harmony, whose properties are functional to that system.

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L9M: Long Talks 9 - Sociology

Time: Friday, 27/Jul/2018: 23:00 - 23:59 · *Location:* Montreal_1

Session Chair: Juan Chattah

Do you like what sounds right?

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Background

The popularity of singing contests attests to the aesthetic draw of the singing voice. Lay and expert listeners of singing performances share similar definitions of “what sounds right” (Larrouy-Maestri et al., 2017) and base their judgements on the combination of specific acoustic features. However, we don’t attend opera to evaluate a performance’s correctness but to enjoy it. Unlike for correctness, little is known about listeners’ preferences and several questions arise: Do listeners share singing preferences for operatic voices? Do listeners prefer what sounds right? What acoustic and musical features inform preference judgments?

Aims

This on-going study investigates what “preference” means when listening to sung performances and explores the roots of such aesthetic experience.

Methods

Thirty-eight participants with various degree of musical expertise (26 women; age: M = 34.45 years old, SD = 16.21) were invited two times. The musical material consisted of nine a cappella versions of the first musical phrase of the “Vocalise” Op.34, No.14 of Sergei Rachmaninoff, performed by highly trained soprano singers.

Participants listened to pairs of clips (each one presented with all the other ones) and selected one version either on the basis of preference, correctness, or typicality (in separate blocks, order randomized). Participants' choices were analyzed using logistic regression to estimate preference, correctness and typicality values for each stimulus for each participant.

Results

Surprisingly, the degree to which participants expressed similar choices was highest for preference judgments ("mean-minus-one" correlation MM1 = 0.78), followed by correctness (MM1 = 0.72), with typicality showing much lower agreement (0.44; difference between questions was significant $\chi2(2) = 40.7$, $p < .001$). This was not simply a result of listeners being more consistent for one judgment type over another, as test-retest reliability (1 week later) did not significantly differ [r(preference) = 0.73, r(correctness) = 0.71, r(typicality) = 0.63; $\chi2(2) = 2.06$, $p = .357$]. In addition to both being relatively shared by listeners, we observed a strong relation between preference and correctness judgments [β(correctness) = .60 and β(typicality) = .16 in a hierarchical linear model predicting preference].

Conclusions

Our findings suggest that despite the subjective nature of preference judgments and lack of a definition of a typical operatic voice, lay listeners build highly shared representations of which operatic voices they prefer. Compared to other aesthetic domains, listeners’ behavior (i.e., agreement) toward operatic voices seems closer to attractiveness judgments of faces than to judgments of visual artworks (Vessel et al., 2014). Finally, while listeners tend to prefer what sounds right, there is variance in preference that is not predicted by correctness. Ongoing analyses seek to understand the degree to which acoustical characteristics predict preferences and to clarify mechanisms behind listeners’ appreciation of singing voices.

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L10M: Long Talks 10 - Structure

Time: Friday, 27/Jul/2018: 23:00 - 23:59 · *Location:* Montreal_2

Linguistic structure and listener characteristics modulate the “speech-to-song illusion”

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Background

The "speech-to-song illusion" (S2S) is a perceptual phenomenon in which a spoken phrase shifts to be heard as sung after a series of repetitions. This transformation indicates a tight link between language and music perception, and has received much attention since its discovery in 1995 (Deutsch 1995). In a previous study, we showed that acoustic characteristics of looped phrases influenced the perceptual shifts (Falk et al 2014). However, it is still unclear whether linguistic (lexical or syntactic) properties of phrases influence S2S. Moreover, listeners themselves are likely to contribute to their experience of the shift. S2S has been observed in musicians and non-musicians, yet musicality itself is likely to increase the likelihood of the reported shift frequency (Falk et al 2014). A further open question concerns individual differences in cognitive processing styles, and if previous language experience may also shape this perceptual phenomenon.

Hypothesis

We hypothesized that the transformation is achieved via functional re-evaluation of prosodic properties: aspects relevant to speech processing dominate the perception initially and diminish during repetitions when underlying rhythmicity comes to light, enabling a melodic re-analysis of the sentence as singing. This general hypothesis allowed for predictions involving both linguistic structure and listener characteristics, e.g. a smaller memory span, longer sentences, sentences with a semantic or syntactic violation were expected to delay the transformation due to higher demands on speech processing.

Method

Two sets of sentence pairs were created in English. The first set contained alternations in the plausibility of lexical constituents (Ducks can fly. vs. Trains can fly). The second set comprised of "garden path" sentences in which prosodic break location influenced the sentence interpretability (While the woman washed (.) the cat (.) purred). Sentence length was varied in terms of the number of syllables (3-14). 40 native English listeners participated in the experiment. They rated each test sentences on a scale from 1 (clearly speech) to 8 (clearly song) before and after being exposed to its massed repetitions. Individual data (autistic traits, auditory working memory capacity, flexibility, divided attention, alertness, self-reported musicality and foreign language proficiency) were collected via an online questionnaire and the TAP battery (Zimmermann and Fimm 2011). The data of 40 non-native listeners (native speakers of the prosodically dissimilar French) are currently being collected.

Results

Preliminary results show that overall, all stimuli sounded significantly more song-like after the exposure to their looped versions. Shorter phrases transformed into song much quicker and more often than longer phrases. Most transformations occurred during the 3rd-5th repetition. The shift occurred earlier, however, for listeners showing worse performance in the divided attention test. These preliminary findings with S2S provide the opportunity to gain insights into the cognitive and structural factors governing the links between music and language.

Prosody, Poetry and Processing: ERP evidence for hierarchical metrical structure in silent reading

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Background

Under the Implicit Prosody Hypothesis, readers generate prosodic structures during silent reading that can direct their real-time interpretations of text (Fodor, 2002). Evidence for the realization of metric structure during silent reading is demonstrated by longer reading times for metrically unpredictable words than predictable ones (Breen & Clifton, 2011), but the cognitive processes underlying metric structure processing in silent reading are unclear.

Aims

The current study was designed to investigate whether metric unpredictability in silent reading is processed similarly to metric unpredictability in listening to speech and music.

Method

We analyzed ERPs from nineteen participants (18 female; 1 nonbinary) who silently read 160 rhyming couplets. We manipulated the lexical stress pattern (strong-weak, weak-strong) and metrical predictability (predictable, unpredictable) of the target word (present in [1-4]) in a 2x2 design. In this way, the first syllable in the target word appeared as: [1] a strong syllable aligned with a strong beat (predictable); [2] a strong syllable aligned with a weak beat (unpredictable); [3] a weak syllable aligned with a weak beat (predictable); [4] a weak syllable aligned with a weak beat (unpredictable). An additional 160 metrically predictable rhyming couplets served as fillers. Each couplet was presented in center-embedded 1-to-4-word segments for 700 ms each; the rhyme prime (peasant in [1,4]) was presented for 1000ms. The target word was presented alone for 1000 ms.

1. Trochaic; Predictable:

There once was a penniless peasant // Who couldn't afford a nice PREsent

2. Trochaic; Unpredictable:

There once was a clever young gent // Who gave to his girl a *PREsent

3. Iambic; Predictable:

There once was a clever young gent // Who had a nice talk to preSENT

4. Iambic; Unpredictable:

There once was a penniless peasant // Who went to his master to *preSENT

Results

Metrically unpredictable trochaic targets (*PREsent in [2]) elicited a negativity between 325 400ms over left and medial-frontocentral scalp regions relative to predictable trochaic targets (PREsent in [1]). Conversely, there was no difference between iambic targets on strong or weak beats.

Conclusions

The larger negativity for the occurrence of a strong syllable on a predicted weak beat is consistent with results from overt listening (Bohn, et al., 2003), demonstrating that consistent metric structure creates temporal expectancies even during silent reading. Moreover, this finding is consistent with music perception results demonstrating larger negativities to metrically unexpected notes (Ladinig, et al., 2009), demonstrating cognitive overlap between hierarchical timing processes in speech and music.

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L9Mcont'd: Long Talks 9 - Sociology cont'd

Time: Saturday, 28/Jul/2018: 0:00 - 1:00 · *Location:* Montreal_1

Film / Music / Narrative: A Multidimensional Mapping Processes

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Background

Music operates at an almost subliminal level during a film, activating sensorimotor reflexes and conveying complex messages that motivate, support, highlight, complement, or even negate other facets of the cinematic experience. To fully understand our response to (or interpretation of) the music and the film, we must trace the logic underlying the perceptual and cognitive processes that elicit musical meaning within film; this requires a holistic approach that navigates through the humanities and sciences alike.

Aims

I advance an analytical framework that (re)frames cross-modal and cross-domain correspondences as metaphorical mappings mediated by image schemas. Because music in film often acts as one agent within a multidimensional mapping that involves the visuals and the narrative, I draw exclusively on the film music repertoire.

Main Contribution

First, I unpack Lakoff & Johnson's (1980) Conceptual Metaphor theory and Johnson's (1987) Image Schema theory. Second, I apply these theories as investigative frameworks to explore multidimensional mappings within film, and survey empirical studies within music cognition that draw parallels between the perception of music and the perception of visual or bodily motion (e.g., Eitan & Granot, 2005) and parallels between the perception of music and the induction of psychophysiological states (e.g., van der Zwaag et al., 2011). Third, I review theoretical and empirical research that seeks to uncover the neural underpinnings of metaphor and schema theories, with particular attention to two strands: one favoring the notion that mental models of concrete domains are recruited as prototypes to build mental models of abstract domains (e.g., Boroditsky & Ramsca, 2002); the other, more biologically grounded strand, arguing that both domains in a metaphor (the abstract and the concrete) share neural substrates as part of a process coined by Anderson (2010) as "neural reuse."

Implication

Overlaying the metaphor and image schema frameworks onto the investigation of cross-modal and cross-domain correspondences within film provides numerous advantages—such approach reveals an (unobserved) implicit directionality of mappings, uncovers the intrinsic qualities of the domains that enable such mappings, expands the relevant body of research to include investigations on the neural underpinnings of metaphor and image schemas, and ultimately serves to lay an experiential foundation upon which broader testable hypotheses may be constructed.

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Stereotypes of Listeners and Producers of Different Music Genres

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Background and **Aims**

Previous research indicates fairly clear stereotypes about the personality and other characteristics of people who listen to certain genres of music (Rentfrow and Gosling, 2003; North and Hargreaves,1999). North and Hargreaves (1999 and 2007) use social identity theory to suggest that music preferences can signal social group membership. Rentfrow, McDonald and Oldmeadow (2009) showed that ethnicity and social class were associated with specific music preferences.

We explored the stereotypes concerning social class and motivation for both listeners and producers of different music genres

Methods

We used the 14 genres that Rentfow and Gosling (2007) suggest as the best level of analysis for understanding how music preferences relate to stereotypes of music listeners. One hundred and twenty participants evaluated listeners of each genre on the degree to which; they belonged to a privileged group, were wealthy, listened to influence other peoples' impressions of them, and intrinsically enjoyed the music. Participants also evaluated writers of each genre on the degree to which they belonged to a privileged group, produced this music primarily to make money, and intrinsically enjoyed the music.

Results

Listeners' wealth and privilege were correlated for all genres so the results for those two questions are presented together. Participants rated wealth and privilege highest for classical music, then jazz, then soundtracks; the lowest ratings were for rap followed by blues, soul, country, folk and heavy metal. Participants evaluated listeners of religious music, then rap, then classical genres as most likely to do so to influence others' impressions of the listener; the lowest ratings were for blues, then folk, then soul music. The highest ratings for intrinsic enjoyment of the music were for classical, rap and religious music; the lowest was for soundtracks.

For music writers, participants rated privilege highest for classical and pop, followed by soundtracks; The lowest ratings were for blues, rap and soul music. Participants rated pop followed by rap highest in terms of motivation for monetary gain and, to a lesser extent, electronic music and soundtracks; the lowest ratings were for blues, folk, jazz, religion, and soul music. Participants rated intrinsic enjoyment of music as highest for writing jazz, followed by blues, classical, rock, soul, and folk music; the lowest rating was for pop music.

Conclusions

Our results for privilege and wealth of listeners mirror previous findings for social class. Classical, rap, and religious music were rated high on both impression management and also intrinsic enjoyment. The relationship between these two ratings may result from tight associations between these three genres and specific social classes. There was no overlap of genres for low ratings on these two measures. For music producers the patterns were the same for privilege but strongly differed on other factors. Pop and soundtracks are associated with greed, pop with low intrinsic enjoyment, but classical with high intrinsic enjoyment. Blues and soul have low rating, though rap has high, ratings for greed. For producers, greed and intrinsic enjoyment seem to be opposing motivations.

L10Mcont'd: Long Talks 10 - Structure cont'd

Time: Saturday, 28/Jul/2018: 0:00 - 1:00 · *Location:* Montreal_2

The Effect of Comparison on Categorizing Musical Excerpts

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Background

While music theorists assume that listeners categorize musical themes using structural features (e.g. pitch, rhythm), previous empirical work find listeners use surface-level features instead (e.g. dynamics, genre) (Lamont & Dibben, 2001; Ziv & Eitan, 2007). Cognitive psychologists distinguish between relational categories (where members share relational/structural features) and entity categories (where members share surface-level features) (Gentner & Kurtz, 2005). In studies with visual stimuli, comparison of co-presented structurally-similar exemplars promote relational category acquisition, influencing participants to categorize based on relational/structural features over surface-level features (Markman & Gentner, 1993).

Aims

We investigate whether comparing structurally-similar musical patterns sways participants to categorize musical patterns using structural features over surface-level ones.

Methods

In study 1, participants (N=60) completed a forced choice triad task. They heard a target musical excerpt, followed by two musical excerpts: one a structural match (shared the same harmonic progression, pitches and/or rhythm with target, but not surface-level features) and one a surface-level match (shared the same ornamentation, texture and/or genre with target, but not structural features). Participants chose which excerpt best went with the target to form a category. 30 participants heard one target excerpt before choosing (no-compare condition), while 30 participants heard and compared two structurally-similar target excerpts before choosing (compare condition). We used a 2x3 between-subjects design where categorization choice (surface-level or structural match) was the dependent variable and musical training and comparison manipulation were between subject-factors. We hypothesized that participants would choose structural matches significantly more often after comparing exemplars. Participants heard three stimuli types over thirteen sets: 18th-century thematic variations, 18th-century contrapuntal excerpts (Gjerdingen, 2007), and 21st/20th-century popular music chord progressions. Variables were controlled differently depending on stimuli (e.g. popular music: target shared harmonic progression with structural match and genre with surface-level match). In study 2, participants heard two target excerpts in both conditions, but only compared excerpts in compare condition.

Results

Participants in the compare condition chose structural matches significantly more than the no-compare condition for all stimuli types. A 2 (no-compare v. compare) x 3 (musician v. casual musician v. non-musician) ANOVA revealed a significant main effect of condition for popular music stimuli ($F=20.36, p<.001, w2=0.24$), thematic variation stimuli ($F=7.79, p<0.01, w2=0.1$), and contrapuntal stimuli ($F=5.71, p<0.05, w2=0.08$). There was no significant effect of musical training nor was the interaction significant.

Conclusions

This study is the first to test auditory relational categories. Results indicate that listeners use relational-processing to categorize music based on structural features. We discuss these results with respect to music-based relational categories, relational (also analogical) processing, and how task influences what features listeners attend to.

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T15G: Short Talks 15 - Health

Time: Saturday, 28/Jul/2018: 7:00 - 8:00 · *Location:* Graz_1

Session Chair: Annemarie Seither-Preisler

Health behaviours, personality and flow in South African undergraduate music students

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Background

Research has shown that South African music students' health behaviours generalize across different socio-cultural contexts (Kreutz et al., 2009; Panebianco-Warrens et al. 2015). The experience of flow has been related to the subjective well-being of music students (Fritz & Avsec 2007), however, little is known of the associations between health behaviours, personality traits and flow.

Aims

The study aims to explore South African undergraduate music students' health behaviours, personality and experiences of flow. A further goal is to discover potential correlations between health behaviors, personality, and flow, and the possible influences of gender, year of study and instrument.

Method

A cross sectional study was conducted involving students from five university music departments across South Africa. A total of 162 (N = 109 w; N = 52 m) participants completed an online survey. The survey consisted of the Health-Promotion Lifestyle Profile scale (HPLP-II), the Flow-Short-Scale (FSS) (Rheinberg et al. 2003), and the BFI-10 ten-item personality inventory (a brief measure of the Big Five inventory, Rammstedt, B. & John, O.P. 2007).

Results

The results show significant correlations between health behaviours, flow and personality. GLM analysis revealed gender as a predictor of health responsibility, nutrition, spiritual growth, interpersonal relations. Gender was also found to be a predictor of personality traits conscientiousness and neuroticism. Year of study, course and number of hours was a predictor of flow and motivation.

Conclusions

These findings emphasize associations between health behaviours, personality and flow in the undergraduate tertiary music student context in South Africa. However, the relationship between these variables is complex. The study provides valuable insight into this population and provides useful evidence to address key curriculum issues in South African institutions.

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How do musicians spend their leisure time? A thematic analysis

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Background

Research in the field of music, health and wellbeing has demonstrated the beneficial effects of music on individuals who do not identify themselves as musicians and amateur musicians who engage in music in moderate amounts (MacDonald, Kreutz, & Mitchell, 2012). Research in the field of music medicine has also demonstrated the negative effects of music on musicians' physical and psychological health and suggested a range of potential coping strategies (Braden, Osborne & Wilson, 2015). Research in the field of leisure studies has shown that optimal use of leisure time, including structured leisure activities such as musical engagement, contributes to improved quality of life and wellbeing (Brajša-Žganec, Merkaš, & Šverko, 2011). It is therefore worth investigating musicians' leisure activities to discover the extent to which music contributes to their wellbeing. Although a small number of studies have looked into musicians' wellbeing (e.g. Croom, 2015) no such research has been undertaken to date.

