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APPLICATION OF EDUCATIONAL-REHABILITATION TREATMENT FOR IMPROVING VISUAL PERCEPTION IN STUDENTS WITH VISUAL IMPAIRMENT

PRIMJENA EDUKACIJSKO-REHABILITACIJSKOG TRETMANA ZA POBOLJŠANJE VIZUELNE PERCEPCIJE KOD UČENIKA S OŠTEĆENJEM VIDA

Sadmela Bratanović[1], Amela Teskeredžić[1], Hurma Begić[1]

[1]Faculty of Education and Rehabilitation, University of Tuzla

Univerzitetska 1, 75000 Tuzla, Bosnia and Herzegovina

Case Study

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ABSTRACT

Visual impairment can occur in different periods of life, and each person reacts differently in a way that corresponds to their personality, abilities, goals, as well as the life situation in which they find themselves. The aim of this research paper was to show, according to the available literature, the impact of individual educational-rehabilitation treatment on visual perception in students with visual impairment. The sample of respondents included a student, male, aged 9 years, diagnosed with nystagmus, amblyopia, and astigmatism. The student was included in an educational-rehabilitation program in order to improve his visual functioning. For the purpose of assessment and evaluation, the Beery-Buktenica Developmental Test of Visual-Motor Integration (VMI) fifth edition was used, which is intended for the assessment of visual-motor integration, visual perception, and motor coordination. An initial and final assessment was conducted with the student, and the Visual Perception subtest, consisting of 30 tasks, was used for the same. After the initial assessment, an individual educational-rehabilitation treatment was carried out for 2 months. The research data were processed by frequency analysis. On the basis of statistical processing and data analysis, the results showed an improvement in the area of visual perception, thereby confirming the need to implement an educational-rehabilitation program for a student with visual impairment.

Keywords: visual perception, visual impairment, individual educational-rehabilitation program.

[1]**Correspondence to:**
Sadmela Bratanović, Faculty of Education and Rehabilitation, University of Tuzla
E-mail: sadmelabratanovic4@gmail.com

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SAŽETAK

Oštećenje vida može se dogoditi u različitim životnim razdobljima, te svaka osoba različito reaguje na način koji odgovara njenoj ličnosti, sposobnostima, ciljevima kao i životnoj situaciji u kojoj se nalazi. Cilj ovog istraživačkog rada bio je prikazati uticaj individualnog edukacijsko-rehabilitacijskog tretmana na vizuelnu percepciju kod učenika s oštećenjem vida. Rađena je studija slučaja U istraživanju je sudjelovao učenik, muškog spola, uzrasta 9 godina, s dijagnozom nistagmusa, ambliopije i astigmatizma. Učenik je bio uključen u edukacijsko-rehabilitacijski program kako bi se radilo na poboljšanju njegovog vizuelnog funkcionisanja. U svrhu procjene i evaluacije korišten je Beery-Buktenica razvojni test vizuelno-motoričke integracije (VMI) peto izdanje, koji je namijenjen za procjenu vizuelno-motoričke integracije, vizuelne percepcije i motoričke koordinacije. S učenikom je provedena Inicijalna i Finalna procjena, te je za istu korišten subtest *Vizuelna percepcija* koji se sastoji od 30 zadataka. Nakon inicijalne procjene, proveden je individualni edukacijsko-rehabilitacijski tretman u trajanju od 2 mjeseca. Podaci istraživanja obrađeni su frekvencijskom analizom. Na temelju statističke obrade i analize podataka, rezultati su pokazali poboljšanje u područje vizuelne percepcije, čime je potvrđena potreba provođenja edukacijsko-rehabilitacijskog programa s učenikom s oštećenjem vida.

Ključne riječi: vizuelna percpecija, oštećenje vida, individualni edukacijsko-rehabilitacijski program.

