Combination therapy for patients with a history of ischemic stroke: selected approaches based on special education and psychology in a systematic case study

(overview essay)

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Abstract: *The content of the article encompasses the results of a research survey of a patient with a history of ischemic stroke (hereinafter referred to as ICMP, according to ICD-10; I63 cerebral infarction and I69.3 – consequences of cerebral infarction). The aim of the research was to find out the effect of combination therapy using long-term special educational (speech therapy and music therapy), occupational therapy, and psychological interventions on the development of cognitive and fatal functions of patients after ICMP (cognitive rehabilitation). The paper deals with the possibilities of development and support of individuals after the disease with a possible correction of deficits from a multidisciplinary point of view. The person was selected by random, stratified selection and corresponded to relevant characteristics in advance (age over 45 years, acute ICMP, cognitive and fatal disorder, hospitalization). The selected person participated in the research (female, 47 years old, acute ischemic stroke – March 12, 2021). For our needs, the therapy was focused on special educational care (speech therapy, cognitive rehabilitation, music therapy) and psychological intervention (psychic intervention and psychotherapy). A physiotherapist and an occupational therapist were present during hospitalization and post-hospitalization care. In the implemented research process, we point out the selected case study of the person, which corresponded to the relevant features, and the design of therapy with a focus on special education and psychology. The results of the research point to the fact that when working with patients with a history of ICMP, there is a need for regular multidisciplinary cooperation of an occupational therapist, a physiotherapist, a special educator (speech therapist, music therapist), and a psychologist. The given professions focus on specific areas of support with a focus on cognitive, fatal, and motor functions with the support of social adaptability.*

Keywords: *Ischemic stroke, motor skills, rehabilitation, special education, psychology, helping professions, comprehensive rehabilitation*

1 Introduction

Stroke (CVA) is one of the most common causes of mortality, morbidity, and disability in the population worldwide (Feifin et al., 2003; Rosamong et al., 2008). According to Škoulodík et al., (2012; Truelsen et al., 2006), ischemic stroke (ICMP) accounts for 85% of all CVAs in Europe and North America. The incidence varies in European countries; however, it is the highest in the Czech Republic, Lithuania, and Greece. CVA is a common disease, especially in the elderly population. The complex issue is multidisciplinary thus, to prevent frequent disabling relapses, it is more than desirable to correctly implement effective secondary prevention (by secondary prevention we mean the approaches of helping professions), (Škorňa, 2021). Ischemic stroke is defined as an episode of neurological dysfunction caused by a local cerebral, spinal, or retinal infarction. Such an infarction is necrosis of the brain, spinal cord, or retina caused by ischemia. Ischemia is detected by a pathological finding (Sacco et al., 2013). ICMP is manifested by a sudden onset of focal neurological deficits. The deficit corresponds to the territory of the affected cerebral artery. In practice, we often encounter a movement or sensitivity disorder of half the face, limbs, the whole body, a speech disorder (aphasia or dysarthria), or other symbolic functions (apraxia), a vision disorder, ataxia, etc. (Škoda et al., 2016). According to Kovářová et al., (2018; Béjot et al., 2016), despite improvements in primary prevention and acute treatment in recent decades, ICMP is still a serious and common cause of mortality. Therapy for patients with a history of ischemic stroke is an interdisciplinary (multidisciplinary) problem that involves the cooperation of a neurosurgeon, a radiologist, a neurologist, a rehabilitation physician, a physiotherapist, an occupational therapist, a speech therapist, a psychologist, and other professionals.

Thus, the rehabilitation process itself includes the cooperation of not only experts but also family members (especially after being discharged from the hospital). The number of professionals affects the patient's condition and the consequences of ICMP. The team management and coordination support the rehabilitation process and increase its benefits. Furthermore, it strengthens the positive rehabilitation effect (Fegin et al., 2007; Kalita 2006; Röthlisberger et al., 2018; Štětkářová et al., 2012). The rehabilitation process should take place as soon as possible after the patient has been stabilized. Also, the process should continue as long as the patient improves in his/her functional abilities. At the same time, it should be followed by and, if necessary, extended by social, educational, and work rehabilitation. The patient improves the most in the first half of the year after the stroke. However, its improvement even after several years might not be excluded. At present, there is a predominant

effort to shorten hospital stays and return patients to their home environment since such discharge might have a positive effect on the patient's recovery. Subsequently, the rehabilitation should be targeted at the home environment (Škoda et al., 2016; Clemson et al., 2016). Patients' reintegration into society and their quality of life i.e., their health condition, being physically active, and their self-realization are crucial for them. As a result of ICMP, up to 50% of patient's experience apathy, fatigue, low physical activity, and depressive symptoms. The goal of coordinated rehabilitation is to ensure patients' self-sufficiency and enable them to return to their home environment (Švestková et al., 2017; Winstein et al., 2018).

