Neuroendocrinology Letters Volume 45 No. 3 2024
ISSN: 0172-780X; ISSN-L: 0172-780X; Electronic/Online ISSN: 2354-4716
Web of Knowledge / Web of Science: Neuroendocrinol Lett
Pub Med / Medline: Neuro Endocrinol Lett

ORIGINAL ARTICLE

Supervised Combined Therapy for a Pediatric Patient After a Cerebral Stroke: Selected Special Pedagogical, Occupational Therapy, and Psychological Approaches in a Case Study of the Czech Republic.

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Submitted: 2024-02-29 Accepted: 2024-04-26 Published online: 2024-07-02

Key words: **Special pedagogical intervention; Psychological intervention; Occupational therapy; Arterial Cerebral stroke; Combined therapy; Pediatric stroke; Speech Therapy; Supervision**

Neuroendocrinol Lett 2024; **45**(3):157–166 **PMID:** 39146561 NEL450324A01 • **www.nel.edu**

Abstract

OBJECTIVE: The article presents the results of a research study on a patient after an ischemic cerebral stroke, as presented in a case study. The aim of the research was to determine the impact of combined therapy, utilizing long-term and intensive special pedagogical care, occupational therapy and psychology, on the development of the patient's motor and communication abilities. The contribution deals with the possibilities of development and support for individuals in childhood after experiencing the illness, with the potential correction of identified deficits from a multidisciplinary perspective.

CASE REPORT: The case study highlights a patient at the age of 7.2 years, following an ischemic cerebral stroke during the post-hospitalization period. Based on the analysis of medical documentation, we have developed a therapy proposal that reflects the individual needs of the patient from the perspective of special pedagogy, occupational therapy and psychology, taking into account the patients of school age.

CONCLUSION: The results of the research study indicate that when working with a patient after an ischemic cerebral stroke, regular collaboration of a multidisciplinary team, along with effective integration of the various components of comprehensive rehabilitation, is necessary. Furthermore, this case study serves as a poignant example of the efficacy of such integrated therapy approaches in addressing the complex needs of pediatric stroke survivors. It not only highlights the potential for substantial functional recovery but also emphasizes the essential role of ongoing collaboration among diverse healthcare professionals.

INTRODUCTION

Arterial ischemic stroke (AIS) in pediatrics is considered a severe condition with long-lasting detrimental effects on motor and cognitive abilities, educational and social integration, as well as challenges in achieving the specific individual's global goals (Kossorotoff *et al.* 2020; Hujar & Kopyta, 2020). Arterial ischemic stroke, defined as occurring in children aged 29 days to 18 years, accounts for approximately 1 % of all pediatric strokes. The incidence in developed countries varies between 1 to 3 cases per 100,000 children per year (Fullerton *et al.* 2003 report 2 to 13 cases per 100,000 children per year). It is a relatively serious condition with a mortality rate of around 5 %, which can increase to 15 % in the case of recurrent episodes. Long-term consequences are also common. At least two-thirds of patients experience ongoing developmental disorders, such as motor, intellectual, or language deficits, along with behavioral issues. This can lead to adaptation difficulties in daily life (Fullerton *et al.* 2003; Mallick *et al.* 2014; Bigi *et al.* 2011; Christerson & Strömberg, 2010). Arterial ischemic stroke results from the interruption of arterial blood flow to the brain. Thromboembolic stroke may be caused by a remote embolic source, such as congenital or acquired heart disease, or in situ thrombosis related to arterial wall abnormalities. Risk factors for stroke in children differ from those in adults. For example, atherosclerosis and smoking are very rare in childhood (Ferreiro *et al.* 2019; Goldenberg *et al.* 2009). An estimated 80% of children with arterial ischemic stroke have at least one identifiable stroke risk factor. Approximately 25 % of children diagnosed with AIS have arteriopathy and congenital heart disease (Mackay *et al.* 2011). In older children with arterial ischemic stroke, it is essential to rule out common infections and COVID-19 (Šín *et al.* 2020), head or neck injuries, ICHS (intracerebral hemorrhage), dehydration, or systemic diseases (liver, kidney, hematological etc.). The disease typically presents in childhood with focal neurological symptoms, with or without headaches. These symptoms include hemiparesis, hemisensory deficits, visual field deficits, aphasia, facial weakness, other cranial nerve deficits, and unilateral ataxia. Focal seizures are also relatively common (Kirton, 2009). Initial symptoms may include speech disorders, headaches, weakness, numbness on one side of the body, dizziness, accompanied by nausea and vomiting. Loss of spatial, temporal, and self-orientation may also occur, along with possible unilateral blindness or loss of visual fields (Gusev & Kamchatnov, 2004). In medical practice, it is crucial to differentiate other neurological disorders that may mimic stroke in children. These may include focal weakness, reversible posterior leukoencephalopathy syndrome, acute demyelination, or tumors (Braun *et al.* 2006). In general, strokes are prevalent conditions with significant repercussions. The therapeutic focus primarily revolves around optimizing the recovery of the affected brain. Ultimately, the objective is to foster the individual's development to a level where they can integrate well socially and achieve independence in daily activities. (Medvedev, 2019). Rehabilitation following a stroke should encompass a comprehensive approach involving medical, psychological, educational, socio-economic, and other specialized measures aimed at restoring disrupted functions and supporting the social rehabilitation of the patient (Skoryatina & Yu, 2017). The comprehensive rehabilitation's objectives include the restoration of impaired functions, prevention and treatment of complications (e.g., urinary tract infections, venous thrombosis etc.), motor skill training (both gross and fine motor skills), and self-care activities. Active participation in the rehabilitation process is a crucial aspect influencing the recovery of neurological and psychological deficits. Medical professionals, rehabilitation specialists, psychologists, and special educators all play a role in such a process (Glagoleva & Zavalishina, 2017; Epifanov, 2005).

