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VOICE ANALYSIS OF HYPNOTISTS

INTRODUCTION

The 18th century was certainly the century of pioneers, pioneers of science. The year 1734 is an important date in the history of phonetics: Farkas Kempelen, a pioneer in phonetics was born. But the same year is important in the history of another branch of science, too. Namely, Franz Anton Mesmer, the father of mesmerism, the forerunner of modern hypnosis was also born in 1734. Kempelen's invention, the talking machine was marveled, but its significance was not appreciated at the time – to Kempelen's sorrow. Mesmer's healing method, what he called "animal magnetism", also attracted great attention and interest, but the reaction to it was rather mixed. He was even declared "a charlatan" by the physicians in Vienna.

Yet Mesmer was not only highly successful in removing symptoms and in healing various diseases of the nervous system, but also attempted to base the explanation of his observations on a scientific basis. His theory, that it is the flow of magnetic fluid – emanating from his own hands – that is at the root of these cures was disproved by an official scientific commission (Franklin et al. 1784/1965), nevertheless, his theory pointed at the importance of the role of the healer in the healing process. And his followers carried on.

Repeatability is an important criterion when scientific findings are evaluated. In accordance with this, it was a milestone in the scientific investigation of hypnosis, when, in 1959, Weitzenhoffer and Hilgard developed a standard procedure by which hypnosis could be induced reliably (Weitzenhoffer/Hilgard 1959). In this method – the various forms of the so called Stanford Hypnotic Susceptibility Scales (SHSS) – the hypnotist has to read the hypnotic induction verbatim, the applied test-suggestions are also determined word by word, strict criteria (in centimeters and seconds) are used to determine if a suggestion was effective in the given case or not. This way people's susceptibility to hypnosis could be measured repeatedly and reliably – not only in English, but in other languages as well, for these scales have been translated and standardized in more than a dozen tongues. It was an important finding that hypnotic susceptibility is a very stable personality trait. Today, according to the most widely accepted definition of hypnosis,

> "Hypnosis may be defined as a social interaction in which one person (designated the subject) responds to suggestions offered by another person (designated the hypnotist) for experiences involving alterations in perception, memory, and voluntary action. In the classic case, these experiences and their accompanying behavior are associated with subjective conviction bordering on delusion, and involuntariness bordering on compulsion." (Kihlstrom 1985)

In the history of hypnosis, the cause of hypnotic effects was traditionally attributed to the hypnotized person for a long period. Yet when we applied these scales in our hypnosis research studies, we noticed that even when the hypnotist read the text true to the standard (i. e., verbatim), his or her voice sounded quite different in cases of different subjects. Nowadays, when although the role of the special interaction between the hypnotist and the hypnotized person has been increasingly recognized (see e. g. Nash/Spinler 1989; Bányai 1991, 2002), we still do not know much about one of the most important tools of the hypnotist, that is, his or her voice.

In the present study we attempted to get an answer to the question if there is any systematic change in the hypnotists' voice in a standardized hypnosis situation. Essentially, our question was if changes in the hypnotists' voice could be measured by objective physical parameters. And if yes: How are they related to the behavioral and experiential characteristics of hypnosis?

METHOD

In 2001, our laboratory at the Department of Experimental General Psychology started a long research project within which we have applied the standardized scales of hypnotic susceptibility in 180 persons so far. Today, I am going to report the results of analysis of 38 hypnosis sessions carried out by 5 female hypnotists. All hypnotists hypnotized at least 2 low, 2 moderately and 2 highly hypnotizable subjects. Altogether, there were 29 female and 9 male subjects. The hypnosis sessions were carried out in a sound attenuated room. The sessions were videotaped, but the voices of the hypnotist and the subject were recorded through an independent sound system directly on the computer by the Goldwave computer program. Off-line acoustic analysis was carried out by Praat 4.0, developed at Amsterdam University (Boersma/Weenink 2001). In the course of this, we took predetermined phases of the experimental sessions and calculated the average intensity of the hypnotist's voice, the average pitch (F0) of the hypnotist's voice, and its variability (F0-var), and the long term average spectrum (LTAS) in a 1000 Hz bandwidth. In relation to hypnosis, we recorded the subjects' hypnotic susceptibility score (SHSS, Form A) and their performance on the individual test suggestions, and measured both the hypnotist's and the subject's experiences (by PCI, the Phenomenology of Consciousness Inventory: Pekala 1982), relational dimension (by AIM, the Archaic Involvement Measure: Nash/Spinler 1989) and their evaluation of the relationship between hypnotist and subject (by DIH, the Dyadic Interaction Harmony Questionnaire: Józsa/Varga/Bányai 2002).