Psychic intervention and psychotherapy

When working with a patient after ICMP, it is always necessary to consider the extent and intensity of the central nervous system (CNS) impairment. This affects whether and to what extent the patient is aware of his illness and how he experiences it. The treatment of the disease and the subjective experience of the disease by the patient subsequently determine the process of the intervention and possible subsequent psychotherapeutic care, which, in contrast to the intervention, is long-term and, if possible, regular. When processing the disease by the patient, it is necessary to consider the basic stages of this process i.e., a shock or a denial, the phase of gradual admission of the traumatizing fact, and afterwards the phase of reconciliation with the disease and its consequences. Psychological intervention is especially important in the first and second stages of disease processing. In the third phase, psychotherapy is convenient, not only for the patient's gain, but it is also beneficial to include the patient's social network (if possible) in the psychotherapeutic process. Disease and situations associated with it always cause a disbalance of the body and the psyche. In other words, the patient is dealing with a crisis, and he/she is looking for an effective solution with the help of a psychologist and other experts. We begin with the patient's internal picture of the disease, which reflects how the patient experiences his disease. We consider four basic areas of the subjective experience of the disease in patients, namely the area of sensitivity, emotionality, volition, and information (Zacharová, Šrámková, Hermanová, 2007). We, therefore, strengthen effective strategies applied in contact with frustraters (Sawicki, Wedlich, Fleischmann, 2008).

Special educational intervention

Always at the beginning of the therapeutic plan, it is necessary to thoroughly know the client's anamnestic data, the state before the onset of ICMP, and the approximate state of cognitive, language, and speech skills. Cognitive-communication disorders in clients with the history of ICMP are usually manifested simultaneously on all language levels and require a specific diagnostic and therapeutic approach i.e., on the phonetic-phonological language level (pronunciation), on the lexical-semantic

language level (vocabulary, meaning of words), on the morphological-syntactic language level (grammar), in the pragmatic language level (the use of language in real-life situations). Articulation exercises, so-called facial gymnastics are performed during the first phase. We relax facial muscles and lips, we train the tongue, lips, jaw movements, we include selected articulation, phonation, and respiratory exercises, we develop auditory perception and phonemic hearing according to the client's individual needs. We evoke vowels, then syllables and we include writing and reading. The pace of reading and writing is individual and depends on the extent of the disorder. For naming, we use pictures that are further described with other word classes. We compile sentences from several words, we create simple sentences, we invent words for a selected letter, etc.

Aids as communication books or individualized cards for a client's needs, worksheets, computer programs (Brainjogging, Mentio), or dictionaries for people with aphasia are also suitable. It is necessary to develop short-term verbal memory, short-term visual memory, calculation skills, short-term attention, verbal fluency e.g., lexical, semantic. Not to forget the repetition of words, fluency in describing a photograph or an image, writing (text transcription, dictation), naming (object identification, understanding of verbal instructions, and understanding of written instructions). In the care of clients with a history of ICMP, the use of the method of partially impaired performance (PIP) has proved successful. PIP needs to be individually adapted to the client's abilities and the mode and speed of receiving and processing information. An individual training program is compiled according to the extent and depth of the client's problems (Scharingerová, 1999; Scharinger, 1995).

2 Case study

Due to the protection of personal data, we present only basic, essential, and anonymized information without a detailed description of e.g., the relevant place of hospitalization. We drew the necessary information from the progress and discharged report with the patient's consent and we present it in the form of a case study with an overview table (see Table 1 and Table 2 assessing the problem and the patient's strengths and weaknesses).

