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Original article

Visual-motor integration of younger school-aged children

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Summary

Introduction. Visual-motor integration (VMI) is defined as the degree to which visual perception (VP) and finger-hand movements are well coordinated. The VMI consists of two components: VP and motor coordination (MC). The main goal of our research was to determine whether there are differences in age and gender categories in VMI, VP and MC scores, as well as whether there is a correlation between VMI and school success of younger school-aged children.

Methods. Out of 103 student respondents, 52 were female (50.5%), aged 6 to 11 years (8.05 ± 1.44 years), divided into two groups according to age: 6–8 years (first, second and third grade) and 9–11 years (fourth to fifth grade). Data on the level of VMI were obtained by applying the following tests: Beery-Buktenica Developmental Test of VMI, VP test and MC test.

Results. In the older age group of subjects, a significant difference was observed in the mean values of the score on the VMI (12.67 ± 1.92), VP (23.69 ± 3.21) and MC (24.34 ± 3.23) tests comparing to the younger group of subjects (9.98 ± 2.12; 20.80 ± 3.2; 19.65 ± 3.82) ($p < 0.001$), while the difference in the mean values of scores in relation to gender was not observed. A significant, positive and strong correlation was observed between the scores on the VMI, VP and MC test with the success of second to fifth grade students ($p < 0.050$).

Conclusion. Given such a strong correlation between VMI and the success of younger students, we conclude that it is important that VMI disabilities are identified in time, so that these students can be referred for further assessment and receive the necessary support.

Key words: younger school age, visual-motor integration, visual perception, motor coordination

Introduction

Visual-motor integration (VMI) is defined as the degree to which visual perception and finger-hand movements are well coordinated [1]. VMI represents the ability to connect a motor output to a visual input [2]. This ability refers to the complex process of integrating visual and motor information in order to achieve the most precise movement with the least possible consumption of energy and time [2, 3]. Visual-motor integration is influenced by various factors, such as psychological and/or health-medical factors, and environmental conditions. Thus, children who have such disturbances or difficulties, or unfavorable environmental conditions, show worse results than their peers on the Beery-Buktenica developmental test of VMI. The authors also state that the construct of VMI is composed of two components: visual perception (VP) and motor coordination (MC), but that this construct cannot be viewed only as a simple sum of these two areas, rather as a separate entity. These two parts may function well independently, but not in a combination. Therefore, in addition to the test of VMI, two supplemental tests are performed: the test of VP, and the test of MC [1].

The first component of VMI is VP. Visual perception is defined as the process by which individuals assign meaning, understanding and interpretation to what they have seen, that is, it represents an intermediate step between a simple visual sensation and cognition [4]. Visual perception refers to the process of organizing and deciphering visual information [5]. VP skills are often assessed in children, because they are related to school readiness and school success in reading, mathematics and writing, especially at a younger school age [5].

The second component of VMI is MC. Motor development of children is directly related to the maturation of the child, and it begins from the first day of life. This development depends on the maturation of the central nervous system, the proper development of body structures and sensory systems [6]. During the early stages of motor learning, movements are inaccurate and largely dependent on feedback [2]. Movements become more complex over time and children's coordination of movements develops. Children with underdeveloped fine motor coordination may have problems in achieving harmonious writing and rewriting [7].

Difficulties in VMI cause problems in acquiring academic skills, participating in school activities, social relations and self-concept [8]. These difficulties are reflected in writing, drawing, following lines while reading, navigating maps and charts and other school activities [9]. It has also been shown that the ability of VMI is less developed in children with writing problems compared to peers who do not have these problems, and that difficulties of VMI have been shown to predict handwriting legibility and writing speed [10]. Children of younger school age may have writing problems due to difficulties with VMI, and the most common problems are: incorrect letter formatting, poor alignment, reversals, uneven letters size, irregular spacing between letters and words and slow motor speed [11]. Many authors also emphasize the importance of these abilities for other academic skills, especially emphasizing the importance of VP for reading [12, 13]. Accordingly, and given that we have a very small number of papers dealing with this topic, our paper will try to provide answers about the level of development of VMI among younger school-aged children. Based on the above, the main goal of our research was to determine whether there were differences in age and gender categories in VMI, VP and MC scores, as well as whether there was a correlation between VMI and school success of younger school-aged children.