RESULTS AND DISCUSSION

Overall we have found that it was possible and worth studying the acoustic parameters of the hypnotists' voice in longer intervals, for we found characteristic changes in every objective physical parameters we recorded in every hypnotist.

The answer to our question whether the hypnotists' voice was any different when they were hypnotizing from that when the were talking to the waking subjects was in the affirmative. That is, we found changes in every hypnotist's voice during hypnosis than when talking to waking subjects:

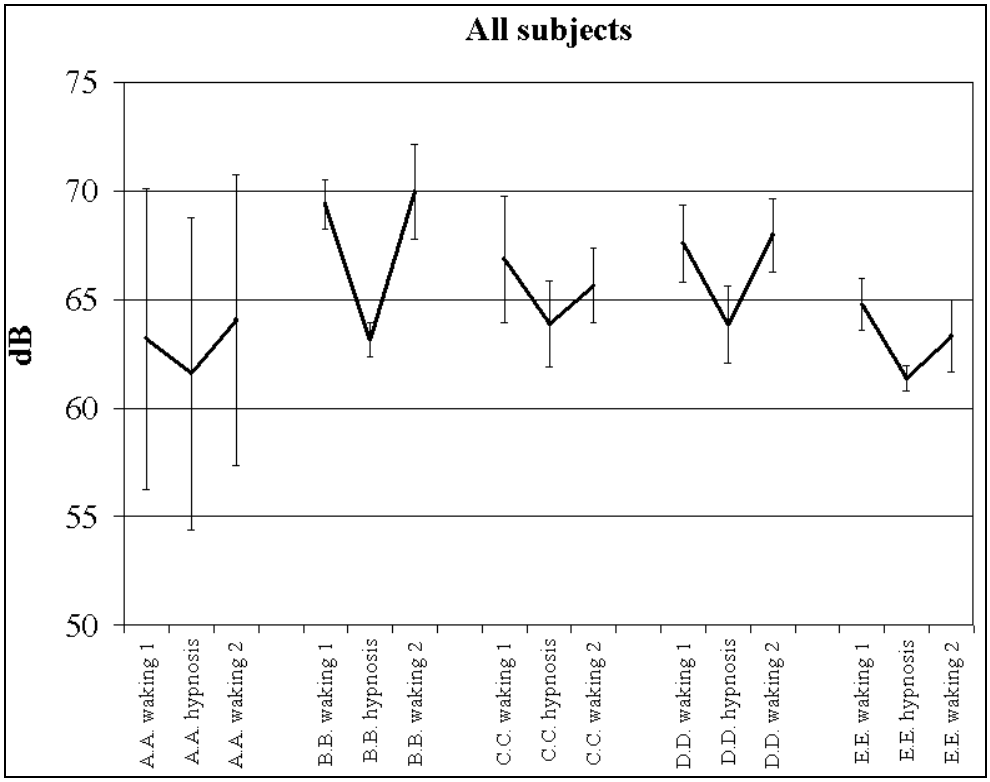

Figure 1: Average intensity of the hypnotists' voice in the pre-hypnotic waking, in the hypnotic, and in the post-hypnotic waking states (ANOVA: A.A.: $F(2,18)=0.22$, $p>0.05$; B.B.: $F(2,18)=45.59$, $p\ll0.01$; C.C.: $F(2,21)=3.51$, $p<0.05$; D.D.: $F(2,21)=13.25$, $p\ll0.01$; E.E.: $F(2,21)=15.45$, $p\ll0.01$)

As to the intensity of the hypnotist's voice, we expected a softening or lowering of the voice. As can be seen in *Figure 1*, all of the hypnotists' voice did change in the expected direction during hypnosis, and returned to its normal level in the post-hypnotic waking part – although in one case (A.A.) this was not significant statistically, due to the great standard deviation (because of accidentally high noise level).