The patient is a 47-year-old woman with a history of acute ischemic stroke (March 2021). The patient (primary school teacher) came home from work at around 4 p.m. when she reported nausea. She reported having a headache for about three days before that. At around 8 p.m. the same day, she stopped talking and her RUL (right upper limb) was paralyzed. Based on these symptoms, she was transferred to Emergency. Upon arrival, a CT angiography of the brain (i.e., areography of the arteries) was performed on a native CT without acute ischemia. The ACI (internal carotid artery) occlusion on the left is evident from the examination. **Summary:** The patient was received with moderate right-sided hemiparesis, bulbar symptoms,

and fatal lesions. Furthermore, according to medical documentation with paresis of the glossopharyngeal nerve, vagus nerve, accessorius nerve, and hypoglossus nerve (n. IX–XII), Turner syndrome, hypothyroidism, and speech therapy findings (mild dysarthria, Broc's aphasia, dysphagia, oral and verbal apraxia, emotional and ideological apothermia, level II horizontal nystagmus). **Conclusion of the progress report:** ideal and ideomotor apraxia, oral and verbal apraxia, dysphagia within oral apraxia, Broc's aphasia, mild dysarthria. **Conclusion in the discharge report:** symptoms of fluent aphasia with dominant deficits in naming, repetition, understanding, Lexia, and graphics. Oral and verbal apraxia. Mild dysarthria.

Table 1: *The overview of symptoms in the progress report from neurology to the rehabilitation department with a comparison of the discharge report from the rehabilitation department*

	Progress report 2. 4. 2021	**Discharge report 27. 4. 2021**
Subjectively	It doesn't work but is actively trying	Improvement, but it still doesn't work
Orientation, cooperation	Distorted by a phatic lesion, oriented by place and person, the patient is actively trying – increased fatigue	Distorted by a phatic lesion, oriented by place and person, active cooperation
Verbal manifestation	Non-fluent with low information value, many information empty words, neologisms, agrammatism, phonemic paraphrase (e.g., tuchta instead of buchta), verbal apraxia	Fluent in common conversation, focusing on performance non-fluent with a paraphrase, anomic pauses, agrammatism at the level of words and sentences, spontaneously good gesture support, purposefully gestures fail
Repetition	Severe deficit already at the level of short words	Severe deficit already at the level of short words
Naming	Targeted naming is severely deficient. From 20 words / 0 word	Targeted naming is severely deficient. From 20 words / 1 word
Comprehension	Distorted by limb apraxia, deficient already at the level of simple instructions (e.G., Show your nose)	Distorted by limb apraxia, situational understanding preserved to a relatively good extent, targeted understanding of deficit, phonemic hearing in deficit
Lexis	Not possible	At the level of simple graphemes with a moderate deficit
Grafie	Unexamined	Unexamined
Verbal and oral ability	Targeted movements in the orofacial area with a severe deficit	Still with a severe deficit
Swallowing	Does not know "how" to swallow, impaired oral phase due to severe apraxia	Symptoms of dysphagia in the context of emotional apraxia are no longer noted
Motor realization of speech	Limited by a slight asymmetry of the right corner	Still a slight asymmetry of the right corner

Speech therapy recommendation: progress report 2.4.2021

Dysphagic disorders – thickening fluid, not serving crumbly foods. Food and drink fed by another person in small doses, spoon pressure on the tongue to improve the sensitivity of the oral cavity. The family was provided with information, materials, and leaflets on the issue of aphasia.

Speech therapy recommendation: discharge report 27.4.2021

The family was educated on the issue of aphasia and the possibilities of subsequent outpatient therapy and autotherapy. The development of word production and understanding. Articulation, phonation, and respiratory exercises. The development of auditory perception and phonemic hearing. Practise simple verbal instructions and provide plenty of time to execute them.

Table 2: *Examination of phatic functions*

	Progress report 2. 4. 2021	Discharge report 27. 4. 2021	Max
Verbal production	0	2	20
Oral comprehension	0	2	55
Repetition	0	0	25
Naming	0	1	30
Lexis	0	4	100
Grafie	0	0	70

3 The design and the course of therapy

Special education intervention with the focus on speech therapy and music therapy

It is necessary to know the extent of the brain damage, age, and associated diseases when determining individual therapy and prognosis for a client with ICMP. Moreover, it is vital to begin the therapy in time, choose appropriate re-education procedures, appropriate exercise intensity and consider the motivation and will of the client.