Methods

This cross-sectional study was conducted in the elementary school "Vuk Karadžić" in Vlasenica (Republic of Srpska, Bosnia and Herzegovina) in September 2021. Testing of the examinees was performed individually in an empty classroom, in order to enable peaceful conditions for uninterrupted work.

The Beery-Buktenica Developmental Test of VMI was used in our research (VMI 6th Edition, Beery KE and Beery NA, 2010). It is usually used for screening purposes to identify difficulties in visual-motor integration, and can also be used for research purposes. The test tasks consist of copying geometric forms and can be applied individually or in groups in just 10–15 minutes. In our research, we used three subtests of VMI.

The VMI test has 15 tasks, which consist of 15 geometric forms arranged in developmental order, from simpler to more complex. It assesses the extent to which individuals can integrate visual and motor abilities. Examinees were asked to copy the given forms in the marked fields below each given form. Each correctly done task carries one point, and the total number of points is 15. The test is not limited in time, but the test is ended if the examinee incorrectly copies three given forms in a row.

The VP test consists of 30 tasks arranged in complexity, from more simple to more complex. It assesses individual's visual perception when not integrated with fine motor coordination. In order for this test to be as focused as possible on visual-perceptual tasks, motor tasks are reduced to a minimum, that is, examinees only need to choose their answer among the offered figures. Each correct answer carries 1 point. The total number of points is 30, and the time allowed to solve these tasks is 3 minutes. Testing is stopped after 3 minutes, as well as when the examinee makes three consecutive errors.

The MC test consists of 30 tasks and evaluates fine motor skills when not integrated with visual perception. Examinees need to draw simple geometric shapes in the space provided, first connecting the dots, then without dots, and finally, to draw complex shapes in the space which size is progressively decreasing without crossing the borders. One point is awarded for each correctly completed task. The maximum number of points is 30. The test is limited in time and the allowed time for this test is 5 minutes.

In the research we used the methods of descriptive and analytical statistics. Among the methods of descriptive statistics, measures of central tendency and measures of variability were used, namely: arithmetic mean with standard deviation, as well as relative numbers for categorical variables. Among the methods of analytical statistics, parametric methods were used to assess the significance of the difference between three or more groups, namely one-factor analysis of variance (ANOVA). In case of deviation from the normality of the distribution, a non-parametric alternative Kruskal-Wallis U test was used with additional Dunn-Bonferroni post hoc analysis. The Mann-Whitney U test was used to assess the significance of the difference between the two groups of subjects. For the correlation analysis, Pearson correlation analysis was used. SPSS software package version 21.0 (Statistical Package for Social Sciences SPSS 21.0 Inc, USA) was used for statistical data processing.

Results

The sample consisted of 103 students of both genders. Distribution of students/respondents in regard to socio-demographic parameters, as well as overall and area specific children`s success are represented in table 1. Mean age of the students was 8.05 ± 1.44 years.

Figure 1 shows the mean values of the VMI, VP and MC scores in relation to the gender and age of the respondents. There was no statistically significant difference in the mean

Table 1. Socio-demographic characteristics of respondents

Socio-demographic characteristics	n (%)
Gender	
Male	51 (49.5)
Female	52 (50.5)
Age, years	
From 6 to 8	60 (58.3)
From 9 to 11	43 (41.7)
Grade	
First	20 (19.4)
Second	22 (21.4)
Third	18 (17.5)
Fourth	22 (21.4)
Fifth	21 (20.4)
School success – II grade	
Subject area – my environment	
Participates	0 (0.0)
Successful	3 (13.6)
Extremely successful	19 (86.4)
Subject area – speech, expression and creation	
Participates	0 (0.0)
Successful	2 (9.1)
Extremely successful	20 (90.9)
Subject area – sport, rhythmics and music	
Participates	0 (0.0)
Successful	0 (0.0)
Extremely successful	22 (100.0)
School success – III, IV and V grade	
Insufficient	0 (0.0)
Sufficient	0 (0.0)
Good	5 (8.2)
Very good	14 (23.0)
Excellent	42 (68.9)

values of the VMI, VP and MC scores between girls and boys. A high statistically significant difference in the mean values of the VMI score was observed between the respondents of the younger and older age groups ($p < 0.001$). The older age group of examinees (12.67 ± 1.92) had significantly higher mean values of the VMI score compared to the younger age group (9.98 ± 2.12). The older age group of subjects (23.69 ± 3.21) had significantly ($p < 0.001$) higher mean values of VP score compared to the younger age group (20.80 ± 3.21). The older age group of subjects (24.34 ± 3.23) had significantly ($p < 0.001$) higher mean values of MC score compared to the younger age group (19.65 ± 3.82) (Figure 1).

