

# Neuropsychological Health Technologies

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**Abstract:** *The article reveals the problem of neuropsychological technologies for maintaining, strengthening and developing human health from early to adulthood as a set of corrective and developmental measures to ensure the relationship of an optimal level of a functional brain function with efficiency and learning - conditions of well-being and quality of a life in different age groups. . The functional role of neuropsychological health technologies is reflected. Within the objectives of the article, an attempt is made to define health as a condition for effectiveness in learning and activities, a sense of comfort through the optimal provision of an interhemispheric interaction and the development of higher mental functions. Neuropsychological health technologies are primarily concerned with the prevention of a nervous exhaustion, mental retardation and neuropsychological corrective effects. The professional tasks of a modern neuropsychologist of an international level should serve needs of the individual subject of their own life with the value of maintaining and developing health, in a person-centered humanistic approach. Implementation of neuropsychological technologies of preservation, strengthening and development of health requires competent neuropsychological and subject (personality-oriented) humanistic approaches taking into account individual features of the subject of interaction with the specialist of a neuropsychological professional training, specifics of a neuropsychological problem and social demands for values to preserve, strengthen and develop, above all, physical and mental health.*

**Keywords:** *High-tech revolution; mixed reality; multimedia technical means; entertainment; musical art.*

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## Introduction

According to the World Health Organization (WHO), there is a monthly deterioration in health of all mankind, the number of people with depression is growing, the development of neurosis is recorded even in young children, there is an increase in fears and anxieties due to pandemics, social instability, information and military challenges. In this regard, there is a socio-scientific request to study the problem of innovative technologies for the preservation, promotion and development of human health as an urgent applied problem.

In addition, numerous neuropsychological works are devoted to the neuropsychocorrection of disorders in mental and psychological health, but in scientific neuropsychology is poorly studied the neuropsychological aspects of maintaining human health without impaired psychological development (Demchenko et al., 2021; Sarancha et al., 2021). Neuropsychological health programs are usually developed and implemented by specialists in psychology and pedagogy, mainly in the private sector of a modern education, which places high demands on the quality of an educational training and development of high levels of socio-psychological well-being (Berbets et al., 2021; Kondratiuk et al., 2022; Nikolaienko et al., 2022; Ovcharuk et al., 2021; Prots et al., 2021).

**Objective of the article** is to carry out a theoretical analysis of modern neuropsychological technologies for maintaining, strengthening and developing health of children and adults - from early to adulthood. The novelty and practical significance of the article is that an attempt was made to determine human health in an interdisciplinary context of key issues of education and professional activity; It is recommended to consider neuropsychological technologies of health care as a set of developmental and corrective measures to ensure the relationship between the optimal level of a functional brain function with the effectiveness of activities and learning - conditions of well-being and quality of life in different age groups.

Generalizations of neuropsychological foundations of human health can be used by neuropsychologists and medical psychologists in a correctional and developmental practice, educational psychologists in pedagogical practice and specialists of rehabilitation centers in the psychological support of people with the burnout, depression and neurotic states.

## **Theoretical and methodological analysis of neuropsychological technologies for human health**

In modern science, in an interdisciplinary perspective, health is interpreted as a process of maintaining internal positive changes in the body; as an internal potential (resource) of man, which can be considered on the physical, mental, intellectual, psycho-emotional, spiritual, personal, bio-socio-ecological levels; subjective perception of the body's own state; prerequisite for effective human performance and the condition of its well-being; multilevel continuum of qualitatively and quantitatively different states; state of balance, balance between human adaptive capabilities and changing environmental conditions; state of complete socio-biological and mental comfort; absence of mental and physical defects.

According to the WHO, human health is not just the absence of disease, but complete physical, spiritual and social well-being. In light of this formula, man appears as the author of his own health, and in terms of its preservation - plays a leading role, which is determined by the mature self-awareness of the individual and respect for their essence (Tolkunova et al., 2018). The concept of psychological well-being is a key aspect of mental health, which covers a wide range of conceptual topics: happiness, well-being, affective-behavioral patterns, competence, aspirations, autonomy, integrated functioning, etc. (Warr, 2012). Levine et al. (2021) consider mental health, well-being and the mind-heart-body relationship through the relationship between psychological and cardiovascular health.

We interpret health as a condition for the effective performance of activities: children - in the learning process, and adults - in the professional sphere; a sense of comfort and pleasure from a contact with your body and a social interaction with other people. At the level of a brain function, neuropsychological health-preserving technologies are able to provide at the optimal level of an interhemispheric interaction and the development of higher mental functions; effectively and quickly relieve mental stress in the body; to establish the functional work of those parts of the brain that are responsible for the flow of nerve processes between cells and groups of nerve cells in the norm and stabilize nerve processes in the body - which in general can ensure quality of health and, consequently, life.

