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GRAPHOMOTOR SKILLS IN PRESCHOOL-AGED CHILDREN

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ABSTRACT

Mastering writing skills is preceded by a significant developmental pathway of graphomotor abilities, which starts early in childhood. Considering that graphomotor ability and visual perception are prerequisites for mastering the writing, this study analyzed the graphomotor abilities in preschool-aged children, with the aim of identifying children exhibiting elements suspected of dysgraphia. The sample consisted of 100 preschool-aged children (age 5-6), of both genders (49 girls and 51 boys). Pre-writing skills were assessed using the Predictive Test for Dysgraphia. The research was conducted in a Preschool Institution in Danilovgrad, in March and April 2024. The results of analysis showed that preschool-aged children have specific difficulties in meeting the following criteria: accurately following the given sequence of figures and their careful and precise drawing (size and shape). It was also found that children of this age group have a particular problem in maintaining the specified distance of the figures from the edge of the rectangle (drawing around the edge). The only test item that the majority of respondents were able to respond to was perseverance in completing tasks, in terms of finishing the drawing (a series of started figures). Based on inadequate visual discrimination of the size and shape of given and drawn figures, and poor spatial orientation on paper, it is possible to identify children with graphomotor difficulties. Early detection of children with visual-perceptual and graphomotor difficulties will help overcome these deficiencies through systematic exercises through speech therapy treatments, so that children can start school being better prepared.

Keywords: graphomotor abilities, writing, preschool-aged children

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Introduction

Mastering the skill of writing is preceded by a relatively long developmental pathway of graphomotor abilities, which begin to develop in early childhood. In order to master graphomotor skills at a certain stage of his development, the child must go through the entire motor development, which begins with the development of gross motor skills and continues with the development of fine motor skills (Ćalasan, Vuković, Pavlović, Vuković, & Zečević, 2015). It can be said that the child acquires certain skills needed for writing through drawing, as one of the basic forms of self-expression. To be specific, children between year and a half and two years begin to scribble, although at first they do not stick to the surface on which they draw. With the development of motor skills and eye-hand coordination, the child gradually masters the surface on which he draws. Between the age 3-4, the child can say what he is about to draw while the drawing becomes more and more differentiated, so that at the age of five he draws square shapes and human figures, which resemble tadpoles. Between the age 3-6, children begin to trace a circle, square and triangle pattern. Before starting school, a recognizable drawing appears, when interest in writing letters also appears (Nikolić, 2012; Nikolić, Ilić-Stošović, Ilić & Pešić, 2012) meaning that in preschool children are exposed to prewriting activities such as tracing and coloring; over time, they learn writing alphabets and simple words such as names (Achymy, Kadar, Razaob, & Wan Yunus, 2022).

Writing represents a complex human ability and at the same time the most complex form of language activity (Vuković, 2012). The writing process itself takes place in certain stages. Writing begins with a planning phase in which thoughts are organized and a lexical-grammatical sketch is prepared. The next stage scopes the inclusion of awareness of linguistic and social conventions that guide the child while writing. This includes the system of writing used, legibility of handwriting, rules of graphic expression, spelling rules and the use of punctuation marks. The next phase, which includes motor control and visuospatial orientation, implies the inclusion of a number of factors, such as the ability to coordinate eye and hand, and hand and body during the act of writing (Vuković, 2012).

Dysgraphia is a disorder of the written expression characterized by writing skills that are significantly below expectations, when the child's chronological age has been taken into account, average or above-average intelligence, appropriate sensory and motor functioning, and adequate learning conditions (WHO, 1990). Some authors define dysgraphia as a child's stable inability to master the skill of writing according to the spelling rules of a particular language (Posohkova, 2007). Actually, when a child enters the primary education system, it is possible to single out symptoms that speak of specific difficulties in writing of various quality. The main symptoms of dysgraphia are incomplete letter formation, mixing written and printed letters in the same word, illegible handwriting with letters of the wrong size, unfinished words or letters, omitted words, difficulties in writing numbers and crossing out geometric shapes (Reid, 2011). These errors are constantly present, regardless of preserved intelligence and good speech development, preserved sensory perception and good education (Semrud-Clickeman, 2005). It is also characteristic that

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children with dysgraphia do not progress in mastering the fine motor skills of writing, despite a sufficient amount of education and practice (Smits-Engelsman & Van Galen, 1997).