Figure 2 shows that there is a high statistically significant difference in the mean values of the VMI score between the groups of respondents divided in relation to the grade. Subjects attending the fifth grade (13.28 ± 1.73) had statistically significantly higher mean values of VMI score compared to respondents attending the first (8.90 ± 2.40) ($p < 0.001$), second (10.04 ± 1.83) ($p < 0.001$) and third grades (11.11 ± 1.52) ($p < 0.001$). Examinees attending the fourth grade (12.09 ± 1.94)

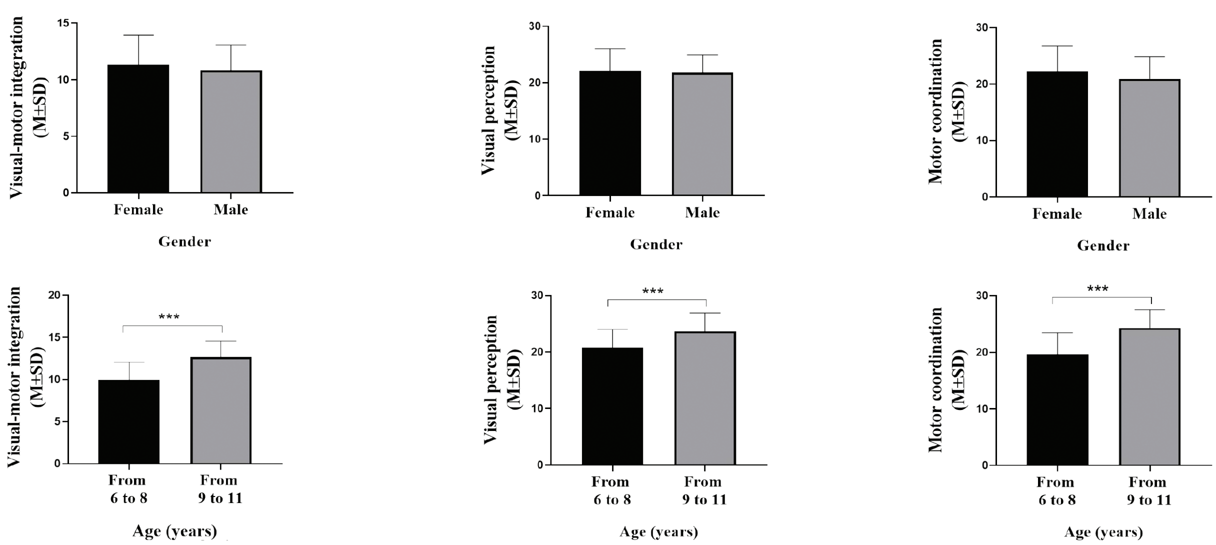

Figure 1. Mean values of subtests of visual-motor integration, visual perception and motor coordination between respondents divided in relation to gender and age

