PSYCHOLOGY

Features of forming graphic skills of children with autism spectrum disorders (ASD) in the context of written language

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Abstract. The article defines the main autistic disorders, which lead to difficulties in the development of the graph-motor skills of children with autism. It describes the author's created integrated qualitative level model of diagnostics of the state of formation of graphic skills of children with autism spectrum disorders (ASD). It can determine not only the quality and level of mastery graphic skills by this category of children, and also the type of their mental activity and the degree of autonomy in performing diagnostic tasks.

Keywords: *writing difficulties of children with ASD, qualitative level model of diagnostics of the formation of graphic skills of children with autism spectrum disorders, difficulty in forming graphic skills*.

Teaching of reading and writing is the most difficult and most responsible period in the school life of children and teachers. The process of writing in logopedical scientific-methodical literature recognized as a special form of expressive speech, which is provided by the work of several analyzer systems such as speech-motor, speech-auditory, visual, motor-and complex psychophysiological mechanisms of their coordinated inter-state connections. The act of writing in its prevailing form is distinguished by the complexity of the coordination structure (Akhutina T.V., Bernshtein N.A., Danilyavichyute E.A., Leontiev A.N., Luria A.R., Sobotovych E.F., Tsvetkova L. S., Cherednichenko N.V. etc.). The level of paleocynical regulations (the level of the red nucleus) creates: 1) the general tonic limb's background, which writes the whole working posture; 2) the main vibrational innervation of the muscles of the forearm (the promoters and suppositories, as well as the flexors and extensors of wrist and fingers). This vibration, like all vibrations created in this level, is monotonous and rhythmic. The level of synergy ensures smooth roundness of movement and its temporal pattern. The circular motion occurs due to the creation of a very thin but strong synchrony of the forearm and the wrist, which provides inconspicuously the gradual transition of intention from one muscle to another. Due to this, the wrist of the child's hand is considered not only as an organ that provides motor activity, but also that activates and stimulates the activity of the cerebral cortex, increases the efficiency of all its departments, positively affecting on the formation of higher cognitive functions in preschoolers, especially on thinking and speech.

Sufficient level of forming graphic skills as an important component of the written language should become the basis for teaching children to use written speech not only in the lessons of the Ukrainian language (making and writing of retellings, written statements, descriptions, copying, dictation, etc.), but also during the studying of other subjects. In this case, in the process of forming writing skills, the specialist should take into account the main groups of ASD symptoms, especially those relating to the motor child's system. Particularly, it includes the association of autism with motility problems, including weakened muscle tone, deteriorated motion planning and walking on tiptoes, as well as inadequate motor skills, such as cutting with scissors, copying forms, imitation movements, running, squeezing, etc. In everyday life, most preschool children have difficulties in carrying out subtle movements of their hands, particularly movements that require the use of fine motor of hand's fingers, do not have the simultaneous execution of the fingers of both hands. They are also characterized by the disorder of the regulation of arbitrary movements, lack of coordination and clarity of execution, difficulties with switching from one movement to another and automatization of the new movements, the presence of accompanying movements, procrastination, chaos and inconsistency. In the process of special training, it is difficult for children to reproduce a certain position of fingers as at the example. These disorders in the motor system determine the specific difficulties in mastering different graphic skills within different categories of children (Lubovskiy V.I., Mastjukova O.M., Fomina L.P., Koltsova M.M., Semenovych A.V., Tarasun V.V., Tsvetkova L.S. etc.).

At the same time, the teacher should take into account the specificity of the formation not only graphic skills, but also a set of diverse skills: conscious language analysis, specific speech mechanisms (reproduction of acquired language knowledge, graphical implementation of the statement, simultaneously-succession analysis and synthesis), visual-spatial, motor, auditorial functions and operations.

In this regard, the study of essential features in learning of graphic skills and acquirements of children with ASD is an important and actual problem, the solution of which may be the basis for improving the content of corrective and preventive work. At the same time, we took into account that the assessment should be based on a positive principle, that is, to determine not only the degree of failure of the extremely complex category of children with the ASD, but above all, to find out the level of their achievements.

