

Darko Novosel, Tatjana Novosel & Volkbert M. Roth<sup>1</sup>



## 1. INTRODUCTION

A man is a unique game of nature, built of a combination of genes and all he has lived through his life, ever since his conception to this very day thus being a system of two programs: genetic and syngenetic (Guntern 1980).

Shaped, developed and adapted to different conditions for millennia ... Yes, it is us as we are. And yet, imperfect and aware of that. But there has always been a wish to be different from the others. And we are. It is the speech that makes it possible. It is the unique and most complex human activity calling for concordance and harmony of the whole orchestra called: the body. Seemingly very simple, but in fact very complex. Today we still cannot be certain to say and explain what is going on in the human brain in the course of the speech activity. We can only guess. Science has advanced very much in explaining the anatomy and physiology of almost every body organ except the brain. What are the links and relations within the brain that appear during the use of cognitive functions of thinking, memorizing, speaking ...? They are interactively related to all biotic, mental and social structures woven into the structure of a man and they are determined individually. How? It is not known (Novosel/Kadežabek 1998).

A man has body and soul, and he can think and feel. A man is left only one day a week to fight and solve problems. But when today's burden is added to the one of yesterday and tomorrow, he collapses because he is not capable of carrying it all on his own. This is how many illnesses and disorders have started, disturbing the health in one way or another. The

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<sup>1</sup> Prim.dr.sc. Ivan Pavliček, neurologist, and Prim.dr.sc. Miroslav Pospis, pediatric neurologist, acted as reviewers (recenzenti) of this article.

pace of life today does not allow us to stop not even for a little while, because survival and existence are sometimes more important than we ourselves. We struggle here in big or small space, more or less successfully. In order to be successful we need SPEECH – the most important means of establishing quality relationship of any kind with other people. It is not possible to express opinion, wish, willingness, ideas, joy or sorrow without speech. Unfortunately, there are many people today who are deprived of the ability to speak. Those who are incapable of establishing human communication due to injuries or central nervous system illness have been struck most (Novosel/Kadežabek 1998).

## 2. CONDITIONS TO SUCCESSFUL REHABILITATION

*Aphasia* is not only the loss of the ability to speak or the speech and language disorder but also a syndrome of different neurological and psychological behavior. From our point of view it is not only the phenomenon of the central nervous system. Everything that happens on the intimate social plan just before and in the course of the rehabilitation plays an important role here as well (Eccles/Zeier 1984). Successful rehabilitation does not solely depend on the sort of aphasia and its degree or on a good therapist and a good program. It is not enough to rehabilitate and, if we may say so, to reactivate speech and language centers but also to create relational and interpersonal conditions that are going to stimulate reactivating or activating of these and other centers and to make their functioning possible (Eccles/Zeier 1984). That is why we consider it crucial for the rehabilitation of aphasia to know and use *interpersonal dynamics* of a patient inside the immediate family (Novosel/Brajša 1989).

Furthermore the next component that is necessary for the successful rehabilitation considers the changes in emotional dynamics, i. e. *emotional distribution*. Many authors agree that the psychical is a relevant factor with aphasia patients, too.

The problem arises regarding the attitude towards the psychic sphere, since different authors allow for different aspects of the psychical. Some of them put the main stress on the cognitive sphere thus avoiding the emotional one.

### 2.1. Emotional dynamics with aphasia patients

A cerebral vascular insult leading to aphasia almost always causes changes in the emotional structure of personality. The most frequent changes are emotional apathy, depressive mood, hypersensibility, aggressiveness and the like. Changes of personality occur not only as an organic result of brain lesions but they are secondarily also due to the loss of speech, constant frustrations concerning illness or fatigue accompanied by the inability to speak. Emotional conditions are not only phenomena but also dynamic processes of personality that are strongly connected to the human body and can contribute to its healthy state or sick condi-

tions in many ways. Owing to the deficiency of diagnostic instruments for the emotional sphere, our research and experience show that Plutchik's test of emotions (PIE) has solved some of the essential problems concerning a more exact approach to the psychical dynamics of the emotional (Kuhar et al. 1989).