M - mean; SD - standard deviation; Mann-Whitney U test; ***$p < 0.001$

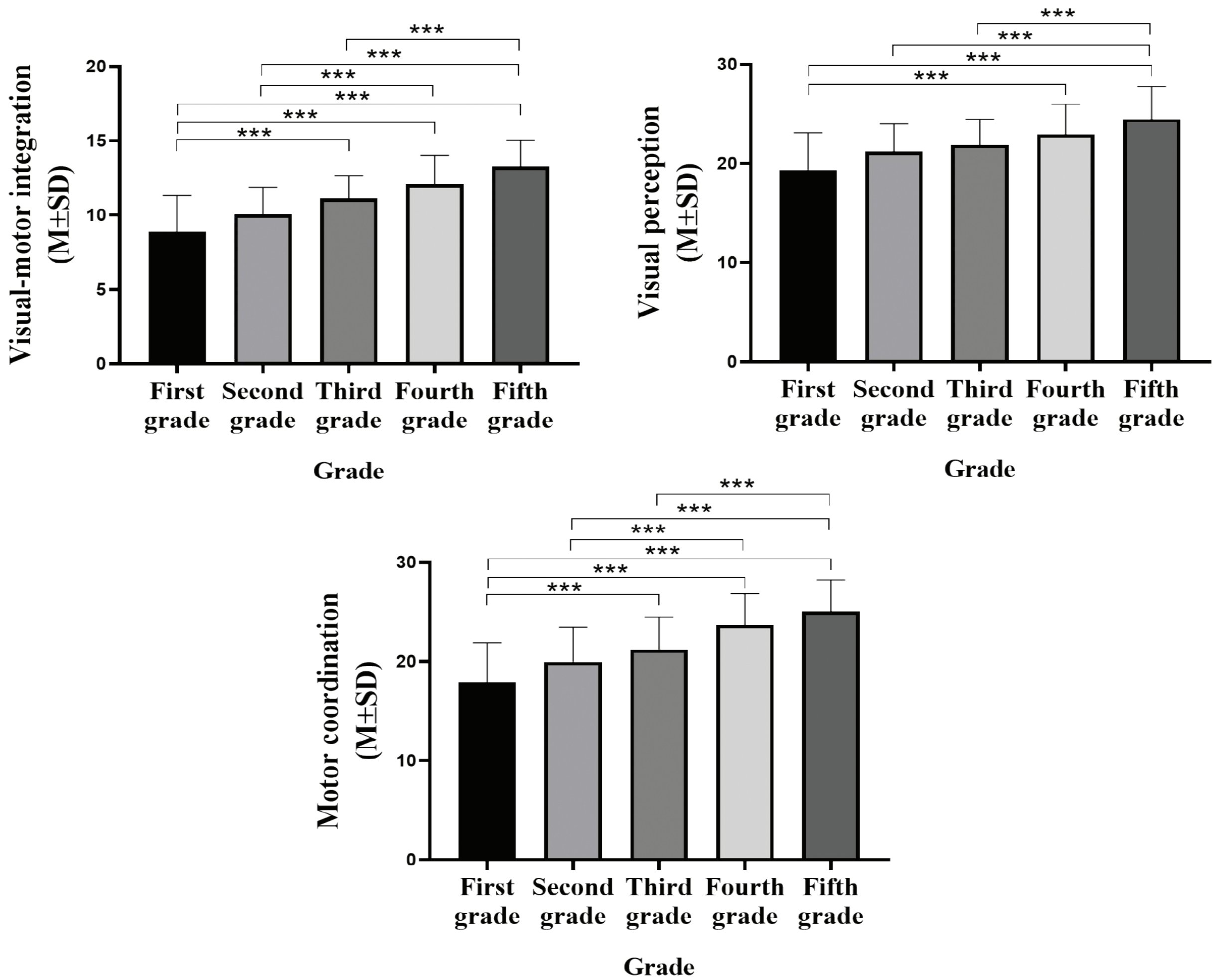

Figure 2. Mean values of subtests of visual-motor integration, visual perception and motor coordination between respondents divided in relation to grade

M - mean; SD - standard deviation; Analysis of variance (ANOVA), Tukey post hoc test; ***$p < 0.001$

had higher mean values of this score in relation to the examinees of the first and second grade ($p < 0.001$). There was a high statistically significant difference in the mean values of the VP score between the groups of respondents divided in relation to the class. Subjects attending the fifth grade (24.47 ± 3.29) had significantly higher mean values of the VP score compared to the subjects attending the first (19.35 ± 3.75) ($p < 0.001$), the second (21, 22 ± 2.77) ($p < 0.001$) and third grades (21.88 ± 2.58) ($p < 0.001$). Also, the examinees attending the fourth grade (22.95 ± 3.03) had significantly higher mean values of this score in relation to the examinees of the first grade ($p < 0.001$). Subjects attending the fifth grade (25.04 ± 3.21) had significantly higher mean values of MC score compared to examinees attending the first (17.90 ± 3.99) ($p < 0.001$), second (19, 95 ± 3.59) ($p < 0.001$) and third grades (21.22 ± 3.26) ($p < 0.001$). Also, it was noticed that the examinees attending the fourth grade (23.68 ± 3.18) had higher mean values of this score in relation to the examinees of the first and second grades ($p < 0.001$) (Figure 2).

Table 2. Mean values of the visual-motor integration scores between groups of second-grade students divided according to success in the subject areas of my environment and speech, expression and creation.