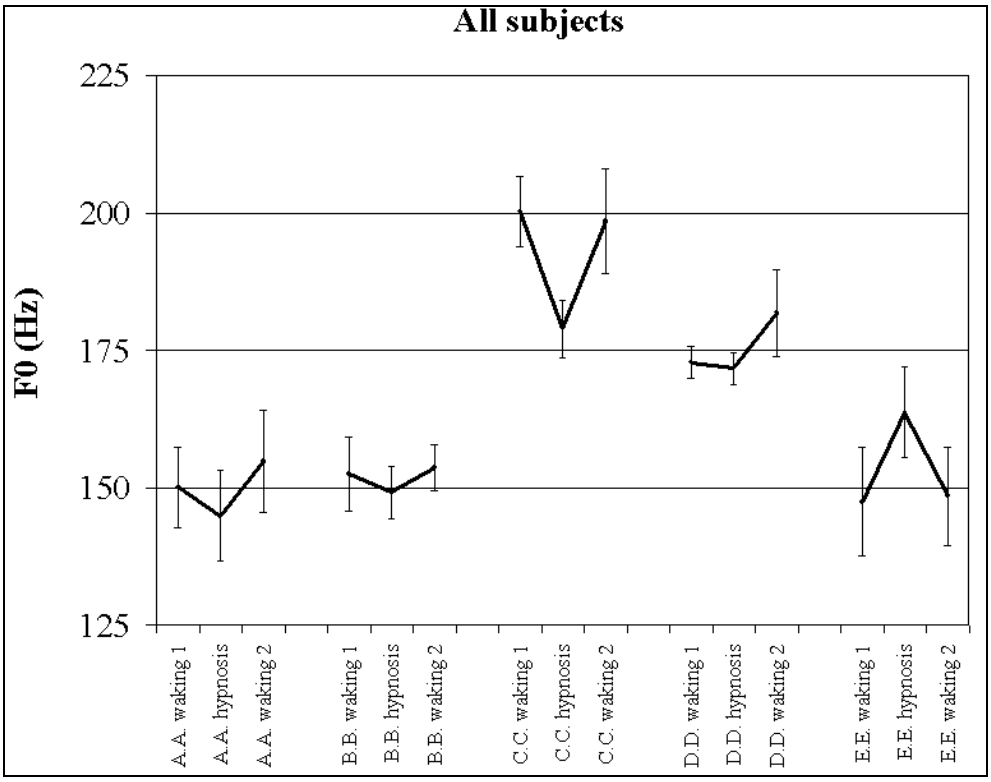

Figure 2: Average pitch (F0) of the hypnotists' voice in the pre-hypnotic waking, in the hypnotic, and in the post-hypnotic waking states (ANOVA: A.A.: $F(2,18)=0.22$, $p>0.05$; B.B.: $F(2,18)=45.59$, $p\ll0.01$; C.C.: $F(2,21)=3.51$, $p<0.05$; D.D.: $F(2,21)=13.25$, $p\ll0.01$; E.E.: $F(2,21)=15.45$, $p\ll0.01$)

Our results were more controversial with respect to the pitch of the voice of the hypnotist. Due to the relaxational nature of hypnosis, we expected a deepening of the voice. As shown in *Figure 2*, the voice of four of the five hypnotist really became deeper, but only two of them (C.C., D.D.) reached statistical significance, while one hypnotist's, E.E.'s voice changed in the opposite direction and her pitch become higher.

The lowering and the deepening of the voice can be related to the decreased level of arousal, which is congruent with the even lexically emphasized relaxing nature of traditional hypnosis. How can we explain then the rise in pitch in one of the hypnotists then?