In the applied neuropsychology literature the scientific idea of human health in the interdisciplinary aspect is formed: (Kotsan et al., 2011; Tolkunova et al., 2018); developed practical recommendations for optimizing the psychophysiological support of professional development for

the sake of psychological (professional) health (Kokun, 2013); the importance of neuropsychological diagnostics, health-preserving technologies used for optimal organization of the educational process and physical activity of schoolchildren in order to preserve mental health of children with disabilities is revealed (Kryzhanovska, 2021); neuropsychological methods of stress relief and restoration of interhemispheric interaction have been proposed, in particular imaging techniques (Sirotyuk, 2003; Gremling & Auerbach, 2002); developed a unique method of learning through kinesiological movements, which allows to relieve stress in the body, enhance interhemispheric interaction, improve the quality of learning (Dennison & Dennison, 2015); the specifics of neuropsychological diagnosis and correction are noted (Sultanova, 2017).

Neuropsychological technologies of health preservation are connected first of all with prevention of nervous exhaustion (physical, mental, emotional), psychosomatic diseases, low stress resistance under the influence of chronic stress factors, loss of optimum working capacity, depressive and neurotic states, often accompanied by anxiety. , loss of professional (psychological) and even mental health. Such goals and objectives may also be subject to neuropsychological corrective actions, depending on the functional status and needs of the client of neuropsychological rehabilitation centers.

Today, topical issues of neuropsychological preventive and corrective technologies for maintaining and developing health are covered primarily in child neuropsychology and applied psychology (medical aspects of occupational psychology) - as neuropsychological methods of prevention of the burnout in various occupational areas against the background of anxiety-depressive and neurotic.

Thus, Blom et al. (2016) believe that an adolescent depression is a growing problem health care with an increased risk of adverse health effects, including suicide. In this regard, researchers reviewed the neuroscience of the adolescent depression, focusing on the neurosystem of constant threat, and summarized the contextual factors that influence a brain development and pathophysiology of depression and recommend diagnostic neuroimaging and prevention of the adolescent neuropsychological development.

Straub et al. (2019) found a clear effect of age on the whole brain: the older the participants, the lower their gray matter volume, especially the prefrontal cortex. Contrasting depressed and healthy youth with a full-brain approach, we found larger volume of gray matter in the dorsolateral

prefrontal cortex in depressed patients. In addition, an analysis of the region of interest showed lower levels of gray matter volume in the hippocampus in participants with depression compared with healthy controls. Research on adolescents and young adults can provide a unique opportunity to understand aspects of the development of the neurobiology of depression. Detection of more prefrontal cortex, especially in younger adolescents with depression, may indicate that these participants were more prone to delayed the brain maturation or increased neuroplasticity. In our opinion, such neuroscientific facts indicate the need for neuropsychological correction of adolescents in order to restore and maintain their mental health.

Pedagogical experience of taking into account the individual psychophysiological characteristics of children in the educational process is based on many studies: the organization of the educational process should be based on the main channel of information perception, the dominance of a certain hemisphere of the brain educational process, selection of objects and tasks, health-preserving technologies of education. Modern methods of an art therapy, kinesiological exercises make it possible to develop mental abilities and physical health through certain motor exercises aimed at activating different parts of the cortex of the large hemispheres, develop human abilities or correct problems in various areas of the psyche. In the course of regular classes in kinesiology programs, the child loses the symptoms of dyslexia, develops interhemispheric connections, improves memory, concentration, spatial representations. The task of teachers is to create maximum conditions for identifying, supporting, educating and developing individual personal talents of children, as well as to create a microenvironment that promotes the formation and a full realization of creative abilities of the child (Kryzhanovskaya, 2021).

In child neuropsychology, in the subjective approach of Luria, the structure of the defect (combination of strengths and weaknesses of the mental functioning of the child) cannot be understood and effectively corrected without analyzing motivational and personal components. The lag in the mental development of the child cannot be limited to the research of its cognitive processes and language activities. Only the inclusion of elements of learning in the neuropsychological examination, i. e. work in the area of the child's immediate development, allows you to correctly diagnose it and develop a strategy for its correction. The main trends in neuropsychological research are shifting the focus of attention on the role of individual brain structures and the brain localization to problems of a

psychological structure and organization of higher mental functions and study the interaction of the subject (with disorders of mental processes) and surrounding people and factors vital activity. The main ones are his personal experience, perception of deviations (illness) and the concept of health, his coping strategies and attitudes, self-esteem and social interactions (Glozman, 2012). Therefore, the professional tasks of a modern neuropsychologist of an international level should serve the needs of the individual subject of their own lives with the value of maintaining and developing health, in a person-centered humanistic approach.

