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Features of The Influence of Neuropsychological Correction Methods on Human Physical Development

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Abstract

The main purpose of the study is to analyze the modern neuropsychological methods of correction on the physical development of a person. The relevance of the introduction of neuropsychological methods in working with children is due, in particular, to the fact that psychological and pedagogical support for children is effective only if the objective laws of development are taken into account: they inevitably include the main patterns of the development of the child's brain. The correctional developmental method and specific technologies in it working, built taking into account all the components of the psychological development of a preschooler in the norm. They include psychosomatic and cognitive, regulatory and executive aspects. Knowledge of the underlying mechanisms of all these processes, the logic and stages of their formation allows a conscious and differentiated approach to the psychological and pedagogical support of the developmental processes of any child. Based on the results of the study, the key neuropsychological methods of correction on the physical development of a person were characterized.

Keywords: *Physical Development, Neuropsychology, Neuropedagogy, Remedial Education, Educational Process.*

INTRODUCTION

Neuropsychological correction methods are designed to address deficits in cognitive functions such as attention, memory, and executive functions. The development and refinement of these cognitive abilities are closely linked to motor skill development in individuals. For example, cognitive training can enhance motor planning, coordination, and execution, which are essential for physical tasks ranging from simple daily activities to complex athletic performances. By enhancing cognitive functions through neuropsychological techniques, individuals may experience improved physical development, leading to better overall motor proficiency and physical fitness. These methods are particularly significant for children with developmental delays or neurological disorders, such as cerebral palsy or autism spectrum disorder. Early neuropsychological interventions can significantly influence the trajectory of a child's physical development. Techniques such as sensory integration therapy or cognitive behavioral therapy can help these children improve their motor skills, balance, and coordination, which are crucial for their overall physical growth and ability to engage in physical activities with peers, thereby supporting social integration and self-esteem.

The brain has the ability to develop throughout a person's life. At the same time, the process involves a certain order that determines the passage of specific stages. If at some stage a so-called "failure" occurs, then the development of mental functions (attention, memory, perception, thinking, imagination, speech, etc.) turns out to be impaired (Kryshtanovych, Kotyk, Tiurina, Kovrei, Dzhanda, 2020).

Mental functions are formed with delay and specificity - lack of formation of voluntary self-regulation, peculiarities of behavior and disorders in the development of the emotional and volitional sphere and communication. It is in such cases that neuropsychological correction or developmental neuropsychological support can help the child (González-Valenzuela, Martín-Ruiz, 2021).

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In a significant number of children, higher mental functions are formed and develop unevenly: some of them can be formed, others can be formed or lag behind in development. On the one hand, such features of different ages do not cause significant concern and cause their individual differences; on the other hand, under adverse conditions of the social environment, they hinder the harmonious development of the personality of pets. Among the many conceptual methods for the correction of psychophysical development, the neuropsychological method deserves special attention. The subject of neuropsychology is the patterns of formation of higher mental functions of a person (Orth, Davids, Chow, Brymer, Seifert, 2018).

Neuropsychology is a relatively young science of the actively developing brain. Providing a fundamental scientific justification for many methods and approaches that are intuitively used in pedagogical and rehabilitation practices, it is of priority interest for the latest and correctional pedagogy and psycho-pedagogical rehabilitation (Philip, Harvey, 2012). Every day, new research scientists reveal to us the mysteries of the human brain. The knowledge based on these studies and the ability to take into account the peculiarities of the work of the child's brain make the learning process effective, explaining the causes and specifics of the existing features, provide tools for correcting pathological development and contribute to the individual advancement of the child's personality.

METHODOLOGY

The following methods were used in the course of the study:

the method of analysis and systematization of historical and modern information regarding the existing experience in the problems of physical development and motor rehabilitation of children using neuropsychological methods - was used to study the degree of scientific development and determine the possibilities of practical use of various models of neuropsychological methods for correcting the physical development of children;

the deductive method included the development of a system of motor rehabilitation of children for the formation of a variable methodological support for the correctionally directed use of neuropsychological methods for correcting physical development.

In order to fully understand the process use of the modern neuropsychological methods of correction on the physical development of a person, we used the IDEF0 functional modeling method.

RESEARCH RESULTS AND DISCUSSIONS

Working with children in a neuropsychological approach is becoming increasingly popular. And this is quite understandable. Every year there are more and more children with disorders of higher mental functions, and their developmental problems become more and more difficult. All this leads to the fact that the old methods cease to work with the same efficiency. The search for new methods and forms of work led to the study and introduction of neuropsychological exercises into daily practice (Sylkin, Buhel, Dombrovska, Martusenko, Karaim, 2021).