From the above, it can be inferred that impairments in sensorimotor functions, speech (e.g., dysarthria), or basic language skills are relatively significant outcomes of pediatric stroke. Often, these manifestations are also the primary reason for initiating rehabilitative care. From a clinical perspective, some functions (e.g., basic vocabulary) recover or develop in accordance with an individual's age, while more severe deficits may persist or worsen (such as language processing or social communication). Examples of these deficits may include attention, working memory, and executive functions. These are areas frequently affected by perinatal or childhood stroke. However, these deficits may only become evident several years after the stroke itself. It is noteworthy that attention deficit hyperactivity disorder (ADHD) development ranges from 15 % to 46 % within this context. Additionally, the regulation of behavior and emotional development is also influenced. Hence, it can be said that pediatric stroke has a significant and measurable impact on social functions (Peterson *et al.* 2021; Fuentes *et al.* 2017; Jacomb *et al.* 2018; Lehman *et al.* 2020). From the given characteristics, the importance of rehabilitation approaches becomes apparent. Numerous studies primarily focus on therapeutic rehabilitation and specialized educational (speech-language) approaches. These approaches thus reflect the clinical manifestations of pediatric stroke with consideration for the child's age. Regarding motor skills, a significant portion of the mentioned technique is constraint-induced movement therapy. This involves limiting the mobility of the upper limb and hand ipsilateral to the central nervous system lesion, promoting cortical reorganization in favor of the contralateral extremity. Training with a robotic arm, among other methods, can also be utilized. In the case of speech-language therapy, it is necessary to address the disrupted communication abilities, which can vary in their development. Based on the analysis of selected studies, aphasia often

appears. Long-term language deficits may then involve verbal fluency, organization of ideas, and synthesis of more complex thoughts. Unfortunately, there is limited evidence that clearly defines specific procedures (Svoboda & Li, 2018; Ramey *et al.* 2021; Laatsch *et al.* 2020; Mrakotsky *et al.* 2022).

METHODOLOGY

Aims

Stroke in childhood poses significant complications not only for the patient but also for the caregiving staff and the legal guardians/parents themselves. According to theoretical principles, it can involve disorders in learning processes, thought structures, mobility, socialization, and so on. In the case of prolonged limitations, social isolation of the individual may also develop. Coordinated rehabilitation approaches are one of the effective methods to prevent such isolation and to develop the individual fully with support for their social adaptability. The presented study deals with a qualitative research of an individual patient. We point out the case history of the patient and verified possibilities of therapeutic procedures in accordance with the principles of coordinated rehabilitation. *The aim of the research was to determine the impact of combined therapy, utilizing long-term and intensive special pedagogical care, occupational therapy, and psychology, on the development of the patient's motor and communication abilities.*

Methods

Participant

The case study focuses on a seven-year-old male patient with a history of an ischemic cerebrovascular accident affecting the territory of the left internal carotid artery, leading to right-sided hemiparesis and other neurological impairments. The participant's medical and developmental history, along with the impact of the stroke on his functional abilities, orthopedic status, and daily life activities, are comprehensively described. Consent for the case study was obtained from the patient's legal guardian.

