

Educating Students with Special Educational Needs in the Context of Modern Neurosciences

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Abstract: *The relevance of this topic resides in the fact that children with special developmental needs should have equal opportunities with other children in getting training and this means not only creation of technical conditions for unimpeded access of children with disabilities to secondary schools, but also specifics of the educational process to be built taking into account psychophysical abilities of physically disabled children.*

The article presents research results of domestic and foreign scientists, teachers and psychologists on education of students with special needs in the context of modern neuropsychology. It is the neuropsychology of children that allows us to get acquainted closer with peculiarities of children's development and, accordingly, to correctly determine methods and principles of working with students.

We considered disorders in the process of ontogenesis, which most often occur in children: speech delay, autism, hyperactivity, intellectual disabilities. All of them complicate social connections, which often leads to low self-esteem, especially with hyperactive children and students with speech impairments. Therefore, in the process of educating students with special needs, domestic scientists call for the use of neuropsychological correction, which is the basis of social protection of children with developmental problems and creates the most favorable conditions for their education and socialization. Methods of correctional work are aimed not only at overcoming some of the disorders, but at development of a harmonious personality.

Keywords: *Child neuropsychology, brain damage, speech delay, developmental disorders, intellectual disabilities, correctional work, accompanying teacher.*

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Introduction

For many decades, in focus of numerous foreign scientific and pedagogical discussions, there are problems of finding effective strategies for practical implementation of theoretical foundations of inclusion, which has been gaining widespread popularity in Ukraine for several decades. At the same time, neurosciences that study structural and functional features of the brain and the nervous system as a whole do not lose their relevance. The science of the nervous system develops our understanding of human nature and what exactly makes person a human, offering their hypotheses and concepts to explain what mechanisms underlie thinking, emotions, behavior and other phenomena of human psyche, which in turn is a lever in studying issues of inclusive education.

Neuroscience has led to creation of one of the areas in psychology – neuropsychology. Different aspects of the problem under study are covered in the works of many scholars Komogorova et al. (2021), Sheremet et al., (2019), Behas et al. (2019).

Neuropsychology combines elements of neurology and psychology. Neuropsychologists study effects of psychological conditions on the nervous system, including brain and spine, and can explore ways in which changes in brain chemistry due to trauma, hormones, or environmental factors can affect mental health.

In the 70's on the initiative of Luria a new area began to develop – a child neuropsychology. Prerequisite for its creation were specific mental disorders in children with local brain damage. Doctors' observations have shown that brain of an adult and a child reacts differently to lesions of the same area, so they began to study separately “children's” neuropsychological symptoms and syndromes.

It should be noted that “Child Neuropsychology” provides ample opportunities to study the problem of hemispheric asymmetry and hemispheric interaction, to study the issue of genetic and social factors in formation of these fundamental laws of the brain. The applied “child neuropsychology” plays an important role, because the neuropsychological methods adapted to the young age make it possible to determine the area of brain damage in children as successfully as in adults.

The current stage of development of neuropsychology, both child and adult, is characterized by extensive development around the world. Neuropsychologists focus not only on patients with organic local brain lesions, but also on patients with endogenous, genetic, and functional

disorders, individual differences in normal mental functioning, specific social developmental situations (e.g., social deprivation or bilingualism), etc.

The objective of today's stage of development of child neuropsychology is to move from a phenomenological description of cases of abnormal child development to study of relationship of brain, genetics, sociology and personality in formation of variants of abnormal or unusual development. In other words, the basis of modern child neuropsychology is an integrative, multidisciplinary approach. The founder of this approach is considered by many to be Lenneberg (1967).

Therefore, due to these trends in development of child neuropsychology, in recent years it has become the basis for creation of a service of practical educational psychology (Asmolov, 1998).

The most common developmental disorders of students with special educational needs

Due to wide popularization and urgency of the problem of inclusive education, the aim of our study is education of students with special educational needs in the context of modern neuroscience.

Let's first consider what disorders in the process of ontogenesis most often occur in schoolchildren.