Neuropsychological methods for correcting the physical development of children are increasingly being introduced into the practice of the work of a teacher, psychologist and other specialists.

The use by teachers of a system of exercises with neurocorrectional effects, which I share my experience with today, can have a positive impact on the formation of children's brain processes, provided that this technology is properly organized. This approach will contribute to the achievement of age standards in general development and, in particular, speech (Awe, Church, 2020).

The effectiveness of the neuropsychological approach has been proven by science and practice. It is a health-saving and gaming technology. The neuropsychological approach involves the correction of disturbed mental processes (attention, memory, thinking, speech, etc.), the emotional-volitional sphere of the child through movement. Many researchers point to the relationship between the mental and motor development of the child. Higher mental functions arise on the basis of relatively elementary motor and sensory processes. For example,

by developing bodily motor skills in outdoor games, dancing, rhythmic lessons, playing musical instruments, prerequisites are created for the formation of such processes as speech and thinking.

Neuropsychological methods can be used at any age, but it is better to conduct classes at the age of 4-12. The goal of neuropsychological methods is the development of brain (neuropsychosomatic) support for mental development. During classes, the specialist relies on the strong properties of the higher mental functions of children, which are determined in the process of neuropsychological diagnosis (Hornby, 2015).

Neuropsychology is a study of the processes of memory, attention, behavior, thinking, abilities (speech, movement), which is carried out with the help of special tests.

The main goal of neuropsychological methods is to provide assistance in mastering cognitive skills, to teach how to overcome the difficulties that a child experiences in communicating with the surrounding world.

This component of the methodology uses tasks in the development of attention, memory, thinking, spatial perception, development of graphomotor skills, various board games. With their help, the skills of arbitrary regulation of higher mental functions — memory, attention, thinking — are formed and developed. This direction is also extremely effective for the development of spatial concepts and fine motor skills.

Timely early diagnosis and prevention of learning difficulties helps prevent the formation and consolidation in children of spontaneous, not always adequate ways to compensate for shortcomings in the functioning of certain cognitive functions that have not yet completed their formation. The problem of an individual approach and a qualitative analysis of the characteristics of a child's development can be successfully solved with the help of differential neuropsychology of childhood, the main task of which is to study individual differences in the formation of mental functions at different stages of ontogenesis (Kryshtanovych, Balukh, Buchkivska, Chubinska, Ilina, 2021).

According to Misciagna (2022), it is necessary to introduce neuropsychological methods for correcting physical development. This approach will solve the following tasks:

identify strong and weak components of higher mental and motor functions of the child;

to predict to what extent the characteristics of information processing will affect the development of mental and motor functions and learning;

build hypotheses about effective strategies for corrective action.

Thus, neuropsychological correction with children takes place on the basis of diagnosed difficulties, delays or disharmonic development of higher mental functions, as well as on the basis of the compensatory capabilities of the child (Kivirand, Leijen, Lepp, Malva, 2020).

An important component of the complex correction of children with developmental problems is the methods of motor correction. Some authors call them mototherapeutic methods. As is known, motor development precedes sensory development in prenatal and early development of a child, and the lag in mastering motor skills correlates, as a rule, with cognitive underdevelopment. In ontogeny, the development of psychomotor skills is far ahead of the formation of speech and thinking, constituting the basis for their development. That is why corrective work should be directed "from the bottom up" (from movement to thinking), and not vice versa (Kryshtanovych, Kryshtanovych, Chubinska, Khromova, Sylkin, 2022).

The need for motor correction is due both to the characteristics of the early development of children in need of remedial training: the lack of phases necessary for the development of motor skills (for example, the crawling phase), the delay in the formation of others (independent sitting or walking), and the fact that in this population of children "energy" problems are often combined with the mechanisms responsible for the state of the "background" of motor activity (muscle tone, maintaining posture, coordination of movements) (Crawford, Garthwaite, 2019).

The reasons for the lack of formation can be different: the individual specificity of the child's development, perinatal and postnatal developmental deviations or often mistakes of parents in the motor education of children, insufficiency or incompleteness of physical exercises, "the physical experience of teaching complex

motor behavior." For example, many children with learning problems at school, as our observations show, have passed the stage of crawling in their early development. Another reason may be insufficient development of sensitivity, a deficit of sensations, leading to inactivity: the child does not know how to handle his own body, how, for example, to change position, release a hurt leg, get out from under the covers, get a toy, etc (Kostenko, Petrova, Pogonchenkova, Neprintseva, Shurupova, Kopasheva, Rylsky, 2022).

