Olga Shterts

Specifics of cognitive processes in children with violations of written speech

Abstract. The article is devoted to the problem of the specifics of cognitive processes functioning in children with violations of written speech and reading. The paper covers and summarizes the researches of scientists regarding the causes and factors affecting the occurrence of violations of reading and writing, the specifics of the manifestation of violations of reading and writing in primary school age, the influence of violations of reading and writing on the development of cognitive processes in children with dyslexia and dysgraphia is indicated. The article provides a comparative analysis of the development of cognitive processes in children with normal development and in children with violations of writing and reading. The importance of correcting not only speech disorders in children with dysgraphia and dyslexia, but also higher mental functions is emphasized.

Keywords: cognitive processes, memory, attention, dyslexia, dysgraphia, mental stability of the personality

The problem of improving the quality of younger generation education remains one of the most actual problems in psychological and pedagogical science. Modern social-economic challenges to society require from a person to maximize his potential of knowledge, skills and abilities. However, as statistics shows, the number of children with certain disorders, including violations of written speech, is increasing. For society, it is becoming an important area of

work of socializing in society of children with limited abilities, using the compensatory psyche capabilities.

The increase of the number of children with violations of written speech in primary school determines the urgency of the problem of correctional work organizing with this category of children in an educational school. For effective correctional work the question of concomitant disorders in children with dysgraphia, in particular in cognitive processes development, becomes important and significant.

Revealing the specifics of cognitive processes functioning in children with dysgraphia and dyslexia will allow to determine the influence of cognitive processes on the effectiveness of children's activities in the learning process and to construct corrective activities more competently and effectively.

The problem of dysgraphia and dyslexia firstly attracted the attention of specialists in the 20th century. This problem was developed in the works of such famous scientists as G.M. Sumchenko, L.G. Milostivenko, R.I. Lalaeva, I.V. Prishchepova L.G., Paramonova, A.N. Kornev, and later in the works of O.I. Azova, O. V. Eletskaya [10, 8, 1, 3].

Within the framework of Russian speech therapy science, it is accepted to separate dyslexia and dysgraphia; in foreign speech therapy, violations of written speech are not distinguished separately, they are considered together with violations of reading and are designated by the same term - dyslexia.

It should be noted that the symptomatology of violations of written speech is characterized by the presence of specific errors, that is, errors that are not associated with the use of spelling rules, are persistent and are not caused either by the child's intellectual or sensory development disorders, or by the nature of his schooling.

Violations of reading and writing can be associated with a delay in the formation of certain functional systems important for the learning of written speech, due to unfavorable factors acted at different periods of the child's development.

In addition, dyslexia and dysgraphia occur in organic speech disorders (A.R. Luriya, M.E. Khvatsev) [12, 9]. Some researchers note a hereditary predisposition to dyslexia (B. Halgren, M. Rudinesco) [5], when the qualitative immaturity of certain brain structures involved in the organization of written speech is transmitted.

Dysgraphia and dyslexia, according to M. Sule, F. Kosher, may be associated with a disorder that occurs in a significant area of praxis and

gnosis, which contribute to the perception of space and time. Therefore, one of the important factors contributing to occurrence of the dyslexia and dysgraphia is the difficulty in finding the starting point in space and time, as well as in the analysis and reproduction of the exact spatial and temporal sequence.

Temple, Elise and Poldrack Russell A. in the course of their researches came to the conclusion that with violations of written speech and reading (dyslexia), disorders in the neural bases of both phonological and spelling processes important for reading can be observed [17].

Lucianne Fragel-Madeira, Juliana S. C. de Castro1, Cristina M. C. Waisenhowerk V. Melo in a joint research came to the conclusion that dyslexia is associated with disorders of neuronal processes functioning [14]. Therefore, it is very important to recognize on time and carry out timely correction of violations of reading and writing in children.

Based on the data of neuropsychological research by T.G. Wiesel and E.D. Dmitrova, it should be noted that children with dysgraphia and dyslexia have an unfavorable anamnesis of an organic nature, in particular [20]:

- residual phenomena of organic brain damage;
- incomplete lateralization of speech processes;
-specific disorders indicating the involvement of certain zones of the left hemisphere in the pathological process (this disorder is characterized by the emergence of problems associated with the selection of spatial and geometric features in the subject, the emergence of difficulties in the analysis of images of visual objects and also highlighting their features, understanding of the meaning of words and their meanings disorder [20]).