The most common deviation in the mental development of children, according to domestic scientists, is *delay in speech development*. The level of development of language functions strongly influences the success of schooling, both according to the Luriev test and according to the psychometric Heidelberg test of language development: in a group of children with high scores on this test there are more successful students than in the group of children with low scores.

In children with general language underdevelopment (GLU), autonomous language is pathologically preserved for a long time, and speech development occurs by accumulating a vocabulary of autonomous words, rather than enriching lexical and grammatical means typical of normal language development (Levina, 1936).

The reason for delays in language development are early brain damages, especially in the left hemisphere. In case of delay in language development, as a rule, language function suffers (to a greater or lesser extent) comprehensively, in all its forms and modalities: oral and written language, expressive and impressive language, spontaneous speech, repetition, naming (especially low-frequency words), understanding the logical-grammatical relationship, etc. Often children with well-developed oral speech, rich vocabulary, scare parents and teachers with the number of

errors in the notebook and poor reading, they have a syndrome of dysgraphia and (or) dyslexia (Glozman, 2009).

However, difficulty of verbal communication creates difficulties in the process of adaptation in team, which has a negative impact on the student's self-esteem, develops negativity, insecurity. The level of communication skills is slowed down or does not even begin to develop (Zhuravlyova, L., 2018).

According to foreign scientists, the most common childhood mental disorder is Attention Deficit Hyperactivity Disorder – ADHD, according to estimates of the prevalence in childhood of 9% among boys and 3% among girls. Superficial symptoms of inattention and impulsivity are often, though not always, accompanied by hyperactivity.

Synonymous with the term “hyperactivity”, also found in the literature, is “hyperkinetic syndrome”. Syndromes of hyperactivity and movement disorders are considered comorbid (belonging to one disease) conditions that have common mechanisms and those that require common therapeutic approaches.

Usually, this syndrome occurs in children and adolescents, and is manifested mainly by altered characteristics of cognitive processes and attention, and it is believed that there is compensation with growing older, so in adulthood it is less common. However, becoming adults and recovering from ADHD, such people are at increased risk for a number of psychopathological syndromes and diseases. It is known that this group has an increased likelihood of affective disorders (depression, bipolar disorders), anxiety disorders, including panic disorder, obsessive-compulsive disorder, various forms of addiction (addictive behavior syndromes) and psychopathy. Hyperactive adolescents and adults are also more likely to develop various forms of antisocial and deviant behavior, including aggression, alcoholism, and drug abuse. Often children with ADHD become criminals in adolescent period. One of the mechanisms of this is reduced sensitivity to weak stimuli, including danger signals. It should be mentioned here that the human brain is not only a reactive system, but also an anticipation system that controls the future behavior of the subject.

The relative emotional immaturity of children with ADHD sets them apart from their peers and often makes them targets for unfriendly grunts. However, it is important to remember that many children with ADHD are extremely intelligent and creative, and eventually they will understand how to communicate with others and avoid people who are not suitable for friendly relations (Smith & Segal, 2020).

The problem of *autism* is gaining widespread popularity not only abroad but also in Ukraine. With autism, it is known that the main symptom of distorted development is the weakening or lack of ability to participate in social communication – social maladaptation. It is explained by the difficulties of prompt assessment and selection of appropriate responses to ever-changing information (rigidity of cognitive attitudes), as well as inability to understand the experiences of others (disturbance of social perception). Unlike children with attention deficit disorder, who have difficulty inhibiting an inadequate response, autistic children only have difficulty switching to a new program. Elementary perseverations correlate with repetitive behavioral responses, and systemic perseverations correlate with persistent narrowly focused interests.

The cerebral basis of autism, according to pathoanatomy and CT, is interpreted as diffuse damage to brain structures and their relationships, including interrupted development of dendritic endings in the structures of the limbic system, decreased neurons and increased number of pathological cells in the cerebellum, overgrowth of the posterior cortex and signs of diffuse disorders of relationships at the level of the cortex (Tager-Flusberg & Joseph, 2003). Electrophysiological studies of children with autism on the EEG show increased beta activity. Such changes are usually observed in a state of drowsiness.