Also in children, the opposite violation can be observed - hypersensitivity. In this case, the behavior of the child also changes, he does not know how to move in order to avoid an unpleasant touch. From the outside, this may look like a violation of the motor sphere, often such children are diagnosed with cerebral palsy, etc. In fact, there are no true motor disorders here.

Motor exercises help, firstly, to raise the level of the child's activation, provide the development of visual and auditory attention, contribute to the formation of interhemispheric interaction, develop the ability to control one's behavior, overcome stereotypes in behavior (Kryshtanovych, Kryshtanovych, Stechkevych, Ivanytska, Huzii, 2020). Having learned to control the movement, the child becomes able to further control his activities. One of the goals of motor correction is the formation of an orienting basis of action. Movement is a unique function that provides ample opportunities for stimulating mental activity; information about the outside world received during movement, combined with sensations from the movement of one's own body, allows you to quickly raise the level of brain activity and restore working capacity. It is this path that the exhausted child chooses, which outwardly looks like restlessness, bad behavior (Trimper, Wolpe, Rommelfanger, 2014).

It is recommended to conduct corrective exercises and games that relieve physical stress and activate the student's movements. Exercises provide the development of coordination of movements, balance, correction of the tone of the muscles of the arms and legs, methods of movement. It is advisable to perform exercises with musical accompaniment, because the effectiveness of rhythmic stimulation has been proven by the studies of many psychologists (Van Mieghem, Verschueren, Petry, Struyf, 2018).

The development of fine motor skills of children is provided on the basis of the following types of work to normalize the functions of the small muscles of the hands: - massage of the fingers of both hands; finger gymnastics; correction of small movements when working with natural material; development of the strength of the muscles of the hands (using an expander, a power meter, involving in work with plastic, natural, plasticine, clay, etc.); development of coordination of movements (during games with a ball, gymnastic stick, ribbon, hoop, geometric material, etc.); drawing numbers, letters, lines with fingers; using constructors; sorting small items, working with mosaics, pyramids (Huzar, Zavydivska, Kholyavka, Kryshtanovych, 2019).

In order to detail and systematize the process of implementing neuropsychological methods for correcting physical development, we used the method of functional modeling. So, as you can see in Fig.1., we have formed a root model for achieving the goal A_0 – «The use of neuropsychological methods for correcting the physical development of a person».

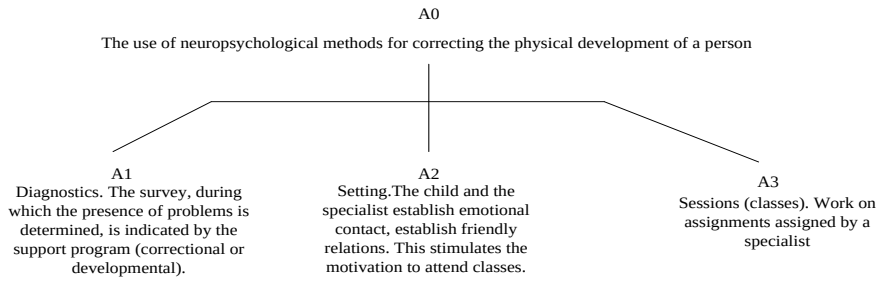

Figure 1. A a root model for achieving the goal A_0 – «The use of neuropsychological methods for correcting the physical development of a person»

The next step will be the formation of a decomposition model for achieving the final goal A_0 – «The use of neuropsychological methods for correcting the physical development of a person» (Fig.2). This model, in addition to demonstrating the way to implement the final goal, demonstrates the intermediate resources and elements that are necessary in this case.