In Russian speech therapy science, the concept of R.E. Levina is spread, who interprets violations of reading and writing as a manifestation of systemic speech disorders, and also as a very vivid reflection of the consequences of the oral speech underdevelopment in all its links [11].

The famous scientist A.N. Kornev believes that the deficit of voluntary concentration, switching and distribution of attention, the successive auditory-speech memory disorder are played one of the most important roles in the occurrence of spelling errors [8].

But not only according to the results of the works of the before mentioned researchers, it can be concluded that a disorder of spelling norms learning may be due to the lack of formation of the main components of literacy, including:

- developed speech;
- sense of language;
- the ability to perform operations with language units.

In foreign and domestic science, the question of the relationship between speech and such a cognitive process as thinking in the structure of a speech defect is also being actively studied. Researchers in their theoretical positions were divided into three groups. The first group (A. Kussmaul, 1879; P. Mari, 1906; M.V. Bogdanov-Berezovsky, 1909) [13] put speech disorders in direct dependence on the defects of the intellectual sphere, believing that it is mental underdevelopment that determines the disorder in the development of speech. The second group (K. Goldstein, 1927, 1960; H. Head, 1963) [4] believed that the introduction of causal relationships between disorders of speech and thinking was wrong, as in both cases the main reason is a disorder of brain integrative activity. The third group (A. Peak, 1931; F. Lotmar, 1919; G. Ya. Troshin, 1917, 1927) believed that thinking disorders are directly caused by speech defects. Herewith, they were united by the fact that all researches were descriptive [15].

Influenced by the ideas of L.S. Vygotsky in the 1930s in psychology and defectology, the theoretical ideas about the origin and structure of the person higher mental functions were radically changed [18]. It is experimentally proved that speech plays a leading role in the development of mental processes. Later, this became the push for a new wave of research aimed at studying the specifics of mental processes (perception, memory, thinking, etc.) in children with normal speech and speech disorder. Among them, the leading place is occupied by the scientific concept of R.E. Levina. In the 40s of the XX century, the activities of R.E. Levina was aimed at developing the principle of a differentiated approach in teaching children with speech disorders [11].

Thus, dysgraphia is polymorphic in its structure, which results in the lack of development in children not only of speech, but also of non-speech higher mental functions. These include:

- attention;
- speech and auditory memory;
- verbal-logical thinking [11].

The results of our study complement the scientific concepts of modern personality psychology, special psychology about the specifics of cognitive processes functioning in children with violations of written speech and reading. They also expand the theoretical and empirical

base of pedagogical and psychological sciences by developing the problem of complex correction of reading and writing disorders in children.

The empirical diagnostics of cognitive processes involved 223 pupils of grades 2-4 of secondary schools in Yelabuga with writing and reading impairments. To conduct a comparative analysis and identify the specifics of the development of cognitive processes in children with dysgraphia and dyslexia, students in grades 2-4 (230 students) with a developmental norm took part in our study as a control sample. As an empirical toolkit, we used the following diagnostic techniques: Bourdon's proof sample, memorizing 10 words according to A.R. Luria [12], Schulte tables [2], "Memorizing 10 pictures" method, Y. Gilbukh's phonemic hearing test [19]. Also, as a diagnostic tool, a package of techniques developed by I.N. Sadovnikova to identify signs of reading and writing disorders in children of primary school age was used [16]. To identify differences in the results of the study between the control sample and the experimental sample, we used the Student's t-test.

It should be noted that speech also belongs to cognitive processes. With the help of speech, a person tries to cognize the world around him rationally and, as we said earlier, speech is closely related to thinking. Therefore, we consider it necessary and important to characterize the specifics of the development of writing and reading in order to create a comprehensive understanding of the specifics of the development of cognitive processes in children with dyslexia and dysgraphia.

Cognitive processes during reading consist in recognizing a letter, remembering a word and its meaning as well as the ability to correlate the text read with knowledge and skills previously acquired. If we consider the mental processes that are activated during writing, then in this case, the ability to establish connections between the heard and the spoken word is very important, that is, the level of phonemic hearing development. But when we write, we not only hear the word, but also see it and write it down. Writing is a complex process that is formed only by the age of 7 years of a child and activates such analyzers as speech-motor, visual, speech-auditory, motor and visual. Writing literacy depends on the coordinated work of these analyzers.