In addition, there is a lack of short-term memory. Therefore, autistic children perform poorly on the choice reaction test. The ability to use internal language to regulate one's own activities is also impaired. With a relatively good command of grammar and vocabulary, children are unable to communicate (Glozman, 2009). Children with ASD need school more than others, despite the fact that for a child with autism it is much more difficult.

Mental retardation is a persistent, irreversible mental development impairment, especially intellectual, due to insufficiency of the central nervous system.

The most common form of mental retardation is oligophrenia, which can be caused by genetic (endogenous) disorders (Down's disease, Klinefelter's syndrome, congenital defect of enzyme structures – phenylketonuria, congenital abnormalities at the neuronal level, especially in the morphogenesis of dendrites and synaptic zones, etc.) or external (exogenous) factors: viral infections, trauma, alcohol intoxication of the mother, radioactive and X-ray irradiation of the germ cells of the parents and the fetus, chronic hypoxia (lack of oxygen) of the embryo (Otake & Schull, 1984).

The neuropsychological picture of non-formation of the higher mental functions in children with oligophrenia includes primarily intellectual disorders, spatial defects, symptoms of weakness of neurodynamics of mental functions (insufficiency of internal inhibition, excessive irradiation of excitation, increased inhibition of memory and general inertia of mental processes), and also immaturity of the functions of programming and control, and especially verbal regulation of mental functions (Rubinstein, 1986). Active vocabulary and capabilities of grammatical design of utterances are also limited (Pevzner & Vlasova, 1973).

One of the mechanisms of language disorders is immaturity of the sense of language, which underlies the ability to control correctness of one's own and another's language. In case of oligophrenia, the ability to determine correctness of phonetically, semantically or grammatically distorted words and sentences is sharply limited (for example: "ammer" (hammer); "The boy washing his face"; "Nina have a big apples"; "The bear sleep well under the snow"), placed next to the correct words and sentences.

Only 20% of mentally retarded students in grades I-II could notice the error, but none of them could specify what the mistake was and how to say it correctly. This indicates an undifferentiated representation of phonetically similar sounds and the unformed sense of pronunciation.

Oligophrenia syndrome, therefore, is a good illustration of asynchrony of development due to impaired functional interaction: development of language, memory and sensorimotor functions (with a sufficient level of development), as well as formation of a full personality is limited by low intelligence. Hierarchy of defects, relative preservation of separate mental functions allow reliance on them at neuropsychological correction (Lebedinsky, 1985; 2003).

We have considered the most common disorders in the process of ontogenesis of children with special needs and put forward the following hypothesis: any disorders of students' development significantly affect formation of their personality and social ties, which in turn leads to negativity, personality disorder, depression in future.

Plan and prerequisites for correctional work with students with special educational needs

Enrollment of students with inclusion in secondary schools involves provision of specialized correctional care and psychological support to monitor development of the child, cognitive abilities, provide assistance in solving problems with adaptation among healthy peers (Hevko, 2019).

Inclusive education cannot be effective without an individual approach to students, the need for which is unanimously discussed by domestic and foreign methodologists and practitioners. The scientific and methodological basis of individualization of learning can be a neuropsychological approach to diagnosis and development of effective learning strategies.

The main document that defines an individual approach to learning is an individual educational program (IEP). Of course, the IEP should contain information that should be mastered by the student by the end of the school year. But variability of school programs is a necessary feature of inclusive education. But the goals of the program will not be achieved without specifying ways and methods of solving the set tasks. The choice of ways and methods should be based on analysis of individual features of cognitive processes and behavior of the student. The most effective methods of analysis are developed in neuropsychology.

In US schools, the IEP is written by a team of specialists. It is approved once a year at a joint meeting, and it contains the following sections.

Data on the current level of knowledge and academic achievements of the student and his or her functional performance, which describes how they affect the inclusion of the child in the learning process and its success in mastering the general education program, his/her role in the class and his/her domestic responsibilities.