We consider it possible that a different interpretation of the relationship between hypnotist and subject is manifested here on part of the hypnotist. It has been shown in the hypnosis literature that there is a tendency for the hypnotic relationship to become regressive, that is, archaic modes of relationship become activated in the hypnotized person (Nash/Spinler 1989). If the hypnotist concentrates more on this aspect of the relationship, then he or she may express that the hypnotic communication is different from the waking

one by a speech tone that is similar to child directed speech. There is a large body of evidence based on acoustic analysis, showing that adults talk to infants and small children in a different voice from adults: Their speech register is higher, their intonation is more sing-song like, i. e. their fundamental frequency is higher and more variable, their speech is more articulated and make less grammatical mistakes (Fernald 1992a, 1992b). Perhaps such a change in the hypnotist's voice is related to the style of the hypnotist. Éva I. Bányai (1991, 2002) has differentiated various hypnosis styles that model the relational patterns that have been relevant in a person's life. Thus she described maternal, paternal, sibling, friend-like and lover-like hypnosis styles – but the most marked one was maternal style. Our next step will be to make an independent measurement of the hypnotists' hypnosis style (we do have a rating method for this), and then analyze changes in the pitch of voice of the hypnotist as a function of their hypnosis style. This way we will be able to test our hypothesis that this hypnotist who spoke in a higher pitch is really maternal in style or not.

Nevertheless, this explanation is already supported by changes in the variability of the fundamental frequency.

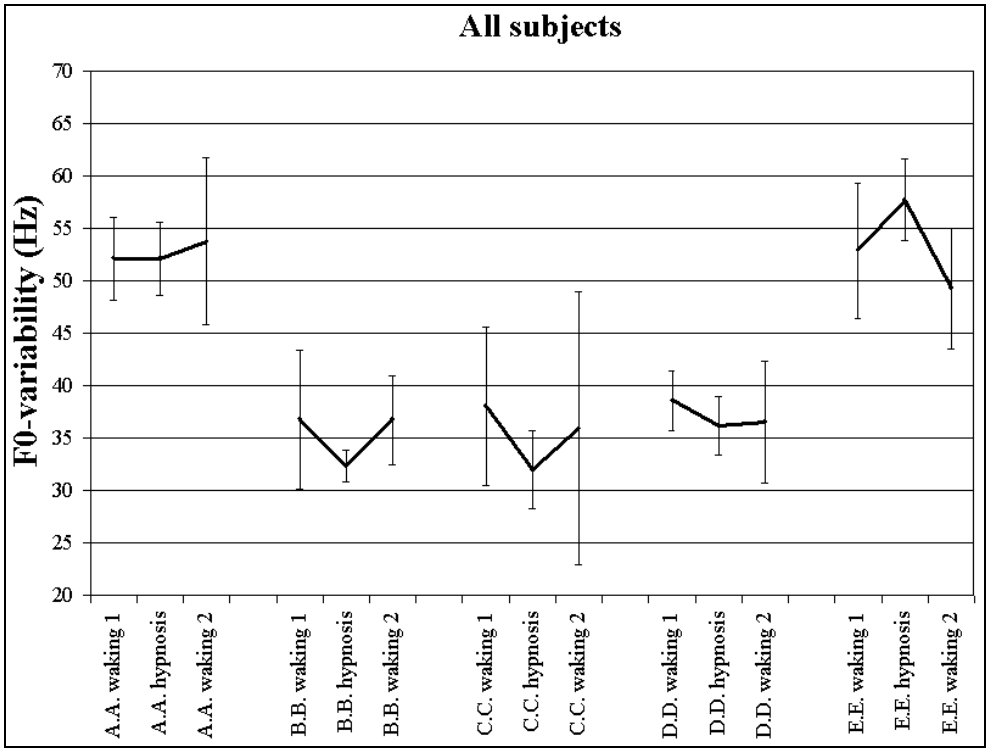

Figure 3: Average pitch-variability (F0-var) of the hypnotists' voice in the pre-hypnotic waking, in the hypnotic, and in the post-hypnotic waking states (ANOVA not significant, except for E.E.: $F(2,21)=4.75$, $p=0.02$)