Assessment Tools

A detailed rehabilitation assessment was conducted to evaluate the patient's functional abilities and limitations. This included: Neurological examination to assess spasticity, dystonia, and hemiparesis. Orthopedic examination, including X-ray imaging, to evaluate skeletal and joint conditions such as coxa valga and postural scoliosis. Functional assessment of the patient's ability to perform daily living activities, with a focus on mobility, self-feeding, and communication abilities.

Intervention Approaches

The case study outlines the therapeutic interventions employed, which include: Regular rehabilitation sessions focusing on improving motor function, reducing spasticity, and enhancing the patient's ability to perform daily activities independently.

Use of an orthosis to stabilize the right lower extremity and address issues with hip joint centralization.

Application of a muscle corset to manage pelvic inclination and associated scoliosis.

Engagement in special education services to support the patient's learning and adaptation to school life.

Ethical Considerations

The study adheres to ethical guidelines for case studies, ensuring the anonymity and privacy of the participant. All personal information has been de-identified, and the presentation of the case study emphasizes the protection of the patient's confidentiality.

CASE REPORT

For the purpose of personal data protection, we present only basic, essential, and anonymized information without a detailed description, such as the specific hospitalization location. The necessary information has been derived from the translation and discharge report with the consent of the legal guardian and is presented in the form of a case study. ***The aim of the case study is to highlight the potential of selected intervention approaches in a pediatric patient following an ischemic stroke.***

Patient's History

The patient is a seven-year-old boy born in 2014 with a complex medical history. In May 2016, he suffered an ischemic cerebrovascular accident that affected the territory of the left internal carotid artery, leading to ischemia in the right upper and lower extremities.

Pre-Birth and Birth History

Before birth, the patient was diagnosed with macrocephaly. His birth was spontaneous, and he weighed 3100 grams at birth, adapting well to the new environment. He also had hydrocele, a condition involving fluid accumulation around the testicles.

Post-Birth Development

During the initial post-birth period, a mild asymmetry in the lateral ventricles of the brain was detected during an ultrasound examination. Although he was not breastfed, he tolerated artificial nutrition well. However, at the age of two, he started exhibiting central hemiparesis on the right side of his body.

Functional Abilities

Currently, he can eat with a spoon and attempts self-feeding, but he crawls on all fours with minimal use of his right upper extremity. Before the cerebrovascular accident, he could eat independently and speak words. He now has a spinal axis with non-fixed postural

scoliosis when his pelvis tilts to the left, and his right lower extremity has shortened by 2 cm.

Gait and Orthopedic Issues
X-ray examination revealed that his right hip joint does not centralize, indicating coxa valga. An orthosis has been used to address this issue and stabilize his right lower extremity. His gait is characterized by circumduction, an inverted swing, and a breakthrough at the load phase with inversion at the heel.

Education and Daily Life
Due to the challenges he faces, the patient experienced a delay in starting school and previously attended kindergarten. He has recently started the first grade of elementary school. Regarding daily activities such as eating, he relies primarily on his left extremity. Assistance from another person is required for dressing and putting on shoes. His speech is dystonic, affecting his verbal fluency.

Rehabilitation Assessment
From a comprehensive rehabilitation assessment, it is evident that his left upper extremity functions within a normal range. However, his right upper extremity exhibits limitations. It can be raised and extended to a slight semiflexion at the elbow, but it remains consistently unstable with signs of spasticity and dystonia. A muscle corset has been applied to address pelvic inclination and associated scoliosis.

Summary and Recommendations
In conclusion, the patient's life has been significantly affected by the ischemic cerebrovascular accident he experienced. Although there has been some improvement after a visit to a spa, his condition remains complex. The treating physician strongly recommends continued collaboration with a special education center and regular rehabilitation sessions to effectively address the challenges he faces and ensure his overall well-being.