INTRODUCTION

The development of vision is a complex process, resulting from both inherited traits and acquired experiences from the environment (Dorn, 2004). Visual perception, which allows for the perception of visual information related to movement, depth, spatial relationships, facial expressions, or object recognition, evolves through the physical maturation of the visual system, through experience gained from interaction, and the ability to process information (Graven & Browne, 2008). Through visual perception, objects we see are given meaning based on prior experiences, and it also enables individuals to physically interact with these objects through spatial orientation (Dennis, Fletcher, Rogers, Hetherington, & Francis, 2002). It facilitates continuous learning, the development of abilities, and the acquisition of skills (Chokron & Zalla, 2017), serving as a foundation for social, motor, cognitive, and emotional development (Hećimović, Martinec, & Runjić, 2014). This implies that many areas of a child's development are influenced by or guided by the development of vision (Moslavac, Bošnjak-Nađ, & Kapitanović Vidak, 2019). The abilities encompassed by visual perception include:

- Visual-motor integration (eye-hand, eye-foot, and eye-body coordination),
- Visual-auditory integration (linking what is seen with what is heard),
- Visual memory (the ability to remember and recall what is seen),
- Visual closure (filling in missing parts based on seen segments),
- Spatial relationships (understanding "where I am" in relation to objects and space around us, as well as where objects are in relation to each other), and

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- Figure-ground discrimination (distinguishing an object from its background) (Politzer, 2008).

Visual impairments arise as a consequence of various damages to the structures of the eye and/or visual pathways (Benjak, Runjić, & Bilić Prcić, 2013). In the absence of visual information, complex skills develop as the brain adapts to the lack of information (Fortin et al., 2008). Due to impaired visual perception, the experiences of children with visual impairments will differ from those of children with intact vision, as visually impaired children will rely more on tactile and auditory perception (Greenaway & Jane Dale, 2017). Visually impaired children have reduced visual perception, and blind children do not have it at all (Šupe, 2009). Visual impairment also affects a child's development by limiting the integration and interpretation of data obtained through other senses, the development of social skills, tactile localization skills, fine motor skills, and other cognitive concepts (Sonksen & Dale, 2002). Therefore, early detection of visual impairments is crucial for the effective implementation of preventive measures to protect vision (Alikadić Husović, Alender, & Ljaljević, 2006).
The aim of this study was to determine the effect of individualized educational and rehabilitative treatment on visual perception in students with visual impairments.

METHODS

Research sample

For the purposes of this study, the sample included a single participant, a 9-year-old male student diagnosed with nystagmus, amblyopia, and astigmatism. The binocular visual impairment was corrected with glasses (as of November 10, 2020), with the following prescription:

OD: -1.50 Cyl ax 174°

OS: -1.00 Cyl ax 179°

The student attends the fourth grade at “Turija” Elementary School, following the regular curriculum. Prior to this study, the student had never undergone any interventions to improve his visual functioning, nor had he been included in individual rehabilitation treatments. Despite the lack of inclusion in rehabilitation programs and the delayed correction with glasses, his academic performance was at the level of a very good student.

Measuring Instrument

The study employed the Beery-Buktenica Developmental Test of Visual-Motor Integration (VMI), fifth edition (Beery K. E. & Beery N. A., 2004). The Beery-Buktenica VMI test is used to identify difficulties in visual-motor coordination, visual perception, and motor coordination. It is applicable for children and adults aged 2 to 100 years. The VMI test comprises of 90 tasks and includes the main test "Visual-Motor Integration" and two supplemental subtests "Visual Perception" and "Motor Coordination". For the purposes of this study, the Visual Perception subtest, consisting of 30 tasks, was utilized. The first three

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tasks are designed for preschool children and are based on identifying body parts and recognizing drawings. The remaining 27 tasks require the child to copy shapes with a pencil while ensuring not to go beyond the lines of the shapes. Children older than 5 years begin with task number 4. Scoring is done by awarding 1 point for a correct response and 0 points for an incorrect response.

Research Implementation Method

The study was conducted individually in the facilities of the "Selo Mira" Foundation. An initial assessment determined the student's current level of functioning in the area of visual perception. Based on the obtained data, an individualized educational-rehabilitation program was created. The program included exercises aimed at improving the student's visual functioning. It was implemented twice a week for a continuous period of two months, during morning sessions when the student was most rested. During the activities, natural lighting was ensured to facilitate the tasks, and distracting factors were minimized to help the student maintain focus. The educational-rehabilitation program was carried out using tasks from the pre-existing Developmental Test of Visual Perception, Second Edition (DTVP-2) (Hammill, Pearson, & Voress, 1993), which included subtests on: *1. Eye-Hand Coordination; 2. Position in Space; 3. Copying; 4. Figure-Ground; 5. Spatial Relations; 6. Visual Closure; 7. Visual-Motor Speed; 8. Form Constancy.* After the treatment, a final assessment was conducted to determine the effectiveness of the intervention on the visual perception of the student with visual impairment.