Figure 3 shows the changes in the variability of F0. As can be seen, the variability of E.E.'s fundamental frequency during hypnosis was significantly higher, i. e. her voice was more modulated than in the waking state. As opposed to this, the voices of three other hypnotists (that of B.B., C.C., and D.D.) were not more modulated, but significantly more monotonous during the hypnotic interval. This again supports the hypothesis that this hypnotist's voice became similar to child-directed speech.

We also hypothesized that in accordance with the relaxing purpose of hypnosis, the hypnotists' voice becomes warmer and more mellow. If the tone of voice is warmer, a change in the LTAS can be expected. There is agreement in the literature that LTAS gives information about the tone of voice (Hurme 2001). However, there is no definite indication of what changes in which band of LTAS can be related to what psychological characteristics. In the process of voice production, when the vocal folds vibrate, the magnitude of closing of the vocal folds affects the quality of voice: If the vocal folds close tightly during vibration, we hear the voice as creaky. If, however, the vocal folds are further apart, more air can pass through, making the voice more breathy, while in the acoustic parameters noise level increases due to greater turbulence (there will be a higher level of energy). Thus, greater energy-content in the different frequency bands of LTAS may be related to the warmth of the voice.

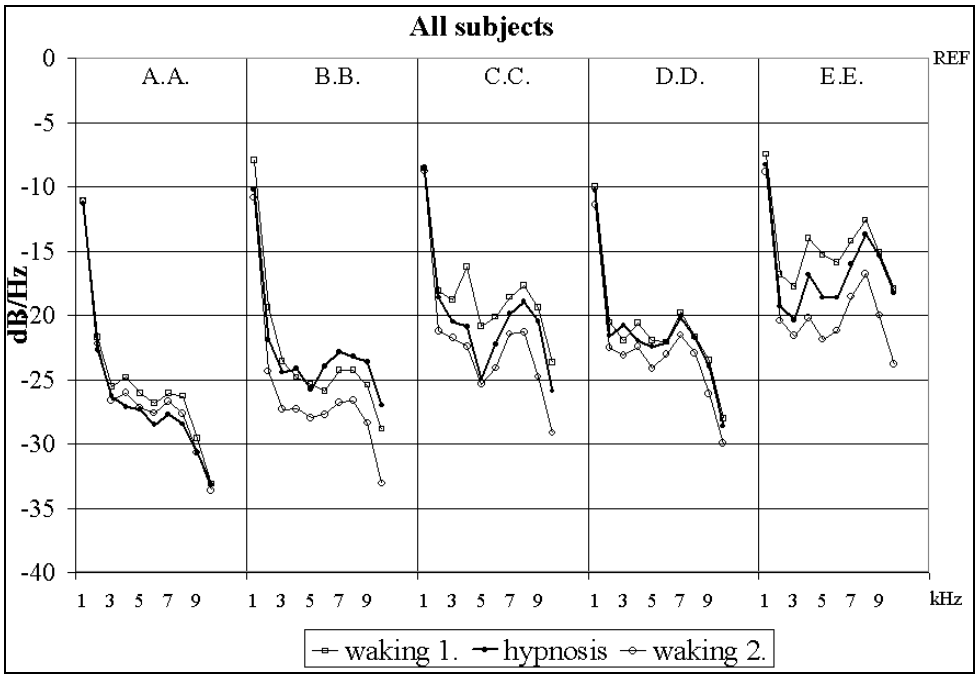

Figure 4. Long term average spectrum (LTAS) of the hypnotists' voice in the pre-hypnotic waking, in the hypnotic, and in the post-hypnotic waking states (bandwidth: 1 kHz). REF = reference level. Two-way ANOVA: A.A.: no significant interaction, B.B.: $F(18)=3.38$, $p<0.01$; C.C.: $F(18)=1.57$, $p=0.07$; D.D.: no significant interaction; E.E.: $F(18)=2.88$, $p<0.01$

According to our results, LTAS was really different in the pre-hypnotic waking, in the hypnotic and in the post-hypnotic waking periods. As can be seen in *Figure 4*, in two cases (B.B., E.E.) this difference was statistically significant, in one case there was a tendency (C.C.) as shown by the different shape of the curves. If breathy voice corresponds to the mellowness of the voice, we can say that in three cases the direction of change in the voice of the hypnotist is in the expected direction, in two cases there was no difference in the tone of voice as measured by LTAS.