EXAMINATION, DIAGNOSIS, INTERVENTIONS

Occupational therapy Diagnostic and Therapy

Pediatric stroke is a significant cause of disability, often associated with long-term motor and cognitive impairments (Mirkowski 2019). Occupational therapy for children following a cerebrovascular accident focuses on three fundamental areas affected by neurological insult. Initial occupational therapy assessments revealed limitations in activities of daily living (ADL), sensorimotor deficits, and cognitive impairments. The occupational therapy plan described below reflects these areas, taking into account the psychomotor development and current needs of the patient. ADL training takes the form of play or modeled activities simulating everyday life tasks based on the child's age. The goal is to achieve the highest possible level of independence. The therapist focuses on the cognitive-motor aspects of performing specific activities. Individual activities are first trained at a theoretical level, including the child's cognitive ability to understand the task, describe it, and phase it into individual steps in the correct sequence. Only then does the therapy transition to the actual performance of the activity, emphasizing motor execution. At this stage, the occupational therapist pays attention to the correct motor execution, including the involvement of the affected upper extremity. Depending on the child's level of dependence in self-care, an appropriate compensatory mechanism is chosen if necessary. In this case, tactile and verbal guidance, along with the use of self-care aids, were selected to facilitate activities requiring fine motor skills and coordination of both upper extremities. The child's sensorimotor skills were initially influenced through Neurodevelopmental Stimulation (NVS). According to Volemanova (2021), the NVS methodology aims to reduce the activity of persistent primary reflexes and enhance sensory perception, enabling the activation of additional skills and, particularly, the learning process. Subsequently, motor learning methodology was applied through robotic rehabilitation using the Balance Tutor device. The 4D perturbation mobile belt allows training of the child's reactive postural control, focusing therapy on the static and dynamic function of the paretic leg. The patient trained balance, stability, and the gait pattern using the device. Robotic-assisted hand therapy took place through the Armeo Spring device, providing the patient with the opportunity to train upper limb motor skills in a virtual environment with feedback. The effect of robotic therapy was supported by individual occupational therapy techniques that complemented each other. As stated by Svestkova *et al.* (2018) in the results of their study, which demonstrated improved upper limb mobility using the Armeo Spring device in neurological patients, the presence of a therapist is crucial.

Cognitive-motor rehabilitation was set up using the Myro device, connecting the aforementioned aspects into a single exercise. The patient could simultaneously train motor skills (hand-eye coordination, bimanual coordination, muscle strength, tactile perception, graphomotor skills, and others), cognitive abilities (speech, attention, memory, logical thinking, abstraction), and, last but not least, ADL (daily plans and activity procedures).

Robotics and virtual environments successfully captured the attention of the pediatric patient, enhancing the effectiveness of standard individual therapies. This perspective is supported by Malone and Felling (2019), who describe the benefits of robotic rehabilitation in caring for pediatric patients by facilitating their engagement in repetitive training tasks. In the practice of occupational therapy for children after a stroke, it is crucial to employ an individualized approach, combining multimodal methods including

games, activity modeling, neurodevelopmental stimulation, and robotic rehabilitation. Involving the family in the therapeutic process and providing them with tools to support the child's progress at home are essential. Regular assessment of progress allows for flexible therapy planning and adaptation to current needs. When necessary, considering the use of compensatory mechanisms and aids is advisable. Taking into account psychosocial aspects, such as motivation and social interaction, is crucial. Maintaining therapy continuity and monitoring long-term progress contribute to skill consolidation. Education for not only the children themselves but also their families and professionals is key to strengthening support in daily life. Monitoring technological trends and implementing evidence-based practice are important for effective care of children after a stroke.

Special Education Diagnostic and Therapy

Special Education Diagnostic in 1st Grade – 11/2021: A boy with a neurological disability – status post ischemic cerebral stroke, moderate to severe right-side central hemiparesis with significant functional deficit in the right upper and lower limbs. Expressive aphasia in partial regression. Limited verbal expression with marked impaired fluency. Stuttering. Dyslalia. Significant uncertainty in phonemic hearing. Very slow work pace. The boy is anxious, diligent. Throughout the examination, psychomotor restlessness was observed. Speech Therapy Diagnostic 12/2021: The boy post ischemic cerebral stroke sudden loss of speech (expressive aphasia), Token test upon admission for speech comprehension, a total score of 24, indicating a moderate comprehension disorder (performance in the test correlates positively with methods assessing the receptive component of speech, i.e., the ability to perceive and understand spoken expression, and with methods assessing speech production performance. During the examination, the boy was tearful, further examination and testing were subsequently paused. Signs and manifestations of stuttering, dyslalia in speech. Vocabulary acquisition is hampered.