Speech therapy plan

Focused on breathing exercises, mimic muscle exercises, gum massages, oromotoric exercises, etc., because the client was still unable to set the speech organs for the necessary sounds and words when pronouncing (articulation). A partial aim of the breathing exercises was to strengthen the endurance and strength of the breath and to practice the coordination of the breath with speech. Aids for myofunctional

therapy were also used during the exercise of oromotoric skills (motor skills of the lips, tongue, face, swallowing) and the orofacial muscles were warmed up. Speech therapy developed from simple to more complex i.e., from sounds through syllables and words to speeches. Intonation and accent training as well as the intelligibility of speech were included. All exercises were carried out with feedback. At the same time, so-called key isolated words were chosen, such as pronouncing one's name and the names of one's family members. Since the graphic side of the speech was disturbed, the client almost did not understand spoken expressions, nor could she cope with written text. The therapy focused on voice listening practice, naming things, repetition of words, word skills, and speech. Gradually, it was necessary to teach the client to express herself using simple gestures and pointing, because even drawing or writing was not possible to use at the beginning. Following that the therapy was aimed at practising oral comprehension and simultaneously reading, writing and numeracy skills, including graphomotor skills, were renewed. From reading and writing of isolated sounds to simple words and simple retelling of short texts with adapted font size due to a worse left visual acuity. In the area of mathematical skills, it was counting to 10, memorizing numbers, and writing them down. Understanding simple money transactions have not yet been successful.

From the beginning of the intervention, a picture communication book with words, drawings, and photos of the client was created as a means of communication including her choice of topics. They gradually expanded and thus helped to develop the active and passive vocabulary of the client. The picture communication book served her for greater independence in communication and offered a feeling of security in social interactions. Furthermore, individual selected thematic units according to dictionaries for aphasics were discussed. Aids and worksheets depicting frequent expressions were used, followed by the assignment of an auxiliary word to the graph and phoneme. Thus, the therapy focused on cognitive functions, memory, speech functions, speech production, i.e., fluency, intelligibility, and comprehension of speech, and on improving the ability to read, write and count. We started from topics that were motivating for communication therapy. Since the client's cognitive processes were impaired in attention, orientation, perception, memory, recollection, organization, planning, and time sequence, the method of partially impaired performance was used in **a special educational intervention**. Gradually, the program included exercises that focused on optical and acoustic deficits, spatial and temporal orientation, intermodality, and seriality.

The whole therapeutic process was characterised by the active cooperation of the client's partner and their family members, who significantly supported the client and at the same time helped her as a communication partner. In agreement with the client and her family members, the therapy focused on the client's needs and interests and her personal and family life. One family member at least was present during most

therapies so the therapy could take place daily. Family members had to be trained in therapeutic procedures. It was constantly emphasized that the exercise should be short but frequent and that if signs of fatigue were observed, it was necessary to stop and allow the client sufficient time to rest. Family members were also reminded of the principles of communication with the client with ICMP, such as keeping eye contact, slow pace of speech, short sentences with keywords supplemented by written text, the need for feedback on understanding, sufficient time for conversation, the use of the picture communication book, stationery, and paper available for a possible entry of important words in the communication book, asking simple questions, using gestures and facial expressions.

The client worked intensively with her family members during therapy sessions to improve her deficits. A great advantage was the fact that the client and family members started the therapy on time and were significantly motivated and willing to cooperate. The client's condition improved after intensive therapies in a targeted special educational intervention and the client was advised to renew social contacts with friends. The individual therapy was later followed by group therapy in the form of cognitive and conversational training, which made it possible to train the acquired skills, share experiences and establish new relationships with other clients with the history of ICMP.

Music therapy

Sensitive mapping procedures were used as it was necessary to recognize the client's preserved abilities, limitations, and disappearances. **Systemic music therapy** modified for a special educational intervention, which subtly reflected the nature of the preserved and affected cognitive, emotional, and social functions of the client, proved to be effective. Selected exercises from the special educational intervention were connected to movement to purposefully activate and improve memory and speech centres. An emphasis was placed on situational thinking and memories. The development of fine and gross motor skills related to musical activities, first rhythmic-dynamic with acceleration and deceleration followed by melodic-intonation therapy.