Subject area	Subtests of visual-motor integration	Evaluation of subject area (M±SD)		p (MW)
		Successful	Extremely successful	
My environment	Subtest of VMI	7.66±1.52	10.42±1.60	0.021
	Subtest of VP	18.00±4.58	21.73±2.15	0.026
	Subtest of MC	16.33±3.78	20.52±3.30	0.058
Speech. expression and creation	Subtest of VMI	7.50±2.12	10.30±1.65	0.036
	Subtest of VP	17.50±6.36	21.60±2.18	0.043
	Subtest of MC	15.50±4.94	20.40±3.26	0.064

M - mean; SD - standard deviation; VMI - visual-motor integration; VP - visual perception; MC - motor coordination; MW - Mann-Whitney U test; ***$p < 0.001$

Table 2 shows the mean values of the VMI scores between groups of second-grade students divided according to success in the subject areas of *my environment* and *speech*, *expression* and *creation*. It was noticed that the respondents who are extremely successful (10.42 ± 1.60) in the subject area of *my environment* have significantly ($p = 0.021$) higher mean values on the VMI score compared to respondents who are successful in this subject area (7.66 ± 1.52). Also, extremely successful (21.73 ± 2.15) students had significantly ($p = 0.026$) higher mean scores on the VP test compared to successful students in this subject area (18.00 ± 4.58). The difference in the mean values of the MC score between the groups of examinees divided according to success in the subject area *my environment* was not observed. It was noticed that the respondents who are extremely successful (10.30 ± 1.65) in the subject areas of *speech*, *expression* and *creation* had significantly ($p = 0.036$) higher mean scores on the VMI test compared to respondents who are successful in this subject area (7.50 ± 2.12). Also, extremely successful (21.60 ± 2.18) students had significantly ($p = 0.043$) higher mean scores on the VP test compared to students successful in this subject area (17.50 ± 6.36). The difference in the mean values of the MC score between the groups of examinees divided according to success in the subject area of *speech*, *expression* and *creation* was not observed (Table 2).

Figure 3 shows that excellent students of the third, fourth and fifth grades had a significantly ($p < 0.001$) higher VMI score (13.09 ± 1.33) compared to very good (10.28 ± 1.32) and good students (10.20 ± 2.48). Also, excellent students of the third, fourth and fifth grades had a statistically significant ($p < 0.001$) higher VP score (24.61 ± 2.05) compared to very good (19.78 ± 2) and good students (20.40 ± 4.09), and excellent students of the third, fourth and fifth grades had a significantly ($p < 0.001$) higher MC score (25.00 ± 2.52) compared to very good (20.14 ± 2.87) and good students (19.40 ± 3.13) (Figure 3).

Pearson's correlation coefficient showed the existence of a highly statistically significant ($p < 0.001$) positive and strong correlation between all scores of VMI. Highly statistically significant, positive and strong correlation was observed between the scores of VMI and the VP with the success of second grade students in the subject area my environment ($r = 0.526$; $p < 0.010$; $r = 0.473$; $p < 0.050$), the success of second grade students in the subject area of *speech*, *expression* and *creation* ($r = 0.448$; $p < 0.050$; $r = 0.435$; $p < 0.010$) and general school success of third, fourth and fifth grades students (r =