Measurable goals of the school year program (educational and / or functional).

A description of how progress in achieving the program's goals will be measured.

Special and additional training is required with a description of program modification and additional assistance provided by school staff in acquisition of the general education program and in additional classes.

List of class activities in which the student will not participate.

A description of what opportunities will be provided to the student when writing municipal tests (for example, increasing the time). Note: if the student is unable to participate in tests, what alternative methods will be used.

Dates of beginning and end, and frequency of additional classes.

This document, important for planning (and auditing) educational services, also includes:

- description of the strengths and weaknesses of the child,
- request of parents,

- results of the latest surveys,
- child support strategies,
- language and communication status and the need for (Detrich, 2008).

In the process of teaching and educating students with special needs, domestic scientists call for the use of neuropsychological correction, namely, correctional and developmental (conductive) learning, or medical pedagogy, which is the basis of social protection of children with developmental problems and creates the most favorable conditions for his/her education and socialization. The task of neuropsychological correction is not just to ensure the intellectual development of the child within a conditional “tolerance”, but to educate an intellectually healthy, full-fledged citizen.

Corrective work begins with the establishment of an emotional contact with the child, clarifying his/her interests, presence of valuable interests, motivation, self-esteem, tolerance to mental stress, the time during which the child can actively participate in the lesson (Tsyganok et al., 2006). Only on the basis of differentiated and systemic neuropsychological diagnosis, which is not limited to identifying weak links in the development of the child, but determines the area of his/her immediate development (Vygotsky, 1984), i.e., possibilities and conditions of correction of defects at a dialogic mode of carrying out neuropsychological inspection, a timely individual program of correctional and developing training (substitution of ontogenesis) of the child can be developed.

The methodological advantage of the neuropsychological approach to corrective action, which ensures its effectiveness, is based on the principle of systematicity. It means that the correction program is not aimed at overcoming a single defect, but in general at harmonizing the mental functioning and personality of the child. This principle does not exclude the need to choose the main, priority area of work at each stage of correction of each individual child on the basis of its comprehensive neuropsychological examination.

The neuropsychological approach to the methods of correctional and developmental learning means development of a weak link with the support of strong links during a specially organized interaction of the child and the teacher. This involves interaction of strong and weak parts of the psyche. Detection of a weak link is carried out on the basis of neuropsychological inspection and the analysis of educational activity of the child and its results. In the process of interaction, the adult assumes first the functions of the weak link of the child, and then in accordance with the

ideas of Vygotsky, the tasks should vary from simple to complex with the following parameters:

- common – independent (from division of functions between teacher and student through a gradual reduction of the role of the teacher to independent action);
- externally mediated – internal (from the action involving external materialized supports, external program to internal, performed in mind);
- expanded – collapsed (from expanded element-by-element execution and control of action to their collapsed forms) (Akhutina et al., 2011).

Practical use of methods and techniques that promote education of students with special educational needs

Let's consider the methods and principles of working with children, according to their individual developmental characteristics.

Often parents of children with *speech defects* complain not only about difficulties in their children's education, but also about emotional problems, behavioral disorders in the family and at school. Most often it is a complaint of increased anxiety, aggression, hyperactivity of the child. As a result, children without severe cognitive impairments, without diagnosed pronounced neurological or psychiatric pathology are forced to repeatedly change schools or even resort to home schooling. Development of communication skills and self-esteem is an important factor in overcoming school maladaptation, i.e., the child's inability to fully (as far as their abilities and development and not to the detriment of their physical and mental health) meet the requirements of mainstream school.

To ensure harmonious development of the personality of a child with speech defects, a comprehensive care is needed, which includes not only an inclusive component, but also correctional classes in a group.