How can it be explained that our findings did not fully support our hypothesis?

This can partly be explained by the fact that there are great differences among the various pars of hypnosis. Until now we have considered hypnosis as a uniform process, which is not quite the case. Hypnosis can be divided to many phases: hypnotic induction, giving instructions, suggestion proper, canceling of test suggestions, etc. According to our findings different acoustic changes characterized the progression of hypnosis and the various phases of the test suggestions (for details see Gősiné Greguss 2003). Furthermore, the test-suggestions themselves were not uniform, either: There were so called direct suggestions (suggesting some event to take place), challenge suggestions (suggesting the hypnotized person that s/he cannot do something), and cognitive suggestions (altered mental activity), while passing or failing a suggestion also influenced this effect as a moderating variable. Thus, our expectations were not supported partly because changes in the acoustic parameters exhibited a relationship with passing the individual suggestions. Overall, the hypnotists showed different patterns in how they modulated their voice as a function of the performance of the test suggestions, when their voice became louder or softer, when their voice became warmer.

Another of our hypothesis stated that the hypnotist's voice may be related to the hypnotic susceptibility of the subject. In this area we found less relationship than with performance on the individual test suggestions. This finding reinforces data in the literature according to which characteristics of the hypnotist (e. g. previous practice) has no effect on the overall score of hypnotizability (Hilgard 1965). Thus, prosodic changes probably belong to these characteristics. But since there may be a relationship with performance of the individual test suggestions, probably it is not the changes in the hypnotist's voice that make someone more or less hypnotizable, but the hypnotist's voice may reflect the subject's hypnotizability – for instance, a hypnotist may want to increase the intensity of his voice during the instruction phase of a suggestion in order to help the subject overcome his lack of initiative to move.

As far as we know, this has been the first attempt at describing the prosodic changes in the hypnotists' voice systematically, along objective physical parameters. We have found that during hypnosis, both general and specific changes appeared in the voice of the hypnotists. In

this relaxational type of hypnosis, softening of the voice seemed to be a general feature. Yet there appeared individual patterns of changes as well. In fact, the individual changes were more prevalent. The reason behind this can be that just as hypnosis (from the side of the hypnotized person) is not a uniform state, hypnotizing (from the side of the hypnotist) cannot be considered as a uniform process, either: The phases of instruction, suggestion proper and removal of suggestion may require different changes in the voice of the hypnotist. The hypnotist has to constantly follow the constantly changing state of the hypnotized subject in order to be congruent. Under standardized circumstances, when the hypnotist is sticking to the text, he can do this accommodation the most easily by changing his prosody.

Analyzing and describing the hypnotists' voice may also contribute to the interpretation of the acoustic parameters of affective prosody. This is theoretically possible, because hypnosis research has well-established methods for controlled laboratory studies. If we used this situation which elicits natural and real emotions from the persons involved, while it is still standardized and controlled, we could perhaps get closer to demonstrating the relevant elements in affective prosody and their relationship with other psychological variables. For instance, it was the standard methods of hypnosis research that made it possible to demonstrate that there exist various hypnosis styles. Bányai (1991, 2002) has shown that hypnosis interactions can be reliably classified into maternal, paternal and friend-like styles. These styles parallel the most important lasting and intimate interpersonal relationships in one's life. If we can describe the affective prosodic characteristics of the different hypnosis styles, then this way we can not only learn more about hypnosis itself, but this may contribute to revealing the role of affective prosodic changes in interpersonal adaptation as well.

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