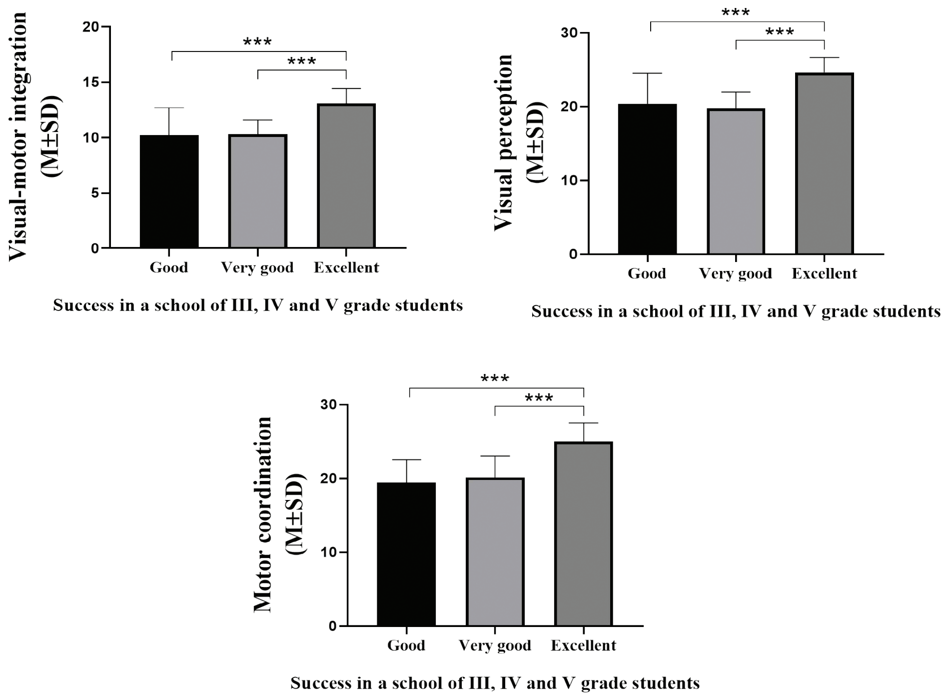

Figure 3. Mean values of the visual-motor integration scores between groups of third, fourth and fifth grade students divided according to success in school

M - mean; SD - standard deviation; Kruskal-Wallis U test, Dunn-Bonferroni post hoc; ***p < 0,001

Table 3. Correlation between scores of visual-motor integration, visual perception and motor coordination with school success of second, third, fourth and fifth grade students

	Visual-motor integration score	Visual perception score	Motor coordination score	Success of II grade students in subject area „may environment“	Success of II grade students in subject area „speech, expression and creation“	Success of III, IV and V grade students in school
Visual-motor integration score						
Visual perception score	0.865***					
Motor coordination score	0.929***	0.763***				
Success of II grade students in subject area „may environment“	0.526**	0.473*	0.410**			
Success of II grade students in subject area „speech. expression and creation“	0.448*	0.435**	0.401	0.796***		
Success of III IV and V grade students in school	0.632***	0.622***	0.638***	0.583***	0.511**	

Pearson's correlation coefficient (r) was used, the level of statistical significance p <0.05, r values are shown in the table; *p < 0.05, **p < 0.01, ***p < 0.001

0.632; p < 0.001; p = 0.622; p < 0.001). Also, it was noticed that the correlation between the MC score and the success of second grade students in the subject area *my environment* (r = 0.410; p < 0.010), and general school success of third, fourth and fifth grades students (r = 0.638; p < 0.001) was strong, positive and statistically significant, while a significant correlation between the MC score with the success of second grade students in the subject area of *speech*, *expression* and *creation* (r = 0.401; p > 0.050) was not observed (Table 3).

Discussion

The goals of our research were to determine the level of development of VMI ability of younger school-age students and whether there were differences in achievements on VMI, VP and MC tests between the students divided into groups according to gender, age and school success. The results showed that fifth grade students had significantly higher average values (p < 0.001) on the VMI test compared to first, second and third grades students, as well as fourth grade students compared to first and second grade students. In Brazilian study, which included 50 students of younger school age, ie, ages 6–11, fourth grade students achieved the highest average number of points on the VMI test and fourth grade students had significantly higher mean values (p < 0.001) on the VMI test compared to first and second grades students [11]. In our research, fifth-graders proved to be the most successful on VMI, VP and MC tests, while in the Brazilian study, fourth-graders achieved the best results on all three tests [11]. First grade students of the mentioned Brazilian study performed worse than the students of the older grades on the VMI, VP and MC tests [11], as shown in our research. Apart from being the youngest, one of the reasons why the first grade students in our study achieved such low results may be that our research was conducted in September, ie at the very beginning of the first grade, and there is a possibility that these students were not adapted enough to the new environment.

In our study, we found that in the older age group of subjects a significant difference (p < 0.001) was observed in the mean scores on the VMI, VP and MC tests compared to the mean scores of the younger group of subjects. From these results we see that VMI, VP and MC progresses with age of the child. In the study by Radovanović et al. [9], conducted in Serbia, in order to determine the differences in achievement on VMI, VP and MC tests between deaf and children with hearing impairment, and children of typical development, it was found that children of typical development of the older age group achieved better results on all three tests compared to younger age group respondents. However, these differences did not prove to be statistically significant, which the authors explained by the complex relationship between age and the development of VMI; the correlation was not linear [9]. Ercan et al. [8] conducted a study on a sample of 148 children aged 5 and 6 years in order to determine the impact of age and socio-economic status on the VMI. The results of this Turkish study showed that a group of older respondents achieved better results than younger respondents on the VMI, VP and MC tests. These results were statistically significant, which proved that the development of VMI, VP and MC abilities of children dictates with age [8], which was confirmed by the results of our study. Differences in achievement in the VMI test in terms of students age were also found in a 2014 study conducted by Harmanci Baskut [14] in Turkey. This study involved 87 first graders, ages 5 to 7. Students of the older age group achieved statistically significantly better results compared to the younger age group on the VMI test [14], which is in line with the results of our research.