Neuropsychological care for children with mild neuropsychiatric disorders is aimed at overcoming existing disorders, achieving mental and psychological well-being, normalizing ontogenesis, preventing the formation of more serious developmental and behavioral disorders, reducing the risk of social maladaptation. Neuropsychological correction of children with complex defect structure, with severe ontogenesis helps to improve the child's development, improve learning, prevent a number of secondary pathological conditions, raise social adaptation, improve the quality of life in the family and in general (Sultanova, 2017) .

P. Dennison and G. Dennison (2015) developed a unique method of learning through a movement, which is often used by neuropsychologists in the field of applied research of the brain. The complex of movements allows to activate the interhemispheric interaction, integrity and coordination of the brain through the corpus callosum (thick bundle of nerve fibers, located between two hemispheres, intensively develops up to 7-8 years) it transfers information from one hemisphere to another. The inability of the right and left hemispheres to integrate, full interaction - one of the reasons for the violation of the function of learning and managing their emotions. The use of motor exercises will activate and synchronize the work of the hemispheres, improves the regulating and coordinating role of the nervous system, improves the memory and attention, facilitates reading and writing, increases emotional well-being, improves a visual-motor coordination, forms a spatial orientation. Even after performing several exercises from a complex developed by P. Dennison and G. Dennison, students who have previously had difficulty learning are beginning to learn better and achieve a significant success.

Neuropsychology today goes beyond pathological, painful disorders of a mental activity and focuses its attention also on the psyche of healthy people, thus acting as a health factor in the process of their primary socialization. Preservation of health in all its multifaceted sense must be

realized primarily in the period of early and preschool childhood, which will be one of the main factors in the formation of a successful personality in general. It is from this age that the process of socialization of the individual, i. e. the involvement of the child in the society, its inclusion in public life, assimilation of norms and rules of behavior in the team, should be accompanied by the formation of values to their own physical and mental health. The set of corrective exercises for children is made in accordance with their level of development and the general laws of the human brain development. Neuropsychological approach based on the brain organization of the child through exercises and games develops and corrects unformed or impaired functions (Kuryshkina, 2015).

Berson (1990) consider the application of neuropsychological diagnostics and neuropsychological development technologies in education. Neuropsychological orientation can be seen as an additional tool to promote a fuller understanding of children's problems. By integrating neuropsychological data with a more comprehensive conceptualization of challenges in the school environment, school psychologists can complement their methods for understanding children and thus improve the provision of educational services.

The basis of neuropsychological prevention and development of psychological (professional) health can be the concept of a psychophysiological support of becoming a specialist in professions such as "man-man", important components of which are: determining the general content, components and factors of the professional development; psychological and psychophysiological features of a professional development, features of activities and requirements in professions such as "man-man"; the main difficulties and negative phenomena that can complicate this process; determination of the content, basic principles and directions of psychophysiological support of becoming a specialist in professions such as "man-man"; quantitative and empirical specification of psychophysiological features and factors of professional development of a specialist in professions of this type; development of measures and practical recommendations aimed at psychophysiological support for becoming a specialist in professions such as "man-man", optimizing the development of professionally important qualities and psychophysiological properties (mental functions, memory, attention, professional motivation and identity, communicative, conflict and psychohygienic competence ; prevention of

professional deformations and stressful situations in specialists of human-to-human professions (Kokun, 2013).

### **Neuropsychological health technologies**

Neuropsychological technologies of health are a set of developmental and corrective measures to ensure the relationship of the optimal level of functional brain function with efficiency and learning as a condition of well-being and quality of life in different age groups, aimed at improving human well-being, maintaining and strengthening mental and psychological (professional) health, the formation of neuropsychological competence in overcoming an excessive, physical, intellectual and emotional stress. Modern methods of the body-oriented therapy, art therapy offer neuropsychological techniques and exercises to maintain mental and physical health of both children and adults. Thus, certain creative-cognitive or motor exercises activate the work of different parts of the cortex of large hemispheres, which can ensure successful learning and effective activities. The implementation of a set of neuropsychological health-preserving technologies should be carried out on the basis of a qualitative data of neuropsychological diagnostics.