As part of music therapy, the client expressed her inner authentic experience for the given role in her musical creations. The client's musical creations monitored and made visible the beginning, the course, and the end of the inner and mental solution of a given task. The desired solution had to be found and anchored. The client's musical creations that were made while dealing with selected tasks and made her internal mental events visible, contributed to the discovery of desired procedures. The client's undesirable practices, which manifested themselves in moments of crisis and uncertainty, were also visible. The music organization itself was used, in cooperation with a music therapist, to guide the client to find a solution that is optimal and emotionally satisfying at the same time. In the client's musical creations and

cooperation with the music therapist, possible solutions to problems in the field of speech, motor skills, social interactions, etc. were found. The selected procedures described above are suitable within a special educational intervention focused on speech therapy and music therapy.

Psychic intervention and psychotherapy

Experiencing fear is a relatively significant complication. Clients experience fear as a significantly unpleasant emotion, thus they tend to fight it, so they draw their attention to it. Paradoxically, this intensifies and fixes it. Subsequently, they experience a feeling of failure and intense fear often turns into anxiety with a negative somatic accompaniment. We consider the use of so-called "paradoxes" to eliminate excessive fear. We based it on the principles of communication therapy of the Palo Alto school. We achieve the desired goal by prescribing the opposite. That implies not fighting the fear but accepting it. It is appropriate to use a formula as "Fear is not your enemy, but a friend who protects and motivates." In addition to the ventilation of the above-mentioned effects, it is appropriate to use *relaxing and imaginative methods* that use muscle relaxation, concentration, autosuggestion, and imagination either in combination or separately. Through regular exercises, the patient learns to regulate some of her vegetative functions and mental processes. This autoregulation is usually activating or calming, sometimes soothing, which is suitable, for example, in dyskoimesia or reactive insomnia. In this case, it is possible to recommend, for example, Schultz's autogenous training (Schultz, 1982). The same principles should be followed when compiling individual hypnotic formulas. They should therefore be clear, brief, and concise. In the case of the patient, various formulas may be recommended: neutralizing formulas (e.g. "I am indifferent to falling asleep, I am just lying and resting.", "I am indifferent to unpleasant thoughts, let my head run calmly.", "I do not mind people around me."), self-directing formulas (e.g. "I am important to myself.", "I deserve to take care of myself.", " the body is my partner", "I help the body, the body helps me.") and strengthening formulas (e.g. "I am brave, calm and patient.", "I can say thank you to the body for every positive progress.", "Every day I feel better and better in every way."). The formulas need to be figured out with clients so that they like them, and they want to identify with them. At the same time, we recommend, especially in patients with aphasia, to use so-called internal speech for training and application of formulas. If the patient can gradually apply the formulas aloud, use internal and external speech.

Another useful exercise for the client may be *controlled imagination*, according to Schultz, the so-called higher degree of autogenous training. It focuses on mental processes and includes six exercises namely: ideas of colours, objects (first concrete, then symbolic), emotionally significant positive experiences, specific people, asking vital questions (e.g. "What do I want?"), formulating life slogans to improve one's

personality (e.g. "I am handy.", "I can be patient.", "I can be strong."). If the exercise progresses well, it is possible to practice topics for the fantasy development of positive symbolic events, which should be combined with the wishes of the client. And especially orientation on wishes we consider very important. We divert the direction of thinking from negative thoughts, which are the source of negative emotions and tension, to positive thinking, which is relaxing and supports the volition component of the autoplastic image of the disease.

As another indicated method, it is appropriate to use *rational psychotherapy*, which can be effective in detecting inappropriate patient opinions. Common misconceptions include, for example, the belief that one is there for others, that the priority is to take care of others, that the views of others and their evaluation is most important to us, that one must not be selfish and think only of oneself. Those misconceptions constitute the source of increased pressure, they contribute to the development of anxiety, tension, and are the source of problems, often including health problems. After uncovering and clarifying misconceptions, we provide adequate information on how to work with ourselves, with our bodies and the environment, how our irrational thoughts, often uncritically accepted in childhood, contribute to a disadvantageous system of opinions, which then leads to mental and health problems or both. We are trying to restructure our thinking to some extent. We explain that if a person gives, he also needs to take, that a person is not selfish when he takes for himself so that he can give. A selfish person takes for himself at the expense of others and gives nothing. The priority is to be able to take care of yourself so that you can take care of others. As a part of the restructuring of thinking, it is necessary to support the patient in taking a new view of the crisis (that the disease certainly is). It is the client's choice whether to conceive the crisis as a catastrophe, which brings helplessness and hopelessness, a future full of fear and anxiety, or will conceive it as a call for a change, to find new tools to solve the crisis. The basic question is what the crisis should teach the client e.g., working on their wishes, goals, learning to be patient, a new approach to the body, to themselves, to others. By applying this approach, we strengthen not only the informative component of the autoplastic image of the disease but also the volition.

