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Memory and communication disorders after a central nervous system injury from the perspective of a long-term rehabilitation process

Abstract: The study compares some results of a long-term logopaedic intervention in two male patients after a traumatic brain injury, which has resulted in persistent cognitive and communication impairment. The injuries were inflicted at the age of 40 and 36, respectively. The two compared case studies are oriented towards the results of repeated diagnostic assessments of the patients, during a 2-year period of regular therapeutic sessions at the Department of Clinical Logopaedics in Česká Lípa. This study characterises principal motivation, consultancy and some therapeutic aspects within the process of the long-term logopaedic intervention.

Keywords: traumatic brain injury, cognition-communication disorders, memory disorders, cognitive training, memory tools.

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Zaburzenia pamięci i komunikacji po urazie ośrodkowego układu nerwowego z perspektywy długoterminowej rehabilitacji

Abstrakt: Opracowanie porównuje wyniki długoterminowej interwencji logopedycznej na dwóch pacjentach płci męskiej po traumatycznym uszkodzeniu mózgu, które skutkowało utrzymującym się upośledzeniem umysłowym i komunikacyjnym. Urazy wystąpiły odpowiednio w wieku 40 i 36 lat. Dwa studia przypadków zaprezentowane dla porównania zostały zorientowane na wyniki cyklicznej diagnostycznej oceny pacjentów, podczas dwuletnich, regularnych sesji terapeutycznych na Oddziale Logopedii Klinicznej w Českiej Lípie. Opracowanie to jest nacechowane motywacją, konsultatywnością oraz leczniczymi aspektami procesu długoterminowej interwencji logopedycznej.

Słowa kluczowe: traumatyczne uszkodzenie mózgu, zaburzenia umysłowo-komunikacyjne, zaburzenia pamięci, ćwiczenie umysłu, narzędzia pamięciowe.

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1. Introduction

Brain injuries represent a severe and common cause of neurogenic speech communication disorders. Apart from strokes, traumatic brain injuries are the second most common cause of these speech disorders, especially due to the increasing number of traffic accidents with severe consequences. Almost 50% of traffic accidents are accompanied by brain injuries (most commonly as a part of severe polytrauma). These brain injuries are at the origin of about one third of speech communication disorders. Cerebral concussion, cerebral contusion or cerebral haemorrhage with subsequent cerebral haematomas are the most frequent consequences of traumatic brain injuries. Chronic disorders of speech communication on the basis of memory disorders, phatic dysfunctions or motor speech disorders are mostly caused by cerebral contusion and haemorrhage.

2. Speech communication disorders following CNS trauma

Cognition/communication disorders in patients suffering from traumatic brain injury commonly manifest themselves both as a distinct neurogenic impairment of speech (e.g. aphasia, dysarthria) and as cognitive disorders accompanied by changes in personality and social behaviour. Chapman et. al., (1995) have demonstrated a 100% manifestation of aphasia or dysarthria in a group of 125 patients with a severe coma following a traumatic brain injury. The seriousness of the injury correlated with the gravity of the initial CNS trauma. At the same time, these patients suffered from disturbances in visual differentiation and naming of visual stimuli, in verbal fluency and in comprehension of longer multi-verbal instructions. In Czech literature describe speech disorders in patients with CNS trauma in the following fashion: “Mixed-type aphasia is most frequently noted. It is necessary to also expect dysphonia, due to the impairment of X's cranial nerve, or due to the impact on vocal cords after a long-term intubation“. Conversely, the same authors repeat the universally acknowledged statement that only a minor part of the patients who underwent closed brain concussions or contusions develop classic phatic disorders. These patients more commonly suffer from disturbances in memory, activity planning, self-perception and control of impulsive behaviour (Chapman, et. al., 1995; Hutchinson, Marquardt, 1997).

Various forms of mostly cognition/communication disorders, which are difficult to define and which represent consequences of CNS trauma, are a common occurrence. These injuries manifest themselves by a diffused loss or temporary blackouts of cognitive functions in the area of verbal memory, targeted attentiveness, differentiation of stimuli in the visual or auditory field etc. These disorders always require individual therapeutic

procedures, commonly designed as a cognitive/communication therapy (Brookshire, 2007). These procedures are designed to support the organic processes that the brain undergoes during the process of recovery by means of a functional long-term influence. The restoration of functions following CNS trauma is not instigated by the resumption of neural connections, but it is rather a result of the functional reorganisation of cerebral tissues, which undergo biochemical and micro-structural changes (Kertesz, 1995). "Both clinical and experimental studies of different processes of CNS adaptation have revealed that the functional restoration of deficits incited by CNS injuries is possible. Central designing areas may be restructured, previously suppressed pathway systems may be activated and the processes of reorganisation are initiated on cellular level" (Lippertová-Grunerová, 2009, p. 99).