In order to develop and test the quality of the model (which can then be adjusted), levels of forming the graphic skills and acquirements, we first used a pilot (test, pre-

vious) experiment. In our opinion, this type of experiment has helped to study the risks associated with further full-scale implementation of the proposed methods for assessing the levels of forming the graphic skills, and first of all, to see the results of studying the state of their formation in children with ASD on a small scale. At the same time, the pilot experiment revealed unexpected problems that subjected to correction for the full implementation of the diagnostic technique. In addition, a successful pilot experiment revealed not only unforeseen problems, but also unexpected opportunities, due to which the risk associated with changing the process of assessing the state of forming graphic skills of children with ASD was not too high.

The purpose of the pilot experiment (small in scale, carried out in the size of a small sample - 23 children from 6 to 9 years old with a diagnosis of "Disorders of the autistic spectrum" which was established in the Kyiv Psychoneurological Hospital №1 by the psychiatrist of the highest category Bikshaeva Y..B., the psychiatrist of the highest category Kuznetsov I.V. and at the Zaporizhzhia centre of assistance and protection of children with autism "Dialogue" by the psychiatrist of the higher category Dolenko O.V. These children study at the general education schools in such cities as Kyiv, Irpin and Berdyansk as frontal, so and with individual educational programs for 1-4 classes and with six months' time limit) is to analyze the prospects and the ways for minimization the risks in the process of forming graphic skills of children with children with ASD. Based on the findings of the pilot experiment, we have developed the content and methodology of the main stage of the confirmatory experiment for children with ASD, focusing on detecting levels of mastery of the main themes of the program material from the mother tongue. However, the main task at the same time was to determine the state of forming their graphic skills.

In developing the appropriate diagnostic technique, we took into account the results of didactic and theoretical studies of domestic and foreign authors that the study of the results of mastering literacy, particularly graphic skills, different categories of children, as a rule, requires the use of qualitative, level, elemental and general-element approaches. At the qualitative stage of our study, while developing the content of the methodology, we, however, focused on the development and application of an integrated quality-level approach.

Taking into account this approach to the definition of the state of learning by children of different knowledge and skills (Bespalko V.P., Lerner I.Ya., Polonsky V.M., Tarasun V.V., Shevchuk L.I., etc.), we have developed four series of test tasks. The essence of such tasks is that the same diagnostic task is given in its four variants, depending on which type of mental activity (reproductive-passive, reproductive, productive, creative) of the child is supposed to be used for its implementation. At this stage of our research was assumed that the application of the integrated level-qualitative approach developed by us would determine not only the quality and level of mastering the graphic skills of children with the ASD, but also the type of their mental activity and the degree of independence in the performance of diagnostic tasks.

Thus, based on the application of the qualitative level of the approach for obtaining data on the degree of independence, completeness and strength of mastering the program knowledge, skills and acquirements (including graphic) children with ASD, we developed the content and methodology of verification tasks. The methodology included written tasks involving the use of graphic skills in various types of practical written work defined by the curriculum - writing (letters, syllables, words, structurally simple sentences), dictation (visual, visual-auditory, vocabulary) and creative writing (independent drawing up of signatures under subject and plot drawings). That is, we used written works which are provided by heterogeneous psychophysiological mechanisms on which they rely on. The mechanisms of optical analysis without significant participation of acoustic (temporal) and kinesthetic (back-central) systems are used while copying and with the obligatory acoustic and kinesthetic systems while writing dictation and in free writing. At the same time, we forecasted that the state of formation of these types of writings of children with ASD may be different - from complete non-mastery of one kind and to the sufficient formation of another, that is, giving examples of dissociation between different types of writing in the process of mastering the writing skills by the child.

Thus, the task of the level I of mastering graphic skills required the activation of the reproductive passive type of mental activity when children perform graphic activity on the recognition and distinction of letters, syllables and words. Instruction: Is this the letter A ? Yes or no? Show where the letter A is written ..., this is the syllable MA, AM? Yes or no? Is this a written word - BOY? Is this the word KITTENS? Yes or no? Show where the word SCHOOL is written? DOCTOR? Etc. Do I show correctly - this is the written word BOY? Yes or no? Etc. In other words, the tasks of this type included the discovery of the state of reproduction perceived and disparate by the children with ASD previously studied educational information from the section "Sound and Letter".

At the first level of assimilation, 85% of the examined children satisfactorily performed.