Based on the fact that graphomotor ability and visual perception present prerequisites for mastering the function of writing, this paper analyzed the results of the graphomotor ability test in preschool children, with the aim of identifying children with elements suspicious of dysgraphia.

Research methodology

Participants

A sample consisted of 100 children of preschool age (age 5-6), of both sexes (49 girls and 51 boys). Research was carried out in a Preschool Institution in Danilovgrad, in March and April 2024 .

Research instruments

The Prediction Test for Dysgraphia was used to assess graphomotor skills, by Budimirović & Vladisavljević (Kostić, Vladisavljević, & Popović, 1983). This test primarily examines graphomotor dexterity and visual perception. The examinee is offered a test material, which consists of a rectangle drawn on a sheet of A4 paper form. On the outside of the rectangle, in the upper left corner, there is a pattern with a circle, a cross and a triangle. The examinee is asked to draw the given geometric figures around the four sides of the rectangle, and to do his best to follow the given order, dimension and shape of the figures. While the subject is drawing, the examiner records whether the subject understands quickly how to solve the task, whether he is interested in the very work, as well as whether he is independent and persistent in solving the task. Also, the examiner monitors whether the examinee notices mistakes while working, whether he gets tired quickly and whether he works evenly and calmly. The examiner also records the number of drawn groups (small/large number of groups), which can vary from four to twenty, which depends on the size of the figures and the density of the drawings. All these observations are entered by the examiner in the form. After the child completes the task, the examiner scores five items on the test with the mark from 0 to 3: following the order of the figures, the correct size of the figures, the correct shape, drawing around the edge, and completion of the drawing.
The test is carried out individually. Suspicion of dysgraphia is determined based on the test results.

Research procedures

Before the research began, the written consent was requested and obtained from the parents for each child included in the research, whereby the anonymity of the data was guaranteed. Each child was individually tested by the researcher with the Prediction Test for Dysgraphia, in a special room in the kindergarten (speech therapist's office).

Statistical analysis

Descriptive statistics methods were used in the research. The results of the research obtained after processing the collected data are presented in the following tabular form.

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Results

In Table 1 are the results of the assessment on Pe

Table 1. Results of the assessment of subjects on the Prediction Test for Dysgraphia

Evaluation criteria	Successfully (3)		Partially successful (2)		Partially failed (1)		Failed (0)		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
Follow the order of the figures	12	**12**	32	32	33	33	23	23	100	100
Appropriate figure size	2	**2**	28	28	44	44	26	26	100	100
Appropriate figure shape	2	**2**	19	19	52	52	27	27	100	100
Draws around the edge	15	15	48	**48**	17	17	20	20	100	100
Completed drawing	74	**74**	0	0	0	0	26	26	100	100

Table 1 shows the results of the assessment of the subjects on the prediction test for dysgraphia according to five assessment criteria (following the sequence of figures, appropriate size of figures, appropriate shape of figures, drawing around the edge, completed drawing). Looking at the table, we can see that only 12% of the children fully met the first criterion, following the correct order of the assigned figures. We can also perceive that a very small percentage of children (2%) was successful when it was necessary to complete the appropriate size of the figures and their appropriate shape. The analysis of achievements also showed that children of this age were mostly partially successful in the criterion of obeying the rule of the specified distance of figures from the edge of the rectangle (drawing around the edge), 48% of them.

The only criterion of the test that the majority of respondents managed to meet was persistence in solving the tasks, in the sense of finishing the drawing (a series of started figures); 74 preschool children succeeded in doing it.