3. Application of a specific EANDSC examination

In the two case studies, a so-called: Examination of the Acquired Neurogenic Disorders of Speech Communication in Adults – EANDSC (Neubauer, 2001, 2007) has been applied. It represents a newly assembled set of logopaedic clinical examination tests with a rating scale, which depicts neurogenic disorders of phatic functions, dyslexia, dysgraphia, dyscalculia, dyspraxia of upper extremities and oral dyspraxia, motor speech functions and cognition/communication disorders. The results of these diagnostic tests are assessed by means of a scale of particular sub-modalities and are placed into tables.

A. Table of sub-modality in phatic functions.

B. Table of lexical and graphic abilities and calculia/praxia sub-modalities

C. Table of sub-modalities in motor speech functions.

D. Table of cognition/communication/comprehension sub-modalities.

A diagnostic curve has been implemented, indicating the severity and the type of a given disorder. This type of graphic record is illustrative and as such, it provides a clear visual comparison of changes in the depth and type of a given speech communication disorder.

4. Therapeutic procedures in patients with CNS trauma

Some patients after a stroke and commonly patients after a severe cerebral injury, severe brain concussions and polytraumas, suffer from a predominantly mnestic type of disorder. In clinical practice, practical differentiation between a predominantly mnestic disorder and aphasia is established by a distinctive disproportion between phatic and mnestic functions. Thus, the affected patient manifests mild deficits in typical mani-

festations of severe expressive or impressive aphasia on the one hand, and on the other hand, he suffers from distinctive memory deficits. If the affected patient also suffers from severe aphasia, then it is very difficult to isolate his or her mnestic and phatic disorders, and at the same time, it is necessary to consider sublimital performance in verbal memory and naming to be a part of a severe phatic disorder syndrome.

Thus, predominant memory stimulation is a principal modality and procedures of logopaedic therapy of phatic disorders, together with strategies of memory and cognitive training, may play a key role in the treatment of the affected patients. Treatment methods must be adapted to predominant cognitive and memory disorders and to a different image of individual language abilities from that present in most patients with aphasia. These methods may be mostly built on more intact, expressive syntactic abilities and they may remedy predominant semantic disorders, temporary aphasia and initiation of speech disorders, which is necessary to uphold coherence and clearly targeted speech functions.

The involvement of multimodal stimulation by means of repetitive tasks may be effective in the process of memory functions restoration training. Thus, a term is presented by visual and auditory means, with a prolonged stimulation accompanied by movement. i.e. searching the term and coupling its written form to a corresponding picture followed by repetitive vocalisation of the term**.** Multimodal stimulation increases the probability of subsequent recollection of the term.

The strategy of facilitating communication is meant to apply adequate procedures in order to recall the searched words in a form of semantic and phonemic clues (these represent some suggested word parts and a rhythmic clue). Other strategies try to support the preservation of cohesion within a conversation by forming a draft of the given topic. In this area, application of short picture sequences with a storyline has proved to be very effective. An accompanying text is presented, then the sentences are written next to the pictures and then it is possible to reproduce the story by a succession of pictures, without the need of using the written expression.

A connection of speech and restoration of memory may be effectively achieved in clinical practice by means of daily diary records, reading with subsequent reproduction, i.e. writing down the story which has just been read and involving memory stimulation in a form of crosswords, word games etc. These strategies have also been identified by foreign therapists (van Vliet, 1996) and are considered to be repetitively applicable in practice. In our clinical practice, we have introduced an exercise book with daily records, which has proved very effective:

1) Date, selected information about family and immediate environment, information about the schedule and duration of repetitive activities;

2) Reading aloud with an effort to correct possible inaccuracies, repeated reading of parts of a text;

3) Segmentation of the text that has just been read into short sections and writing down the memorised content. These sections may be gradually extended.

4) Use of stories in the form of comics – a plot in picture sequences to facilitate memorisation and subsequent record in writing;

5) The connection of the text which has been read, instantly memorised and written down is essential for an amelioration of the recollection. It is not advisable to transcribe the read text, as this strategy has proved ineffective.

Specialized computer programs may be used as a part of intensive cognitive rehabilitation. Supporting the recollection of memory imprints by means of compensatory devices and strategies is mostly used in the therapy of dementia. However, in the discussed area it is more likely to be used in persistent and stubborn, severe memory disorders (Wilson, 1984). Displaying calendar lists with regular records of key words, time and names has proved to be the most effective, as well as the use of portable diaries and lists on inserted cards with important information and commonly used expressions.