We found that no statistically significant difference was observed in the mean scores on the VMI, VP, and MC tests between girls and boys. These results are in line with the results of the previously mentioned research by Radovanović et al. [9], also by Duiser et al. [15], Van Wyk et al.[16], Harmanci Baskut [14] and Coetzee et al [17].

In our study, Pearson's correlation analysis determined a highly statistically significant, positive and strong correlation between scores on VMI and VP tests with the success of second grade students in the subject area my environment, in the subject area speech, expression and creation and with general school success of third, fourth and fifth graders. In 2003, Sortor and Kulp [18] demonstrated the significant correlation between these abilities and success in mathematics and reading, especially emphasizing the role of VP, and concluded that in children with poor performance in mathematics and/or reading, further assessment of VP should be made [18]. The results of a recent study conducted in Australia in 2019 are also consistent [19]. The study, which included 222 second-grade elementary school students in Brisbane showed a significant correlation of VMI with students success [19]. The correlation of these abilities with the success of younger school age children was also proved by the results of the South African study from 2020 on a sample of 863 students of mean age (9.9 ± 0.42 years) [20], and the significant correlation of the abilities of VMI, VP and MC with success in mathematics, reading and writing was also proven in a recent study published in 2022 [21].

Conclusion

The results of numerous studies conducted around the world [16, 17, 19], have shown that VMI is better developed in older children, that there is no difference in gender and that VMI is necessary for basic academic skills: reading, writing and arithmetic [18, 19, 21], which was partially evidenced by the results of our research. Given such a strong correlation between VMI and achievement of students in school, it is clear that it is important that VMI disabilities are identified in a timely manner, so that these students can be referred for further assessment. It is well known that elementary school acquires knowledge that forms the basis for higher levels of education, and that school success is taken as a condition for enrollment in higher education. Therefore, a timely assessment of VMI is necessary in order to create an adequate stimulation program immediately after the detection of difficulties.

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Ethical approval. The Ethics Committee of the Health Center Vlasenica, Republic of Srpska, Bosnia and Herzegovina, approved the study and informed consent was obtained from all individual respondents. The research was conducted according to the Declaration of Helsinki.

Conflicts of interest. The authors declare no conflict of interest.

References:

1. Beery KE, Beery NA. Visual-Motor Integration-The Beery-Buktenica Developmental Test of Visual-Motor Integration. Pearson Clinical Assessment. 6th ed. USA; 2010.
2. Tükel Ş. Development of visual-motor coordination in children with neurological dysfunctions: Karolinska Institutet (Sweden); 2013.
3. Shumway-Cook A, Woollacott MH. Theory and practical applications. Motor Control. 1995.
4. Brown T. Are motor-free visual perception skill constructs predictive of visual-motor integration skill constructs? HKJOT 2012;22(2):48–59.
5. Kulp MT. Relationship between visual motor integration skill and academic performance in kindergarten through third grade. Optom Vis Sci 1999;76(3):159–63.
6. Cowden JE, Torrey CC. Motor development and movement activities for preschoolers and infants with delays: A multisensory approach for professionals and families: Charles C Thomas Publisher; 2007.
7. Golubović Š, Rapaić D. Contribution of neuromuscular maturity to the quality of performing graphomotor assignments. Specijalna edukacija i rehabilitacija 2008(1-2):121–33.
8. Ercan ZG, Ahmetoglu E, Aral N. Investigating the Visual-Motor Integration Skills of 60-72-Month-Old Children at High and Low Socio-Economic Status as Regard the Age Factor. Int. Educ 2011;4(3):100–4.
9. Radovanović V, Kovačević J, Karić J, Jovanović V. Poređenje rezultata na testu vizuo-motorne integracije gluve i nagluve dece i dece tipičnog razvoja. **Tematski zbornik radova - Specifičnost oštećenja sluha – koraci i iskoraci. Beograd, 2018;85–100**.
10. Cornhill H, Case-Smith J. Factors that relate to good and poor handwriting. The Am J Occup Ther 1996;50(9):732–9.
11. Capellini SA, Giaconi C, Germano GD. Relation between visual motor integration and handwriting in students of elementary school. Psychology 2017;8(2):258–70.
12. Kavale K. Meta-analysis of the relationship between visual perceptual skills and reading achievement. J Learn Disabil 1982;15(1):42–51.
13. Çayir A. Analyzing the Reading Skills and Visual Perception Levels of First Grade Students. Univers. J. Educ. Res 2017;5(7):1113–6.
14. Harmancı Başkut Y. Effect of age and gender on motor proficiency and visual motor integration as a measure of handwriting readiness: Middle East Technical University; 2014.
15. Duiser IHF, van der Kamp J, Ledebt A, Savelsbergh GJ. Relationship between the quality of children's handwriting and the Beery Buktenica developmental test of visuomotor integration after one year of writing tuition. Aust Occup Ther J 2014;61(2):76–82.
16. Van Wyk Y, Coetzee D, Pienaar AE. The influence of gender, race and socio-economic status on visual-motor integration of nine-to 10-year old learners: The NW-CHILD study. Tydskrif vir Geesteswetenskappe 2017;57(2-2):649–66.
17. Coetzee D, Du Plessis W. Visual-motor status of Grade 1 learners in the North-West province of South Africa: NW-Child study. SAJR SPER 2013;35(2):37–50.
18. Sortor JM, Kulp MT. Are the results of the Beery-Buktenica Developmental Test of Visual-Motor Integration and its subtests related to achievement test scores? Optom Vis Sci 2003;80(11):758–63.
19. Hopkins S, Black AA, White SL, Wood JM. Visual information processing skills are associated with academic performance in Grade 2 school children. Acta Ophthalmol 2019;97(8):e1141–e8.
20. Van Wyk Y, Pienaar AE, Coetzee D. Relationship between academic achievement, visual-motor integration, gender and socio-economic status: North-West Child Health Integrated with Learning and Development study. SAJCE 2020;10(1):1–11.
21. Carames CN, Irwin LN, Kofler MJ. Is there a relation between visual motor integration and academic achievement in school-aged children with and without ADHD? Child Neuropsychol 2022;28(2):224–43.

Vizuo-motorna integracija djece mlađeg školskog uzrasta

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Uvod. Vizuo-motorna integracija (VMI) se definiše kao stepen u kome su vizuelna percepcija (VP) i pokreti prstiju i šake dobro koordinisani. Konstrukt VMI je sastavljen iz dvije komponente, i to VP i motorne koordinacije (MC). Osnovni cilj našeg istraživanja bio je da utvrdimo da li između učenika različitog uzrasta i pola postoje razlike u skorovima VMI, VP i MC, kao i da li postoji povezanost između VMI sa školskim uspjehom djece mlađeg školskog uzrasta.

Metode. Od 103 ispitanih učenika, 52 je bilo ženskog pola (50,5%), uzrasta od 6 do 11 godina (8,05±1,44 godina), podijeljenih u dvije grupe s obzirom na uzrast: 6–8 godina (prvi, drugi i treći razred) i 9–11 godina (četvrti i peti razred). Podatke o nivou VMI dobili smo primjenom testova: Beery-Buktenica razvojnim testom VMI, testom VP i testom MC.

Rezultati. Kod starije uzrasne grupe ispitanika uočena je značajna razlika u prosječnim vrijednostima skora na testu VMI (12,67±1,92), VP (23,69±3,21) i MC (24,34±3,23) u odnosu na mlađu grupu ispitanika (9,98±2,12; 20,80±3,2; 19,65±3,82) (p<0,001), dok razlika u prosječnim vrijednostima skorova u odnosu na pol nije uočena. Uočena je statistički značajna, pozitivna i jaka korelacija između skorova na testu VMI, VP i MC sa školskim uspjehom učenika drugog, trećeg, četvrtog i petog razreda (p<0,050).

Zaključak. S obzirom na ovako jaku povezanost VMI sa uspjehom učenika mlađeg školskog uzrasta, zaključujemo da je važno da smetnje VMI budu prepoznate na vrijeme kako bi se ovi učenici uputili na dalju procjenu i dobili potrebnu podršku.

Ključne riječi: mlađi školski uzrast, vizuo-motorna integracija, vizuelna percepcija, motorna koordinacija