Speech Therapy Care 2021: The boy under the care of a clinical speech therapist for expressive dysphasia, stuttering, and dyslalia. During therapies, severe stuttering manifestations. Present were repetitions and prolongations of words (lasting up to 5 seconds), blocks, facial expressions – strong squinting, open mouth, tightened muscles in the neck area. Furthermore, very low vocabulary and very slow word retrieval. The boy is unable to retell what he did over the weekend or yesterday afternoon. Picture description very limited due to low vocabulary. Therapy focused on phonorhythmic exercises – syllabification according to predrawn dots. With this method, he manages to say a shorter sentence. Necessary development of vocabulary – basic verbs, nouns. Furthermore, speech therapy care will focus especially on the development of speech comprehension, differentiation of active and passive vocabulary, development of the expressive component of speech, and strengthening of verbal memory. Diagnostic at the End of 2nd Grade 04/23: The boy is uncertain in contact, evident progress. Minimal progress in the area of verbal expression, persistent massive speech fluency disorder, incorrect pronunciation. When he answers, he answers in single words. Improved understanding of speech – Token test – a total score of 35. Apparent weakening in the coordination of speech and thought. When tired, he forgets the content of the conveyed thought. Independent walking with a limit, fine motor skills exclusively with the left hand, the right hand is practically not involved. The work pace is very slow, work endurance has improved, he tries to comply with instructions. Fixed on the presence of the mother during the examination. The boy now nicely manages the shapes of cursive writing, writes into auxiliary lines. The grip of the writing utensil is with the left hand, the pressure on the pencil varies, the stroke is smooth, the grip is low. There is a tendency to confuse letters of similar shape, less frequent letters are not yet recalled. Copying still without spaces between words. Differentiating vowel lengths and mimicking rhythm is challenging.

He manages to read open syllables at a slow pace, composes closed syllables in a whisper. Auditory analysis at the level of words from three open syllables, does not identify consonant clusters. Auditory synthesis only for closed syllables so far. Visual differentiation is normal. Mathematical skills up to twenty, concept of numbers up to five. Understanding of verbal instructions including simple tasks is challenging. Sometimes, understanding of spatial prepositions is challenging. Cognitive Performance According to WISC III Currently in the Obvious Below-Average Range. Performance in individual subtests is relatively balanced, except for the subtest capturing the ability to verbally solve various social situations, i.e., weaker understanding and CNS fatigue. He has not yet developed a correct concept of the word in internal speech considering the neurological base (status post cerebral stroke). Overall, performance is negatively affected by a weaker coordination of psychological functions for writing, reading, and counting, and higher CNS fatigue. For good performance, he needs time and calm. Under stress, his rationality easily blocks. Speech Therapy Care 12/2022: Improved in breathing stereotype, uses some elements from phonorhythmy. In oromotor skills, improved strength of lip closure, elements of basal stimulation, and ball exercises according to Jebavy, leading to reduced tension in the intercostal muscles, muscles around the bronchi, respiratory tracts, and mitigating the sensation of breathlessness. Oromotor skills: can inflate both cheeks, blowing out is unsuccessful, tongue elevation yes, can suck the tongue to the palate. Articulation disorder of alveolar sounds, involvement of the movement of the lower jaw up to a firm bite.

Development of shorter sentences, naming pictures, development of vocabulary. Therapy continues at a gradual pace, fatigue sets in quickly, unable to fully concentrate, it is necessary to often take shorter.