5. Case study of a long-term procedure of logopaedic intervention

The short case studies of two patients after a traumatic CNS injury who are in a long-term care at Clinical Logopaedic Department may characterise some issues of long-lasting rehabilitation strategies. The patients suffer from milder, but persistent communication disorders that are related to right-hemisphere and memory functions. These patients had had a tendency to disorders in communication and social behaviour even before the injury.

Case study 1.

D.K., male, born in 1970.

University degree, engineer.

He never worked in his profession. Instead, he specialized in importing cars, servicing and travelling abroad to earn his living.

Single, no steady relationship.

Disorders in the area of social relations, impulsive behaviour.

The patient underwent a severe cranial cerebral trauma in 2006 during a car accident. He has been in the care of a specialized ICU and at the Neurological Department at the hospital of Kladno, where the accident had taken place. Subsequently, he has been in the long-term care of the Rehabilitation Department of the 1st Medical Faculty in Prague. He has also been treated at the Psychiatric Department of the 1st Medical Faculty in Prague with a diagnosis of organic psychosyndrome, conflicts with the

personnel and the family and loss of partnership. The Outpatient Psychiatric Department "RIAPS" in Prague recommended the patient to be handed over into the care of our Logopaedic Department in August 2008. At the beginning of the treatment, the patient was once more taken to the Neurological Department for treatment of some neurological aftermath. Then, a programme of stimulation of communication and cognitive functions was initiated.

The diagnostic/therapeutic program in 2008 involved:

1) Naming of terms, surmounting dysnomias;
2) Recollection of speech terms;
3) Understanding of grammatical structures and the content of speech;
4) Maintaining speech coherence;
5) Alleviation of impulsivity and negativism;
6) Employment of cognitive stimulation with the aid of PC;
7) Writing diary records accompanied by reading;
8) Coherent evolution of the records related to the content of the read book;
9) Finding appropriate texts for the development of positive interests.

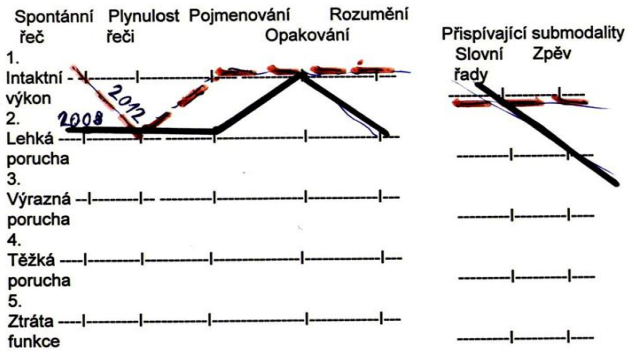
Essential orientation of the implemented therapeutic programme:

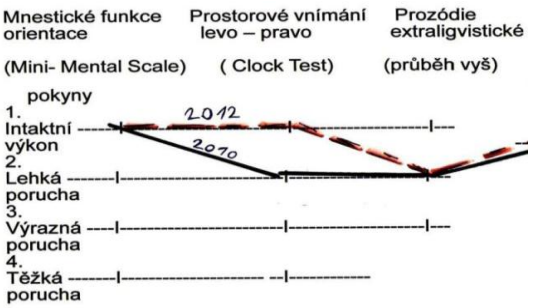
– The use of appropriate diary records and the calendar;
– Regular stimulation by means of text reading and storyline reproduction;
– Training in coherent verbalization of the topic, maintenance of speech coherence;
– Efforts to understand the attitude of people in immediate surroundings, alleviation of impulsive reactions in communication;
– Reconciliation with the real capacity of cognition.

The tables[3] demonstrate the development in the area of phatic functions (mild dysnomic aphasia) and cognitive functions (mild cognitive disorder), according to classification on the EANDSC scale.

[3] The figures have not been translated.

I. Tabulka submodalit fatických funkcí / automatické řady a múzické dovednosti:





Case study 2.

M.N, male, born in 1973.

Secondary school education, a technician.

He has worked in graphics and interior design.

Single, a long-lasting relationship with complicated history.

Some disruptions in social relations, egoism and depression prior to the accident.