*Example: Patient M.A., 54 years old, Dg: Status post CVI, Hemiplegia lat. dex., Aphasia sensomotoria.*

*PIE test was done by his wife. The results show strong depression (95%), the central problem of the personality being the fear of the loss of everything that is of value for him. Suicidal ideas or total apathy can always be found in depressed. Intrapsychic conflict is present concerning the relation 'happiness – sorrow'. In the initial phase of the rehabilitation the patient accepted the therapy with difficulty. Depression gradually disappeared owing to the good preparation and the change of the attitude of the family members towards the patient.*

Globally speaking negative emotions are dominant in aphasia patients, that is depression, introverted nature, anxiety, passive aggressiveness, fear, and often an autoaggressive suicidal profile can be found.

Past experience with the *PIE* test brings us to the conclusion that in the course of rehabilitation the emotional sphere and its dynamics must also be taken into account as equally important factors for successful rehabilitation. Past analyses show that it is necessary, for the time being, to postpone rehabilitation with the patients with 'stronger negative emotional distribution' in the *PIE* and to work with them and their family in the meantime on the emotional plan so that they can be more realistic, objective and motivated in the correction of the speech and language disorder later on. An aphasia patient does not create emotional disturbance by himself. It is the consequence of a series of events both before and after the insult within the family and life context. Our experience shows that better results in aphasia rehabilitation are achieved when the handicap is "divided", especially in the family. Negative emotional fund measured by the *PIE* can be significantly reduced with time through our program which is based on the system, relative and circular psycho-dynamics. Each and every process of rehabilitation must have its width and depth in which all the aspects of human behavior are observed. With some of the patients it is not advisable to "go for" the basic symptom at once. It is more important to analyse other manifestations and changes as well, including the emotional sphere.

## 2.2. Interpersonal prerequisites in aphasia patients

In the course of the rehabilitation of aphasia patients the problems of interpersonal relations, interpersonal communication, interpersonal adaptation and interpersonal psychodynamics inside and outside the family must be taken into account.

### 2.2.1. Interpersonal family relations

The characteristics and the quality of marital and family relations of a patient are not insignificant. What matters is the relation between closeness and distance, symbiosis and individuation, symmetry and complementarity and directness and indirectness of these relations. Strong closeness, too intensive symbiotic joining, fixed complementarity and forced directness can have as negative influence on the development of the rehabilitation as the maximum distance, forced individuation, stimulated symmetry and functional indirectness. Both poles of the stated relative modalities must be equally represented. In the course of his qualification a patient needs both, not just one or the other. As a matter of fact it is the recreation of the situation in which he found himself as a child. Like before he now needs protective closeness, symbiotic joining and immediate love but with the aim of getting away from individuation, rivalry partnership and the functional usage of relationships. Owing to that it is necessary to work with members of the family in order to create conditions for his self-reliance and independent functioning (Brajša 1984a & b, 1985; Novosel/Brajša 1989).

### 2.2.2. Interpersonal family communication

This sphere also requires favourable communication conditions for as successful a rehabilitation as possible. Verbal communication is just one part of the whole communication complex. The family has to give the patient adequate stimuli on the level of non-verbal and relative communication, too, meaning it has to show and not just express its support, as well as define positively its relationship towards him and give him the opportunity to freely express his own feelings and experiences. According to the Hamburg concept of communication psychology our patient has got four "ears". With his first ear he listens to the content, with his second one he assesses his partner in communication, with the third one he contemplates the relationship offered to him, and with the fourth one he decides whether to use the message in his behavior or not. This influences his own communication with others and his verbal speech significantly. Only in stimulating surroundings can a patient start speaking faster and better and successfully speak longer (Brajša 1986a & b).

### 2.2.3. Interpersonal family adaptation

Only a fully adapted patient has the conditions for successful rehabilitation. It does not depend solely on him but also on the behavior and the adaptation to him of the others who are "significant" for him. What is important here is the flexibility to adapt oneself, heterogeneity and reciprocity. Adaptation must not be rigid, homogeneous or one sided (Brajša 1990; Brajša/Ozimec 1986; Novosel/Brajša 1989).

#### 2.2.4. Interpersonal psychodynamics

Our patient has his inner world, too, his experience and emotions, his feelings, all of it being a part of his relative interpersonal atmosphere. These are psychodynamic aspects of the interpersonal set of problems of our patient. He must be trained to verbalize not only the things happening between him and the family but also the things happening inside of him. If it is suppressed in him it can cause problems when he has to verbalize things happening around him. The suppressed experience of others around him, connected to him, plays an equally important role here. The patient feels it and sees it but possibly misinterprets it. It can also have negative influence on his speech abilities. It is the psychodynamic, often unconscious to him and others around him that must find a way to clear and unambiguous verbalizing in everyday communication between him and his environment (Brajša/Ozimec 1986; Kuhar et al. 1989; Novosel/Brajša 1989).