Aims

The aim of this study was to gain insight into the leisure experiences of musicians. The findings will inform the design of a subsequent large-scale study, a questionnaire survey.

Methods

Ethical approval was sought and granted by the RNCM Research Ethics Committee. Five professional musicians, three from the UK and two from Sri Lanka, and two master's students at the Royal Northern College of Music expecting to pursue a career as professional musicians, aged between 24 and 52 years, took part in face-to-face semi-structured interviews. Interviews with Sri Lankan musicians were conducted and transcribed in Sinhalese which were translated into English before analysis. The English interviews were transcribed verbatim. The transcriptions were analysed thematically.

Results

All participants reported that they do have leisure time or that they make time for leisure as it is important for their wellbeing. The main themes identified were: (1) participants' self-concept as professionals; (2) from a hobby to the choice of career as a professional musician; (3) their perception of leisure and work with three subthemes: (3.1) engaging in musical and non-musical activities for leisure; (3.2) the distinction between leisure and work; (3.3) the overlap between leisure and work; (4) choice of leisure activities and its impact on wellbeing.

Conclusions

The interviews provided initial insights into how musicians spend their leisure time, engaging in musical and non-musical activities for pleasure. They all perceived their chosen leisure activities, musical and otherwise, to have a positive impact on their wellbeing.

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Musical training could compensate for the detrimental effects of noise exposure on speech-in-noise processing abilities

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Background

Musicians are vulnerable to noise-induced hearing loss (NIHL) because of prolonged exposure to loud music on a daily basis. A newly described form of NIHL, 'cochlear synaptopathy', is not detectable by conventional testing, and so many musicians may be affected despite appearing to have normal hearing. Cochlear synaptopathy refers to a loss of connections between inner-ear hair cells and auditory nerves which relay sound signals to the brain (Liberman et al. 2016). This may lead to perceptual difficulties such as difficulty hearing speech in a noisy environment. However, there is also evidence that musical experience may improve auditory attention and working memory, and this may reduce some of the detrimental effects of high noise exposure (Swaminathan et al. 2015).

Aims

The aim of this study was to assess how high levels of noise exposure might impact on hearing perception in early-career musicians and to determine which aspects of the hearing pathway might be affected.

Methods

Fifty-eight early-career musicians (female n = 26; age = 18-26 years) and thirty non-musicians (female n = 19; age = 18-26 years) completed a testing battery to assess auditory functioning including pure-tone audiometry (PTA), extended high frequency audiometry (EHF), distortion product otoacoustic emissions (DPOAEs), and auditory brainstem responses (ABRs). Speech-in-noise processing abilities were assessed using the coordinate response measure (CRM) which requires participants to follow instructions from a target speaker whilst ignoring conflicting information from distracting speakers (maskers). Maskers were presented centrally or spatially offset. A lifetime noise immission rating (NIR) was obtained by structured interview, which was used to classify participants into low and high noise exposure groups.

Results

The total NIR did not differ between musicians and non-musicians in either low or high noise exposure groups. There were no effects of musicianship or noise exposure on PTA, EHF, or DPOAEs. However, there was a significant interaction between musicianship and noise exposure on CRM performance [$F(1, 71) = 8.733$, $p = .004$] . For all participants, performance was improved for spatially offset maskers compared to central, but non-musicians with high noise exposure showed significantly less improvement for spatially offset maskers compared to non-musicians with low noise exposure and musicians with high and low noise exposure (all $p < .05$). In addition, total NIRs were correlated with the amount of improvement for spatially offset maskers (i.e. higher noise exposure = less improvement in spatially offset conditions) for non-musicians only. There were only very modest (non-significant) effects of musicianship or noise exposure on auditory nerve function as assessed by the ABR.

Conclusions

High levels of noise exposure could impact on speech-in-noise processing, but musical experience may help to negate these perceptual effects through enhanced auditory cognitive processing abilities. However, there is little evidence that noise exposure produces large deficits in auditory nerve function consistent with cochlear synaptopathy, and so poorer speech-in-noise processing is likely due to an alternative mechanism.

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T16G: Short Talks 16 - Improvisation

Time: Saturday, 28/Jul/2018: 7:00 - 8:00 · *Location:* Graz_2
Session Chair: John Anthony Sloboda

Visual Signals between Improvisers Indicate Attention rather than Intentions

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Background

Music performance is an inherently creative task requiring either interpretation of a score or improvisation of new material. During ensemble performance, creativity is distributed across group members as they combine their efforts to produce a cohesive performance. There has been some debate in the literature over the nature of the interpersonal interactions that take place during these task – when is explicit communication needed to coordinate individual intentions, and when does coordination unfold autonomously through a dynamical exchange of low-level sensory information? We study musicians' body movements and eye gaze patterns as they perform collaboratively in duos, either improvising or rehearsing from a score. Both tasks require cognitive flexibility and a willingness to accommodate variability in others' playing; however, the types of variability that should be expected are different (e.g., greater temporal variability is expected during performance of Western classical music than during jazz improvisation). The communication strategies that performers draw on may differ as a result.

Aims

This study tested the hypothesis that visual signals serve a primarily social function during jazz improvisation, helping performers monitor each other's attention. Gaze patterns were expected to relate to leader/follower roles and the turn-taking structure of improvised performances. During rehearsal of notated music, visual signals were expected to serve a similar social function, but to contribute to temporal coordination as well.

Method

Twenty pairs of classical musicians (playing clarinet or piano) and three pairs of jazz musicians (playing various instruments) rehearsed a new duet piece or performed a set of improvisations. Optical motion capture and mobile eye tracking were used to record their upper body and instrument movements and their eye gaze patterns. Eye gaze coordinates were then mathematically mapped to the motion capture space to allow automatic calculation of when and how often performers looked towards each other.

Results

Preliminary results suggest that jazz musicians rely minimally on visual signals to coordinate their improvisations. Performers look at each other often (compared to musicians performing from a score), but their glances do not relate to the structure of the improvisation. In contrast, classical musicians performing from a score exchange glances at predictable points in the performance. Their gaze patterns also reflect fluctuating leader/follower relationships. Analysis of performers' head and upper body movements (still ongoing) are expected to show that performers' movements are mutually influential.

Conclusions

Our findings show that visual communication is used to communicate attention and engagement during music ensemble performance, particularly during performance of notated music, when performers' glances towards each other occur at predictable points in the piece. Musicians tend to glance at each other's faces rather than bodies/instruments, suggesting that most glances serve a social function. Research on ensemble performance has already shown how performers monitor (and accommodate) each other's sound output; this study is expected to show how ensemble members monitor each other's participation in the interaction.

Acknowledgements

Funding for this work was provided by Austrian Science Fund (FWF) grant P29427 and European Research Council (ERC) grant 670035, project ``Con Espressione''.

Free collective improvisation and transindividuation

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Background

Free collective improvisation requires that performers play something together that is not determined in advance. Rather, it has to be co-created on the spot. In other words, the shape of the music has to be actively co-constructed and co-regulated in the very moment of the unfolding performance. Classical explanatory schemes in cognitive sciences generally explain behavioral performances in terms of the individual mental processes that underlie them. However, the very fact that free collective improvisations have to rely on actual bodily performances as well as on interactions between musicians lacks in this picture.

Aims

To account for the real-time, interactive creativity that can be observed in the course of free collective improvisations, I propose an enactive and dynamical account of collective creativity. I describe a three-fold process of participatory sense-making (De Jaegher & di Paolo, 2007) that leads to what I coin as « transindividual aesthetics », borrowing a concept from Simondon (1989).

Main Contribution

By transindividual aesthetics, I designate :

the emergence of an aesthetic outcome that cannot be reduced to the mere sum of individual contributions, thanks to the dynamics of interactions themselves

the transformation of individual creativity by the dynamics of the interaction process, so that individual players enact behavioral patterns that were absent from their previous repertoire (that is, they wouldn't have enacted these patterns outside of the context of interaction)

The co-regulation of the dynamics of interaction by the performers which leads to creative processes and outcomes that are proper to the ongoing collective meeting.

To illustrate, I will show exemples drawn from dyadic improvisations performed in a pedagogical context by children with their teacher (Laroche & Kaddouch, 2014).

Implications

Overall, improvising together brings forth a peculiar form of aesthetics that is based on the intersubjective processes themselves. In this process, the musical outcome is co-individuated by the performers and gets an autonomy on it own, and it individuates the performers in return by transforming their autonomous dynamics ; this is why collective improvisations are a paradigmatic case of the process trans-individuation. By using this paradigmatic case, I aim at bringing together the enactive and dynamical views in cognitive sciences on the one hand, and the philosophy of Simondon on the other hand.

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Does the Primary Motor Cortex Contribute to Musical Creativity? A tDCS Study

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Background

Research on musical improvisation has identified key brain regions that underpin musical creativity, including the dorsolateral prefrontal cortex (DLFPC) and the ventro-medial prefrontal cortex (vMPFC) (Limb & Braun, 2008; Bengtsson, Csıkszentmihalyi & Ullén, 2007). The DLPFC mediates attention, working memory, and organisation; the vMPFC mediates mind wandering and mental simulation. Other research has examined high-level motor areas, including the pre-supplementary motor area and pre-motor cortex (Bashwiner, Wertz, Flores & Jung, 2016; Sosnik, Flash, Sterkin, Hauptmann & Karni, 2014). However, the role of the primary motor cortex (M1 region) has never been examined. The M1 region mediates dexterity, orientation, and velocity of the hand (Sosnik et al., 2014).

Aims

To investigate the role of the M1 region on creativity and technical fluency in music improvisation, and to assess the interrelation between creativity and technical fluency. Creativity is defined as an idea that is novel and appropriate. Technical fluency involves the attainment of fine motor skills that are harnessed through regimented practice.

Methods

Transcranial direct current stimulation (tDCS) was used to excite or inhibit the left M1 whilst jazz pianists performed right-handed improvisations. 16 jazz pianists performed ten novel jazz piano improvisations in a two-block design (baseline and tDCS). There were two tDCS groups: one received excitatory tDCS (anode left M1/cathode right M1) and the other received inhibitory tDCS (cathode left M1/anode right M1). Two expert adjudicators rated all performances for creativity and technical fluency. We hypothesised that excitatory tDCS would enhance both creativity and technical fluency relative to inhibitory tDCS.

Results

For the first eight participants (one adjudicator) excitatory tDCS enhanced technical fluency ($p=.05$) and a trend was observed for creativity ($p=.07$) relative to inhibitory tDCS. Creativity and technical fluency were strongly correlated, $r(78)=.765$, $p<.001$. Data from a complete sample (16 pianists) and two expert-musician adjudicators will be presented at the conference.

Conclusions

In light of the current understandings of the neural mechanisms that mediate creative improvisations, the results from the current study suggests that the M1 region does contribute to creative and technically fluent improvisations. This study adds to the complex brain networks that drives creativity in a musical context.

References

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T17G: Short Talks 17 - Perception

Time: Saturday, 28/Jul/2018: 7:00 - 8:00 · *Location:* Graz_3

Session Chair: Jonna K. Vuoskoski

An information theoretic characterisation of neural predictive coding in rhythm perception

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Background

Rhythmic perception appears to be grounded in prediction (Vuust, Ostergaard, Pallesen, Bailey, & Roepstorff, 2009). The brain's goal is to minimize the surprise (or prediction error) induced by an event stimulus to attain temporally precise predictions (Vuust & Witek, 2014). This view is now supported by plenty of empirical evidence. What is less known is whether predictive coding is affected by the information properties of temporal stimuli - here, the amount of information content.

Aims

Our study explores this question with EEG by investigating how an entropy metric derived from information theory (Shannon, 1949) modulates the neural predictive responses to rhythmic sound sequences. Specifically, we investigate how a neural signature of prediction error, the auditory Mismatch Negativity (MMN) (Näätänen, Gaillard, & Mäntysalo, 1978), changes as a function of entropy.

Methods

Seventeen right-handed volunteers (11 females) participated in the study. During EEG participants sat in a sound-attenuated booth in front a monitor. Sequences consisted of equitone rhythms of 5 beats, presented in 3 oddball recording sessions. In each session, participants were presented with continuously repeating standard rhythms of given information content (isochronous, low-content, or high-content) with rare changes in timing of the fourth beat. In the meanwhile, the subjects were watching a self-selected subtitled movie. EEG data were pre-processed according to standard procedures, so to obtain 500 ms epochs (-100 to 400 ms from the stimulus onset). First, we used an RM-ANOVA to test the presence of the MMN. Then, we used linear-mixed effect models to explore the effects of entropy on MMN amplitude and latency.

Results

Our results show that time-deviant sounds generated a neural error response which is consistent in timing and scalp topography with the mismatch negativity (MMN). Critically, we observed a decrease in the magnitude of the error signal as a function of entropy.

Conclusions

Our results demonstrate the sensitivity of predictive timing processes to the information content of temporal stimuli. The weaker response associated to high-information content stimuli is in agreement with the precision weighting hypothesis of predictive coding (PC) (Heilbron & Chait, 2017). In PC, regular signals are up-weighted and prioritized (over irregular signals) for further processing. In turn, this can explain the privileged perceptual status for metronomically organized stimuli.

References

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Relationships between musical imagery and musical listening in everyday life: An experience sampling study.

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Background

Imagining music or hearing it in the 'inner mind' is a frequently occurring phenomenon for people with and without formal musical training. Recent and frequent exposure to music does increase the likelihood of involuntary musical imagery, whilst voluntary musical imagery is a skill developed alongside active musical training. Trait and state characteristics may influence the proneness to involuntary musical imagery (INMI) (Wammes & Baruss, 2009). Nevertheless, INMI especially seems to be a consequence of training through everyday music listening (and playing), implying that INMI may reflect the ways an individual chooses to listen to music and the functions that music plays for an individual.

Aims

This study aimed to explore the hypothesis that INMI is highly influenced by music listening habits. This influence may concern the context in which music is heard, the genre of music, and particular situation in which the individual would want listen to music.

Methods

An Experience Sampling Method (ESM) was used, asking participants 6 times a day to fill in an online form for 6 days in a row. During the first three days, the participants followed their normal routines without any particular instruction apart from responding to the alerts. In the second three days, participants were asked to refrain from music listening. Music listening was monitored through the Last FM 'scrobbler' software. Nineteen participants completed the study.

Results

First results showed that on average participants reported voluntary or involuntary musical imagery 35% of the time. They reported listening to music in a smaller proportion of individual reports (27%). The number of reports including musical imagery varied as can be expected considerably across participants from 3.8% of the reports to 78%. Reports of listening to music varied equally strongly, if not even stronger from a small proportion of 3.3% to a very large proportion of 81%. There was no reliable correlation between the frequency of musical imagery and musical listening reports. Participants frequently experienced the musical imagery as 'somewhat' entertaining, changing their mood, helping to pass time, helping to socialise, helping to evoke emotions. It was also perceived as an accompaniment to activities. Not surprisingly, the effect of music listening was stronger with more participants responding 'very much so' instead of 'somewhat' when indicating whether the music listening is entertaining, changing their mood, helping to pass time, etcetera. Both the musical imagery and the music listening made participants most frequently feel alert and happy. The degree to which this happened was again slightly stronger for music listening than musical imagery, but the effect of musical imagery seemed otherwise comparable.

Conclusions

As this study is in progress, further analysis will look at the specific relationship between individual's INMI experiences and the music listening habits, and examine the effect of 'abstaining' from music listening. The first results confirm a close correspondence between the functionality of INMI and music listening.

References

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Hardware Guitar Amplifier Sounds vs. Simulation by the Kemper Profiling Amp: Discernibility of Sound Sources

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Empirical Background

The technical means of special software to simulate expensive hardware have evolved over the last decades. Computer programs like Cubase enable users to produce music using sample libraries so that no real music instrument, musician or recording studio is required. In a previous study, we could show that non-expert listeners were not able to discriminate a recording of a live orchestra from one based on a high quality sample library, whereas experts showed a higher discrimination ability.

For about 20 years, modelling amplifiers (e.g., POD by Line 6) have been able to emulate the sound of a particular hardware guitar amplifier. However, differences between the original amp and the resulting model are still substantial. The Kemper Profiling Amp [KPA], developed in 2011 by the German company Kemper, uses a new approach to overcome these limitations by providing a device that is able to analyze the sound characteristics of a particular system and to produce a simulation that is supposedly “so close that you won’t be able to distinguish [it] from the original” (Kemper GmbH, 2017).

Aims

The aim of this study is to determine the simulation quality of the KPA compared to the sound of two original amplifiers. We want to quantify the overall degree of discrimination between both sound sources and hypothesize that there will be differences between (a) subgroups of different levels of musical sophistication, and (b) non-electric-guitar-players, amateur electric-guitar-players, and professional electric-guitar-players.

Method

Six musical examples differing in musical style were professionally recorded, each under both of the different recording conditions (via the original amp and via the profile using the KPA).

For the evaluation, a Signal Detection Paradigm and an online experiment are used. Participants are mostly (semi-)professional electric guitarists as well as others with presumably high sound discrimination skills (e.g., audio engineers). After explaining the features of the KPA and training audio examples, 14 stimuli are presented in random order including retests of two examples. Participants decide whether the example was produced using an original amp or via the KPA. Additionally, the quality of the audio equipment used by the participant is tested using an objective method. The Gold-MSI is used to determine the musical sophistication degree of each participant. Finally, the participants’ sociodemographic background and expertise concerning electric guitars and the KPA are surveyed.

Results

The online survey is currently running, and the data collection will be completed in February 2018.

Conclusions

To determine the quality with which the KPA can simulate the sound of an original amplifier is very important for professional electric guitarists and modern music production. The investigated device is already widely used by experts but also considered to have deficits. Our study will contribute to an objective discussion of the potential and limitations of modern digital music production in popular music.