Data Processing Methods

For the processing of the obtained data, the statistical program SPSS 21.0 (Statistical Package for the Social Sciences) was used. The research data were processed using non-parametric statistics, with basic statistical parameters calculated, including frequencies and percentages. The results were presented in tabular and graphical formats.

RESULTS AND DISCUSSION

Developed visual perception is crucial for the smooth performance of daily activities, including school tasks. A student with visual impairment will encounter difficulties in these areas since the impairment can stem from various factors that directly or indirectly affect a child's development and functioning within their environment. This condition can worsen if the visual impairment is not detected and corrected in time, and if a rehabilitation program is not promptly initiated. Therefore, implementing such a program is essential to enhance the visual functioning of these students.

Table 1 presents the results achieved by the student in the area of visual perception. In the initial measurement, the student did not succeed in tasks 12, 17, 19, 20, and 26 related to form constancy, but after the treatment, he succeeded in these tasks. For tasks 21 and 25, there was initial failure, subsequent improvement, and then failure again in the assessment after two months. These tasks, part of the form constancy series, are particularly challenging

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due to the need for two-dimensional and three-dimensional viewing, which is difficult given the student's visual condition.

During the first session, before the individualized educational-rehabilitation treatment, the student failed tasks 23, 24, 27, and 28, but showed success in the final measurement (Table 1).

Table 1. Descriptive results in visual perception (initial-final)

Visual perception	Measurement	Did not succeed	Succeeded
VP12	Initial	1	-
	Progress	-	1
	Final	-	1
VP13	Initial	-	1
	Progress	1	-
	Final	-	1
VP17	Initial	1	-
	Progress	-	1
	Final	-	1
VP19	Initial	1	-
	Progress	-	1
	Final	-	1
VP20	Initial	-	1
	Progress	1	-
	Final	1	-
VP21	Initial	1	-
	Progress	-	1
	Final	1	-
VP23	Initial	1	-
	Progress	1	-
	Final	-	1
VP24	Initial	1	-
	Progress	1	-
	Final	-	1
VP25	Initial	1	-
	Progress	-	1
	Final	1	-
VP26	Initial	1	-
	Progress	-	1
	Final	-	1
VP27	Initial	1	-
	Progress	1	-
	Final	-	1
VP28	Initial	1	-
	Progress	1	-
	Final	-	1

Legend: VP-visual perception

Applying frequency analysis, the results were compared between the initial measurement, the measurement conducted after one month, and the final measurement of visual perception in the student with visual impairment. The obtained results show the tasks where no changes were recorded regarding the student's progress in the area of visual perception across the three different time periods. This indicates that there was no improvement even after the individual educational-rehabilitation treatment (Table 2).

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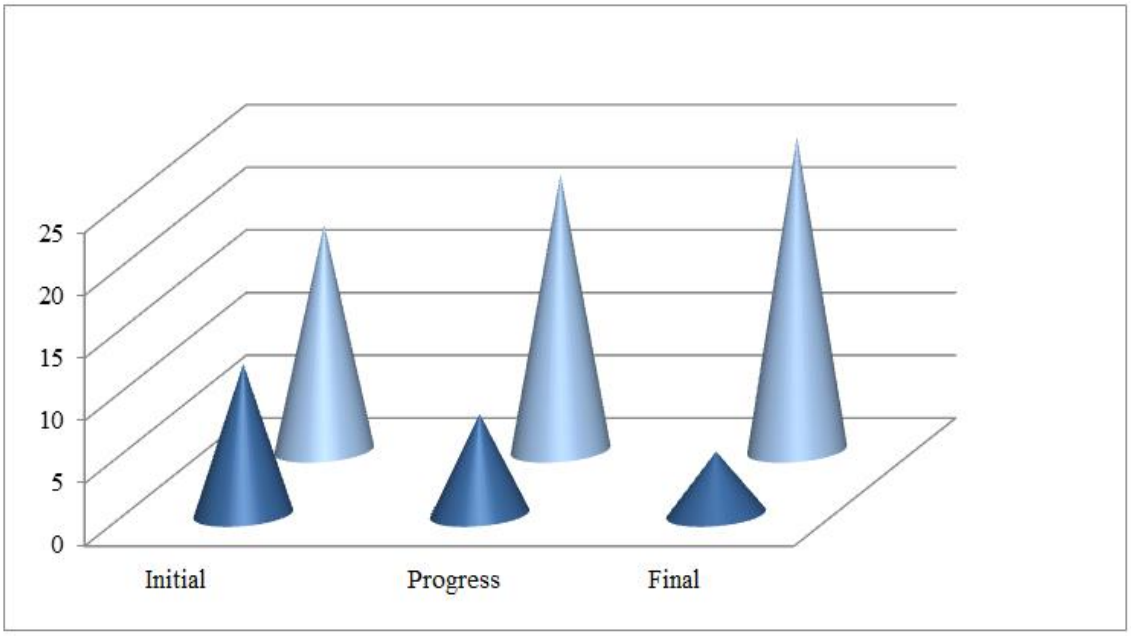
Table 2. Descriptive representation of results in visual perception (no recorded changes)