A lot of success has been achieved in clinics for speech therapy but it is diminished later on in the family and elsewhere if no favorable and adequate conditions for the maintenance and further development of the achieved rehabilitation results can be found.

Within this context the MODAKT<sub>hr</sub> computer program is a complex stimulation system of four basic speech and language modalities. These modalities are speaking, understanding, reading and writing. They can be damaged by various brain injuries caused by either external or internal factors. One of the consequences caused by external and/or internal factors is aphasia, that is a speech and language disorder arising as result of the organic brain damage. These cerebral vascular incidents can occur due to embolism, when a blood clot obstructs a blood vessel and cuts off one part of the brain from supply. CVI also occurs due to bleeding, i. e. a blood vessel bursts, blood vessel ischaemia, due to tumor or abscess, arteriosclerosis etc. Aphasia can also occur due to brain injuries caused by external factors in traffic accidents or head injuries in war.

### 3. THE MODAKT<sub>HR</sub> PROGRAM IN APHASIA THERAPY

Using the computer program MODAKT<sub>hr</sub>, which stands for 'modality activation', can in various ways trigger certain mechanisms and relations in the brain, and with the aid of polysensory stimulation of all senses it is possible to 'awaken' certain centers, certain voices, words, combinations, and so on. The rehabilitation process of people suffering from aphasia is complex, hard and a long procedure in the context of which we try to render usable or rehabilitate some earlier functions, which were temporarily or permanently out of use, to the maximum extent and in that way reintroduce into functioning. One of the most difficult forms of rehabilitation is the rehabilitation of people suffering from stroke, especially where the speech-language function has been

damaged, that is, where due to brain damage the communication chain gets brutally and abruptly disrupted. The advantage of using MODAKT<sub>hr</sub> is that the patient can relatively well establish some kind of communication with the computer that speaks and leads the person through the process with the help of a speech pathologist. In so far as the rehabilitation process has been done in a 'pencil and paper' manner, the therapy was on a very abstract level. For example, if a patient was shown a picture of a bird, he would see the bird and the written word 'bird', which was still not enough information to make a connection. MODAKT<sub>hr</sub> introduces here auditive stimulation, namely, bird singing on demand (click), which enables quicker transmission of polysensory stimulation.

Apart from aphasia, the program can be used for other speech-language pathologies or disorders, for example, undeveloped speech in kindergarten children, problems with learning, dyslexia – problems with reading, dysgraphia – problems with writing, and partly for children with impaired hearing. The program in the hands of a good therapist, or a speech pathologist, will lead the patient to better results of the rehabilitation process.

#### 4. MODAKT IN CROATIA

The Speech and Hearing Rehabilitation Department of the General Hospital Varaždin is where a team of experts work on the development of rehabilitation procedures. Amongst them, one should mention the long-term expert and scientific cooperation in that field of Professor *Darko Novosel*, Sc.D. speech pathologist and *Tatjana Novosel*, speech pathologist with a well-known aphasiologist *Mike Roth*, Ph.D., the author of MODAKT program, from the University of Konstanz in Germany. MODAKT came to Croatia in 1995. The first version was programmed for DOS in Turbo Pascal in German language. Its use created some problems related to the application of the program itself, scanning possibilities, simpler creation of exercises, use of Croatian letters, sound processing, etc. As they grew in number, the idea arose to start anew within Windows. That is how MODAKT<sub>hr</sub> was created, at the time, the only program in Croatia in Croatian language that could be used for the purpose of rehabilitation.

#### 5. MODAKT<sub>HR</sub>

This computer program has been written for Windows 95, in Delphi 4.0 and it uses Paradox base. The program had to meet the following multimedia requirements: use of pictures of different formats (\*.bmp, \*.wmf, \*.jpg), free sound recording through microphone and its processing (\*.wav), option to use video format (\*.avi), use of Croatian graphemes, interactive deciding option, writing and drawing by using the mouse or pencil, and additional O/I units, for example, scanner, graphic table, and the like.

Minimal required configuration is a 486 processor with 16 MB RAM, while the ideal one would be IBM Pentium/350 MHz or more, 64 MB RAM, floppy 3,5", CD-ROM, monitor 17", SVGA 2 MB, video-card, SB 64bit Pro, scanner, color printer, mouse, keyboard and tablet. A bigger hard disk is of advantage because of many pictures, sounds and films in the MODAKT program.