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T18G: Short Talks 18 - Choral singing

Time: Saturday, 28/Jul/2018: 7:00 - 8:00 · *Location:* Graz_4

Session Chair: Birgitta Burger

The magic touch? The effect of physical contact on interpersonal physiological coupling during singing.

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Background

A large body of depictions originating between the 14th and 17th century show ensembles maintaining close physical contact while singing. These depictions, in the absence of supporting written evidence, raise the question of whether this was a genuine historical practice and if so what purpose it may have had. While one practical reason could simply have been the necessity for close proximity in order to read out of a single note-stand, another may have been the recognition of potential benefits of tactile stimulation on action coordination. Such benefits have been seen in a variety of contexts (e.g. Sofianidis, Hatzitaki, Grouios, Johannsen & Wing, 2012) and we hypothesized that similar benefits in a singing context may be evidenced by increased coupling of physiological responses.

Aims

To examine whether physical contact during singing increases interpersonal physiological coupling over and above that made possible through the joint action of singing.

Method

Respiratory activity and heart rate variability (HRV) were recorded from a choir of 8 professional singers while they performed (three pieces of approximately 6 minutes each) in three standing positions. In the Touch-Close condition (TC), singers stood in two rows of four with their arms around each other. In the No-touch-Close (NTC) condition, they stood in two rows of four (as in the TC condition) but without any physical contact. Finally, in the No-Touch-Far (NTF) condition, the singers adopted a typical contemporary arrangement of forming a semicircle with no physical contact. Within-subject ANOVAs were used to examine the effects of this manipulation on interpersonal synchrony which, in turn, was calculated as the relative number of phase-locked points lying in a specific range (the Absolute Coupling Index: Müller & Lindenberger, 2011).

Results

We observed a significant increase of respiration and HRV coupling during singing compared with rest, replicating Müller & Lindenberger (2011). However most importantly, we also showed greater coupling in the TC condition compared to the NTC condition in line with our main prediction, although this effect was limited to respiratory activity.

Conclusions

Our results support the notion that singing with close physical contact results in greater interpersonal coupling than singing without such contact. In doing so, it expands evidence of the beneficial effect of tactile stimulation on action coordination to the music-making domain and informs research in biological psychology and music pedagogy. Finally, our study provides an example of how utilization of empirical methods can help gain some insight into open historical questions. Further analysis will examine the extent to which the touch-induced increase in physiological coupling revealed here is associated with a higher quality output during singing.

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Synchronization in singing ensembles: Do performed asynchronies bear a relationship to the synchrony that listeners with a variety of levels of musical experience can perceive?

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Background

Synchronization between musicians in ensembles is a complex phenomenon. Empirical investigations show that synchrony is maintained through micro-timing adjustments (Keller, 2014) that might be affected by the visual contact between musicians, group roles such as leader-follower relationships, and the growing level of expertise achieved during rehearsals. Perceptual studies also suggest that listeners might be sensitive to the degree of synchrony between musicians and that the perceptibility of the synchronization might depend on the level of music training of the listener (Repp, 2010). Whether the performed asynchronies are directly related to the asynchronies that listeners perceive remains mostly unclear.

Aims

The main objective of this study is to observe whether the effects of manipulated visual contact, group roles and degree of rehearsal on the synchronization recorded in vocal groups is perceived by listeners with different levels of music expertise.

Methods

60 listeners took part in the experiment, grouped as non-experts (i.e. little or no music training), experts (i.e. highly trained music students), and performers (i.e. singers who performed the pieces). Two sets of ensemble performances were used for the study. One included a total of 48 performance snippets by 12 singing duos, who sang a two-part piece under four conditions: with and without visual contact, and with a designated leader or follower. Each snippet was approximately 1 sec long and extracted from the onset of each recording. The other set comprised 20 recordings, approximately 40 secs long, of two five-part pieces, performed by a newly-formed singing quintet before and after 5 rehearsal sessions. Participants listened to each recording and judged the level of “togetherness” and to what extent they heard the role of leader(s) in the performance, on a continuous sliding scale from 0 to 100. The order of recordings was randomised for each counterbalanced question. Physical measures of the recordings were precision and consistency of synchronization, and tendency to precede-lag note performance, extracted from note beginnings and endings of electrolaryngography and audio recordings. Physical measures (i.e. recorded levels) and subjective measures (i.e. listener perceptions) of synchrony were compared.

Results

The analysis of the physical measures show a significant increase in the precision of synchrony over the course of study and with visual contact between singers, and complex patterns of leader-follower relationship, rather than a distinct division of roles. Data collection from the listening test is underway. We hypothesize that people perceive differences in asynchrony and that discrimination is better for performers, compared with experts and non-experts. Finally, we conjecture that patterns of leader-follower relationships highlighted by the performed asynchronies are closely reflected in the perception of synchrony from performers.

Conclusions

Improving understanding of the role of synchronization in ensembles provides insights for musicians to develop strategies to employ in performance.

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How do conductors shape the way choirs sing in rehearsals? The role of co-construction behaviours and interruptive feedback'

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Background

Studies of choral conductors have previously examined the gestures used to shape an ensemble's concurrent music (e.g. Daugherty & Brunkan, 2013), but often consider the movements in isolation from the ongoing rehearsal (although there are exceptions e.g. Poggi, 2011). In Conversation Analysis (CA) research, the term 'co-construction' refers to the collaborative production by two or more people of some verbal or non-verbal aspect of interaction e.g. a jointly produced word or sentence (e.g. Lerner, 1996).

Aims

This study aims to place some of the previously-researched conducting gestures in the context of choir rehearsal interaction, by looking at how they become part of the co-constructed shaping of the music by choir and conductor, as well as how the co-construction is formed and broken by the conductor and choir.

Methods

Choir rehearsals were videoed with nine conductors (two female) of varying expertise, all from a Western classical background, and each conductor took part in a semi-structured interview following their rehearsal. Choirs varied in size and proficiency. Conversation Analysis was used to examine the video data. CA focuses on the sequential organisation of verbal and non-verbal communication in interactions, meaning that gestures and talk can be considered in context. This allows for better understanding of their use at specific points and within certain activities.

Results

Analysis of the rehearsal data suggests that choirs and conductors co-construct the music together as one party, through a near-simultaneous, ongoing exchange of information. CA examines the way conductors set up and begin the co-construction before the choir sing (e.g. through gaze), and then break it off after they finish (e.g. by turning away). During singing, conductors' co-construction behaviours include verbal feedback and instructions, and non-verbal body language including posture, gesture, expression and gaze. These behaviours are used to constantly respond to and influence the choirs' singing. Comments made in the interviews supported the findings: one conductor described the choir and conductor as 'inextricably linked', and the music as 'this massive thing of clay and everyone's got their hands on it'.

Conclusions

Choirs and conductors work together to co-construct music during rehearsals. Conductors use their bodies, faces, gaze, and (less commonly) verbal instructions to influence sound during singing. The findings add to our knowledge of how choir rehearsals function as a unique form of interaction.

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T21G: Short Talks 21- Therapy and Preference

Time: Saturday, 28/Jul/2018: 8:30 - 10:30 · *Location:* Graz_1

Session Chair: Joshua Albrecht

The effect of a music intervantion during caesaren sections on anxiety and stress of the expectant mother

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Background

Stress and anxiety during pregnancy and birth have detrimental effects on mother and child. Studies have shown that music in medical settings can have a positive and soothing influence. However, data for music during caesarean sections is sparse and inconclusive.

Aims

The aim of the present study is to systematically examine the anxiolytic effect of a music intervention during the caesarean section in the wake patient.

Method

The German SAMBA trial is a monocentric, prospective, controlled and randomized study. Patients in the intervention group listened to music after selecting one out of four genres via speakers during caesarean section in regional anesthesia. At admission, at skin incision, at skin closure and two hours after completion of surgery different subjective (STAI-State, visual analogue scale for anxiety (VAS-A)) and objective parameters (salivary cortisol/amylase, heart rate, blood pressure) were measured.

Results

304 patients (154 in the intervention group and 150 in the control group) participated in the SAMBA trial. At skin closure patients in the intervention group had significantly lower STAI-State and VAS-A values compared to the control group. Two hours after surgery VAS-A was still significantly lower. Objective parameters showed a significantly lower increase in salivary cortisol from admission to skin suture as well as lower systolic blood pressure and heart frequency at skin closure in the intervention group compared to the control group.

Conclusions

Music during caesarean section is an easy to implement, effective tool in order to reduce stress and anxiety of the expectant mother.

Musically induced archetypal imagery in Guided Imagery and Music therapy (GIM)

Helena Dukic[1], Richard Parncutt[1], Leslie Bunt[2]

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Background

Jung proposed two opposing archetypal systems that govern human behaviour: Eros (emotional, imaginative, enveloping, passive) and Logos (rational, critical, reasonable, active), and 9 archetypal characters, each containing Eros or Logos traits or both. These archetypes were later applied to narrative forms by Campbell (1949). Newcombe (1992) and Almen (2003) used Jung's theory to assign semiotic meaning to musical elements in music analysis. However, their analysis did not take into consideration the listener's experience. GIM therapy does: clients experience imagery that appears to be evoked by music and has a narrative structure related to music's temporal structure (Bonny, 1995).

Aims

We investigated musical meaning by analysing the discourse of GIM participants during Bonny's 'Nurturing' programme, and comparing content with a collection of randomly selected myths from different cultures.

Method

Elicited imagery (emotions, social and physical situations) collected during 23 GIM sessions featuring the 'Nurturing' programme (7 compositions) was recorded, transcribed and categorised by 5 coders into 7 sub-categories, each belonging to either Jung's Eros (Flora, Fauna, Feelings) or contrasting Logos (Events, Structures, Actions) principle. The 7th category (Characters) contained both Eros and Logos traits. The same categorisation was applied to 23 randomly selected fairy-tales from different cultures (control group). Imagery in the sessions was expected to be of Eros quality because of the nurturing intentions for the programme.

Results

However, results showed that the imagery categories of Structures, Flora, Fauna and Feelings were selected significantly more often in the music group compared to the control group. Events, Actions and Characters were selected significantly less often in the music group compared to the control group. The dominant categories of Structures, Flora, Fauna and Feelings are plot-static; they do not generate active relationships between characters.

Conclusion

This suggests that music of this type has the psychological function of creating an emotional-scenic background, but does not drive the narrative plot.

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Effects of externalized preferred music on the brain's name-discrimination response

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Background

Normally, sounds we hear are located in the space around us. Real-world sound sources are acoustically filtered by the head and torso of the listener and by the reverberation producing variations in interaural cues across time. Headphone listening is not subject to these effects and gives the impression that the sound originates from within the head (it is "internalized"). Enhanced auditory quality, through addition of the acoustic filters present for outside-the-head sounds ("externalization") leads to a deeper meaning associated with the stimuli and an increased level of presence, emotion, and spatial perception (Brinkman, Hoekstra, & Egmond, 2015). Surprisingly little is known about the impact of auditory externalization on brain processes. Furthermore, how the effects of externalisation translate to acoustic stimuli with autobiographical context, personal relevance and emotion, such as preferred music remains unknown. The use of autobiographical stimuli are especially important in neurological pathology, like Disorders of Consciousness (DOC; patients showing no or limited signs of consciousness) where these stimuli lead to improved diagnostic accuracy. For example, the use of preferred music has shown effects on behavioral (Heine et al., 2017) and neuroimaging (Edlow et al., 2017; Heine et al., 2015) assessments due to temporary improvements of cognitive function. Enhanced realism created through sound-externalization is expected to improve attentional brain-processes both in healthy subjects as well as patients with DOC.

Aims

To study the effects of acoustic externalization of preferred music on cerebral processing in both healthy subjects and patients with DOC.

Method

Hd-EEG ERP analysis of the own-name paradigm (Perrin, Garcia-Larrea, Mauguire, & Bastuji, 1999) following four contexts: externalized preferred music, internalized preferred music, externalized neutral sound and internalized neutral sound.

Results

Both externalized, as well as internalized conditions show the classic P3 component after the own name. Further stimulus discrimination can be observed in the externalized condition through early differences between the own-name and other name. Moreover, own-name versus other-name discrimination is more often seen in the externalized condition on an individual level. In addition, effects on treatment of non-salient stimuli can be observed in the externalized condition in healthy subjects, but not in patients with DOC.

Conclusions

More realistic (externalized) quality of sounds causes enhanced discrimination of salient (own-name) versus non-salient (other-names) conditions and enhances attention to non salient stimuli. Translation of these findings into clinical practice might improve sensitivity of diagnostic assessment.

"For The Times They Are A-Changin'": Lifespan Developments in Preferred Musical Performance Tempo

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Background

Controlled laboratory experiments have shown that preferred tempo when tapping spontaneously or when listening to monotone sound sequences decreases over the lifespan and that a wider range of tapping tempos can be performed by 39-59-year-olds compared to older or younger individuals (McAuley et al., 2006). These findings led to the preferred period hypothesis and entrainment region hypothesis, respectively, ascribing these effects to age-related changes in internal oscillators. The conjectured biological basis suggests that age-related slowing should generalize to expert music performance where tempo choice is often attributed to aesthetic preferences or eccentric whims (Bazzana 2005).

Indeed, both absolute durations of movements and standard deviations of durations increased dramatically between Glenn Gould's famous recordings of J.S. Bach's Goldberg Variations as 22-year-old in 1955 and as 48-year-old in 1981 ($Z = -3.16$, $p = .001$). In 1980, Gould considered his first recording "too fast for comfort" (Bazzana 2005) and could "no longer recognize the person who did that" (Roberts, 1999). In addition to Gould's eccentric personality (Bazzana 2005) and general decreases in performance tempo since the emergence of recording technology, lifespan changes in biological event-tracking mechanisms offer a promising competing explanation.

Aims

This project tests whether mean performance tempo decreases with age and whether tempo variability follows an inverted U-shape over the course of expert pianists' lifespan, as predicted by the preferred period and entrainment region hypotheses.

Methods

For the final sample, beat-per-minute (BPM) values were recorded through manual tapping of ~800 recordings of 28 Chopin mazurkas. For the preliminary sample of 262 recordings, BPM values were available through the Center for the History and Analysis of Recorded Music (CHARM) "Mazurka Project". Multiple regression was conducted on the normalized means and standard deviations of BPM with performer age and recording year as predictors.

Results

Preliminary analysis of 234 recordings shows that age explains unique variance in tempo decrease, not accounted for by recording year, $F(1,231)=4.97$, $p =.027$. Moreover, the use of rubato decreases over a performer's lifespan when controlling for historical performance changes, $F(1,231)=16.71$, $p<.001$, but there was no evidence that an inverted U-shaped curve fits better than linear decrease. Analysis of the full sample is in progress.

Conclusions

The preliminary results suggest that age-related slowing in internal oscillators may subconsciously affect performance decisions in expert musicians. When combined with a strong apprenticeship model where tempo preferences are passed on from older mentors to younger pupils (Cook, 2007), this may explain historical declines in performance tempo of classical music during the 20th century.

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Music in the body: How does music listening influence the reality of pain? A scoping review.

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Background

While meta-analyses demonstrate the effectiveness of music listening interventions (MLI), it is not yet clear how the positive effects of music listening interventions are mediated (Bradt, Dileo, Magill, & Teague, 2016; Cepeda, Carr, Lau, & Alvarez, 2006). The absence of defined cognitive mechanisms coincides with inconsistencies in terms of how MLIs are delivered (with wide variability in terms of duration, frequency, style, genre, and sound quality) and in terms of how they are evaluated.

Aims

The primary objective of this scoping review is to explore the reported cognitive mechanisms underpinning the pain reducing properties of music listening interventions.

Main Contribution

A scoping review protocol (Howlin, Guerin, Rooney, In press) was designed using the principles from the Arksey and O'Malley (2005) framework, adapted by Levac (2010), and registered on the PROSPERO database. The protocol includes decisions about the search strategy, inclusion/exclusion criteria, article selection process, data extraction and data synthesis. Seventy-Six articles were included, spanning a time range from 2006 to 2017 from both laboratory and healthcare contexts. Using thematic synthesis, primary themes that emerged were distraction, direct impact on emotion, relaxation, perceived control, direct physiological responses alongside irritation, and music listening setting. Secondary themes within these categories included, cognitive engagement, affective engagement, personal memories, imagination, maintenance of self-identity, changing the meaning of pain experience, enjoyment, interruptions, and holism, amongst others. Together these themes help to identify the primary features that may facilitate optimal cognitive and affective engagement with a music listening intervention. For example, in a clinical context it seems that some patients are interrupted in their music listening experience, which would likely interrupt their music engagement, and potentially undermine their perceived control of their environment. The impact of environment is particularly important given the disparity in results between lab and hospital based studies, despite patient preferred music regularly being chosen in both settings. Results are discussed in line with the BRECVEMA unified theory of musical emotion, and the dynamic nature of music listening experiences as opposed to 'emotional induction' (Juslin, 2013).

Implication

The review has helped to identify differences between the underlying theoretical frameworks of music listening studies, which in turn shape how the studies are designed and how the music listening experience operationalised. Considering the wide range and sometimes opposing frameworks underlying MLI studies in pain contexts, it is unsurprising that such wide variability is seen in the results. This review helps to generate testable hypotheses to further define the underlying cognitive mechanisms of MLIs, and also to highlight theoretical issues when designing an MLI for clinical contexts.

T22G: Short Talks 22 - Rhythm

Time: Saturday, 28/Jul/2018: 8:30 - 10:30 · *Location:* Graz_2
Session Chair: Jan Stupacher

Pupillometry of Groove

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Background

Why does music make us want to move? Groove is defined as the quality of music that induces a subjective sense of wanting to move. Several studies have demonstrated that perceptual ratings of groove are highly consistent across listeners (Janata, Tomic, & Haberman, 2012; Madison, 2006). On a neural level, imaging studies have demonstrated that rhythmic music engages not only auditory but also motor pathways (Grahn & Brett, 2007).