Visual perception	Measurement	Did not succeed	Succeeded
VP29	Initial	1	-
	Progress	1	-
	Final	1	-
VP30	Initial	1	-
	Progress	1	-
	Final	1	-

Legend: VP-visual perception

During the implementation of the individual educational-rehabilitation program, the student demonstrated resourcefulness, improved attention, memory, and reasoning ability. In the final sessions, better concentration, dedication to tasks, more appropriate visual perception and shape discrimination, and adequate visual memory were also observed.



Graph 1. Summary result of frequencies on visual perception

In Graph 1, the difference between the initial assessment results and the results obtained after one month and two months of implementing the individual educational-rehabilitation treatment is illustrated. In the first measurement, just before the commencement of the educational-rehabilitation treatment, the student scored 18 points in the area of "Visual Perception." One month later, he scored 22 out of a total of 30 points. Compared to the initial measurement, in the final measurement, the student achieved 25 points, indicating the significance of implementing the individual educational-rehabilitation treatment with visually impaired students (Graph 1). Alimović (2017) concluded in her research that functional vision assessment must become mandatory for all children with intellectual disabilities to timely recognize difficulties in visual functioning.

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The results of Adilović's research (2014) showed the importance of timely treatment and the need for early detection, systematic examinations of preschool children, and the prevention of strabismus and amblyopia, as younger children achieve better results in terms of improving visual functions. Dusek, Pierscionek, and McClelland (2010) described and compared measurements of visual functions within two groups of school-age children from 6 to 14 years old. One group consisted of participants with reading difficulties, and the other group comprised participants without reading difficulties. Refractive errors, visual acuity, binocular vision, and reading speed and accuracy were examined. The results did not show differences between the two groups of participants regarding refractive errors but indicated a high incidence of visual function anomalies in the group with reading difficulties. Furthermore, Teskeredžić and Radžo Alibegović (2015) investigated whether different types of visual impairments affect reading in visually impaired students. The sample consisted of elementary school students from the Center for Blind and Visually Impaired Children and Youth in Sarajevo. The research results showed a statistically significant difference within the group of visually impaired students with different types of visual impairments. Vučinić and Gligorović (2018) in their study stated that the school age is a significant factor for overall achievements in tasks assessing visual organization, and achievements in tasks such as completing pictures and shapes, recognizing unclear and incomplete drawings, and noticing differences significantly correlate with success in Serbian language and Mathematics. Duranović, Salihović, Ibrahimagić, Tucaković, and Veljačić (2010) examined auditory and visual discrimination and the influence of articulation pressure on understanding written text in children with reading and writing difficulties on a sample of 10 children with reading and writing difficulties and 10 children in the control group. The results showed differences between children with reading and writing difficulties and the control group in variables related to visual discrimination, and articulation pressure influenced the understanding of written text, while no differences were found in the variable related to auditory discrimination. Verdier and Ek (2014) also presented results showing that the outcome of education for students with different visual impairments varies depending on the level of academic achievement and reading ability, but it also greatly depends on the support needed and received. In the reading ability study, visually impaired students read at the same level as their peers, but their reading ability varied in terms of speed and fluency. Reading speed is important due to its potential impact on academic success, and researchers associate visual impairment with poorer academic achievement (Buhrow, Hartshorne, & Bradley-Johnson, 1998; as cited in Reed, Kraft, & Buncic, 2004). Tseng and Chow (2000) examined differences between children in terms of writing speed. By analyzing the results, it was concluded that visual-motor integration is a significant factor between groups of subjects with normal and lower writing speeds. It was also found that visual-motor integration emerges as a significant predictor of writing speed in children with lower scores. Kabeto (2015) conducted a study on the academic experiences of students with visual impairments in integrated schools. The study involved 7 visually impaired students, a principal, and three teachers. The results showed that in most cases, the attitude of teachers toward visually impaired students was mostly negative, and the social isolation of these students was a significant problem. It was also found that there is a lack of learning materials and exchange of teaching materials that meet the needs of these students.