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Table 2. Distribution of respondents according to gender in relation to the existence of elements suspicious of dysgraphia

Gender	Without elements suspicious of dysgraphia		With elements suspicious of dysgraphia		Total	
	No.	%	No.	%	No.	%
Male	31	60.8	20	**39.2**	51	100
Female	43	87.8	6	**12.2**	49	100
Total	74	74	26	**26**	100	100

On the basis of the analysis of achievement on the criteria of the prediction test, we determined the suspicion of dysgraphia (respondents who, on all the test criteria, were evaluated exclusively with the grade 0 or 1, which indicated their failure). Looking at table 2, we can see that on the level of the entire sample of 100 respondents, there were 26% of them with elements suspicious of dysgraphia.
Also, when it comes to gender, we can see that a higher percentage of the presence of dysgraphia is in boys which is 39.2%, when compared to girls, whose the percentage of the presence of dysgraphia elements is 12.2%.

Discussion

Based on the fact that graphomotor ability and visual perception are prerequisites for mastering the function of writing, this paper analyzed the results of graphomotor ability testing in preschool children. The results of the analysis of achievement on the Prediction Test for Dysgraphia showed that children of preschool age have difficulty meeting most of the test criteria (following the sequence of figures, appropriate size of figures and appropriate shape of figures). It was also stipulated that children of this age have a special problem in keeping the given distance of the figures from the edge of the rectangle (drawing around the edge), where most of them were partially successful. The only test criterion that the majority of respondents managed to satisfy was persistence in solving the tasks, in terms of completing the drawing (completion of the started series of figures).

The difficulties in meeting the criteria of the prediction test were also highlighted in the results of other researches. Pešić and associates (Pešić, Nikolić, & Ilić, 2012) in their study, which also dealt with children of preschool age, state that only 6.4% of the respondents adequately answered all the requirements of the Prediction Test for Dysgraphia, and that more than half of the

respondents did not correctly reproduce the given model. These authors also concluded that based on inadequate visual discrimination of the size and shape of the given and drawn figures and poor orientation in space on paper, children with graphomotor disorders can be singled out.

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As part of our research, a significant number of children of preschool age with elements suspicious of dysgraphia were found (26%). These data are in accordance with the results of the research that dealt with the connection between graphomotor abilities and lateralization in preschool children (Ćalasan and associates, 2015). To be more precise, within this study, a significant percentage of children with elements suspicious of dysgraphia was determined (31.1%), and certain gender differences were also determined in favor of female respondents. Our results also show a higher percentage of the presence of elements suspicious of dysgraphia in male respondents, when compared to female respondents. Research conducted on older children, when they are included in the primary school education system and have undergone or are undergoing conventional writing training, also indicate a higher frequency of dysgraphic handwriting in male respondents (Brakus 2003; Stevović, 2010, Mitić, 1999; Vuković, Ćalasan, Jovanović-Simić, & Kulić, 2015).

Based on previous research and the results of this research, it can be concluded that graphomotor abilities and visual perception present essential prerequisites for mastering the skill of writing, and that disturbances in the field of graphomotor and visual abilities of preschool children can be considered as a predictor of dysgraphic handwriting in school-aged children. According to Van Hartingsveldt, De Groot, Aarts, and Nijhuis-Van Der Sanden (2011) up to 27% of school-aged children experience difficulties with handwriting. Failure to attain handwriting competency during the school-age years often has far-reaching negative effects on both academic success and self-esteem (Feder & Majnemer, 2007). Poor handwriters have difficulty developing their writing skills and, as a result, often suffer in their educational and emotional development (Rosenblum, Weiss, & Parush, 2003). Although it can be argued that the obstacles to maturation, imposed by dysgraphia as a writing disorder, are relatively mild when compared to other forms of disabilities, its high incidence and tendency to become more complicated with age makes it a significant educational and developmental problem, along with other learning disabilities, dyslexia and dyscalculia (Obradović, Krstić 2012).

Conclusion

On the basis of inadequate visual discrimination of the size and shape of assigned and drawn figures and poor orientation in space on paper, it is possible to single out children with graphomotor disorders already at the preschool age. These disabilities will consequently affect the mastery of writing skills during conventional school training. Therefore, detecting children with visual-perceptual and graphomotor difficulties at preschool age would help to overcome these deficiencies with preventive, timely and systematic exercises through speech therapy treatments, so that the children can start school better prepared.

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