4 Final evaluation

Stroke is a debilitating condition that affects more than 15 million new patients each year worldwide. One in three patients then remains with permanent consequences in motor or cognitive areas. It is estimated that up to 42% of stroke survivors need help with daily activities (Teasell et al., 2012). Early rehabilitation in these cases is essential to maximize functional recovery (Horn et al., 2005; Krakauer et al., 2012; Samuel et al., 2017). In addition to the above-mentioned special educational and psychological approaches, motor and cognitive neurorehabilitation, in which physio-

therapists and occupational therapists participate, is also crucial in combination therapy. These approaches are based on intensive task-specific training and learning with the support of neural reorganization and recovery itself (Alia et al., 2017; Galetto and Sacco, 2017). Traditional rehabilitation of individuals with a history of stroke integrates different treatment strategies that correspond to different levels of support. Quite often, repetitive exercises are performed that help build muscle strength (Dundar et al., 2014). The combination therapy in this case is a team effort where health professionals, psychologists, and special educators within the sectors work together. This facilitates a coherent rehabilitation process. The rehabilitation is necessary for patients to retain, develop and restore previous or new functions. It is also recommended that rehabilitation is aimed at a particular client and thus respects his individual needs (Donnan et al., 2008; Kristensen et al., 2016). Research studies show that the involvement of clients and other important people in their treatment, care, and rehabilitation processes helps to increase their autonomy. This reduces the economic costs of rehabilitation. Specialized rehabilitation programs, which include physiotherapy and occupational therapy were proven effective in the rehabilitation of impaired functions (Ranner et al., 2018; Christensen et al., 2019; Brouns et al., 2018). In addition to traditional rehabilitation procedures, technology applications are also used today.

Rehabilitation technologies are designed to provide consistent objective feedback that can help patients. We suggest, for example, commercial game systems, the Internet (e.g. telerehabilitation), various types of virtual reality or robotic systems (Stone, 2014; Antonio et al., 2015; Klein et al., 2014; Fulk et al., 2014). The cooperation of a multidisciplinary team seems to be an effective way of rehabilitation for people with a history of stroke. In this paper, we focused on the cooperation between special education and psychology in a client with a history of an ischemic stroke. However, the therapeutic approaches of physiotherapy and occupational therapy are also an integral part. This offers a compact and comprehensive approach. The presented case study points to the results of the progress and discharge report. The instances of improvement in individual areas are evident in the discharged report, even only after 20 days of intensive multidisciplinary cooperation. It was after this period that the client was discharged from the hospital with a recommendation for outpatient speech therapy and rehabilitation care. The client continued to experience difficulties in speech, cognitive, and motor functions after discharge. During her hospitalization, however, she reached the level that allowed her to be discharged from the hospital, with her spouse currently taking care of her.

Limits of the study

As this is a hospital (and special education) descriptive case study it included only one participant that matched the relevant characters. Therefore, the findings we present

do not necessarily reflect real factors from the general population. Based on this fact, the results may not be generalizable, but rather indicative and procedures rather recommended. Due to the study design, there are limitations to causal conclusions.

Future

We consider it extremely important to point out the effectiveness of multidisciplinary cooperation. It is this cooperation that reflects the comprehensive coverage of the patient's needs, from mental problems to motor, cognitive or speech therapy problems. Based on this submitted case study, where the effectiveness of the cooperation is evident, we consider it important to continue to address this issue. It would be appropriate to increase the research design to a number that will be statistically significant. We would be able to better interpret and generalize the results and thus better formulate the conclusions and recommendations for practice. It is this significance that will allow us to interpret the results with specific recommendations.

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