At the second level of assimilation, there were proposed the tasks that involve the use of a reproductive type of mental activity for the independent (or with the help of a teacher) reproduction of a graphical drawing of letters, syllables, words, sentences, and small texts. For example, the letter A from this card, the syllable MA, the word BOY, the sentence BOY SLEEPS, etc. Thus, in order to diagnose the state of mastering the children's ability to apply the acquired graphic skills in practical work, the child is offered to perform tasks (copying) based on the model. At the same time, for the proper performance of tasks at this level, it is necessary for children with ASD to have an adequate development of kinestetic analysis, graphic movements and kinesthetic memory.

At the second level of assimilation, 74% of children children with ASD were able to perform their tasks satisfactorily. In this case, the researchers found insufficient formation of the motor sphere particularly the motor motility of the hand, which, as a result, was in the difficulty of the kinestetic analysis. Children know how to sit and keep writing supplies, but they did not keep the correct posture needed for writing and wrongly held a pen. There

was no holistic perception of the text, not everyone could say what they were writing, the words and sentences had written by letters, bringing them to the necessary reproduction of the image, rather than writing the letter entirely. Looking at the printed letters, the children with ASD transferred their elements to the sentence in written letters. In other words, they did not keep the image of the letter in memory and did not remember the order of movements while writing.

Moreover, 50% of children with ASD while writing the words went beyond the working line in the copybook.

Tasks that allow diagnosing of children with ASD the third level of graphic skill acquisition, in order to fulfill their established ability to apply the acquired skills in those types of dictations. That required their implementation in the mainly reproduction-productive type of mental activity. To such types of dictations, we classified: visual-auditory, vocabulary and free. For example, SPRING COMES. THE BIRDS HAVE FLOWN. SUMMER COMES. HOT.

Children who cope with the implementation of these kinds of dictations also offered the performance of self-diction and graphic dictation: THE DUCK QUACKS. IT DOES NOT SEE THE DUCKLINGS.

In other words, all tasks at this level of assimilation required to children with ASD the ability to transfer their acquired graphic skills to complex types of written work. In this case, due to complicated activity, it is even more necessary to have a sufficient formation of polymorphic graphic skills children with ASD: writing the elements of the letter, writing the letter itself; reproduction of lines in space; visual-motor coordination, actualization of visual-spatial images of words, visual memory and its preservation. In this case, the child must all the time realize the main task associated with the writing of a particular type of dictation. At this level, the tasks performed by children were involuntary movements that were arbitrary (sinkinesis). Almost all children made many mistakes and practically did not notice them without reminding. Repetitive difficulties were found at the second level. 61% of children with ASD cope with tasks satisfactorily.

Performance of tasks of the fourth level required from the child a sufficiently developed ability to apply elements of creative activity by solving the problem situation, connected with the need to determine independently the meaning of the presented plot and a serie of drawings, as well as implement the process of graphic movements and be able to organize them serially. Tasks of this level for successful implementation even more need from the child mainly to engage in a productive type of mental activity, particularly, in terms of regulation of the performance of graphic activity: its planning, implementation and control. An example of such tasks is the formation by the child the signatures of plot drawings: THE BOY WATCHES TV, etc., as well as drawing up a story in a serie of drawings: The boy came home. The boy is washing his hands. The boy dined. Made a homework. Switched on the TV. The boy is watching TV.

The children, who performed the above task, were offered two more tasks: to complete the sentence and write the essay on a free topic (Write about what happened to you ...) without visual reinforcement. AT THE GARDEN GROWS ...SOMEBODY CAME FOR US ... I WANT.

The main tasks of the fourth level were fulfilled by 39% of children (8-9 years old). 13% of the surveyed (8-9 years old) coped with additional tasks, and 1% of children (9 years old) were able to write an essay.

At this level, children with ASD managed to identify the positive aspects of the written speech, in addition to the difficulties found in the performance of tasks of the previous levels. On the one hand, when performing creative tasks, there was no strict time limit, and children in a more relaxed state much better performed kinesthetic actions, wrote graphic signs more correctly, practically not exceeding the line of the line.On the other hand, the presence of spelling and graphic mistakes was high. In addition, children were limited in identifying events without analyzing these events and not formulating conclusions.

Summarizing the received experimental materials, we note that at the first level, 85% of children with ASD satisfactorily fulfilled the task. 74% of children with ASD coped with tasks at the second level; at the third level - 61%, and the task of the fourth level was fulfilled by 39% of schoolchildren; additional tasks at the fourth level were fulfilled by 13% of pupils; and the essay was written by 4% of children.