He suffered from severe cranial/cerebral injury in 2009 as a consequence of being run over by a car. He has been treated in the specialized Reanimation and Neurological Departments at the hospital of Česká Lípa for life threatening complications (cranial dissection, stroke with left-sided symptoms). The situation resulted in left-sided hemiparesis with a complete left-hand plegia. Locomotion has been limited, the patient uses a walking stick, he requires assistance with dressing and personal hygiene. In the wake of stabilization of the instances in organic impairment, the patient underwent rehabilitation at the Rehabilitation Institute Hostinné and in the resort of Jánské Lázně, from the beginning of 2010. During the

rehabilitation, there were some depressive reactions instigated by the realization of the locomotion impairment, conflicts with the personnel and the family, communication problems and passivity. Outpatient Neurological Department in Nový Bor recommended the patient be referred to the logopaedic care of our department in November 2010. The Neurological Department also describes his communication disorders as a "somewhat skeptical mind" (cf: October, 18, 2010). We have initiated a program of stimulation of communicative and cognitive functions, making all efforts to capture the patient´s interest.

The diagnostic and therapeutic program in 2010 included the following:

1) Motivation to active communication with the surrounding people;

2) Recollection of speech terms;

3) Understanding of grammatical structures and the content of messages;

4) Development of fluent thematic dialogues;

5) Employment of a PC program for cognitive stimulation;

6) Overcoming the neglect syndrome while reading, instructions for targeted attention in the left vision field;

7) Reading aloud with an effort for auto-correction of inaccuracies accompanied by extralinguistic deficits;

8) Coherent development of records made on the basis of the read text. The texts were selected appropriately to the development of positive interests.

Current orientation of the therapeutic program:

– Regular stimulation with the employment of text reading and recording the storyline. Targeting on surmounting the deficits within the left-sided symptoms;

– Training in active verbalization of the topic;

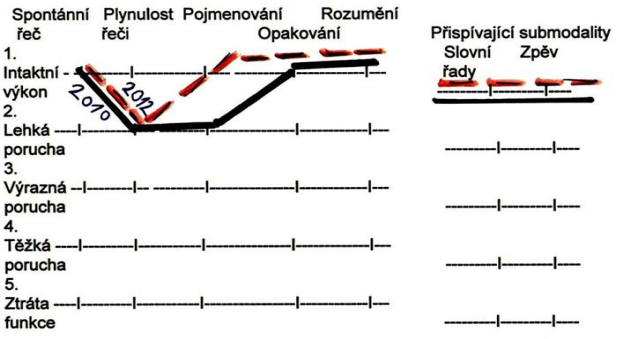
– Efforts to understand the attitudes of other people, alleviation of anger and depressive reactions in communication;

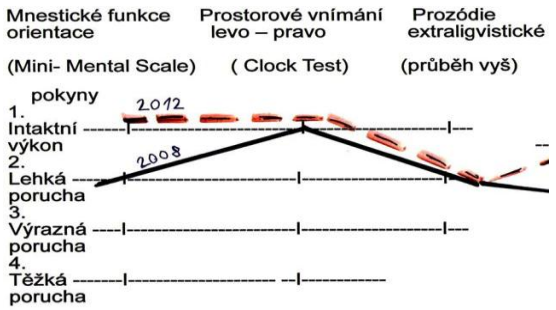
– Reconciliation with the reality of physical impairment, assistance in the development of self-sufficiency, i.e. a car, adaptation of the flat etc.

The tables[4] demonstrate the development of the areas of phatic functions (mild dysnomic aphasia) and cognitive functions (extra-linguistic cognitive disorder, neglect syndrome), based on the examination on the EANDSC scale.

[4] The figures have not been translated.

I. Tabulka submodalit fatických funkcí / automatické řady a múzické dovednosti:





6. Conclusions

The current premises for the subsequent therapy are mostly influenced by the following:

1) Both men are nowadays on a disability pension;

2) The development of social relations with their family members is rather positive, but not without conflicts;

3) Instability, in the wake of an absence of a steady relationship;

4) Efforts to find new active interests and follow an active daily routine;

5) Development of positive communication with the surrounding people;

6) Acceptance of their own deficits.

Both men have stable inner motivation to continue the treatment at the Clinical Logopaedic Department. They have been active during the procedures and they subjectively assess the intervention as necessary and helpful on a long-term basis.

A good-quality therapeutic relation must rely on confidence and long-lasting personal activity of patients after CNS trauma. Moreover, all the

following components of the complex logopaedic intervention in this area are indispensable:

1) Methods and strategies of speech and lingual therapy in the area of restoration in the therapy of aphasia;

2) Psychotherapeutic influence – psychotherapeutic approach, support for covering psychotherapy;

3) Stimulation of cognitive, mainly verbal and memory functions, lexia and graphia, attentiveness;

4) Counselling and consultation activities oriented towards family members and the patients' social surroundings.

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