The study of the level of cognitive processes development in children with impaired writing and reading is very important, as it makes it possible to identify the specifics of the impairment in this category of children, develop effective strategies and methods for correcting dysgraphia and dyslexia in children of primary school age and use these methods in the future.

According to the results of an empirical study, 73% of children from the experimental sample had mixed dysgraphia and symptoms of dyslexia, 11% of the examined children had symptoms of acoustic dysgraphia and symptoms of phonemic dyslexia, 8% had dysgraphia against the background of impaired language analysis and synthesis, and 8% had agrammatic dysgraphia and dyslexia.

Inshakova O.B. in his works he also focuses our attention on the fact that isolated forms of dysgraphia are not most often encountered in primary school age [6]. The leading form of dysgraphia is accompanied by the presence of specific errors characteristic of other types of dysgraphia. Consequently, as our studies have shown, the mixed form of dysgraphia is the dominant form of dysgraphia in primary school age [7].

When reading, the majority of subjects with symptoms of dyslexia encountered disorders associated with distortion of the sound-letter composition and the syllable-rhythmic structure of the word, letter-by-letter reading, that is, the children had difficulties in sound-syllable synthesis of the word, as well as unreasonable guesses. When children tried to think out the content of the whole word by the first letters of the word, and not read it. Difficulties in reading associated with the global holistic perception of the word were less common.

If we consider the content of specific writing errors, then the most common errors in the examined children from the experimental sample were those associated with the phonemic perception of the word, in particular, the mixing of voiced and voiceless paired consonants, hissing and sibilant consonants. Also, such mistakes as omission of letters and words, insertion of extra letters, non-observance of the boundaries of the sentence, writing prefixes separately, and prepositions together with the word were quite common.

The study of phonemic perception showed that in the experimental sample in 48% of the examined children the level of phonemic hearing (perception) was developed at a high level, in 46% of the surveyed children the level of phonemic hearing was at an average level, 2% of the surveyed children had a low level of development of phonemic hearing. Diagnostics of phonemic perception in the control sample (children with a norm of age development) showed that 89% of children had a high level of phonemic hearing development, 11% of children had an average level of phonemic hearing. There were no children with a low level of phonemic hearing development in the control sample. Phonemic

hearing directly affects the sound-letter analysis of a word. Accordingly, children with a developmental norm when writing distinguish well between the sound of voiced and voiceless consonants, hissing and sibilant consonants. Violation of the sound-letter analysis of a word leads to the fact that in children with a violation of written speech there are errors associated with the displacement of letters by acoustic-articulatory similarity.

In the course of the study of cognitive processes (attention and memory) it was revealed that in children with impaired writing and reading attention processes are most affected.