Aims

We aim to determine whether neural sensitivity to groove can be detected in peripheral physiology (absent actual movement), and thus provide an objective measure of how we react to rhythm in music.

Methods

We do this in a series of psychophysiological experiments examining the pupillary response of listeners hearing (1) excerpts of real music varying in groove, and (2) drum loops varied in bass frequency content and syncopation. All stimuli were controlled for tempo and loudness.

Results

We demonstrate pupillary sensitivity to groove in music, showing that music perceived as high in groove stimulates greater dilation than music perceived as low in groove. We also demonstrate pupillary sensitivity to bass frequency content and syncopation. Linear mixed models designed to predict pupil dilation in these experiments show significant interactions with listener sex for all manipulated factors: groove, bass frequency content and syncopation.

Conclusion

These findings provide evidence that peripheral physiological reactions can provide an objective measure of the link between movement and music in our species. Applying the techniques developed here in other species should allow us to determine whether they exhibit similar sensitivities, thus providing insight into the biological foundations of music.

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Style preference and familiarity affect the groove experience of individuals listening to Western popular music drum patterns

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Background

Groove has been defined as a pleasurable urge to move one's body in synchrony with the rhythm of music. Groove has been recognized as an important reason why listeners engage with music on a daily basis (in dance, sports, work, and ritual). The musical factors that contribute to the groove experience are still largely unknown. Past research has found that rhythmic syncopation, event density, beat salience, and rhythmic variability are positively related to groove [1-5].

Aims

This explorative study investigates the groove effect of 250 reconstructed drum patterns from different popular music styles (pop, rock, funk, heavy metal, rock & roll, rap, soul, R&B, jazz). It aims at identifying factors that are relevant for groove and that are worth investigating in a controlled setting in the future.

Methods

Drum patterns of eight bars duration, chosen from 250 popular music tracks, have been transcribed (including dynamics and microtiming) by expert musicians and faithful audio reconstructions have been created on a MIDI/sample basis. During an online listening experiment, 682 participants rated the reconstructions a total of 8,329 times using a reliable 3-item groove questionnaire (Cronbach's α=0.81).

Results

Results show that syncopation (R^2=0.010, p<0.001) and event density (R^2=0.011, p<0.001) were each positively associated with the groove ratings; beat salience (p=0.804) and rhythmic variability (p=0.338) showed no effect. Listeners' familiarity with a drum pattern (their impression that they know the song) was positively associated with the groove ratings (η^2=0.051, p<0.001). The largest isolated effect was measured for listeners' style preference (R^2=0.123, p<0.001): groove ratings tended to be high if listeners had the impression that the drum pattern belonged to a style they liked. Combined, the participant-related effects of style preference and familiarity (R^2=0.152, p<0.001) exceeded the effect sizes of either syncopation or event density by a factor of 15.

Conclusions

We conclude that taste and musical biography have a strong moderating effect on listeners' groove experience. This suggests that groove research should expand its focus: in addition to studying the music, we should also study the people who listen to it.

References

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The Effect of Tempo on Non-Isochronous Subdivisions in Performed Samba Groove

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Background

Several empirical studies have investigated the role of tempo on the characteristic non-isochronous long–short duration pattern on eight note level in jazz. Friberg and Sundström (1997) found an approximately linear decrease of swing ratio with increasing tempo and suggest a lower limit to the duration of the short second eight note around 100 ms. Honing and Haas (2008) found that the swing ratio is adapted to the overall tempo, but did not find that it scaled linearly with tempo. Non-isochronous subdivision patterns have also been found in samba groove (e.g., Gerischer, 2006; Haugen, 2016; Naveda, 2011)–that is, at the level of sixteenth notes. In samba groove the fourth sixteenth note seems to be longer in duration than the others.

Aims

The aim of this study is to investigate the influence of tempo on the duration pattern on sixteenth note level in a performed samba groove.

Method

Two professional samba performers, a percussionist and a dancer, participated in the study. The analysis in present paper is based on the recorded sound. The percussionist played a samba groove at three different tempi: 133, 100, and 69 BPM. Since all the sixteenth notes are played in this recording, their temporal position could be detected using onset detection. Subsequently, the inter-onset-intervals (IOIs) between the sixteenth notes were calculated and converted into percent values according to their percentage of the beat.

Results

The analysis showed significant differences between all the sixteenth note durations in all three tempi–that is, a medium/long–short–medium/short–long duration pattern on sixteenth note level were found at all tempi. In addition, a significant interaction between sixteenth note type and tempo were found. The analysis showed that as the tempo increases the short second sixteenth note became shorter and the long fourth sixteenth note became longer. In the fastest tempo, the short second sixteenth note's mean duration is only 68 ms, something that is much shorter than 100 ms that has previous been suggested to be the shortest interval that we can hear and perform.

Conclusions

The results suggest that the non-isochronous duration pattern on sixteenth note level in samba becomes even more non-isochronous with increasing tempo. In addition, the results indicate that the lower limit for IOIs in samba groove is below 100 ms.

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Categorizing western popular music drum patterns

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Background

The Lucerne Groove Research Library is a collection of 250 reconstructed drum patterns and associated metadata, derived from recordings of 50 highly acclaimed drummers covering the last 60 years of Western popular music. The Library was published online in August 2017 [1] with the goal of providing ecologically valid audio stimuli for groove studies (http://www.grooveresearch.ch).

Aims

This paper proposes a system for the classification of the drum patterns currently available in the Lucerne Groove Research Library, based on selected structural features.

Main Contribution

A Western popular music drum pattern usually consists of three rhythmic layers: The rhythm of the downbeat layer is played on the bass drum; in most cases it accentuates the first and third quarter note beats of the common time bar. The backbeat layer is normally played on the snare drum and adds the second and fourth beats of the bar to the pattern. Finally, the pulse layer presents a basic, often quite regular pulsation on hi-hat or ride cymbals.

Patterns were classified using a semi-automatic, iterative method: categories were defined according to the smallest metric subdivision necessary to represent the pattern (quarter notes, eighth notes, etc.), separately for each layer. This procedure

resulted in six categories for the downbeat and backbeat layers, and five categories for the pulse layer. Eleven combinations of downbeat, backbeat and pulse categories were frequent and covered 200 of the 250 patterns.

Metadata associated with the drum patterns suggests that these 11 groups also reflect historical and stylistic changes: the distribution of the recording years shows that some pattern types are more prevalent during specific eras, while others are widely spread across several decades. Listeners' genre associations (collected in a listening experiment in the course of an ongoing study with 682 participants) connect the eleven pattern types with different genre families (rock and related styles, funk-soul-R&B, pop-disco-dance). These style associations are consistent with the median tempi in the groups: the more complicated patterns associated with funk show slower tempi in the median, whereas the more straightforward rock patterns are played with faster tempi.

Implications

The classification of the drum patterns was based on simple, purely structural criteria. Metadata and listener responses show that the structural features are associated with specific popular music styles and eras. A more detailed, corpus-based music analysis of the patterns will be likely to shed further light on the history and development of Western popular music drum patterns.

References

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Testing a model of rhythmic syncopation

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Background

Syncopation has been found to influence the sensation of groove [1-3]. In order to investigate how syncopation affects our perception of music, a reliable measure of syncopation needs to be developed. In 2014 Witek et al. proposed a method to model syncopation in backbeat drum patterns, which is based on Longuet-Higgins' and Lee's idea of light and heavy metrical positions [3,4].

Aims

The aim of this study was to test the fit between the Witek et al. (2014) model and listeners' perceived degree of syncopation.

Method

Six audio stimuli based on 8-bar transcriptions from popular music drum patterns (rock, pop, funk) were constructed, using sounds from a drum sample library. The patterns consisted of consecutive eighth notes, played on the hi-hat, and bass/snare drum figures that introduced more or less syncopation by variation.

17 professional musicians listened to the randomized 15 pairwise combinations and decided, for each pair, which stimulus appeared to be more strongly syncopated (win). The patterns were ranked according to their total number of wins. The listeners' ranking was then tested against the ranking predicted by the model.

Results

The results show that overall the model is a good predictor for perceived syncopation: All stimuli but one were ranked by the participants as the model predicted.

For this one pattern, however, the model predicted significantly stronger syncopation than perceived by the participants. This pattern is a simple backbeat, except the bass drum is played with additional, softer strokes on the 16th note positions after the downbeats. This "echo" is the main factor for the high syncopation predicted by the model, but seems to have little influence on participants' perception of syncopation.

Conclusion

This study offers empirical data on the validity and possible limitations of the Witek et al. model. More rhythmic patterns need to be tested in order to investigate whether there are other rhythms, where perception and model disagree.

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T23G: Short Talks 23 - Education

Time: Saturday, 28/Jul/2018: 8:30 - 10:30 · *Location:* Graz_3

Session Chair: Dawn Carole Rose

Music and social protest: the effect of musical genre and lyrics

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Background

Music has always played an important role in social movements, expressing criticism and opposition to social and political issues, and encouraging protest (Eyerman, 2002; Peddie, 2006). Although the message of dissent is conveyed through lyrics, certain genres are perceived as more typical of protest than others. Thus, whereas rap is perceived as a musical style expressing social discontent, pop is regarded as more mainstream and conformist (Rentfrow & Gosling, 2007). To our knowledge, no previous study has empirically examined the effect of lyrics and musical genre on attitudes towards protest.

Aims

The aim of the present study was to examine the effect of lyrics and genre two songs dealing with social injustice: a rap song and a pop song.

Method

123 participants took part in the study (66 males, 57 females), aged between 18-38 (mean age = 25.69). In a 2X2 design, participants either read lyrics or listened to a rap or pop song, chosen through a pre-test as expressing protest. Participants were asked to evaluate the song and reply to questions regarding the importance of social activity, and their degree of trust in the government and in politicians.

Results

MANOVAs were conducted to examine the effect of genre (rap/ pop) and presentation (music/ lyrics alone) on song evaluation and on the perceived importance of protest and attitudes towards the government and politicians.

Regarding the songs' perception, preliminary results show a main effect of presentation, with songs presented with music being perceived as being more familiar, and more encouraging of protest. A main effect of genre was found for expression and encouragement of protest, with the rap song receiving higher ratings than the pop song.

As for the effect of the songs on the importance of protesting and degree of trust in the government and politicians: several main effects of music were found, showing that songs presented with music have a stronger effect than lyrics alone. Likewise, several interactions between song and lyrics were found, showing that although the pop song was perceived as less of a protest song, when presented with music, its effect on these variables was stronger than that of the rap song.

Conclusions

The presented study is a first attempt to examine how musical genre and lyrics influence attitudes towards social injustice and the need to protest. Results demonstrate how music influences attitudes regarding social issues, beyond lyrics. Moreover, although in general rap is perceived as more encouraging of protest, the effect of the combination of lyrics and music is more complex. Future studies, controlling for lyrics and using larger samples of songs, are needed in order to allow generalizations regarding these issues.

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Patterns of Social Distinction in Music: A Cross-Cultural Study

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Background

Since Bourdieu (1979), musical genres have been understood as carriers of social distinction. Apart from marking social status by their listening habits, people may also have stereotypical beliefs concerning the listeners of other musical genres (North & Hargreaves, 1999). What is less clear is how such listener stereotyping is affected by cultural differences: only western comparisons have been carried out (Rentfrow & Gosling, 2007; Kristen & Shevy, 2012).

Aims

Based on theories of social categorization (Leonardelli & Toh, 2015), we suggest that associative beliefs concerning other musical listeners' social standpoints only receive their meaning in relation to the respondent's own social standpoint. For different respondents, similar genre-based associations might thus represent different value distinctions with regard to their own positions. We ask (1) whether such genre-related value distinctions show cross-cultural differences, and (2) whether they form broader patterns that reflect fundamental differences in value schemata between cultures.

Methods

58 Finnish and 49 South African university music students heard 12 musical excerpts representing four musical genres (gospel, old-time dance music, opera, rap), and responded to a 27-item questionnaire concerning the potential life goals of typical listeners of the music. The participants also rated the correspondence of the items to their own life goals. Value distinctions were obtained by subtracting the latter judgments from the ones regarding the musical excerpts.

Results

Generalized estimating equation (GEE) analyses of the value distinctions showed significant interactions involving participants' nationality and musical genre for 18 of the questionnaire items. Post hoc tests revealed cultural differences for each of the genres. For example, opera appeared to signal negative social distinctions for the Finnish participants, whereas in South Africa, imagined opera listeners seemed closer to the participants' own values, suggesting an "indigenization" of the genre.

Exploratory factor analyses of the value distinctions revealed different national patterns. For instance, whereas in the Finnish responses altruism was associated with global values such as environmental concerns, for South Africans it was connected with communitarianism and traditionality, suggesting a kind of traditional group morality ("ubuntu").

Conclusions

This is the first empirical study conceptualizing listener stereotypes as differences between participants' judgments concerning musical genres and their own social standpoints. We have shown that the social distinctions attached to musical genres may be culture-dependent, and that they may form broader patterns of value, reflecting world-views such as (European) ethical individualism and (African) communitarianism.

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It's time for a break - reasons for not listening to mobile music

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Background

The focus of mobile music related literature has been on the reasons and situations surrounding the use of portable listening devices (e.g., Bull, 2000). Music has been found to motivate (Laukka & Quick), and influence emotions (Sloboda et al., 2001), among other things, which can happen anywhere since the invention of the portable listening device which enables access to a whole music library at any given time. However, there has not been any research on the reasons for not listening to mobile music, the topic of this paper.

Aims

The aim was to discover situations in mobile music listening where the listener decides that 'it's time to turn off the music'. The situations will be described and possible reasons for not listening to mobile music revealed. The reasons for non-users of mobile listening devices to not engage in that activity are also explored.

Method

To answer these questions 11 mobile music listeners were interviewed, shadowed (DeNora, 2003), i.e., observed in their everyday behaviour of mobile music listening, and then interviewed again. Additionally, 11 non-users of portable listening devices were interviewed about their opinions on and experiences with mobile music listening.

Results

Results show that both users and non-users would not use headphones if they are not ideal for the situation, e.g., too warm in summer. Furthermore, while crowded, noisy, unpleasant urban environments lead to the wish for music for distancing and mood management purposes, nature and rural surroundings have the opposite effect.

Moreover, the listeners' reasons for turning off their devices are that the music is experienced as too much information, and sometimes the concurrent activities will not allow for music listening, e.g., when trying on clothes in shops. None of the interviewees would listen to music when they are walking around with someone else.

Conclusions

The findings shown here indicate that there are several circumstances in which users of mobile listening devices as well as non-users would decide not to listen to music. Most of these relate to the environment and the situation around them, e.g., whether there are acquaintances present, what kind of activity is carried out, and what kind of environment it is. This clearly demonstrates that mobile music listening means being aware of one's surroundings, because it includes making choices relevant to the situation.

Future research should try to expand this to different kinds of music listening to gain a more complete picture of possible reasons for turning off the music.

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Music Performance Analyses Of In-Car Music Engagement During Simulated Driving

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Background

Drivers often listen to music, sing-along, and drum rhythms. Although the benefits for in-car music are entertainment, stress reduction, combating boredom, counteracting fatigue, and emotional regulation, adding music to a hazardous road environment impacts safety. There is a controversy: Does music facilitate driver performance via increased arousal leading to more focused concentration (Unal et al., 2012, 2013a; 2013b), or cause distraction placing drivers at greater risk (Brodsky, 2002, 2015; Brodsky & Slor, 2013)?

Aims

The investigation examined driver music engagement. It was expected that as perceptual demands increase (parking low-demand driving high-demand driving), music performances would be corrupted. Music Performance Analysis (MPA) was employed to examine secondary-task driver behaviour.

Method

There were two simulated driving studies: Singing-along and Drumming-along. In Study 1, 19 participants (Mage = 26, 68% female, Mdriving years = 7) drove while singing 2 songs in 3 conditions: no-drive baseline, low-demand driving, and high-demand driving. Vocal recordings underwent MPA by a Répétiteur. Statistical analyses compared baseline to driving conditions, and between the two driving conditions. In Study 2 19 participants (Mage = 24, 74% female, Mdriving years = 6) drove while drumming to 2 songs. Electronic drum-kit sensor clip technology was coupled to steering wheel, gear stick, driver's left thigh, and left foot floorboard. Percussive recordings underwent MPA by an orchestra musician.

Results

The results indicate that as perceptual demands of driving increased, music activity was hampered. Sub-optimal music performances featured intonation errors, rhythmic inaccuracies, lack of synchrony, inconsistent and unstable temporal flow, lyric replacement, and neglect. Study 1 found memory for lyrics of popular well-known songs significantly obstructed. Study 2 found songs covered less with increased errors; errors were less when tapping a steady pulse beat or melody rhythm than when drivers improvised an accompaniment.

Conclusions

Two alternatives surfaced: (1) While drivers attempt to allocate mental resources to the primary driving task, secondary music tasks draw resources away from the required allocation (i.e., neglect); or, (2) Obstructed music performances result by ranking attention between the primary driving task and secondary music task (i.e., prioritization). Further studies are needed.

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What Infants Hear On TV: A Soundscape Analysis Of Infant-Directed Broadcasts

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Background

Music and songs serve as fertile ground for learning skills among young children. Caregivers, parents, and teachers use music to scaffold children's behaviour since it can help to accelerate cognitive, emotional, and sensorimotor development (de l'Etoile, 2006). However, not all music representations are educationally and developmentally appropriate for young children. If music is to be used for developmental and educational purposes, pieces have to feature specific characteristics (Sulkin & Brodsky, 2015). In the last decades media has become an important part of young children's environment. Babies and infants spend a considerable amount of time every day in front of screens. Sound and music are integral components of programming that target young viewers. The presence of sound effects and music pieces can assist in transferring information required for viewers' interpretation (Brooks, 2014). Therefore, aural features are not simply decorative figures, but rather essential constituent components of infant-directed content. Several investigations examining young children's learning processes from television advocate that it is explicitly the soundtrack that manages the passage from 2D animations to 3D real-world settings; it is also well documented that children react to music they hear from the screen (Barr et al., 2009). But, are the musical utterances educationally and developmentally appropriate for the young ears? Surprisingly, little research has targeted the soundscapes of infant-directed broadcasts.