The system of movements based on "Brain Gymnastics" by P. Dennison and G. Dennison (2015) was developed to stimulate individual development and help in the acquisition of knowledge in various spheres of life. It consists of simple movements that are suitable not only for young children and schoolchildren, but also for adults and the elderly. The authors of the method offer to try the exercises and see their effectiveness and enjoy the joy of learning through movement. The proposed exercises are kinesiological (kinesiology is a modern direction of body-oriented psychotherapy, which uses various motor, respiratory and energy exercises to correct problems in learning and psycho-emotional development of children and adolescents). At the level of the brain, these exercises contribute to: removal of stress in the body, the connection of the stem parts of the brain, which are responsible for the volitional regulation of behavior; communication of the limbic part with other parts of the brain responsible for emotions, provide the necessary speed and intensity of nerve processes between cells and groups of nerve cells in the brain; simultaneous work of two eyes, arms, legs, ears, integration of two hemispheres of the brain and include the mechanism of "unity of thought and movement", as a result of which a person can move and think simultaneously, process



information by two hemispheres simultaneously; stabilize and rhythm the nervous processes in the body and help to look at the disturbing situation from a new perspective, increasing the overall positive attitude.

There is a well-known test to determine the presence of interhemispheric interaction and predisposition to dyslexia and dysgraphia: A child holds one hand behind his back. An adult touches phalanges of fingers with a brush (1st or 3rd phalanx of any finger, except the thumb, only 8 options) in any order. The child should point with the thumb on the other hand, to which phalanx, which finger was touched. If the child gave incorrect answers more than 30%, it means that he or she is prone to dyslexia, dysgraphia. More than 30% of errors indicate a violation of interhemispheric interaction. The corpus callosum (interhemispheric interaction) can be developed through kinesiological exercises. Modern kinesiological techniques are aimed at activating different parts of the cortex of the large hemispheres, which allows you to develop human abilities or correct problems in various areas of the psyche. Kinesiology views the human brain as a computer that already contains information about all the functional connections in the body. The brain accumulates information and is able to solve any problem related to the regulation of body functions. In progressive schools around the world, there is a daily lesson in school schedules - kinesiology. In the course of regular classes in kinesiology programs, dyslexia disappears, develops hemispheric connections, improves memory, concentration, spatial representations (Kryzhanovskaya, 2021).

From the standpoint of neuropsychological approach, within the method of substitutional ontogenesis by Semenovich, physiologically determined movement of a child development is considered, in the trajectory of which the primary place is occupied by exercises for high motor skills, sensorimotor development, interhemispheric interaction, spatial relations, visual-motor coordination. Neuropsychological training programs use health-preserving technologies similar in purpose and content to neuropsychological techniques, namely: physical education, finger gymnastics, eye gymnastics, breathing gymnastics, relaxation, rhythmic plastics, stretching, orthopedic gymnastics, and orthopedic gymnastics, exercises aimed at developing the child's thinking, memory, language and skills (Kuryshkina, 2015).

In the implementation of neuropsychological correction by a competent professional has a double impact: both exercise themselves, and a specially organized interaction with a child, for who this type of correction

creates unique conditions. The most effective integrated approach, when sensorimotor correction is combined with other methods of psychological and pedagogical work. Neuropsychological correction reduces neurodynamic disorders, improves attention and memory, increases child's learning, language comprehension, ability to follow instructions. Against this background, the effectiveness of other specialists - a teacher-psychologist, speech pathologist, speech therapist and others - increases significantly (Sultanova, 2017).

McEwen (2007) describes in detail how the brain as a key organ of stress response determines physiological and behavioral responses, and maladaptive ones indicate low human stress resistance. Burgdorf and Pankseppa (2006) confirmed the relationship between psycho-emotional stress and its discharge and systemic brain mechanisms, including the limbic system, cortex and subcortical formations. In the neuropsychological literature (Sirotyuk, 2003) it is noted that the constant action of stress leads to the fact that nervous activity is concentrated mainly in the right hemisphere and brain stem, in the sympathetic nervous system (part of the autonomic nervous system brain, it is involved in the regulation of a number of body functions: the fibers are impulsing and that cause increased metabolism, increased heart rate, vasoconstriction, dilation of the pupils, etc.).

One of the effective psychotechnologies for stress relief is visualization. Erasing stress information from memory (visualization) is a process of creating images in the imagination, can occur in both hemispheres of the brain, especially needed for the education of younger students. Images can be formed both through the visual channel of perception and through other modalities. Sometimes it is enough to perform the exercise "erasing stress information from memory" (visualization instructions) for emergency stress relief: close your eyes and mentally draw a negative situation on a piece of paper that you need to forget. It can be a real picture, figurative association, symbol, etc. Thoughtfully take an eraser and begin to consistently "erase" from a sheet of paper created a negative situation. After a while, repeat the exercise. After performing anti-stress exercises, interhemispheric interaction is restored, the neuroendocrine mechanism is activated, which provides adaptation to a stressful situation and a gradual way out of it (Sirotyuk, 2003).