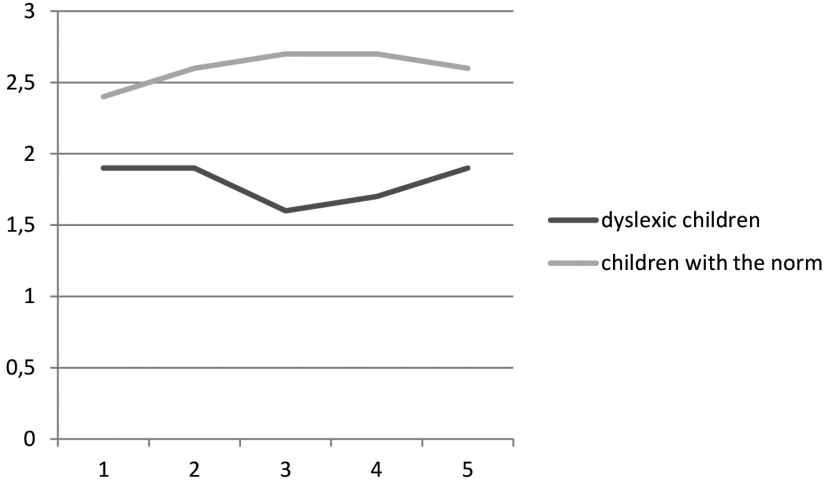

Fig. 1. The pace of activity according to the Bourdon's proof sample

Children with dyslexia and dysgraphia find it difficult to get involved in work. The pace of work is unstable and at the end of the work, as the results of our research show, the pace of work is very slow. You can see visually data on the pace of activity of children with reading and writing disorders and developmental norms in Figure 1. Therefore, they get tired and overworked very quickly. In 63% of children with dyslexia and dysgraphia, attention span is at a below average developmental level, and 37% of children have an average attention development level. At the same time, it should be noted that in 84% of children with writing and reading impairments, the accuracy of tasks is at a high level and only

in 19% at an average level. As for the control sample of our study, 34% of children have developed attentional stability at a high level, 39% of children have above average attentional stability, and 27% of children have an average attentional stability level. 90% of children with developmental norms have a high level of task accuracy, and 10% of children have an average level of task accuracy. As we can see from the results of the study, the accuracy of task performance in children with dyslexia and dysgraphia does not differ from children with normal development. Statistical analysis showed that the differences in the accuracy of the tasks are not significant (t = 1.67)

Our results help us to conclude that if children with writing and reading impairments are given a little more time to complete tasks, this can help to reduce the number of mistakes the child makes when writing and reading and, as a result, improve the quality of the task.

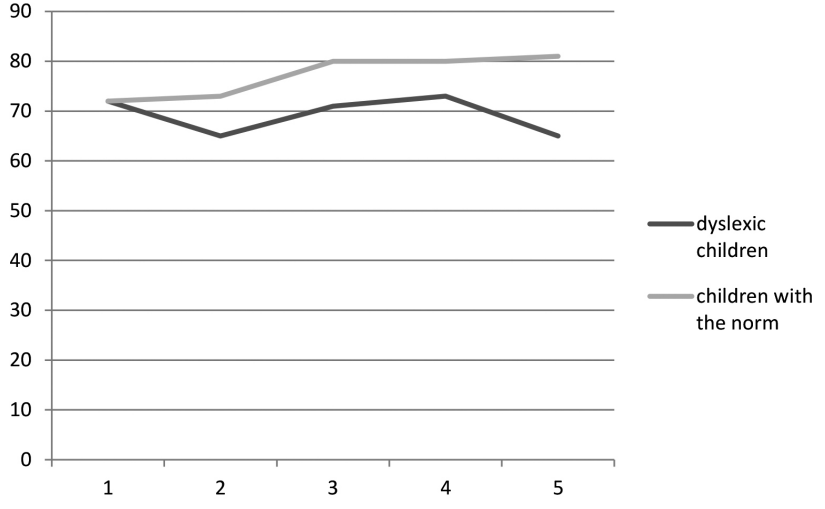

Fig. 2. Efficiency of work according to the "Schulte table" method

In the process of studying attention according to the Schulte method, a high level of instability of work efficiency was revealed. These indicators are clearly shown in Figure 2.

Thus, children with a written language disorder begin to work effectively and actively, but then there is a sharp decline, followed by a grad-

ual rise in work. But at the end of the activity, the effectiveness of the work definitely drops. This instability in work leads to a decrease in the achieved results. Therefore, to consolidate the learning and success of a child with writing and reading impairments, it is necessary to repeat the previously studied material many times. If we consider the dynamics of work efficiency, then, on average, children with developmental norms do not observe sharp jumps in work efficiency indicators. Children with a developmental norm learn the material under study faster.

Also, according to the Schulte method, 26% of students had a low level of mental stability, 55% of children had an average level of mental stability, and 18% had a high level of mental stability. When diagnosing children from the control sample of the study, we obtained the following results: 7% - a low level of mental stability, 45% - children with an average level of mental stability and 48% of children with a high level of mental stability. Accordingly, a significant part of the children we examined with writing and reading disorders, depending on the situation (for example, it is not emotionally significant), can demonstrate confidence in their actions and firmness in achieving the goal. In other situations, especially if these situations are emotionally significant, for example, completing writing or reading assignments that the child previously failed, demonstrate uncertainty in their own actions and do not show firmness in achieving the goal. Children with developmental norms in most cases show a high level of mental stability, can cope with difficult tasks without loss of work efficiency. Consequently, children with impaired writing and reading demonstrate anxiety, lack of confidence in their own actions and a low level of self-esteem more often than children with developmental norms, low level of mental stability and susceptibility to the influence of their own emotions. Children with writing disabilities can find it very difficult to control their own emotions, especially when they fail. And this contributes to a decrease in the effectiveness of the work of children with impaired writing and reading. Statistical analysis showed that the differences in the level of mental stability in the control and experimental sample are significant, $t = 2.74$ at $p \leq 0.01$.