Aims

The current study aimed to fill the above-mentioned gap by implementing a soundscape analysis of infant-directed TV broadcasts. We considered both musical and linguistic constituents as structural components of the soundscape.

Method

A representative corpus of 39 programs broadcasted by BabyTV channel were analysed. BabyTV was chosen because of its global relevance; it is distributed in more than 100 countries in 18 languages. For the purposes of the study, a descriptive inventory was developed to assess sound-related features of the broadcasted show-series: Soundscape Appraisal of Broadcast Shows. In addition, we developed a criterion-based checklist to measure age appropriateness and developmental fitting of songs materials: Sulkin Infant Song Inventory.

Results

The results indicate music constituents mainly employed as a strategy to attract young viewers to the screen. For the most part, musical materials are educationally and developmentally inappropriate. Moreover, the linguistic constituents were often non-intelligible utterances that cannot be recalled or reproduced by young viewers.

Conclusions

The urge for co-operation between media content creators and music education development specialists is warranted. Such co-operation will support creating appropriate content for young children and will make screen viewing a more suitable platform for infant's growth.

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T24G: Short Talks 24 - Musical Skill

Time: Saturday, 28/Jul/2018: 8:30 - 10:30 · *Location:* Graz_4

Session Chair: László Pál Stachó

The Chinese Version of the Gold-MSI: Adaptation and Validation of an Inventory for the Measurement of Musicality in a Taiwanese Sample

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Background

The Gold-MSI (Goldsmiths Musical Sophistication Index) includes one self-report questionnaire and four music tests which altogether measure musical ability, attitudes toward music, and music-related behaviors in the general population (Müllensiefen, Gingras, Musil, & Stewart, 2014). The questionnaire contains 39 items that comprise five subscales and one general factor. Previous studies showed that the inventory demonstrates good reliability and validity, and its factor structure could be consistently replicated (Fiedler & Müllensiefen, 2015; Schaal, Bauer, & Müllensiefen, 2014). However, these findings emerged from samples within the European cultural region. The question of its generalizability for into Far Eastern cultures remains open.

Aims

The current study aimed to investigate the psychometric qualities of the Chinese Gold-MSI questionnaire using a Taiwanese sample by examining its factor structure, reliability and validity.

Method

The translation of the Gold-MSI followed the ITC Guidelines for Translating and Adapting Tests (International Test Commission, 2017). To create the first draft, we obtained three independent translations by professional translators. Discrepancies were discussed with an expert for in psychological testing. In the next step, it was translated back into English by a native speaker. Two experts then compared the backward translation with the original questionnaire, resulting in the second draft. Thereafter, six Taiwanese evaluated the readability of all the items' readability. Accordingly, we improved the syntactic quality of two items' syntactic quality. From April to July 2017, we administered the Chinese Gold-MSI along with two music tests from the Gold-MSI test battery (the Melodic Memory Task and the Beat Alignment Perception Task) and the Musical Intelligence subscale (Chou, 2006) in an online survey. Additionally, participants were invited for a retest after two weeks. In all, 1,065 and 160 valid responses returned for the first and second inquiry, respectively.

Results

First, the confirmatory factor analysis showed that the original factor structure could be replicated (SRMR = 0.053, CFI = 0.886). Second, the values of Cronbach's α and test-retest reliability coefficients (Pearson's r) were between .74 and .90 as well as .77 and .92, respectively, supporting the questionnaire's good reliability. Third, the convergent validity could be corroborated by the correlation between the General Musical Sophistication factor and the Musical Intelligence subscale (r = .78).

Conclusions

The Chinese Gold-MSI possesses good psychometric qualities, and its factor structure remains invariant. Hence, the present study provides a solid foundation for further intercultural inquiries in the field of musical development.

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Explaining Objective and Subjective Aspects of Musical Sophistication: Insights from General Fluid Intelligence and Working Memory

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Recent work in music psychology has examined the relationship between individual differences and factors that predict various aspects of musical sophistication. Some of the recent research has begun to model how musical sophistication or aptitude relates to various cognitive measures, ranging from executive functions, to measures of general fluid intelligence. Recent research has also investigated how differences in musical training may lead to differences in working, short-term, and long-term memory capacity. While some of the previously mentioned work uses continuous measures of musical sophistication, many only collect data on years of formalized musical training as opposed to a more multi-faceted view of musical sophistication. The aim of this paper is to share findings from a large study investigating how musical sophistication, as measured by the Goldsmiths Musical Sophistication Index (Gold-MSI), relates to measures of working memory and general fluid intelligence. Results using structural equation modeling (SEM) suggest working memory capacity and general fluid intelligence explain more of the variance in perceptual tasks than self-report measures of musical sophistication. In light of these findings, we suggest that further models of music perception should focus on modeling what processes contribute to a task, rather than using large, composite latent variables.

Sight reading strategies and personality dimensions

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Background

The framework of the self-regulative learning theory was used (McPherson & Zimmerman, 2002) in order to find out about the metacognitive strategies used during each phase of the sight-reading. We are of the opinion that, besides the confirmed place of cognitive, perceptive and motor abilities (Kopiez & Lee, 2008), the non-cognitive factors such as personality and motivation play an important role in acquiring and performing sight-reading as an expert skill (Bogunović, 2017).

Aims

a) To identify the metacognitive strategies used at each phase of the self-regulated sight reading, and b) to determine relations of the sight-reading factors with personality dimensions.

Method

The sample consisted of 95 music students of the Faculty of Music in Belgrade who had 12 to 15 years of specialized music education experience. The participants filled in the Sight-reading questionnaire (12 questions, five-point Likert scale) and the NEO-PI-R. Six Exploratory Factor analysis were performed and correlations with personality dimensions were investigated.

Results

The results yielded the following factors which exist in the subsequent phases of the sight-reading process: while Preparing (Analytical, Inner hearing, General overview), during Setting goals (To Play through, Technical Accuracy, No Goals), during Performance (Expertness, Non-Perfectionism, Visualization and Continuity Control), Problem solving (Corrective or Inefficient strategies), Monitoring (strong and weak sides) and Self-reflection/evaluation (Self-efficacy and Self-satisfaction). The students who have higher self-efficacy have a “bigger” picture of the composition, and “top-down” cognition. They also enjoy sight-reading more. It seems that personality dimensions are mostly related to the sight-reading factors of Preparation and Performance. Namely, students who tend to have the Analytical approach in preparing for the sight-reading tasks showed higher Emotional stability, Agreeableness and Conscientiousness, especially higher Competence, Dutifulness, Achievement striving, Discipline and Deliberate thinking. The factor of Expertness in performing is significantly related to the facets such as Dutifulness and Achievement Striving.

Conclusions

The concept of self-regulated performing is adequate to understand the metacognitive strategies employed in the phases of the sight-reading process. The findings suggest that the non-cognitive factors have a certain role in the self-regulated performance of sight-reading skills. Self-efficacy and satisfaction with the sight-reading skill have to do with personality attributes. The results could have music education implications with respect to enhancing the efficient strategies of sight-reading and supporting the development of self-esteem. The limitation of the study refers to a relatively small sample on which complex analyses were performed. Therefore, the results should be a subject of verification.

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The relationships of theory of intelligence and musicality with concurrent musical activities and training, academic and social self-concept as well as non-verbal intelligence and overall academic performance

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Background

Trajectories of musical development can differ substantially during adolescence and the mechanism and reasons for why differences arise, are often in the focus of music education research (Müllensiefen et al., 2015). Though, rather than an isolated process musical development is assumed to co-vary with other individual differences factors over time such as non-verbal intelligence, overall academic performance, and individual attitudes towards one's own abilities, e.g. the psychometric constructs theory of intelligence (TOI; Dweck, 2000) and theory of musicality (TOM).

Aims

The principal aim of this study was to analyse the relationships between various constructs related to musical development from three subsequent waves of data collection (yrs 2015, 2016, and 2017). Based on previous literature (Dweck, 2000; Müllensiefen et al., 2015) we hypothesize that TOI and TOM will correlate substantially, but will only show a weak association with non-verbal intelligence. Moreover, we assume that TOI and TOM correlate significantly with concurrent musical activities (CCM) and musical training as well as with academic and social self-concept, and students' overall academic performance. The second aim was to conduct a mediation analysis to determine to what degree the level of CCM has a direct influence on overall academic performance and to what degree it is mediated by attitudes towards musicality.

Methods

Data of 308 (100% female, 2015), 425 (83.5% female, 2016), and 573 (65.4% female; 2017) students from three secondary schools from Southeast England are presented.

Results

Across all three years TOI and TOM show substantial correlations (between r=.106 and .525, p≤.05). Moreover, TOI and TOM show significant (p≤.05) but weak correlations with non-verbal intelligence (yr 2017: rTOM=.128 to .184; rTOI=.116) as well as with academic (yrs 2016 & 2017: rTOM=.087 to .246; yr 2017: rTOI=.112 to .267) and social self-concept (all 3 yrs: rTOM =.097 to .184; yrs 2015 & 2017: rTOI=.125 to .170). Additionally, relationships between TOI and TOM with students' overall academic performance (yrs 2015 & 2017: rTOM=.099 to .266; and rTOI=.143 to .241, p≤.05), musical training (all 3 yrs: rTOM=.109 to .324; 2015: rTOI=.121 to .169; p≤.05), and concurrent musical activities (all 3 yrs: rTOM =.088 to .339, p≤.05; yr 2015: rTOI=.169 to .229, p≤.01) are found. The mediation analyses show that the direct effects of

CCM on overall academic performance are significant (p≤.01) across the years (.146 to .174). The indirect effect of CCM on overall academic performance via TOM was only significant (p≤.05) in 2015.

Conclusion

In sum, the results indicate that musical activity is reliably associated with students' attitudes towards their own musicality and intelligence as well as overall academic performance-which is at least partially mediated by TOM. However, only longitudinal models of musical development will be able to provide evidence for causal relationships.

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The neurobiology of language learning ability and musicality

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Background

Various studies have shown that (1) musical ability and foreign language acquisition are positively correlated (Christiner & Reiterer, 2013; Dogil & Reiterer, 2009) and (2) working memory is an excellent predictor for foreign language aptitude (Wen, 2016). However, very few studies so far have investigated the relationship between these abilities considering variation in the neuroanatomy of specific brain regions (Golestani et al., 2006, 2011; Wong et al., 2007; Reiterer et al., 2011) or auditory cortex (Seither-Preisler et al., 2014; Serrallach et al., 2016; Benner et al., 2017).

Aim

The two main aims of our research lie in (1) further exploring the intricate interdependence between musicality, language aptitude and working memory, and (2) relating these abilities to structural variation in human auditory cortex, more specifically Heschl's gyrus (HG).

Methods

Our projects involve adults (N=30) and teenagers (N=58). All subjects took part in MRI sessions and were tested for language aptitude (Hindi task, Reiterer et al.,2011; LLAMA), working memory skills and musicality (AMMA). Furthermore, we analyzed the shape and number of HG in the auditory cortices of these individuals.

Results

Besides the striking correlations between working memory and speech imitation skills, as well as musicality and language aptitude, the gross morphology of auditory cortex of adults could be successfully linked to high language learning ability and musicality. Gifted adults had significantly more HG duplications, but only in the right hemisphere. The behavioral findings observed in adults were even stronger in teenagers and correlated highly with school grades and self-rated aptitude.

Conclusions

We have identified stable neuroanatomical markers for language und musical aptitude in right auditory cortex, which may represent a neural basis for an individual's intrinsic motivation to learn new languages and to play musical instruments.

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L17G: Long Talks 17 - Pitch

Time: Saturday, 28/Jul/2018: 13:00 - 14:00 · *Location:* Graz_4
Session Chair: Daniel Müllensiefen

Vocal similarity predicts the relative attraction of musical chords

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Background

Musical chords are combinations of tones played together. While many different chords are used in music, some are heard as more attractive (consonant) than others. We have previously suggested that, for reasons of biological advantage, human tonal preferences can be understood in terms of the spectral similarity of tone combinations to harmonic human vocalizations (Bowling & Purves, 2015; Gill & Purves, 2009).

Aims

To test this theory further by determining whether the perceived consonance of dyads, triads and tetrads can be predicted on the basis of vocal similarity. We do this by:(1) collecting ratings of perceived consonance for all possible dyads (n=12), triads (n=66) and tetrads (n=220) that can be formed within a single octave of the chromatic scale; and (2) determining whether significant differences in consonance between chords are predicted by two metrics designed to assess spectral similarity to vocalization ("harmonic similarity" and "frequency spacing").

Main Contribution

Statistical analyses showed significant differences in average perceived consonance for all three chords types, with a total of 8321/26301 pair-wise comparisons (32%) being identified as reliably evoking different consonance percepts. For the vast majority of these (98%), the chord perceived as more consonant was correctly predicted by at least one of the two metrics used to evaluate vocal similarity. Indeed, a large majority (78.6%) were predicted by both methods.

Implication

These results support the hypothesis that tonal preferences in music are linked to an inherent attraction to conspecific vocalizations and the biological rewards that follow.

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Harmonically presented Western and Arab intervals are categorized differently by Wetsern and Arab listeners

Roni Granot

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Background

Perception of harmonic intervals is a basic musical ability related to central contrasts in Western music such as consonance and dissonance, major and minor, and more generally harmony.

Aims

In the current study we focus on perception of harmonic intervals by Arab listeners exposed to traditional Arab music which is melodic in nature, and is based on a rich set of 'scales' with quarter-tone intervals. We hypothesized that despite exposure to Western music Arab listeners would show some differences in associating intervals with notions of tension, and emotional valence, with a preference to musical intervals from their musical system.

Methods

Thirty-four listeners with Western musical background and 52 listeners with Arab musical background with little or no musical training listened to a set of 11 harmonic intervals in a synthesized Kanun timbre. The set included 3 equaled-tempered quarter-tone intervals found only in the Arab system (A2 of 150 cents; A3 of 350 cents; and A7 of 1050 cents); two perfect consonants (P8 and P5); three imperfect consonants (m3 ; M3; m6); and three dissonants (m2, M7 and diminished 5th). Intervals were presented 5 times each in two rounds and two counterbalanced orders: In the first round listeners provided open commentaries on each interval; in the second, they rated each interval on four 1-7 likert scales: pleasantness; need for continuation; fusion; and tension. Free descriptions were coded into ten categories emerging from participants' answers including: tension; negative, positive or neutral feelings; negative, positive or neutral sound description; and sound source and context.

Results

A chi-square test showed that the distribution across categories and intervals was different between the two groups ($p < 0.0001$). Clustering using the K-means method resulted in different clusters for the two groups: For the Western group we obtained one cluster including all consonant intervals (P8, P5, M3, m3, m6) a second including dissonant or unfamiliar intervals (m2, A2, A3, A7) and a third including the M7 and diminished 5th (added to the dissonant cluster for K=2). In contrast the consonant cluster for the Arab group included only P5, M3, m3; the dissonant cluster included A2, m2, M7 and m6; and an interim cluster included P8, diminished 5th, A7 and A3 which were clustered with the consonants for $K = 2$. Interestingly a Mann-Whitney test on the two analogous rating scales in the rating task (pleasantness and tension) showed no significant differences between the groups. Consistently, correlations between the rating scales and free categorized responses along pleasantness and tension were very high and significant ($R = 0.85 - 0.91$) in the Western participants' group but not in the Arab group ($R = 0.16 – 0.48$).

Discussion

These results corroborate our hypothesis for a different categorization of harmonic intervals among Western and Arab listeners, while highlighting the need to interpret cautiously results obtained from experimental methods used regularly with Western listeners, though more research is needed to explore whether this is driven by the nature of the presented stimuli.

L20G: Long Talks 20 - Sociology

Time: Saturday, 28/Jul/2018: 13:00 - 14:30 · *Location:* Graz_1

Session Chair: Juan Loaiza

"A little respect"? The influence of background music on the acceptance of gay men in TV advertising

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Background

Companies more often use gay protagonists in TV commercials to attract a new affluent target group (Um, 2014). Studies show, however, that this jeopardizes the customer loyalty of – especially male – heterosexual consumers, who tend to rate these commercials negatively (e.g., Dotson, Hyatt, & Thompson, 2009). The more explicit the homosexuality of the protagonists is portrayed (e.g., two men embracing vs. two men kissing), the more negative the commercial is evaluated – particularly among heterosexual men (e.g., Um, 2014). If music can significantly influence the perception of protagonists in films (e.g., Boltz, 2001), it may also shape the perception of gay protagonists in advertising. While women are generally more open to gay men in advertising, based on Social Identity Theory (Tajfel & Turner, 1986), it can be assumed that heterosexual men accept gay men in advertising, who appear more masculine.

Aims

This study examines whether music can change the perception of gay advertising protagonists (H1) and whether this leads to a more positive attitude towards the brand – also influenced by the recipients' sex (H2). Does music even influence tolerance towards homosexuality (H3)?

Methods

A one-minute commercial for the brand Tiffany, in which two gay men exchange engagement rings, is set to masculine and feminine fitting background music (differing in genres and instrumental clichés). In a 2x2 between-subject online experiment (experimental manipulation of the music's masculinity/femininity, quasi-experimental manipulation of the participant's sex) 192 participants (67% feminine, age M=32, SD=13) were randomly assigned to one of four experimental conditions.