In addition to the above, it should be noted that children with ASD studied at first and second forms of general education schools have very similar difficulties in writing. Thus, at the stage of inducing the reproductive and passive type of mental activity, the children found a sufficient level of recognition of written letters, syllables, words and simple sentences. Children with ASD easily called the letters, recognized the letters for their elements, and determined the letters, imposed one by one. They built the words of different component of complexity from separate letters. Almost all children with ASD have demonstrated their ability to read. However, when reading the words and sentences, some of them transposed the syllables into words, began to read from the middle of the word. Children percept and reproduct the words while hearing and they often distinguished only the accented composition or solid, loud consonant sounds, and the rest of the words were ignored. However, the overall level of knowledge reproduction at this level was satisfactory. At the stage of implementation by children of tasks involving the reproductive type of mental activity, virtually all children did the copying tasks, although the following problems were highlighted. The writing posture changed all the time, there were difficulties for children in keeping the right position of the body during the entire task. The left arm of all children hanging. With the help of the right hand, they did written work, trying to keep the copybook. Although, all students knew how to sit in correct posture. They reproduced the rules of proper sitting at the desk, chose and explained the drawings with the correct landing at the table during the writing. All children kept the pen and pencil, although a significant part of them falsely folded their fingers while holding writing supplies.

With the appropriate reminder of the teacher, some children corrected the position of the fingers, and somebody said that it is uncomfortable for them to change the position of the fingers. Some children, although they knew how to hold the pen, tried to take fancy poses at the

writing all the time, curled their hands to themselves, slowing down the pace of writing and making the writing of graphic symbols more difficult. This led to the fact that the letters at the time of writing differed in size, and almost all the children descended from the line down, more rarely upwards, between the words without a reminder they did not do distances. Several children wanted to reproduce accurately the writing, and did not want to endorse a word that did not fit into the row to another if the word remained in the sample on the previous line. The words were copied correctly, but the letters were written by elements, written in parts, trying to reproduce the example. Some children in long words missed letters or wrote stereotyped several times one prescription, and then they continued to perform tasks. Even children with enough experience in using the writing skills, put a lot of volitional effort to write correctly, after which they were tired very quickly, the graphic motions came out of control and the researchers wrote out of line, or significantly increased the size of the letters.

At the stage of fulfilling tasks involving the reproductive-productive type of mental activity, children, performing various types of dictations, usually began to proclaim loudly the proposed material, while trying to correlate the sound with the letter. During such complicated work, the translation of the sound image into a graphic symbol significantly affected on the correctness of the writing of letters, their calligraphy. There was no observance of the connection between letters, increased number of errors, more children did not fall into the working line.

The studied orthograms were not used at all. For example, writing a capital letter at the beginning of a sentence or in their own names, at the end of the sentences there were no dots, etc. See examples 22.

When performing the tasks of the fourth level, there were the same problems as at the previous level. However, when performing tasks on writing signatures in drawings, drawing up a short story in a serie of drawings and other tasks supported by visual images, it turned out positively that the children were more calm, the task caused in them creative enthusiasm, more disconnected from the fact that the tasks were not strictly limited to the time frame.

The children managed to think out the phrase for its writing, put it almost correctly in copybooks, made the correct distance between the words, correctly carried over the words into another line, because they were not limited with the pattern as in copying, and more calligraphically wrote letters. However, the analysis of the implementation of this type of writing also revealed many spelling and graphic mistakes. However, it is important to note that *creative tasks were the only type of written assignment, where children with autism worked with sufficient enthusiasm, rather meaningful, in some cases, not resorting in writing to its elemental analysis.*

The synthesis of the materials of the confirmatory experiment analysis shows that comparing and collating the nature of the mistakes in the written work of children with ASD allows distinguishing two groups of mistakes. These mistakes caused mainly by disorders in such components of the function writing as:

a) auditory analysis, kinestetic analysis, visual and visual-spatial organization of writing (disorder of components, which are carried out with the involvement of the back of the cerebral cortex);

b) the kinetic organization of graphic movements and the program (plan) of written message and its implementation (implemented with the participation of the anterior cortical units).