Therefore, in order to increase the mental stability of children with dysgraphia and dyslexia, it is necessary to work on the self-esteem of children, to create situations of success for children with impaired written speech at the lesson, so that they have the opportunity to believe in their own strength.

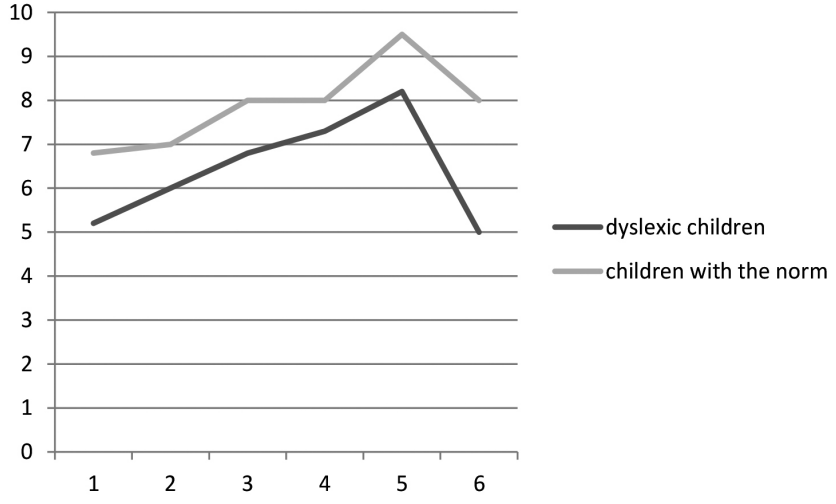

Fig. 3. Auditory-verbal memory (according to the method of AR Luria). Memorization curve.

Memory study by the method of A.R. Luria made it possible to conclude that children with dyslexia and dysgraphia have difficulty memorizing information by ear, but after a certain period of time, they very quickly forget previously memorized information by ear. Visually, the dynamics of memorizing words in children with impaired writing and reading (dyslexia) and in children with normal development can be seen in Figure 3. 8% of students with reading and writing impairments have a low level of sound memory, 73% of children with dysgraphia and dyslexia have an average level of development, and 19% of students with writing impairments have a high level of development of hearing and speech memory. In children from the control sample of the study (children with normal development), 37% have a high level of development of auditory-speech memory, 63% of children have an average level of memory development. As for the low level of development of auditory-verbal memory, in the course of the study it was not revealed in children with normal development. Statistical analysis of the results of empirical diagnostics showed that differences in the level of development of auditory-speech memory are statistically significant ($t = 2.81$ at $p \leq 0.01$)

Consequently, children with developmental norms memorize quite well the information they have memorized by ear, and long-term auditory-speech memory is more stable and productive, in contrast to children with reading and writing disorders. Visual memory in children with writing impairment is more preserved. 91% have a high level, 9% of students demonstrate an average level of development of visual memory. In children with normal development, 95% have a high level of development of visual memory, 5% of children with an average level of development of visual memory. Therefore, we can conclude that in order to increase the efficiency of mastering educational material for children with speech and reading impairments, it is necessary to consolidate the topic under study through stimulation of visual images.

Thus, in order to increase the efficiency of the activity of children with impaired writing and reading, it is necessary to correct speech therapy disorders associated with defects in sound pronunciation, as well as the development of such cognitive processes as attention and memory. It is also necessary to carry out corrective work to increase the speed of the pace of activity and mental stability of children with dysgraphia and dyslexia in order to increase the effectiveness of activities in achieving educational goals.

Conclusions.

1) In children with impaired writing and reading, a decrease in the level of development of phonemic hearing is observed, which significantly affects the sound-letter analysis of the composition of the word and the commission of errors associated with mixing by the acoustic-articulatory similarity of letters.