Psychology

The primary task of psychological assistance to individuals after an ischemic stroke is to support their socialization abilities or, in the case of adult individuals, their resocialization, which involves reintegrating them into society if necessary. In our case, it is advisable to recommend concurrently developing motor skills, communicative abilities, and working with emotions within the framework of an interdisciplinary approach. Regarding socialization mechanisms, we consider imitation, social reinforcement, and suggestion as crucial. By appropriately applying positive models through imitation, we can encourage the selection of adequate goals, motivate individuals to overcome obstacles, and strengthen their frustration tolerance. It is essential to eliminate the so-called boomerang effect, which leads not to the acceptance and tendency to imitate models but to their ignoring or even rejection. Risks associated with presenting models leading to a boomerang effect include their unattainability, unattractiveness, or creating pressure to accept these models. Motivating individuals to overcome obstacles, improve their condition, develop abilities, and skills is beneficially supported by effective social reinforcement, based on the principle of conditioning. Desirable behavior is reinforced with positive feedback and rewards. Considering the psychosocial crisis experienced by individuals at our patient's age, striving against feelings of inferiority (Erikson, 1950), it is necessary to reinforce precisely their effort and will to overcome obstacles related to their health condition. If a patient has mobility issues, it negatively affects their self-esteem, leading to a tendency for negative self-experience and self-perception, critically evaluating the imperfection of their movements. Therefore, an emotional and cognitive component is involved. Both can act as barriers to developing mobility in the form of mental blocks. These mental blocks negatively affect the patient's expectations, leading them to anticipate failure, which usually occurs subsequently.

Thus, it is considered useful to support emotional work training and the application of ideomotor movements, which lead to strengthening the development of neural connections, especially in the primary motor cortex area, ensuring precise and skillful body movements, and in the premotor area controlling more complex voluntary movements dependent on sensory feedback. Training thus eliminates negative anticipation regarding movements realized at the level of imagination. Specifically in rehabilitation, procedures that attempt to find alternative solutions, overcome or bypass problematic areas, and find ways to more effectively utilize existing skills are applicable (Wilson, 1989). The approach is based on the "hemispheric symphony" model combining neuropsychology, behavioral, and cognitive psychology (Buffery, Burton, 1982). Training of psychomotor schemes in imagination, i.e., ideomotor training, where movement imaginations are transferred into specific movement arrangements, serves to practice new or correct existing motor skills. The precondition is to create a high-quality movement imagination, influencing sensorimotor afference and thus achieving a change in movement pattern and subsequently in behavior (Slepička, Hošek, and Hátlová, 2009, p. 211). Visualization, imagination, thus leads to the simulation of action without physical movement since cortical kinesthetic cells can be stimulated not only peripherally but also centrally by movement imagination. Visual perceptions are stronger than verbal instructions. Movement imagination is practiced in a relaxed state to eliminate tension, which can increase with too intense concentration on real motor activity, unwanted critical thinking, anticipation of failure, and fear of failure. Mental training leads to mind control. If concentration on the chosen object or movement is performed intensively, after removing all mental blocks and disturbing stimuli, a state arises in which the mind is calm, without any disturbance and effort regarding the object. The client transitions from a concentration state to a meditative state, experiencing satisfaction, which can be likened to the "flow" state in athletes, where the activity itself leads us to a state of relaxed concentration (Csikszentmihalyi, 2015). Some movements become more or less automatic, without full awareness and conscious control (Dlabal, 2023). Undesirable critical thinking, control, and unwanted tension can be weakened, for example, by using suggestions, which we consider information, a stimulus that leads the subject to engage in some activity or state without consciousness, i.e., involuntarily. When using suggestions, deliberate suggestions targeted at a specific desired activity are preferred. In our case, it is appropriate to use suggestions to induce a deep relaxed state and subsequently when creating imaginations initiating ideomotor movements that correspond to the desired freely controlled movements on a fully conscious level. Creating imaginations in a deeply relaxed state to some extent corresponds to a meditative state, characterized by activity in the hippocampus and posterior sensory and associative systems activated by imaginations, as opposed to the resting state of normal consciousness, where the executive attentional system and cerebellum are active. The relaxed state/meditation and the resting state of normal consciousness are related to complementary aspects of consciousness, which are conscious experiencing of the world and the real or illusory idea of voluntary self-control (Lou *et al.* 1999, in: Kulišťák, 2011). For the actual therapy of voluntary movements, it is possible to recommend a procedure reflecting the above-mentioned findings. To induce a state of muscular relaxation, it is suitable to use elements of Schultz's autogenic training (2019).