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If visually impaired students are provided with appropriate support in performing school tasks and are included in rehabilitation programs, their academic success would be much better, as it would encourage the development of visual functioning. This is also evidenced by the research conducted by Shahed, Ilyas, and Hashmi (2016), concluding that students with visual impairments can achieve significant educational achievements if provided with appropriate support. This, in turn, would improve their self-confidence, leading to even greater achievements. Similar results were obtained by Eguavoen and Eniola (2016) in a study conducted on a sample of 27 visually impaired students. The results confirmed a connection between students' academic achievements and self-perception. It was also emphasized that a positive self-perception can affect their academic success. Đorđević (2007; as cited in Begić Jahić, 2019) in his work states that visual perception is an active mental process that depends on individual learning and experiences, and it is closely related to visual efficiency. He also suggests that visual stimulation or visual training represents a system of exercises aimed at developing and improving visual efficiency in visually impaired students. In the case of the lack of involvement of visually impaired individuals in rehabilitation treatment, even with mild visual impairments, avoidance of solving even the simplest visual tasks is common. Accordingly, by implementing individual educational-rehabilitation treatment, we will positively influence the development of visual abilities, as confirmed by many previously conducted studies suggesting the importance of involving visually impaired students in programs promoting visual perception. Zovko (1988) conducted research on a sample of 18 visually impaired students aged 5 to 14, including 9 boys and 9 girls. The aim of the research was to determine whether applying a specific vision training program could influence the visual perceptual development of visually impaired children. For the purposes of the research, the Diagnostic Assessment Procedure (DAP) test was used to collect data on the visual functioning of students in initial and final measurements. Based on the initial assessment, a visual training program was created, which lasted for six weeks. The research results showed a difference in the results of the initial and final measurements. The final measurement demonstrated a positive impact of vision training on the visual-perceptual development of visually impaired students. Supporting these results are the findings of Gothwal, Sumalini, and Bharani's research (2015), stating that the implementation of rehabilitation programs positively affects the improvement of visual functioning in visually impaired students. Similar results were obtained by Tončić (2018), concluding that visually impaired children achieve better results in reading, general visual functionality, and specific visual functionality after undergoing a vision rehabilitation program. Research on the impact of rehabilitation on the functional vision of visually impaired children has shown the importance of early rehabilitation to reduce the negative effects associated with visual impairment and improve their learning abilities (Ganesh, Sethi, Srivastav, Chaudhary, & Arora, 2013).

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CONCLUSION

The development of visually impaired students progresses in a slower and more challenging manner due to the impairment of visual functioning itself. Therefore, these students require more time to acquire content through educational activities. Early detection of visual impairments is crucial to promptly involve such students in organized rehabilitation treatments consisting of a series of exercises and activities tailored to their chronological age and abilities. Through such programs, we will work on enhancing the visual functionality of students, which will undoubtedly improve their quality of life. The analysis of research results, aimed at determining the impact of individual educational-rehabilitation programs on improving visual perception in students with visual impairments, led to the following conclusions:

- There is a need for vision exercises in working with students with impaired visual perception so that they can learn to use their remaining vision effectively in the educational process and daily activities.
- Before implementing a rehabilitation program, an initial assessment is necessary, and based on that assessment, a vision exercise program should be created.
- The results obtained in this research support the long-term implementation of individual educational-rehabilitation treatments to achieve predetermined goals in improving visual perception.
- It is also essential to ensure ongoing support for visually impaired students from teachers in the schools they attend to improve their academic success.
- Based on the results obtained, it is concluded that the individual educational-rehabilitation treatment positively influenced the area of visual perception covered by the treatment.
- Future research could focus on studying different rehabilitation programs aimed at improving the visual functioning of students to find the most effective way to impact visual functions in students with visual impairments.

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