Results

Gay protagonists in TV commercials with masculine background music tend to be perceived slightly more masculine than with feminine music ($F(1,190)=51.99$, $p<.001$, $\eta^2=.22$). For H2 and H3 two-way independent ANOVAS with planned contrasts were conducted. In general, women rate the commercial's brand significantly more positive than men. Men with masculine music like the brand significantly more than men with feminine music (sex: $F(1,188)=34.35$, $p<.001$, $\eta^2=.16$, music version: $F(1,188)=0.12$, $p=.73$, $\eta^2=.07$ (n.s.), interaction: $F(1,188)=12.88$; $p<.001$, $\eta^2=.07$). Surprisingly, the manipulation of the music changed (at least in the short term) the attitude towards gay men in general. Within the male participants, those who have seen the advertising with masculine music report significantly more tolerance towards gay men than those with feminine music. Women are generally more tolerant than men (sex: $F(1,188)=43.30$, $p<.001$, $\eta^2=.19$), music version: $F(1,188)=6.90$, $p<.001$, $\eta^2=.04$, interaction: $F(1,88)=8.28$, $p<.001$, $\eta^2=.05$).

Conclusions

It turns out that the specific use of music can lead to more acceptance of gay protagonists in commercials. Even men rate the brand more positively when the gay protagonist appears more masculine. These results should be considered in advertising practice.

References

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Comparing the effects of music and images on implicit cultural attitudes

Jonna K. Vuoskoski[1,2], Eric F. Clarke[2], Paul Elvers[3]

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Background

A recent study by Vuoskoski, Clarke, and DeNora (2016) demonstrated that just listening to a piece of music from a particular culture could improve implicit attitudes towards members of that culture, and that participants with high trait empathy were particularly sensitive to the effects of music listening. The authors concluded that empathic engagement with the music may have at least partly contributed to the observed effects, but – due to the preliminary nature of the study – many alternative explanations remained open. For example, it is not yet known whether empathic people are more susceptible to implicit attitude change in general, or whether similar changes in implicit attitudes could be achieved by activating the association that "culture X has nice music" by some other means.

Aims

The aim of the present study was to test whether viewing a slideshow of pleasant images depicting musicians (and music-making) from a particular culture could elicit similar changes in implicit attitudes as music listening. Additionally, we tested whether trait empathy would modulate the effect.

Methods

Fifty-eight participants aged 18-74 (M=25.9, SD=10.2; 34 female) were randomly assigned to one of two conditions: viewing images of Indian musicians, or viewing images of West African musicians. The method and procedure were identical to that of Vuoskoski, Clarke, & DeNora (2016), with the crucial difference that music listening was replaced with viewing the images. Both slideshows comprised 15 images that were shown twice in the course of the slideshow, changing every 10 seconds (total duration: 5 minutes). After viewing the slideshow, participants completed the Implicit Association Test (IAT; Greenwald, McGhee, & Schwartz, 1998); a reaction-time-based sorting task that measures implicit preference for Indian vs. West African people. Trait empathy was measured using the Interpersonal Reactivity Index (IRI; Davis, 1980).

Results

Participants' IAT scores were analysed using linear modelling; Type of Slideshow (Indian or West African) was included as a factor, and Trait Empathy as a covariate. We also included an interaction term in the model. There was a significant main effect of Type of Slideshow; $F(1, 53) = 8.10$, $p < .01$, but no effect of Trait Empathy, and no interaction effect. The magnitude of the difference (in implicit preference for Indian vs. West African) between the two groups was marginally larger than in the music experiment (means: -0.19 vs. 0.05 for slideshow, and -0.25 vs. -0.07 for music).

Conclusions

Our results suggest that viewing pleasant music-related images can elicit similar changes in implicit ethnic attitudes as music listening. However, the lack of interaction with trait empathy (which was present in the case of music listening) suggests that people with high trait empathy are not necessarily more susceptible to implicit attitude change. It may be that – compared to music listening – the images were more 'objective' and identifiable as representations of the two cultures, and their effect more consistently transferred into the visual domain of the IAT.

References

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Reasons behind disliking music - effects of rationales on the degree to which musical styles and artists are disliked

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Background

Understanding why people like or dislike specific kinds of music and prefer one artist or style over another is a central part of research both in music psychology and music sociology. Until now, a vast amount of research has focused on explaining and understanding preferred music and its respective functions. In contrast, the negative side of musical taste, especially the rationales behind the disliking of specific kinds of music, still remain relatively unknown. Disliked music has only been studied empirically as an important part of social distinction in young adults. Whereas for the liked music it has been shown that the strength of preference is closely related to specific functions of this music and that the reasons for the preference mostly relate to the ability of the music to serve and fulfill specific needs, research on rationales and functions of the disliked music and their relationship to the strength of dislikes is scarce.

Aims

Hence, this study aims at clarifying the connections between different rationales for disliking music and the degree of dislikes. Also, we wanted to explore if there are differences in the reasons behind the disliking of musical styles as broader musical classification categories in comparison to the disliking of specific artists.

Methods

656 participants completed an online questionnaire. Each participant sequentially picked one style and artist to which they showed a higher degree of dislike and a lower degree of dislike and then reported on the reasons why they disliked this specific style/artist. The reasons were evaluated with 40 items representing 5 dimensions of rationales (personal, emotional, bodily, social and material/music-related) derived from a previous interview study on the rationales behind disliked music. After rating two styles and artists, participants reported on sociodemographics and six items on the importance of music in their lives (Schäfer & Sedlmeier, 2010).

Results

Multiple regression analysis of the data revealed that the item “because it negatively influences my mood” is a significant predictor for dislikes in all conditions (style high and low dislike, artists high and low dislike). For musical style, also reasons related to social distancing as well as a negative impact on the body and too much musical complexity had a substantial impact. Regarding disliked artists, missing musical variety was significant for both the high and the low disliking condition.

Conclusions

In conclusion, the study gives valuable insights into the rationales behind disliked music and their relationship to the degree of dislikes. The results oppose the common hypothesis that musical dislikes are predominantly social, showing that music-related as well as emotional and bodily reasons play an important role. It further supports the importance of including the disliked music in research about musical taste.

References

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L21G: Long Talks 21 - Synchrony

Time: Saturday, 28/Jul/2018: 13:00 - 14:30 · *Location:* Graz_2
Session Chair: Julien Laroche

Non-synchronised coordinated movement in drumming and its prosocial consequences

Makiko Sadakata[1,2,3], Jeannette van Dithuijzen[1], Kristine Mitchell[2]

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Background and **Aims**

Recent research suggests that behavioural synchronisation is key in establishing prosocial effects (e.g., Phillips-Silver & Trainor, 2005). The current study tests the hypothesis of whether movement synchronisation is the necessary factor here, or it is more a matter of psychological synchrony. Using pre-post design, we tested whether coordinated but non-synchronous drumming can induce similar prosocial effects. While many studies so far used a simple isochronous pattern to demonstrate this effect, we used more musical rhythms on a MIDI drum pad.

Methods

74 participants (37 dyads) were assigned to one of the following four conditions: Listening, Non-Synchronous Drumming, Synchronous and Interactive Synchronous. During the task phase of about 4 minutes, Listening dyads listened to the target rhythms, Non-Synchronous dyads performed the target rhythm along with non-synchronised metronome cues (no coordination), Synchronous dyads performed the target rhythm in synchrony, and Interactive Synchronous dyads performed the target rhythm in coordinated but non-synchronous movements (partners took turns in hitting notes along the same metronome cues, creating a joint performance). The target rhythms or metronome cues were given through headphones. The four groups were matched regarding their pre-test mood score, musical experience (Goldsmith MSI), Beat alignment test, and dispositional empathy (Interpersonal Reactivity Index). The effect of these drumming activities was evaluated using the following three measures: 1) social rapport concerning connectedness, similarity, trust, likeability and closeness to their partner, 2) cognitive empathy (Reading the Mind in the Eyes task), and 3) the self-evaluation of tasks concerning enjoyment, success and difficulty of the task.

Results

Social rapport questionnaire results revealed that Interactive Synchronization group felt more connected and similar to their partners than other groups. Interestingly, cognitive empathy score increased significantly after the Synchronous and Interactive Synchronous drumming. Especially the increase of Interactive Synchronous condition was significantly greater than Non-synchronous conditions. The self-evaluation questionnaire revealed that felt enjoyment was significantly stronger for the Interactive Synchronous group than the Listening group.

Conclusions

Overall, Interactive Synchronous condition tend to have strong impact in our measurements. This suggests that social nature of musical activities is achieved not only through synchronous behavioural movements per se but also by nonsynchronous but coordinated movements to shared beats, in line with the hypothesis that the psychological synchrony is important.

References

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Sensorimotor synchronisation for finger tapping, toe tapping and marching to musical compared with metronome stimuli in people with and without Parkinson's

Dawn Carole Rose[1], Yvonne Delevoye-Turrell[2], Laurent Ott[2], Lucy Annett[1], Peter Lovatt[1]

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Background

For some people with Parkinson's disease (PD) rhythmic auditory stimulation can improve walking, though success may be linked to rhythmic entrainment abilities (Dalla Bella et al., 2017). Individual differences may be due to difficulties in beat perception as basal ganglia function (important for temporal processing) is impaired in people with PD (Grahn & Brett,

2009). External auditory cues may provide a compensatory mechanism enabling sensorimotor entrainment (Schwartze et al., 2011). Furthermore, embodied responses to stimuli may be affected by tempi (Dione & Delevoye-Turrell, 2015).

Aims

This study investigated how PD effects sensorimotor entrainment through different movement modalities. A Finger Tapping condition enables comparison with previous studies; Toe Tapping and 'Marching' are included as naturalistic movements associated with musical engagement. A re-entrainment phase extended a typical synchronization-continuation paradigm.

Method

This was a three-way mixed design study (N = 92). The between-subjects factor is Group (PD n = 30, Healthy Older n = 26, Healthy Younger n = 36). There were two within-subjects factors: Stimuli Type (Music/Metronome) and Modality (of physical entrainment, including Finger Tapping, Toe Tapping and Marching up and down 'on the spot' as a proxy for dancing). Tempi was an independent variable nested within stimuli (range 779 ms – 417 ms). An estimate of spontaneous motor tempo was collected for all three movement modalities. A measure of beat perception (the Beat Alignment Test (BAT), Müllensiefen et al., 2014) was also included.

Results

Analysis (PD sample 2.5 Hoehn & Yahr Scale) found no significant differences between groups for the BAT. Initial analyses of sensorimotor synchronisation for all movement modalities by Stimuli Type suggests that music significantly helps people with PD (as well as healthy controls) to stay in time in comparison to the metronome stimuli, but not at extreme tempi.

Conclusions

Though further analyses are required, these data suggest that music offers enriched information enabling people with PD to perceive a regular rhythm to which they can successfully entrain and re-entrain, in comparison to metronomes, within a range of tempi around their own spontaneous motor tempo.

References

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Synchronization accuracy in individual vs. joint swaying to music

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Background

Synchronization and moving in time to musical stimuli seems to be a relatively straightforward task for most humans (Repp, 2005, Repp & Su, 2013). However, individual differences in synchronizing can still be detected when investigating synchronization accuracy between body movements and the beat of the music. Moreover, carrying out tasks in coordination with another person requires individuals to adapt their motor behavior to one another in order to establish temporal synchronization between the two persons and the music.

Aims

The present study investigates how individual differences in synchronization accuracy are affected by a joint sensorimotor synchronization task.

Methods

Sixteen pairs of individuals were recorded with a motion capture system while being instructed to sway sideways in time with the audio stimuli presented (three 15-sec beat tracks and six 30-sec music clips). Participants first performed the tasks individually, then jointly with the other participant, and then individually again.

Synchronization accuracy was assessed by calculating phase locking indices, i.e., how similar (or well aligned) the movement and music phases were to each other. The movement phase was calculated using Hilbert transform of the sideways (medio-lateral) velocity of the hip marker of each participant, while the music phase was determined via manual beat annotation. The difference between movement and music phase was taken, and, as the measure of synchronization accuracy, the neg-entropy calculated from this difference time-series. The values (averaged per participant) of the first condition (i.e., first time moving individually) were sorted in ascending order and split into two equal halves of more and less accurate synchers. Subsequently, these two halves were used to arrange the pairs into three groups: both accurate synchers, both inaccurate synchers, and mixed synchers (one being accurate, the other being inaccurate).

Results

Analysis of the three synchronization-accuracy groups indicated that accurate syncher pairs become significantly less accurate when performing together as opposed to both individual conditions. For the inaccurate pairs, however, synchronization was significantly more accurate in the second individual condition than both in the first individual and the joint. For the mixed pairs, the accurate synchers were significantly less tightly synchronized in the joint task than in the both individual conditions, whereas the joint task significantly improved the inaccurate partner's synchronization accuracy compared to both individual sessions.

Conclusions

The results show different effects of joint coordination in relation to individual synchronization accuracy, suggesting opposite effects of joint performance for accurate and inaccurate synchers. Accurate synchers get influenced especially by a more inaccurate syncher to perform less synchronized to the beat than when moving alone or with an accurate syncher, while inaccurate synchers benefit from a better syncher and improve synchronization accuracy when moving jointly. Interestingly, for inaccurate synchers, a learning or carry-over effect to the second individual session could be detected making them more accurate when moving with another inaccurate syncher.

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L22G: Long Talks 22 - Vision

Time: Saturday, 28/Jul/2018: 13:00 - 14:30 · *Location:* Graz_3
Session Chair: Laura Bishop

The pupil entrains to prominent periodicities in music

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Background

The locus coeruleus noradrenergic (LC-NA) system plays a critical role in sensory processing, attentional regulation, and memory consolidation. Changes in pupil diameter reflect sub-second changes in attentional state related to LC-NA functioning (Berridge & Waterhouse, 2003; Reimer et al., 2016). As such, the pupil may provide novel insights about musical processing on a fine temporal scale.

Aim

Determine whether the pupil tracks spectrotemporal content of music.

Method

Across two different experiments, participants listened to simple rhythmic patterns (2 second patterns looping for 1 min), as well as excerpts of instrumental music (43-61sec in length) from a range of styles and moods. In both experiments, participants were seated at a desk and fixated a black cross (exp. 1) or dot (exp. 2) on a grey screen, while listening to music through speakers. Pupil data were always recorded binocularly using an Eyelink1000 eye-tracker sampling at 500Hz. The simple rhythm pilot experiment involved 7 participants. The second experiment involved 31 participants who each heard 56 music trials and 14 trials of silence (60 secs), after which they rated their experience in terms of absorption, valence, arousal, liking, and familiarity. We used Tomic & Janata's linear oscillator model (Tomic & Janata, 2008) to obtain predictions of prominent periodicities in the stimuli, which we hypothesized would predict peak frequencies in the pupil spectrum.

Results

Peak frequencies in the linear oscillator model's output predicted peaks in the pupil spectrum of listeners, on a single subject level. Critically, the pupil spectrum for silent trials showed no spectral peaks, neither at stimulus frequencies nor at other frequencies.

Conclusions

The pupil entrains to prominent periodicities in music. It tends to oscillate at a frequency a few subharmonics below that of the beat, suggesting attentional fluctuations at the bar or phrase level of the music. Our study contributes to findings showing that pupillometry is a valuable tool for understanding properties of dynamic attending in music.

References

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Music-colour Synaesthesia: A Review

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Background

Synaesthesia is a relatively rare condition that manifests itself in approximately four percent of the population, occurring automatically and, generally, with consistency over time. Described as a 'union of the senses' (Cytowic, 1989) it typically arises as result of stimulation in one sense (an inducer) triggering a reaction in an unstimulated second sense (a concurrent).

Aims

The aim of this paper (see Curwen 2018) is to provide a commentary on the existing literature that explores a form of coloured-hearing, arising on hearing music: music-colour synaesthesia.

Main contribution

The main neurological hypotheses: the hyperconnectivity theory and the disinhibited feedback theory advocate synaesthesia to be entirely perceptual resulting from either a hyperconnectivity between sensory areas of the brain, or a diminution of inhibition through feedback pathways, respectively. Although some support has been evidenced for each in the examination of grapheme-colour synaesthesia (Neufeld et al., 2012) direct evidence categorically supporting either hypothesis is currently lacking. Later theories promoting the notion of 'ideaesthesia' (Nikolić, 2009) have highlighted the importance of the role of concept and meaning in the understanding of synaesthesia and have pushed for the move away from the purely perceptual sensory to sensory explanations for its cause and towards further research into the role of concept as inducer. Commonalities between synaesthetic experience and normal cross-modal perceptions in non-synaesthetes suggest that non-synaesthetic people appear to use comparable mental processes to make associations between colours and music, and to make similar pairings at a conceptual level. From this it has been argued that certain types of synaesthesia may simply be developed as a useful method for a child to more easily process its first encounter with abstract concepts, such as music unfolding over time afforded by the 'extra qualia' (Wager, 1999) of their synaesthetic experience.

Implication

The different types of phenomenological experience in music-colour synaesthesia and the individual differences between synaesthetes, together with the implications this has for the current methods used to verify the condition, reinforce an existing argument that a single mechanism is not sufficient to explain the phenomenological experiences that arise on hearing music, either from a sensory musical stimulus, or from a non-sensory musical concept (Auvray & Deroy, 2015).