Experience gained in specially organized behavior correction groups helps to solve problems that arise in interpersonal interaction of the child in the family and at school. Hidden factors such as social pressure, partner manipulation, interaction, are daily present at school, in the company of friends, family, are realized, become apparent in the psycho-correctional group, affect individual life attitudes and contribute to behavior change. As a result, the affective experiences that occur in artificially created circumstances can be naturally transferred to the outside world, contribute to personal growth of the child and the correction of his/her behavior.

In accordance with these theoretical provisions, the program of group correction of communication disorders and personal problems of the child is designed to solve such problems:

1. Development of an adequate self-esteem.
2. Improving social skills through group experience in those children who need training in basic social skills.
3. Development of group cohesion.

However, there are many methods of working with such children. Among them: the method of pantomime (Rudestam, 1999), games in which children are invited to praise each other, which in turn helps to overcome shyness; exercise – development of friendly relations, where children are divided into groups and play different situations, for example, at school, in a store, in the theater – this exercise develops cohesion, communication skills; art therapy: individual and group, so that children learn to interact with each other, the method of motor art therapy – the art of dance (Wigman, 1966) – she believed that “dance is a living language spoken by people”.

There are three components of effective group correctional work with children: cognitive (knowledge of communication, about themselves and others), behavioral (development of communication skills and solving own problems) and emotional (self-acceptance and impetus to self-development) – they are the driving force on the way to harmonious development of personality and the establishment of social ties.

Children with *ADHD* usually have a deficiency in executive function: the ability to think and plan in advance, to organize, control impulses, and perform tasks. This means that the teacher needs to take on the role of a supervisor, providing additional guidance as the child gradually acquires his or her own executive skills.

Although the symptoms of ADHD can be irritating, it is important to remember that a child who ignores, annoys, or embarrasses others is not acting on purpose. Children with ADHD want to sit still; they want to make their rooms neat and tidy; they want to do everything their parents say, but they don't know how to do it. With patience, compassion, and great support, ADHD can be managed in childhood (Smith, M., M.A. and Segal, J., Ph.D., 2020).

Treatment of ADHD is comprehensive and includes pedagogical assistance, psychotherapeutic work with the family, teaching parents principles and skills of raising a child with ADHD, development of the child's social interaction skills and, if necessary, drug therapy (Meisel et al., 2013).

To create appropriate conditions for education and upbringing of a child with ADHD, the teacher needs to do the following:

1. Identify the strengths of the child. It is important for every child to hear praise and know that he or she is valued, and children with ADHD are less likely to receive positive feedback because of their behavior. With the help of strengths, you can build quality communication with the student, because children with ADHD learn not on punishment, but on encouragement.

2. Create an appropriate learning space. There should be no extra items in the classroom that distract attention of the child. It is desirable that the child sits at the desk as close as possible to the teacher, because it helps to concentrate better.

3. Allow physical activity during the lesson. It is really difficult for children with hyperactivity to sit at the desk for 45 minutes.

4. Pay attention to the child's condition and respond to it. As soon as the teacher notices that it is difficult for the child to keep sit down, a moving task can be offered: to wipe the board, to bring something from another class or library.

5. Structure the lesson and make it balanced. At the beginning of the lesson, the teacher can write a lesson plan. The plan focuses attention of the child with ADHD on tasks and facilitates the transition from one activity to another, with which he/she often has difficulties.

6. Do not leave the child alone with the task.

7. Encourage good behavior – praise for waiting or waiting for their turn, does not shout out from their place (Zapadnyuk, 2020).

Next, we will talk about *autistic children*. Obviously, care for children with autism spectrum disorders needs to be tailored to their needs.

The general opinion is that none of the methods is good or bad in itself, the validity of its application depends on two conditions:

1. The effectiveness of the method for a particular child at a certain point in his/her development.

2. From the ability of a specialist to correctly apply this method (the level of his training – development of professional and personal qualities).

The practice of therapeutic care for children with autism spectrum disorders in the world has shown that their “treatment” is correctional and educational programs, and although experts from different countries have developed numerous approaches, methods and tools of psychological and pedagogical correction, today there is no ambiguity and consistency in using selection and application of these approaches. (Virues-Ortega et al., 2013).