For children with autism, it was characteristic that, as at the first steps of the development of skills, and in the subsequent, the movement required for the writing of each letter, each element of the letter remained the subject of a special conscious action. In addition, in the future, these individual elements combined with enormous difficulties, and the child who did not have enough writing skills did not begin to record with the integral sign of the complex sets of sounds. In other words, the children did not integrate consistent series of excitations for combining individual impulses into the smooth "kinetic melodies" (by Luria O.R.). Children continued to know which elements formed a complex movement, but they often failed in integrating this movement into a complex, smooth "motor melody". Each link of movement became for them the subject of a special, isolated motor impulse.

At the same time, children could lose the ability to maintain the necessary sequence of motor acts. As a result, individual sections of the movement began or appeared out of line, or that it was more often, ceased to be inhibited, persceurted, and the children were not able to keep excessive impulses that appeared, which violated the normal course of the motor act. As a result, elementary automatisms, which are a function of subcortical motor units, ceased to be controlled and inhibited by bark, which led to the marked disorders of graphic-motor writing skills.

The backwardness of the lower parts of the premoratory region (Brock's area), as a rule, caused a disorder of smooth and organized in time kinetic melody, which was manifested not only in motor acts (for example, the movements of the hand), but in that specialized form of movement that provides a sequence of speech articulations (Sadovnikova I.M.)

In the systematization of specific writing disorders meta-language dysgraphia distinguished among other forms (Kornev AN): dysgraphia due to disorders of speech analysis and synthesis, and disparate (motor) dysgraphia. Both of these forms were peculiar to children with ASD from the experimental group, but with some prevalence of the number of dyspraxic mistakes.

Dyspraxic dysgraphia were expressed in the failure of children (87%) to master the graphic form of letters, which led to mistakes in the form of replacing letters with similar kinetic features. Due to the inertia of the motor stereotype and impulse of the finger's praxis, children with this form of dysgraphia had slowly produced the motional letter images (kinemes). Dyspraxic dysgraphia was characterized by their inability to master the graphic form of letters, the extremely slow development of a stable motor formula of the letter (kineme). This led to the replacement of letters that have similar elements and not finish writing letters during the writing. Replacements of letters arose due to the inertia of the motor stereotype, the presence of two letters of identical initial elements, which provoked the appearance of mixing letters' mistakes. Under the same principle, there was no finishing of the

letter elements, when the presence of the same element was in the previous or next letters. Actually, in this form of dysgraphia, we can assert that children with ASD were defined the mixing of mainly kinesthetic images and motor formulas (kinemes), but not optical images (graphemes) (by Lalayeva R.I.). The children's writing, as a rule, considerably slowed down, the handwriting was uneven, unstable, and the long-term, inevitable writing was complicated or impossible.

Children with ASD (69%), in whom the motor dysgraphia was detected, had specific movement difficulties during the writing, a disorder of the connection between motor image of sounds and words with visual images.

Summarizing the analysis results of the experimental data obtained and based on general representations of the multilevel hierarchical system of movementcoordination (Bernstein M.O.), we note that all levels of the control motion system of children with ASD insufficiently formed or disturbed. From the level A, which determines the muscles tone and participates (along with other levels) in providing every movements, to the levels that determine the state of their synergy (level B). The construction of movements is responsible for adapting to the spatial properties of objects (level C), and the level that provides all kinds of actions with tools and manipulators motion status (level D). As a result, the overwhelming majority of children with ASD have a low level of formation of the E level – the highest level of movement organization that provides motor actions that have the intellectual nature, particularly the execution of movements in writing and articulation movements in pronuncing words (Bernstein M.O.).

At the same time, the difficulties faced by a child with ASD during the mastery of writing skills were not only in the need to aware of the symbolic function of the writing. It was but also in the need to distinguish the content aspect of the sign (meaning) and its form, in a high degree of arbitrariness of the writing act and the presence in a child's complex organization of sensorimotor base. The process of mastering the writing skills for a significant number of children (92%) was accompanied by considerable difficulties caused by their failure to reach sufficient levels of physical, mental, speech and intellectual development. This development would allow them to meet the requirements of systematic training, different kinds of loads, and a new life style would not be too tiring for them.

Based on our experimental data, we concluded that the achievement of such condition should be determined by a sufficient level of development of the preconditions in children. The preconditions take into account, firstly, the research results of the causes of the difficulties of mastering the graphic skills of children with ASD and, secondly, ensuring their successful mastery of this writing skill at the stages of pre-school and elementary school education. Among them: the sufficient level of development of child's oral speech, the formation of functional base (cognitive, sensorimotor processes) and operational components.

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