- Breath calming ("Focus on your breath, perceive only your breath, your breath calms down, becomes regular, deep, calm, ...")
- Muscle relaxation practice (inducing a feeling of weight in the limbs. For individual muscle groups, suggestions such as "your muscle is getting heavier and heavier, you feel greater and greater weight, the weight increases, pulling your body/limb down... your body is heavy... it's pleasant")
- Induction of relaxation-type hypnosis. Here, dissociation or a series of dissociations that divide the client's attention among various phenomena occurring simultaneously can be offered ("... your mind slowly detaches from your surroundings, thoughts drift away into the distance, it's pleasant to feel relaxed, to perceive your thoughts drifting away, you are calm, relaxed... while thoughts are drifting away, your attention shifts to you, you see an image of yourself...")
- Creating imaginations corresponding to desired voluntary movements ("... you see an image of yourself in a place where you feel good... you're relaxed... it's pleasant... your body moves smoothly... movements are precise, smooth... it's pleasant...")
- Anchoring ideomotor movements ("... you perceive your movements, which are smooth, precise... it's pleasant... your body remembers the movements and their execution... your brain creates and reinforces the image of movements... it's pleasant and safe...")
- Own training of voluntary movements in a wakeful state. Before the actual training, it is recommended to induce a state of muscle relaxation again, in which the client feels comfortable and safe. Positive feedback is provided continuously during the training.

Repeated training of psychomotor schemes in imaginations together with voluntary movement training and desired positive feedback not only leads to eliminating mental barriers but also strengthens the client's frustration tolerance, which is a very beneficial effect on the client's life in general.

DISCUSSION

Pediatric stroke, also referred to as arterial ischemic stroke (AIS), has a global mortality prevalence of approximately 10%, ranking it among the top ten causes of childhood mortality. Furthermore, three-quarters of pediatric patients who survive this condition experience long-term and potentially lifelong neurological deficits. These assertions are supported by selected studies, which also indicate that up to 76% of children diagnosed with AIS carry neurological deficits that persist into adulthood following their discharge from hospital care. Such deficits encompass hemiparetic posturing, speech and language disorders, feeding difficulties, cognitive impairments, behavioral changes, and, in some cases, epileptic seizures (Malone & Felling, 2020; Li *et al.* 2021; Gordon *et al.* 2015). From an international perspective, it is evident that survivors of pediatric stroke should undergo regular monitoring and evaluation. The primary purpose of this ongoing process is to identify the specific needs of the child and their family. These assessments are crucial for assessing the attainment of developmental milestones and changes (Greenham *et al.* 2021; Martinez *et al.* 2022). Based on the partial impairments evident in the development of neurological deficits, it is essential to address the issue of activity limitations with an overall impact on participation in everyday activities.

Motor deficits, in particular, play a pivotal role in disrupting self-care skills, communication, and educational abilities. Gradually, such a condition can lead to social isolation, which may further exacerbate the situation. The severity of motor deficits varies among individual patients. While most pediatric patients acquire or regain their independent mobility, even mild motor impairment can restrict a child's ability to participate in specific activities and have a negative impact on their self-confidence (Pavlovic *et al.* 2006; Gordon, 2014; Greenham *et al.* 2016). Regardless of the application of individual intervention methods, it is essential to acknowledge that rehabilitation itself takes place in conjunction with the family or caregivers. This creates a very important whole. In the case of the emerging needs of a pediatric patient, it is crucial to also recognize the needs of the family/legal guardians. Equally important in rehabilitation is the multidisciplinary approach, given the diverse types and number of issues that may be encountered in a pediatric client (Bernson-Leung & Rivkin, 2016; Mirkowski *et al.* 2019).

Current therapies aimed at rehabilitating patients after a stroke involve a process that includes daily one-on-one interactions with therapists. These interactions can often last for several weeks. A current trend in rehabilitation is the application of robot-assisted therapy. In addition to the benefits for patients, it also serves to reduce the workload for therapists in the rehabilitation process. Another advantage is its precision in diagnosing the patient's current condition (Wolbrecht *et al.* 2008; Marini *et al.* 2017). The importance of a multidisciplinary team is also important in other fields such as oncology, neurology, psychiatry, etc. Each of the clinical disciplines requires a multidisciplinary team. It is thus an integral part of the quality of care provided. The knowledge of professionals across the multidisciplinary team can also be useful for supervision in healthcare itself. This is a topic that has been intimately addressed in recent years. More and more professionals are beginning to address the topic, pointing out the importance in one respect, which is the transfer of information from experienced colleagues to younger, novice colleagues in healthcare. And not only in this field (Taberna *et al.* 2020; Vostrý *et al.* 2022). **The limitations of this study can be summarized as follows:**