In the course of inclusive education of children with ASD, the following principles should be followed:

1. Maintaining consistency in the spatial organization of the child's life, which will help to avoid many behavioral problems. Confusion, anxiety will decrease if the child clearly learns his/her main place of study and what he/she can do in all other places in school, which he/she attends.

2. Learning a particularly clear and stable schedule of each current school day with its specific order of switching from one lesson to another, coming to school and going home, the order of these days in the school week, as well as the rhythm of working days and holidays during the school year.

3. Individually adapted rhythm of classes, the possibility of timely switching and having a rest.

4. Hand support, letter "hand in hand", combined action.

5. Exercise is known to increase the overall activity of the child and relieve his/her pathological stress. During training, both are relevant.

6. Reliance on sensor analyzers.

Working with children with *intellectual disabilities* is complicated by a number of objective difficulties.

Pathological disorders of intelligence are manifested in dependence: inability to eat, dress, maintain cleanliness. Often there is a reluctance to communicate with the outside world, with people, where there is a lack of interest in new information, building communications.

Full development requires a joint work of a team of professionals who implement additional education at school. The main person in this team is a tutor (accompanying teacher). His main responsibility is to ensure development of individual educational programs for students and support the process of individualization and individual education at school.

The accompanying teacher facilitates the child's adaptation at school. He resolves conflicts, with his/her personal behavior shows the desired attitude to the student with intellectual disabilities, stimulates the wards to social interaction. For example, involves in the process of alternating with other children. One of the parents can become a personal tutor.

The tutor organizes activities of other specialists: speech pathologists, speech therapists, psychologists. His/her contribution to interaction with the teacher is important in order to form the most convenient curriculum for students with mental retardation without harm to others (Mulatova & Ryabenchenko, 2016).

Conclusions

We found that the education of students with special educational needs requires special knowledge, which is based on neuropsychology, because this science allows us to study disorders of various mental functions, so that in the future we can choose the right methods and techniques for correcting psychological disorders.

To start working with a student, foreign scientists advise to develop an individual educational program, which should contain information what the student must master by the end of the school year. They note that variability of school programs is a necessary feature of inclusive education. The choice of ways and methods should be based on the analysis of individual features of cognitive processes and behavior of the student. The most effective methods of analysis are developed in neuropsychology.

At the beginning of correctional work, it is necessary to establish emotional contact with the student, find out what interests he/she has, self-esteem, level of motivation, tolerance to mental stress, how long they can participate in the classwork.

The advantage of the neuropsychological approach to corrective action is the principle of systematization. It directs the correction program not to overcome a single disorder, but in general to harmonize mental functioning and personality of the child. Перевагою нейропсихологічного підходу до корекційного впливу є принцип системності. Він спрямовує програму корекції не на подолання окремого дефекту, а в цілому на гармонізацію психічного функціонування та особистості дитини.

We also considered methods and principles used today by teachers to educate children with special needs at secondary schools.

In addition to school, children with speech defects need to attend special groups, where not only speech therapists and speech pathologists will work with them, but also psychologists, who will help get rid of complexes, gain confidence to attend school and communicate with healthy peers.

Students with ADHD can easily study in the classroom if the teacher follows certain rules: sits the child closer to the teacher's table, draws up a lesson plan, conducts a warm-up in the middle of a lesson, listens to the needs of a hyperactive child.

For children with ASD, regularity is important: daily repetition of the regime of classes, constant spatial landmarks. It is also necessary to do exercise to relieve pathological stress.

Children with intellectual disabilities need an accompanying teacher – a tutor. Such children need special care for socialization and schooling. The

tutor initiates communication with healthy peers, monitors the child's routine, helps in everyday situations such as dressing or eating.

Thus, we can say with confidence that the correct organization of inclusive education, based on the principles of neuropsychology, allows students with special needs to learn along with healthy peers, which in turn helps to cultivate a positive attitude towards themselves, allows them to better adapt to environmental conditions and feel wanted, and this is an important component of the harmonious development of personality.

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