2) Children with dyslexia and digraphia are characterized by a low level of performance, high fatigue, a reduced level of development of concentration, difficulties in perceiving and assimilating information when activating the auditory analyzer.

3) Children with impaired written language are characterized by emotional lability, which is expressed in uncertainty about their own actions, mood swings, and difficulties in restraining their own emotions. Mental instability of the personality affects the decrease in concentration of attention and the efficiency of activity.

4) Correction of reading and writing disorders should be carried out on the basis of an integrated approach and include not only the correction of specific mistakes made by the child in reading and writing, but work on the development of cognitive processes, mental stability of the individual (for example, self-regulation skills).

5) Carrying out corrective work of such cognitive processes as attention and memory will also help to reduce the number of specific mistakes made when writing related to omissions and insertions of letters and words when reading and writing in children with dyslexia and dysgraphia.

References

1. Azov OI Dizorphography: monograph. / O. I. Azova. M.: TC "Sphere", 2015. 368 p.
2. Andreev A. Schulte tables. Litres: Samizdat. 207 p.
3. Eletskaya, OV Speech therapy work on the correction of dysorphography in fifth grade students of secondary schools: dis. ... Cand. ped. sciences / Eletskaya O.V. SPb., 2008. 221 p.
4. Goldstein, Kurt. (1948). Language and Language Disturbances: Aphasic symptom complexes and their significance for medicine and theory of language. New York: Grune & Stratton.
5. Hallgren B. Specific dyslexia (congenital word-blindness); a clinical and genetic study. Acta Neurol Scand (Suppl) 1950651–287.
6. Inshakova OB Variability of forms of dysgraphia in schoolchildren during primary schooling // Special education. 2018. No. 1 (49). S. 115-124.
7. Inshakova OB Longitudinal analysis of manifestations of dysgraphia in primary school students / OB Inshakova // Special education. 2017. No. 3 (47).
8. Kornev A.N. Fundamentals of childhood speech pathology: clinical and psychological aspects. SPb: Rech, 2005. 533 p.
9. Khvatsev M .: Speech therapy. M.: Education, 2009. 324 p.
10. Lalaeva R.I., Benediktova L.V. Reading and writing disorders in younger students. Diagnostics and correction. Rostov n / a: "Phoenix", St. Petersburg: "Soyuz", 2004. 224 p.
11. Levina R.E. Writing disorders in children with speech underdevelopment. M: Publishing house of the APN RSFSR, 1961. 312 p.
12. Luria A.R. Higher cortical functions of a person. SPb.: Peter, 2018. 768 p.
13. Loriaux D. Lynn MD, Adolf Kussmaul: 1822–1902. The Endocrinologist: May/June 2010, Volume 20, Issue 3, p 95
14. Lucianne Fragel-Madeira, Juliana S. C. de Castro, Cristina M. C. Delou, Waisenhowerk V. Melo, Gustavo Henrique V. S. Alves, Patricia P. Teixeira, Helena C. Castro Dyslexia: A Review about a Disorder That Still Needs New Approaches and a Creative Education. Creative Education Vol.06 No. 11(2015), Article ID: 57459, 14 p.
15. Mendelevich DM, Malysheva S. Yu. A word about professor Grigory Yakovlevich Troshin // Neurological Bulletin. 2003. T. 35, no. 1-2. S. 70-75.
16. Sadovnikova I.N. Dysgraphia, dyslexia: coping technology. M.: Paradigma, 2017. 280 p.

17. Temple Elise, Poldrack Russell A. Neural Deficits in Children with Dyslexia Ameliorated by Behavioral Remediation: Evidence from functional MRI. Proceedings of the National Academy of Sciences April 2003 100(5):2860-5.
18. Vygotsky L.S. Psychology of human development. M: Sense, 2003. 1130 p.
19. Volkova GA Methods of psychological and speech therapy examination of children with speech disorders. Differential diagnosis issues: Study guide. SPb.: CHILDHOOD-PRESS, 2004.
20. Wiesel T.G., Dmitrova E.D. Dysorphography in middle and high school students // Study of Writing and Reading Disorders. Results and prospects: Materials of the 1st Int. conference of the Russian Association for Dyslexia. - M.: Publishing house MSGI, 2004, 296 p.