MODAKT<sub>hr</sub> comprises seven types of tasks related to speech-language processing (Mistic et al. 1994):

1. auditive comprehension
2. reading comprehension
3. producing written items
4. relation hearing – comprehension – reading
5. picture dictionary
6. writing and
7. dialogue.

These tasks extend through four exercises (MODAKT<sub>hr</sub> version 1.1):

1. LETTERS – this exercise combines auditive comprehension, comprehension of what has been read, writing and grapheme-phoneme association, that is, letter-voice visual stimulus (Picture 1.).

Picture 1.



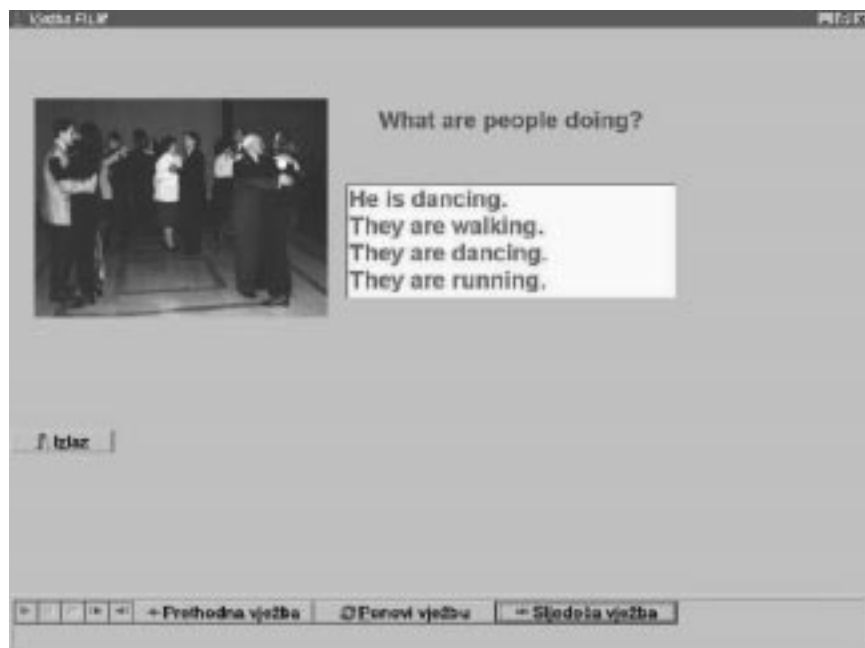
2. TALKING PICTURES – combines visual detail with text and sound in the context of written and oral comprehension (Picture 2.)

Picture 2.



3. FILM – enables demonstration of activities and answering questions (Picture 3.)

Picture 3.





4. FILLING IN – in this exercise a patient reads and hears a certain task in the form of picture or text and then fills in the missing graphemes (letters, words). This is a training of sound analysis and synthesis.

Picture 4.



Each of these exercises is created by a speech pathologist in a special, but simple way, depending on the aphasia type and patient's interests, defining the location of picture, sound and video files, with additional processing options. It means that, if, before aphasia the patient worked in an office, the rehabilitation will begin, for example, with naming objects found in such a place (picture + text + sound); for example, pencil, paper, notepad, chair, desk, computer, calculation, and so on – from simpler to more complex things and concepts.

It makes speech pathologist's work easier in saving his voice and enabling the presentation of some things and concepts that can rarely be created for the purpose of rehabilitation, for example, raining or snowing (\*.avi), bird singing or dog barking (\*.bmp, \*.wav or \*.avi), picture and voice of a family member (\*.bmp, \*.wav) ...

Such polysensory stimulation in a shorter period of time leads to improved functioning of all four speech-language modalities – speech, comprehension, reading and writing, and thus enables quality communication with the environment. Apart from that, the program has

'Personal Data Files' holding basic data of a patient, speech pathology findings, diagnosis from the International Disease Classification and a choice of exercises for each patient (Novosel/Kadežabek 1998).

As important as the medical and already mentioned prerequisites of successful rehabilitation of aphasia patients, is the expert team that plans, creates and carries out the whole rehabilitation program. Each program has to be individually prepared for each patient and must be open to certain corrections and additions.

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Darko Novosel, Speech Pathologist, General Hospital Varaždin, Croatia  
 Tatjana Novosel, Speech Pathologist, General Hospital Varaždin, Croatia  
 Volkbert M. Roth, University of Konstanz, Germany