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L12M: Long Talks 12 - Skill

Time: Saturday, 28/Jul/2018: 13:00 - 14:30 · *Location:* Montreal_1

Session Chair: Helga Gudmundsdottir, Christine Beckett

Dissecting the Effects of Working Memory, General Fluid Intelligence, and Socio-Economic Status on Musical Sophistication

Daniel Shanahan, Emily M. Elliott, David John Baker, Juan Ventura, Elizabeth Monzingo, Hailey Holt, Hannah Keller

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Background

An increasing amount of literature has sought to clarify findings between music and intelligence. A large portion of this literature has focused on the relationship between musical training and various cognitive measures. Both correlational (Slevc, et al. , 2016; Talamini, et al., 2016; Talamini, et al. 2017; Schellenberg, 2006; Degé, et al. 2011; Ruthsatz, et al. 2008) and experimental studies (Schellenberg, 2004; Moreno et al., 2011) suggest that some sort of relationship exists between music and cognitive abilities. Recent studies, such as Swaminathan, et al., 2017, have argued that differences in cognitive ability later in life may be remnants of a selection bias early on where intelligent children who have a high aptitude for music self select into studying music, which is then further confounded by factors such as socioeconomic status. To further investigate this, they found evidence suggesting that musical aptitude is likely a better explanation than musical training for explaining differences in general fluid intelligence.

Aims

This study seeks to replicate and extend these findings, suggesting that differences in musical aptitude and socioeconomic status can serve as better predictors of individual differences in general fluid intelligence. Whereas the previous study examined how the Musical Ear Test can predict general fluid intelligence, this study takes a more comprehensive approach, in which the dependent variable is a composite score of general fluid intelligence, and with a measurement of musicality that is arguably more ecologically valid and updated (the melodic memory and beat perception tasks from Goldsmiths Musical Sophistication Index).

Methods

Data was collected on a sample of undergraduates (N=84) who participated in a battery of tests measuring cognitive ability, musical sophistication, as well as measures of socioeconomic status modeled after Swaminathan et. al (2017). Here, we examine musical sophistication as measured by the Goldsmiths Musical Sophistication Index (Müllensiefen, et al., 2014), as well as a number of cognitive measures that measure working memory capacity including Tone Span, Operation Span, and Symmetry Span Task (Unsworth, et al. 2005), as well as Raven's Advanced Progressive Matrices (Raven & Court, 1998) and a Number Series task (Thurstone, 1938) for measures of general fluid intelligence. Socioeconomic status was then measured by asking for participants to report on both parents' income as well as their parents' highest level of education achieved (see also Corrigall, Schellenberg, & Misura, 2013).

Results

General fluid intelligence and working memory capacity were significantly correlated, but neither were predicted by measurements of socioeconomic status. Years of formal training and the measurement of musical sophistication, however, were significantly predictive of both working memory and general fluid intelligence.

Conclusions

This paper suggests that a more comprehensive approach to modeling both musical sophistication and cognitive abilities is necessary to better understand the causal processing underlying each.

Exploring autistic musicality: Spectral hearing and beyond

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Background

Recent musicological research drawing the field of disability studies has interrogated aspects of autistic "musicality," understood phenomenologically as a receptive, performative, and creative orientation toward/engagement with music. Dave Headlem and Joseph Straus in particular postulate models of "autistic hearing" and "listening," speculating upon how differences in autistic cognition shape the perception and experience of music. Headlem and Straus draw liberally from several sources, including Uta Frith's theory of Weak Central Coherence (WCC).

Auditory processing studies involving autistic subjects since the early 2000's, however, suggest Laurent Motton's theory of Enhanced Perceptual Functioning (EPF) is a better model than WCC in accounting for the autistic experience of sound. Further, autistic strengths began appearing regularly in pitch processing tasks, and weakness in in temporal processing tasks, among others. This imbalance may be partially explained by right-brain overgrowth and right-hemispheric lateralization commonly found in autism, given right-brain functions are typically devoted to spectral sonic elements and left-brain functions process temporal elements.

Aims

This paper provides a critique of earlier theories of autistic hearing and listening, and integrates emerging methods in musicology with recent scientific findings to better understand autistic musicality. Further, this paper introduces the concept of spectral hearing as an autistic perceptual and cognitive trait that strongly shapes musical experience in many dimensions.

Main Contribution

Robust evidence suggests autistic perception and cognition of sound is unique, and includes imbalanced processing abilities regarding spectral and temporal elements. This paper explores autistic musicality by continuing to apply musicological methods to identify links between processing differences and forms of listening to and creating music by autists.

Because the perception of sound is not directly translatable musical experience, this paper seeks to establish concrete examples of autistic musicality that elaborate perceptual and experiential differences. The author will serve the role of subject in two respects: first, as an adult diagnosed on the spectrum, the author will describe how autistic musicality and spectral hearing affected aspects of his musical development, taste, and experiences performing in jazz groups in college and composing in graduate school; second, the author will describe how, in my clinical work as a music therapist working with autistic clients, forms of autistic musicality take shape through improvisation. The author will draw from three in-progress case studies which analyze music created by autistic client and therapist during a ten-month program.

Implication

Greater knowledge of autistic musicality would create more opportunities for communication and interaction between autistic and non-autistic populations, and be a valuable resource for music therapists who work directly with autistic musicality in their clinical processes.

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Relationship between music performance skill and auditory discriminations of timing, pitch, and loudness differences in recordings of artist-level performances

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Background

The development of music performance skills requires not only the refinement of perception and motor behavior but also the ongoing assessment of one's own playing (Chaffin, Imreh, Lemieux, & Chen, 2003; Duke, Simmons, & Cash, 2009; Maidhof, 2013). To encode and refine procedural memories, learners must have well-defined performance goals, experience attempts to accomplish these goals, perceive the discrepancies between the results of their attempts and their intended outcomes, and adjust their behavior to reconcile those discrepancies (Wu, Miyamoto, Castro, Ölveczky, & Smith, 2014).

Aims

We sought to develop a test of musicians' ability to detect small differences in timing, loudness, and pitch in authentic music performances, and to compare the contextual discrimination abilities of musicians at various levels of musical accomplishment.

Method

We created 20 test items that comprised paired versions of brief excerpts from professional recordings of unaccompanied Bach by altering the timing, loudness, or pitch of one or more tones in one excerpt in each pair. Alterations were small (e.g., ±30 cents in pitch) and within the range of plausibility for actual performance. Participants were asked to identify the differences between the excerpts in each pair. We administered the test to 150 graduate and undergraduate music majors attending two universities and one conservatory in the US.

Results

We obtained test-item discrimination indices ranging from 0.24 to 0.65. Thresholds for detectable differences were larger than those observed in tests using isolated tones.The test was internally consistent (Kuder-Richardson 20 = .65). A subset of participants took the test a second time, approximately 10 weeks following the first test administration; test-retest reliability was r = .74.

We established that musicians' auditory discrimination skills varied with their level of expertise. Preliminary analysis of responses from a subset of participants shows that the test effectively discriminated among the levels of expertise represented in the sample, $F(2, 46) = 8.49$, $p = .0007$.

Conclusion

Our findings contribute to our understanding of the development of musicians' auditory discrimination skills and help explain how these discriminations guide decision-making during independent practice—the primary context of musical development. The design of our test provides for the assessment of musicians' discrimination abilities regarding the types of variations that typically occur in the practice and performance of music. Data from the present study supports the notion that refined performance is in the ears as much as it is in the hands.

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L13M: Long Talks 13 - Movement

Time: Saturday, 28/Jul/2018: 13:00 - 14:30 · *Location:* Montreal_2

Session Chair: Matthew Harold Woolhouse

Shared eye movements made in response to choreographic dance

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Background

Studies involving expert and novice viewers indicate that biological-motion schemas influence eye movements in the observation of dance (Stevens et al. 2010). Some gestures and/or musical manipulations create relatively concentrated fixation clusters amongst participants, whereas others lead to more diffuse patterns (Woolhouse & Lai 2014). These, and other similar findings (e.g. Schubert et al. 2013), suggest that experienced dancers may have the ability to dictate where and how they are observed, guiding viewers' gaze and attention in a structured manner. Which is to say, with respect to dance, the power of where to look lies not with the observer, but with the observed.

Aims

The aim of this study is to investigate the influence of specific dance gestures on eye movements, and the extent to which these influences are shared between participants.

Methods

To investigate individual dancer and dancer gaze-direction effects, two females were videoed performing choreographed dance-gesture sequences under three gaze-direction conditions: (1) looking at camera; (2) looking off camera; and (3) looking at their own gestures. Simultaneously, the dancers' biological movement data were recorded using an infrared passive-marker motion-captured system, which enabled body kinematics and moving ROIs (e.g. right hand, left foot) to be included in the analysis. Choreography included 3 anatomical groups (arms, legs, full-body), 2 action locations (peripheral, medial), 2 movement types (staccato, legato), which resulted in 12 gestures. Gestures were arranged into 2 pseudo-random orders prior to being performed and videoed. Videos were presented to 32 males/females, while an optical eye-tracking camera recorded participants' eye movements.

Results

Results reveal the significant impact upon observers' eye movements of dancer gaze-direction, limb type and location, and independent kinematic variables, including peak velocity, periodicity and acceleration.

Conclusions

Consistent eye-movements made my multiple participants in response to dance suggest the existence of shared biological movement schemas. Schemas that are articulated and communicated via the body of a skilled dancer, appear to result in relatively structured and synchronized eye-movement responses, as indicated by the results of the present study.

References

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Neurophysiological effects of dance technologies on the development of Parkinson's disease

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Background

The combination of music and dance is increasingly seen as a remedial modality for neurodegenerative diseases such as Parkinson's (PD; Westbrook & McKibben, 1989). Spurred on by the realization of the palliative efficacy of music and dance, organizations have sprung up which provide PD-focused dance lessons, including Hamilton City Ballet's Dance for

Parkinson's program in Ontario. Based on some of the choreography from these classes, our team has developed a dance-based technology for PD patients to use in the comfort of their own homes. The system provides users with an on-screen virtual dance instructor, which is animated using the motion-captured data of a real dancer (Woolhouse & Zaranek, 2016). Utilizing the motion-sensing capabilities of Microsoft's Kinect camera, the virtual dance instructor adapts to a user's movement abilities as they mimic its gestures: should a user's movements be restricted, the instructor modifies the expressivity of its gestures accordingly.

Aims

Over the past year, we conducted a pilot study examining the effects of our dance technology on physiological and psychological symptoms of PD. We tested the hypothesis that daily engagement with the system benefits three main areas of PD: (1) neurological aspects of the disease's progression; (2) kinesthetic measures including coordination, mobility, and balance; and (3) subjective ratings of mental and physical symptoms reported via a survey.

Method

The pilot study consisted of five subjects who engaged in two sessions: a 4-week control period and a 4-week intervention period. During the control period subjects maintained regular living conditions; during the intervention period subjects had the technology installed in their homes and engaged in daily dance activities. At the beginning and end of each session, three types of measures were taken: (1) magnetic resonance imaging (MRI) to assess neurological markers of PD; (2) clinical assessments of physiological measures including the United Parkinson's Disease Rating Scale and speed-coordination tasks; and (3) a subjective survey of mood and motivation.

Results

Results of the clinical motor assessments showed significantly increased mobility as well as trends of reduced tremors and rigidity after the intervention period. Subjects reported feeling more energized and motivated and had less difficulty sleeping. MRI data analysis is underway.

Conclusions

Data from the study will be used to corroborate and expand existing knowledge into the effects of music and dance on neurodegenerative disease. The benefits of our intervention were positive even with such a small sample size displaying the potential powers of dance therapeutics for PD. We hope this study may inspire researchers and clinicians to incorporate music and dance technologies into palliative healthcare procedures. Study results will be considered and incorporated into further developments of the system, in order to maximize its therapeutic potential and optimize it to the requirements of individuals with PD.

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The effect of syncopation on tapping performance and neural entrainment of the motor system

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Background

A rhythm that is syncopated tends to defy the expectancies created by meter, and tends to de-emphasize points of metrical accent. Yet, humans are still able to feel the underlying pulse of these rhythms, and often report more pleasure and a greater desire to move (e.g., feelings of groove) when listening to them (Witek et al., 2014). It has been suggested that an 'optimal' level of syncopation may exist, whereby rhythms with more (i.e., more off-beat notes) or less (i.e., more on-beat notes) syncopation elicit reduced pleasure and a reduced desire to move (i.e., an inverted-U relationship; Witek et al., 2014). Since feelings of groove are related to reduced tapping variability (Janata, Tomic, & Haberman, 2012), we predicted that tapping performance would be best for optimally syncopated rhythms. Since neurons will also entrain their firing to the beat of rhythms, the same prediction can be made for neural entrainment.

Aims

We seek to investigate the effects of rhythmic syncopation on both sensorimotor synchronization and neural entrainment to the beat. It is predicted that both measures will exhibit an inverted-U relationship with rhythmic syncopation.

Methods

Stimuli consist of 6 rhythms obtained from Matthews, Witek, and Vuust (in prep.): 2 clave rhythms (son and rumba; optimal complexity), 2 versions where notes have been shifted to be more on-beat (low syncopation), and 2 versions where notes have been shifted to be more off-beat (high syncopation). Participants listen to stimuli in two counter-balanced blocks. In the tapping block, they were instructed to tap along to the perceived beat of the rhythm on a MIDI drum pad. In the EEG block, they passively listened to each stimulus and were instructed to refrain from tapping their feet or otherwise moving.

Results

It is expected that both tapping performance and neural entrainment will be greatest for the 2 clave rhythms, and lower for the on-beat and off-beat versions.

Conclusions

Results will be discussed in the context of neural resonance and predictive coding. We expect that certain rhythms will engage (or resonate) with the motor system more than others (i.e., more neural entrainment to the beat in [pre]motor brain regions), effectively priming movements that are complementary with the rhythm (e.g., tapping to the beat). This pattern of findings would be consistent with the notion from neural resonance theory that motor activity elicited by a rhythm will depend on its timing similarity with patterns stored for oscillatory movement (e.g., walking).

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D3G: Demonstration 3

Time: Saturday, 28/Jul/2018: 15:00 - 16:00 · *Location:* Graz_1

Performers' attentional processes and strategies: Theory and pedagogy

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Background

Many established psychological theories of musical ability and standard pedagogical practice equally tend to disregard the fact that a performer is not only expressing but also empathizing with feelings and that performances occur in real time. However, these attributes are the key qualities of a musical performance to be accounted for in the theory and pedagogy of performance, as well as in theories of musical ability.

Aims

My model of the performer's attentional processes and strategies focuses on performers' real-time cognitive and affective processing during a performance that is perceived to be highly expressive and individual. I intend to show how this model can be introduced into pedagogical practice: a short introduction to the model and a novel methodology of music performance pedagogy, based on the model, will be followed by a demonstration of the methodology.

Main content

I argue that a key sign of musical giftedness is the ability to extract 'meanings', grounded in feelings, from musical materials and to fully concentrate on them during performance. Full concentration is fostered through the ability to cognitively 'navigate' in the musical flow in real time, i.e., to be able to position into the future, the past, and the present in the act of performance. This ability, which is likely to rely on a more general empathic ability, can be mastered by the majority of people, including those scoring low on standard musical aptitude tests measuring 'melodic', 'rhythmic', or 'harmonic' skills. In the demonstration, I present in detail the model of performers' attentional processes and strategies that define the real-time 'navigation' in the musical process, followed by an outline of Practice Methodology, which aims at enhancing in musicians (regardless of their instrument and including singers) the ability of real-time 'navigation'. This will be followed by a demonstration of some of the methodology's key exercise types.

Implications for practice

Practice Methodology was gradually developed during the past decade and has already been introduced at the tertiary level education in several institutions in Europe. Further to the conservatoire level, based on initial evidence from primary and secondary level pedagogy the methodology can be used with singular success from the very beginning up to the most advanced levels of music education, yielding a uniquely powerful tool in music performance pedagogy.

Specific value of demonstration for conference

Development of the model of the performer's attentional processes and strategies relies on research from psychology of music, sport psychology and attention research, as well as on hypotheses based on pedagogical practice. Despite the overwhelming theoretical and practical importance of the topic for music psychology, aesthetics, analysis and pedagogy, it has never been investigated in depth but in a very few studies only, which is mainly due to its highly interdisciplinary nature, as well as to difficulties in its theoretical and empirical approachability. Besides the model's strong potential for applications in music pedagogy, further development and operationalization of the core theory can open the way for an innovative cognitive approach in music theory, analysis and aesthetics.

D4G: Demonstration 4

Time: Saturday, 28/Jul/2018: 15:00 - 16:00 · *Location:* Graz_2

A Proficiency estimation system for violin performance

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Background

To realize a proficiency estimation system of musical performances is said as difficult due to the diversity of proficiency evaluation among experts. Several previous studies proposed estimation methods by machine learning [1-3]. The first previous study proposed the estimation method of the proficiency for the piano performance [1] and the study built a computational estimation system of the proficiency of piano performance [2]. The second previous study proposed the estimation method of the proficiency for the violin performance [3]. However, the method has not yet been systematized so far.

Aims

This report builds a computational estimation system for proficiency of violin performance.

Main content

The system estimates the proficiency of the violin performance for the inputted violin audio of one-octave performance. It uses one of the acoustic parameter set which was proposed on previous study[3]. The parameter set divided into two parts from the basic of the parameter properties. First part is the parameter that indicates the basic feature of performance audio. Second part is the parameter that considers the pitch control including pitch and vibrate parameters, thought as important on the non-fret instruments. The pitch is calculated by “YIN[4]”. Ten distinct violinists played the one-octave scale for 10 times, so 100 performances were recorded and five expert violinists were then asked to score the proficiency for all performances. The collected data is then used as the training data on proficiency estimation.

Implications for practice

By using the estimation system realized here, whoever are possible to estimate their own violin performance easily.

Value for this conference

This system contributes to a variety of players, the novice players in particular, since they are difficult to correctly observe and judge their own performance level by themselves without proposed system..

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W3G: Workshop 3

Time: Saturday, 28/Jul/2018: 15:00 - 16:00 · *Location:* Graz_3

A health literacy programme for musicians

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Background

Musicians suffer for their art and this often translates into poor health. The Health Promotion in Schools of Music (HPSM) project has recommended that health education should be included in core curricula, but there are no guidelines with regards to what such courses should include (Chesky et al., 2006). Evidence on musicians' health literacy is scarce. Classical music remains a rather conservative field, and therefore at risk of neglecting the evidence. Although health promotion is now incorporated in higher education music institutions around the world in various forms, conservatoires still endorse practices that are not evidence-based, displaying what seems to be a persistent and romantic attachment to tradition.