- **Single Case Study:** This study is based on a single case report, which may limit the generalizability of the findings to a broader population. The results may not be representative of all patients who have experienced an ischemic cerebral stroke.
- **Lack of Control Group:** The study lacks a control group for comparison. Without a control group, it is challenging to attribute improvements solely to the combined therapy approach used in this case. A comparative analysis with a control group would have strengthened the study's findings.
- **Limited Sample Size:** The study involves a single patient, which limits the ability to draw definitive conclusions about the effectiveness of the combined therapy approach. Larger sample sizes are needed to establish the generalizability of these findings.
- **Short-Term Focus:** The study primarily focuses on short-term outcomes during the post-hospitalization period. It does not provide insights into the long-term effects of the therapy on the patient's motor and communication abilities.
- **Case Selection Bias:** The patient selected for the study may not be representative of all individuals who have experienced an ischemic cerebral stroke. The criteria for selecting this specific case are not fully disclosed, potentially introducing selection bias.
- **Limited Information:** The abstract lacks specific details regarding the therapy proposal, interventions used, and the duration of the therapy, making it challenging to replicate the study or fully understand the therapeutic process.
- **Generalizability:** The study's focus on special pedagogy, occupational therapy and psychology interventions may not be applicable to patients with different needs or those from diverse demographic backgrounds.

CONCLUSION

The presented case study exhibits several typical characteristics that need to be taken into account in the context of coordinated rehabilitation. In summary, pediatric stroke poses significant challenges globally, with considerable mortality rates and a high prevalence of long-term neurological deficits among survivors. These deficits, ranging from motor impairments to cognitive and behavioral changes, profoundly impact various aspects of a child's life. Regular monitoring and evaluation are essential to address individual needs and facilitate developmental progress. Rehabilitation efforts, employing multidisciplinary approaches and innovative therapies, strive to optimize functional recovery and enhance the overall well-being of affected children and their families on a global scale. From the processing of this case study, where we focused on psychological, occupational therapy, and special education aspects, the following relevant recommendations emerge:

From a psychological perspective:

- Psychotherapy: Individual psychotherapy for the patient is recommended, focusing on supporting his mental health and emotional development. This can assist in dealing with potential emotional issues stemming from iCMP and other challenges.
- Family Support: Ensure that the family receives psychosocial support and education regarding the patient's needs. Help them cope with the emotional stress associated with caring for a child facing these difficulties.
- Communication: Foster the development of the patient's communication skills. Augmentative and alternative communication methods (AAC) may be employed to facilitate more effective communication.

From a special education perspective:

- Individualized Educational Plan (IEP): Develop an IEP for the patient that takes into account his specific needs. This includes modifications to teaching methods to better accommodate his learning.
- Learning Support: Provide learning support for the patient, which may include specialized educational materials and methods, individual tutoring, or classroom aides.
- Inclusive Environment: Collaborate with teachers and school staff to create an inclusive environment that allows the patient to participate as fully as possible in school life.

From an occupational therapy perspective:

- Rehabilitation: Continue rehabilitation efforts focused on improving the patient's motor skills and abilities. This may encompass physical therapy, occupational therapy, and structured physical activity.
- Aids and Adaptations: Supply the patient with appropriate aids and adaptations that enable greater independence. This could involve special orthoses, assistive walking devices, or other assistive technologies.
- Postural Support: Address postural issues, such as scoliosis, and work on enhancing the patient's stability and mobility.
- Active School Participation: Assist the patient in developing the necessary skills for participation in the school environment, including dressing and self-shoeing abilities, leading to increased independence.

It is crucial for the interdisciplinary team of professionals to collaborate in creating an individualized care plan for the patient, which should be regularly updated based on his evolving needs and progress. Additionally, it is advisable to monitor and evaluate the patient's development regularly and respond to any changes or needs that may arise over time.

DECLARATION OF COMPETETING INTEREST

The authors declare that there are no conflicts of interest regarding the publication of this paper.

ACKNOWLEDGEMENT

The presentation of this article was supported by a grant from the J. E. Purkyně University in Ústí nad Labem.

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