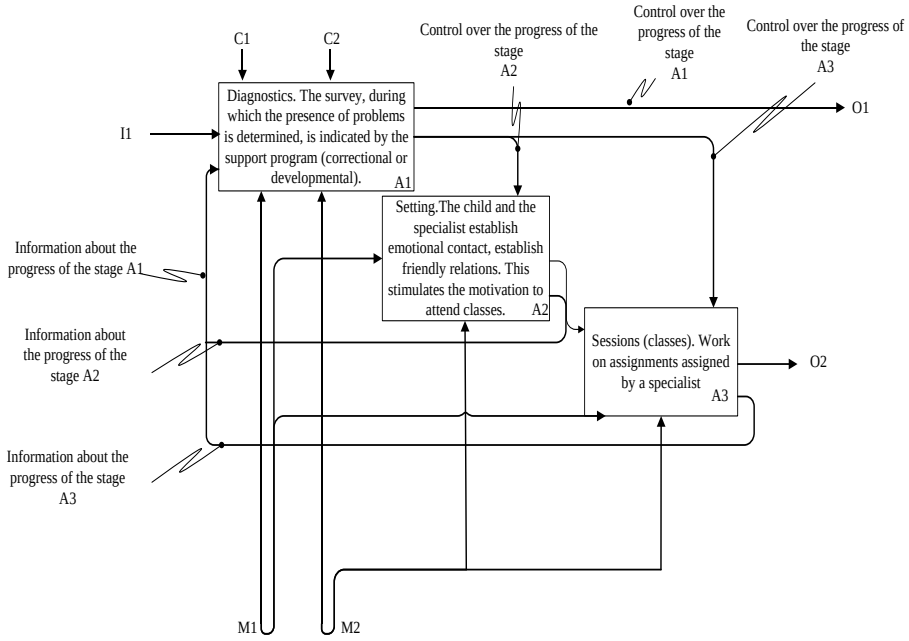

Figure 2. A decomposition model for achieving the final goal A_0 – «The use of neuropsychological methods for correcting the physical development of a person»

In conclusion, we note that in motor correction it is necessary to strictly adhere to an individual approach to each child: without skipping the necessary stages and types of exercises, each child emphasizes those that are associated with an individual pattern of neuropsychological defects. Therefore, motor correction should be carried out only individually or in dyads, and not in large groups of children, as is often the case.

Further, in the process of motor correction, just as in cognitive correction, it is necessary to dose and gradually reduce the degree of external support and assistance of the neuropsychologist conducting correctional classes, gradually moving from activity associated with the psychologist to independent, from external control to internal.

And finally, motor correction is a part of the general complex correctional program, that is, at each correctional and developmental lesson, the methods of motor and cognitive correction are organically combined and complement each other, solving the general problems of developing the weak links of the child's mental functioning.

CONCLUSIONS

Thus, the correction of disorders of the motor sphere is provided in the classes for the correction of development on the basis of neuropsychological corrective exercises for the development of motor mobility, maintaining motor activity throughout the classes; development of general and fine motor skills; improvement of hand-eye coordination. For each student, the optimal aids are selected to improve the functional skills necessary for learning and social adaptation.

The neuropsychological methods presented in the study should include a wide range of types and forms of active activity of the child in interaction with adults and peers. This most favorably affects his emotional, personal and cognitive development. Of fundamental importance here is the combination of methods for correcting (replacing) the stages of development that have not been passed through with methods of directed

formation (habilitation) of various aspects of mental activity. Depending on the specifics of a particular type of development, in one case, the emphasis is on prevention and directed formation of abilities, in the other, on the correction of existing shortcomings. That is why this methodology of using neuropsychological methods for correcting motor development fits perfectly into the ideology of inclusive education. This single technology is addressed to all children, regardless of their type of development. But for children with deviant development, these classes are the only opportunity for correction and return to the environment of normatively developing peers.

Neuropsychological correction can also play a role in enhancing an individual's holistic health. Cognitive and physical health are deeply interlinked—improvements in one can lead to enhancements in the other. For instance, cognitive interventions can reduce stress and anxiety, which are known to impact physical health adversely. By employing neuropsychological methods, individuals can achieve a state of better mental health, which is conducive to physical activity and improved physical health outcomes, such as stronger immune function and better cardiovascular health.

As people age, they often face both cognitive decline and physical limitations. Neuropsychological correction methods can be crucial for older adults to maintain their cognitive agility, which in turn helps in managing and potentially slowing down physical decline. Techniques like memory training, problem-solving tasks, and other cognitive exercises can help maintain motor functions and physical independence in the elderly, thereby enhancing their quality of life and prolonging their ability to perform daily activities. For individuals recovering from neurological injuries or surgeries, neuropsychological correction methods are essential for rehabilitation. Cognitive and physical rehabilitation often go hand-in-hand. Cognitive therapies can assist in retraining the brain to regain control over physical functions, facilitating recovery processes after incidents such as strokes or traumatic brain injuries. These methods can accelerate the recovery of physical capabilities by enhancing neuroplasticity—the brain's ability to reorganize itself by forming new neural connections.

In summary, the influence of neuropsychological correction methods on human physical development is profound, highlighting the interconnectedness of mind and body. These interventions not only enhance cognitive and physical capabilities but also contribute significantly to an individual's overall quality of life, demonstrating the importance of integrated approaches in health and developmental therapies.

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