Aims

To raise awareness of the importance of health education among music students through a literature review of health courses that have been evaluated to date, findings from a survey on existing health training initiatives in 20 European conservatoires, as well as music students' health knowledge. As part of this workshop, we also aim, through practical activities and brainstorming, to reach a consensus with regards to how the ideal health education programme might look.

Audience activities

We invite music educators, music teachers, and other experts with an interest in musicians' health, psychology, performing arts medicine and healthcare curriculum design to share best practices that might be applied to musicians' education and to collaboratively develop a set of topics and guidelines that would form an ideal health education programme. We will use group discussions and brainstorming to choose topics from comprehensive lists and seek consensus on top priority content items.

Implications for practice

A set of guidelines based on the available evidence and expert consensus could further inform the design of specific health education interventions among music students, given the current lack of rigour in the design of such courses. This initiative could generate the sharing of best practices across higher music education institutions, stimulate further research in the field, and also provide opportunities for quality control.

Value for this conference

Given that the conference will bring together international experts, this is a great opportunity to facilitate and encourage a discussion about better health education across conservatoires worldwide, in an attempt to better integrate the available evidence from relevant domains and infuse the curricula design in higher music institutions with more rigour. This could lead to a better regulation of higher education institution in terms of their responsibility towards musicians' health. This would add value to the conference, as it would be the first attempt to define health literacy and health education and to facilitate a focused dialogue with guided practical activities about the content of a health literacy programme.

References

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T27G: Short Talks 27 - Education

Time: Saturday, 28/Jul/2018: 15:00 - 16:00 · *Location:* Graz_4
Session Chair: Ioanna Filippidi

Music student`s ideas about mental practice

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Background

Mental practice is one of the most frequently applied off-task methods to promote learning. The performance of a task is mentally rehearsed in the absence of physical practice. The application of mental practicing has been studied in many disciplines, including sport science, medical rehabilitation or music. Mental practice in music involves formal analysis of notes, acoustic presentation of the play, hand or finger movement, presentation of difficult passages, etc. (Klöppel, 1996). Although the study of mental practicing in music has not a long tradition, some studies were carried out since the 80s, including Ross (1985), Wapnik et al. (1982), Coffman (1990) or Kopiez (1990). Some information's about using mental rehearsal by music students we can find by Fine & bravo (2011), Haddon (2007) and Connolly & Williamon (2004) or Kaczmarek (2012).

Aims

The aim of this study is to examine the structure of mental practice, especially focusing on the mental rehearsal strategies, content of this strategies and its goal. The research groups included young students (instrumentalists and vocalists) from the Music Academy in Lodz (Poland). Age mean was 23.04 (SD=2.71). The sample built 44,7% of men and 55,3% of woman, with at least ten years of experience in playing the instrument (M=11.45; SD=4.5).

Method

In two questionnaires we asked young musicians to reflect on their mental strategies. One was The Functions of Imagery in Music Questionnaire from Gregg, Clark & Hall, (FIMQ, 2008). The FIMQ is based on five different dimensions: two cognitive scales and three motivational scales. The second one was made by Kaczmarek for purpose of the study. Results: 60% of the total sample use mental practice as an integral part of instrumental practice but very rarely (43%). The main content of visualization consists of auditory (aural, 75%), followed by emotional (67%) visual (63%), general (56%) and kinesthetic (47%) images of the piece. More than half of the respondents use relaxation and breathing exercises or different kind of visualization. Most of the respondents sees sense to use mental training to enhance their psychological, emotional, cognitive and motivational skills. For almost all students MT is good for dealing with public performance, enhancing concentration and attention and developing the resistance for stress (95-99%). We have found significant differences in the use of mental strategies between the two groups only in some scale and aspects. Vocal students use often breathing exercises and emotional imagery; Instrumental students instead use often visual and auditory visualizations.

Conclusions

Even studying at the music academy, students (instrumentalists and vocalists) do not know much about mental practice and have little knowledge of the use of appropriate strategies conserving the mental rehearsal in their instrumental or vocal practice. Imagery/mental work should become a more formal part of musical training and can be practiced.

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Music Learning Spaces

Elena Alessandri[1], Nicole Sandmeier[1], Christian Lars Schuchert[2], Nicole Hartmann[2], Sibylla Amstutz[2]

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Background

Music education institutions strive to offer students an optimized learning environment. In terms of infrastructure efforts are usually directed towards the design of practice rooms [1-2]. However, other learning activities, like mental training or relaxation techniques are relevant to music students' artistic development [3]. It should thus be clarified the extent to which these activities are carried out in the school environment and what infrastructure may help promote their implementation.

Aims

Our aim was to document music students' perceived needs in terms of range of learning activities and related infrastructural requirements.

Method

Through a literature review we produced a map of activities thought to be useful to the development of musical understanding and performative skills. Five families emerged: Mental training, Self-study, Fitness, Bodywork, and Networking.

We then ran an online survey for students, alumni, and teachers at three University Schools of Music in Switzerland to explore the perceived usefulness of these activities and the relevant infrastructural requirements. The survey was available between October and December 2017. It was structured in three parts: demographics; perceived relevance of the five chosen learning activities; and expectations concerning room atmosphere, infrastructure, and technical equipment.

Results

225 musicians (155 students, 43 teachers, 27 alumni, mean age 29.58yrs, range 18-64) completed the survey. All five chosen activities were perceived as highly relevant. 78% of participants rated networking as important or very important for a successful music study, this was followed by bodywork (74%) and mental training (73%). When asked how important it is to carry out those activities within the school spaces, two thirds of teachers (65%) and 82% of students/alumni said that it would be important or very important for students to network within the school environment. Bodywork and self-study were also ranked high by most students/alumni (70% and 57%). This view was shared by less than half of teachers (44% and 35%). Bodywork, self-study, and mental training emerged as sensitive towards disturbing factors (surrounding sounds; people who see; people walking around). These activities require a calm, concentrated, and contained atmosphere and spaces that are bookable as well as open to spontaneous activity. Networking emerged as an ubiquitous activity, to be conducted spontaneously in rich, lively, and extrovert spaces.

Conclusions

The findings document a need from the students' perspective for a school environment that allows and nurtures networking, bodywork, and self-study; activities often neglected by the planning of music school facilities. The discrepancy between students' expressed needs and what teachers thought these would be, suggests that students' perspective should be directly integrated in future planning. Together with the typology of spaces, this study will provide an empirical basis for music education institutions to offer students an optimized learning environment.

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The association between music lessons and academic achievement in 10-to 12-year-old children: The mediating role of academic self-concept and personality

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Background

Besides many associations with cognitive abilities (e.g., IQ) (Schellenberg & Weiss, 2013), music lessons show a relationship with academic achievement. Scores on standardized achievement tests as well as school grades are related to music lessons (Schellenberg, 2006). Interestingly, the association between music lessons and academic achievement cannot be explained by cognitive abilities. Even if IQ is held constant the association between music lessons and academic achievement remains reliable (Schellenberg, 2006); IQ only explains part of the association. Therefore, the association between music lessons and academic achievement is not only due to cognitive transfer (i.e., IQ). In addition to cognitive transfer, a conative transfer (i.e., motivational, personality or self-concept variables) might underlie the association. Reasonable candidates for conative transfer in the case of music lessons and academic achievement are academic self-concept and personality, because they are linked to academic achievement and to amount of music lessons. Earlier studies could demonstrate that music lessons influence academic self-concept (Degé & Schwarzer, 2017).

Aims

We investigated whether the association between music lessons and academic achievement in 10- to 13-year-old children is mediated by academic self-concept and personality.

Method

We tested 101 (61 female) 10- to 13-year-old children (M = 143.60 months, SD = 7.37 months). As predictor variable amount of music lessons (in months) was assessed. We measured as outcome variable academic achievement (report card) and as mediators academic self-concept (SESSKO) and personality (BFI). Furthermore, we assessed as control variables gender, grade, SES (parents' education and income), age, motivation, schooling, and IQ.

Results

Music lessons and academic achievement were correlated significantly ($r = -3.1$, $p = .002$). To test mediation hierarchical multiple regression was used to predict academic achievement with control variables entered on the first step, academic self-concept and personality added on the second step, and music lessons added on the third step. The control variables accounted for 4.8% of the variance in academic achievement, $p < .03$. The addition of academic self-concept and personality improved the fit of the model, $F_{inc}(6, 93) = 4.41$, $p = .001$, accounting for an additional 21.1% of the variance in academic achievement. The addition of music lessons on the third step did only slightly improve explanatory power further, $p = .05$ and 3.1% additional explained variance.

Conclusions

The initial correlation between music lessons and academic achievement was significantly reduced by the mediators, which speaks in favor of a partial mediation. Hence, the association between music lessons and academic achievement was partially mediated by academic self-concept and personality (conscientiousness most important contributing variable).

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L14M: Long Talks 14 - Musical Structure

Time: Saturday, 28/Jul/2018: 15:00 - 16:00 · *Location:* Montreal_1

Session Chair: Michael David Golden

Quantitative evaluation of music copyright infringement

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Background

Unfounded music copyright lawsuits inhibit musical creativity and waste millions of taxpayer dollars every year. A major reason for this is that evaluating musical similarity requires specialized expert testimony by musicologists, who tend to use subjective, idiosyncratic, and time-consuming methods. Such analysis has traditionally focused on melodic similarities as represented by standard staff notation, which is hard for lay juries to evaluate (Cronin, 2015; Fishman, 2018).

Aims

Our aim was to develop and test objective methods in order to supplement subjective musicological analyses. To do so, we adapted automatic sequence alignment algorithms from molecular genetics to develop a "percent melodic identity" (PMI) method that was initially developed to measure the cultural evolution of music.

Methods

This method automatically quantifies the percentage of identical scale degrees shared between two melodic sequences (Savage & Atkinson, 2015). This method includes the feature of random permutation to provide not only descriptive measures of similarity but crucially allows inferential statistical testing to determine whether two melodies share significantly more notes than would be predicted by chance for any two melodies constructed from the given scales. We applied the PMI method to a corpus of 20 pairs of melodies from the Music Copyright Infringement Resource (Cronin, 2016) that had been the subject of legal decisions and that had previously been analysed using automatic methods (Müllensiefen & Pendzich, 2009).

Results

Our analysis found that PMIs below 50% usually result in decisions of no infringement (11/13 cases), while PMIs above 50% usually result in decisions of infringement (5/7 cases). Importantly, each of the four outlying cases could be explained by contextual factors not related to melodic similarity (e.g., lyrics, access). Random permutation analysis confirmed that all PMIs over 50% were significant ($P<.05$) and all PMIs below 40% were non-significant ($P >.1$), but provided mixed results for PMIs between 40-50%.

Conclusions

Our results demonstrate that automatic melodic comparison provides important objective information that can help evaluate music copyright infringement cases. It also highlights the need to combine measurements of melodic similarity with contextual factors. Our findings build on those of Müllensiefen & Pendzich (2009) by adding a measure of statistical significance to melodic similarity and by providing a simple PMI metric that is easily interpretable by non-musicologists. Our methods provide promise for creating a more efficient and just system for evaluating music copyright infringement that combines both objective and subjective components.

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Some Influences of Chord Progressions On Accent

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Background

Do particular chords progressions encourage listeners to hear pulses as accented? Corpus analyses of Western European common-practice tonal music have shown that certain chords tend to occur on strong beats (Prince and Schmuckler 2014), and some behavioral experiments have indicated that events perceived as more consonant/stable tend to be associated with metrically accented events (London, Himberg and Cross 2009), while other research has questioned the extent to which harmony plays a role in accent perception (White 2017).

Aims/Methods /Results

This paper outlines four experiments that investigate the ways that chords and chords progressions might cause listeners to hear a pulse as accented. In each experiment, listeners hear two alternating pulses and are asked to tap on the pulse they perceive as more accented. In Experiment 1, Pulse A sounds a chord that retrains the same pitch classes as Pulse B, while Pulse B sounds a chord with at least one pitch-class different from Pulse A. Chords were all the major and minor triads within the diatonic universe. Participants rated Pulse B as accented significantly more frequently than Pulse A, indicating that pitch-class change encouraged a feeling of accent. Experiment 2 replicated the same design, but now in a chromatic universe: the same effect was found.

Experiment 3 tested whether different progressions that change the same number of pitch-classes would be heard as differently accented. Triads have three ways they can transition to one another while changing only one pitch-class (moving the root up a third or down a third, and retaining the root but switching modes). Participants were presented with trials where the alternating pulses instantiated one of these relationships: Pulse A would repeat the previous chord, while Pulse B would change one p.c. but in only one of those three progression types. Now, participants vastly identified pulses hosting major triads as the more accented; we found no effect of transformation type. In order to determine whether particular root motions in of themselves might influence accent perception, Experiment 4 constructed a format in a chromatic universe such that Pulse A would sound a major triad, and Pulse B would sound a major triad rooted a third lower. Different thirds were used in different trials. No effect of pulse or third-type was found.

Conclusions

These findings suggest that pitch-class change influences whether listeners perceive a chord event as relatively accented, that this holds in both diatonic and chromatic contexts. The chord's mode was found to effect accent assessment, but the root motion and transformation type were not found to have an effect. These findings have implications on the overlap between harmony and meter, and the construction of triadic chord grammars.

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L15M: Long Talks 15 - Movement

Time: Saturday, 28/Jul/2018: 15:00 - 16:00 · *Location:* Montreal_2

Session Chair: Matthew Harold Woolhouse

Collective listening: groove, tempo, and visual coupling among audience members affects physical engagement with the music

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Background

Music has a social bonding role. Social interaction in dyads is mediated by motor synchronization (i.e., Cirelli, Einarson, & Trainor, 2014). It is difficult to determine analogous effects in large groups in natural settings but the silent disco paradigm has provided positive evidence in constrained experimental tasks (i.e., Bamford et al., 2016; Woolhouse et al., 2016).

Aims

Does listening to music in groups versus individually lead to increased body movement? Does social context affect listeners' engagement with music and each other?

Method

The study was conducted in the LIVELab, a concert hall with motion tracking capacity covering the seating area. Thirty-three participants listened to musical pieces while their head movements were recorded. Visual cues to others' movements were manipulated by asking participants to close their eyes on some trials. Separate songs were selected for each combination of low/high groove and slow/fast tempo. The factors of visual cues, groove, and tempo were randomized and fully crossed for a total of eight conditions. Grooviness ratings were collected after each song. A matrix of cross-correlations between each pair of participants was obtained and divided into two parts, connected (spatially and visually proximate) and unconnected parts. Furthermore, the principal components of the three-dimensional head movements were parsed into individual cycles whereby the duration, amplitude, energy, and peak time of each cycle were computed. From the cycles we extracted intra-personal measures characterizing properties of movement such as tempo and energy.

Results

Participants' cycle durations matched the song tempos indicating that in general the audience was responding to the stimuli. Movement energy was highest with eyes-open and with high-groove songs and was positively correlated with grooviness. Greater contribution of the second principal component suggested more diversified movements in high-groove songs as the role of a second axis of movement was more pronounced. Interpersonal synchronization was higher in eyes-open trials. Furthermore, in the eyes-open high-tempo conditions, connected pairs were better coordinated than non-connected pairs, suggesting that the social facilitation was partly dependent on movement coordination.

Conclusions

Social facilitation could explain the increase of individual movement energy when people could see each other but the evidence is not conclusive because of the possible role of focus of attention in eyes closed. The association between movement energy and grooviness ratings suggests that social context improves subjective musical experience. The fact that participants were more coordinated if they were in spatial and visual proximity, at least in the high-tempo songs, further underscores the importance of social context in musical experience.

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Coupled sway, coupled hearts: The role of body sway and groovy music in romantic attraction

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Background

Love and romantic attraction are among the most basic forms of human bonding. Previous work has found that moving synchronously enhances interpersonal affiliation (e.g. Cirelli et al., 2014; Wiltermuth & Heath, 2009), and body sway reflects predictive interpersonal interaction (Chang et al., 2017). We predict that initial romantic attraction can be reflected by spontaneous interpersonal body sway, and can be magnified by groovy music through induced body movements.

Aims

The purpose of this study was to use a speed dating paradigm to examine (1) whether pairs with a high degree of coupled body sway are more likely to "match" (in other words, both agree that they would like to go on another date) and (2) whether the number of "matches" is increased by manipulating the likelihood that pairs will move together by playing background music that is high-groove or low-groove.

Methods

Prior to the speed dating experiment, we obtained undergraduates' ratings on a selection of songs from previous studies of groove (Janata et al., 2012) and a number of additional songs. From these ratings, we selected songs that differed on ratings of groove ($p < .001$) but not on familiarity and enjoyment ($p = .28$ and .51, respectively). The speed dating experiment took place in the McMaster University LIVELab. Each of 55 participants experienced up to 15 short dates (4 minutes each) while wearing a headband with motion capture markers. The trajectory of their movements was recorded. During each date, either a high- or low-groove song served as background music. At the end of each date, participants confidentially indicated whether they would be interested in pursuing a romantic relationship with their partner.

Results

Preliminary results indicate that participants indicated romantic interest more often when their date was accompanied by high-groove music than low-groove music ($p = .014$). Because groovy music is associated with a desire to move to the beat, this result offers tentative evidence that interactive movement might underlie participants' increased attraction in the high-groove trials. Results from motion capture data are currently being analyzed.

Conclusions

To our knowledge, this is the first study to extend effects of groovy music to the domain of romantic attraction. It is also among the first to examine social effects of movement coupling in a highly ecologically-valid context. The present results tentatively suggest that interpersonal movement influences social affiliation in romantic contexts.

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