The use of visualization exercises for health purposes is an important neuropsychological psychotechnics. Many proponents of image training (Gremling & Auerbach, 2002) believe that visualization techniques facilitate

the connection between consciousness and the body, which has a positive effect on health processes; can increase the resilience of the immune system (if you visualize healthy lymphocytes that attack and destroy virus-infected cells); deepen bodily relaxation; provide a sense of control and participation in maintaining their own health; reduce the frequency and intensity of pain episodes in people with headaches. For example, image visualization techniques to reduce pain: 1) relax by performing relaxation exercises; 2) imagine your pain and think about an image that would absorb the type, quality and intensity of your pain - an example is the hot sun or a needle; 3) imagine how the pain becomes weaker, change the image of pain to something pleasant and tolerable, visualize the therapeutic image or process for the complete disappearance of pain, to get the effect you need to be relaxed; 4) imagine a positive effect - to create an image of yourself - a positive, active person.

Foreign researchers Eagleson, Hayes, Mathews, Perman and Hirscha (2016) proposed that images of anxiety of high-anxiety people be replaced by various forms of positive ideas, as a result of which pathological anxiety was reduced by changing opinions. Park et al. (2016) confirm the positive relationship between positive psychology (positive emotions, optimism, life satisfaction, etc.) and good health. Waters et al. (2021) believe that positive psychology contributes to the psychological support of people in a pandemic and suggested positive psychology practices to strengthen psychological resources (self-development, ability cope with stress, positive emotions, etc.) during a pandemic in the hope that the cultivation of these results will continue after this crisis and lead to lasting positive results.

Neuropsychological self-regulatory exercises involve the influence of man on himself through self-suggestion instructions and include the following technologies: autogenic training (to relieve mental stress, calm) then the transition to a special state - hope, trust, belief in the body desired mental qualities, while a person does not think rationally, but completely trusts his body; biological feedback is a conscious control and arbitrary influence on a number of processes that are not felt and perceived in the body (biological activity of the brain, heart rate, body temperature, blood pressure, muscle relaxation, etc.) by electrophysiological equipment that changes and shows (in the visual and auditory version) the results of the impact on the course of any arbitrary physiological process, which provides a constant opportunity for the subject of self-regulation to control the nature of its development; meditation is a series of mental actions aimed at

achieving a special state of the human body, characterized by immersion in deep physical and mental peace, isolation from the outside world, which preserves the ability to think - operating on images on previously defined topics and achieved by concentrating internally attention, possible great muscle relaxation and emotional calm (Kotsan et al., 2011).

## **Conclusion**

We interpret health as a condition for effective performance of activities: children - in the learning process, and adults - in the professional sphere; a sense of comfort and pleasure from contact with your body and social interaction with other people. Neuropsychological health technologies are a set of developmental and corrective measures aimed at improving human well-being, maintaining and strengthening mental and psychological (professional) health, the formation of neuropsychological competence in overcoming excessive physical, intellectual and emotional stress.

Neuropsychological technologies for maintaining and developing health should be used from an early age, comprehensively and at a systemic level, which will undoubtedly have a positive impact on socialization and its success in adulthood. The implementation of a set of neuropsychological health-preserving technologies should be carried out on the basis of the qualitative data of neuropsychological diagnostics. At the level of brain function, neuropsychological health-preserving technologies are able to provide at the optimal level of interhemispheric interaction, prevention of brain dysfunction and the development of higher mental functions; effectively and quickly relieve mental stress in the body; to establish the functional work of those parts of the brain that are responsible for the flow of nervous processes between cells and groups of nerve cells in the norm and stabilize nervous processes in the body - which in general will ensure quality of life.

The neuropsychological health-preserving technologies analyzed in the article belong to three directions in the work of a neuropsychologist: preservation, strengthening and development of health of the young generation, first of all young children and students; prevention of neuropsychiatric conditions associated with the burnout , stress, depression; neuropsychological care for children with various forms of pathological conditions, in combination with neuropsychological diagnosis and correction. Such types of work of a neuropsychologist require competent neuropsychological and subjective (personality-oriented) humanistic

approaches taking into account the individual characteristics of the subject of interaction with a specialist in neuropsychological training, the specifics of the neuropsychological problem and its goals, personal and social issues preservation, strengthening and development, first of all, of physical and mental health.

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