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READING OF BLIND STUDENTS

Original scientific paper

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ABSTRACT

The aim of the research was to determine the success of reading Braille graphemes and understanding the read text in congenitally blind students. The research included 61 students: 30 congenitally blind students, 31 students who went blind later in life, aged 7-18, both genders who are in education and rehabilitation in the Centre for Blind and Visually Impaired Children and Youth Nedzarici in Sarajevo and in elementary schools in Tuzla Canton and Brcko District. The obtained results showed that there is no statistically significant difference in the ability to read Braille graphemes, and a statistically significant difference was shown in the understanding of the read text in Braille between congenitally blind students and students who went blind later in life.

***Keywords**: reading, blind students, reading comprehension*

INTRODUCTION

Reading is one of the fundamental communication activities, because it has great importance for individuals and for society as a whole. It provides an experience through which an individual can expand their knowledge, gain a better understanding of themselves and their environment, and develop intellectually, socially and emotionally (Jaegera, 2007). Difficulties at any level will affect the student's success in school and beyond (Hadzic, Tulumovic, 2009). Reading requires the coordination of a series of oculomotor and perceptual processes and the act of understanding. First of all, these are the processes that direct eye movements from location to location, the process of decoding the visual pattern of the word and its meaning, and the process of connecting the semantic and syntactic relations between successive words, phrases and sentences in the text (Roncevic, 2005). Tactile-kinaestheicn perception is indispensable in the cognitive development of a blind child, which is especially reflected in the use of Braille (Vucinic, 2005). Listening cannot completely replace the written word, which also points to the indispensability of reading and writing for blind and partially sighted students. Tactilely, as well as visually, they face the written word and text less often, resulting in slower reading (Dangiulli, Waraich, 2002). In the period of initial reading, comprehension is essentially determined by prior knowledge and experience, and by learning new content with the help of other methods, and not by relying only on the written text (Vances, 1999). In blind people, there are difficulties in the technical mastery of the reading process, which are primarily caused by the successive character of perception typical for the sense of touch, in contrast to the simultaneity that

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dominates the visual perception of people without visual impairment. The success of reading Braille depends on teaching methods, the intellectual development of blind students and the development of perceptual factors (Popovic, 1982). Reading Braille is a skill that requires the use of complex mental processes and is more complex than reading black print. For blind people to master reading, the following are important: speech-language development, auditory perception, development of motor and tactile functions, orientation in space, ability to apply thought operations of analysis and synthesis, level of social and emotional development and motivation (Tulumovic, 2013). Orientation in a small space is an important factor in the use of Braille, but also in the use of tactile maps and other aids for the blind. If a blind student is not able to orient themselves in a small space, most of the information will be unavailable to him. Good orientation in a small space is a basic prerequisite for successfully mastering Braille (Heller, 1999).

RESEARCH OBJECTIVE

The main aim of this research is to examine the success of reading Braille graphemes and understanding the read text in congenitally blind students and students who went blind later in life.

RESEARCH METHODS

Sample of respondents

The sample of respondents consisted of two groups: congenitally blind students and students who went blind later in life, from the population of regular elementary school students in the area of Tuzla Canton who are integrated in regular elementary schools of Tuzla Canton, and the population of the same type of students (same disability) of boarding school in the "Centre for the Blind and Visually Impaired Children and Youth" Nedzarici in Sarajevo. The research included a total of 61 students: 30 congenitally blind students and 31 students who went blind later, of which there were 39 boys and 22 girls aged 7-18, both genders who are in education and rehabilitation at the "Centre for Blind and Visually Impaired Children and Youth" Nedzarici - Sarajevo, and in elementary schools of Tuzla Canton and Brcko District.

Sample variables

An instrument designed by Cvetkovic (1989) was used to test the reading ability of congenitally blind students and students who went blind later in life. The test consists of two subtests: the first subtest for simultaneous recognition of Braille graphemes, the second subtest for reading vertical graphemes, mirror graphemes and graphemes with scattered dots. In examining the reading ability of congenitally blind students and students who went blind later in life, one part of the test adapted for the needs of this research (translated into Braille) was used: "Diagnostic kit for testing the ability of speech, language, reading and writing in children" (Bjelica and Posokhova, 2001). The following tests were used to test reading comprehension: "Sisters", "Lion and Mouse", "Red Sun", "Different Punishments", "Sarka", "Waterfall", "Seagull", "Jonathan Livington" and "Stećak"(medieval Bosnian tombstone).

Method of conducting research and measuring instruments

The research was carried out in the Centre for Blind and Visually Impaired Children and Youth - Nedzarici Sarajevo and elementary schools in Tuzla Canton and Brcko District. Blind students were examined individually. Preparation was carried out in all schools in advance, which consisted of the fact that the method of conducting the test was explained to the children in detail, and the parents of congenitally blind students and students that went blind later in life. School principals and teaching staff were also familiar with the test method. All the material that was used to test the ability to read was adapted to the specific abilities of blind children, i.e. tactile perception.

Statistical data processing

The SPSS 20.0 software package was used for data processing. Statistical significance is considered to be $p < 0.05$. In addition to the calculation of descriptive-statistical parameters, measures of central tendency and variability, a test on the difference (equality) of the arithmetic means of two or more basic sets was used as a parametric test. The non-parametric Mann Whitney test was used to determine the existence of a difference in mean values between two independent samples. An analysis of variance was used to test the existence of a difference in mean values between groups of respondents formed both by age (independent samples) and by other criteria.

RESEARCH RESULTS

Based on the data in Table 1, within the group of congenitally blind students, the average number of points for simultaneous recognition is 28.37 points with an average deviation of 2.36, while the average number of points for vertical graphemes is 9.70 points per student, with an average deviation of 0.84, the average number of points for mirror graphemes is 18.53 points per student, with an average deviation of 2.16, while the average number of points for graphemes with scattered dots is 29.10 points per student, with an average deviation of 1.79. Finally, if we look at the total number of points that congenitally blind students made when reading graphemes, the average number of total points for graphemes is 57.33 points per student with an average deviation of 3.81. Based on everything, we can see that the congenitally blind students had the highest average values for graphemes with scattered dots, during simultaneous letter recognition, followed by mirror graphemes and the lowest average values for vertical graphemes.

Table 1. Mean values and measures of dispersion for the group of congenitally blind students

	Total number of points for simultaneous grapheme recognition	Number of points for vertical graphemes	Number of points for mirror graphemes	Number of points for graphemes with scattered dots	Total number of points for graphemes
N	30	30	30	30	30
Mean	28.37	9.70	18.53	29.10	57.33
Mode	30.00	10.00	20.00	30.00	60.00
Standard deviation	2.36	0.84	2.16	1.79	3.81
Range	12.00	3.00	6.00	6.00	13.00
Minimum	18.00	7.00	14.00	24.00	47.00
Maximum	30.00	10.00	20.00	30.00	60.00
P25	27.75	10.00	18.00	29.25	55.00
P50	29.00	10.00	20.00	30.00	60.00
P75	30.00	10.00	20.00	30.00	60.00
Interquartile range	2.25	0.00	2.00	0.75	5.00

Table 2 presents the results of the group of students who went blind later in life. Within this group, the average number of points for simultaneous recognition is 28.06 points, with an average deviation of 4.80, then the average number of points for vertical graphemes is 9.55 points per student, with an average deviation of 1.34, and then the average number of points for mirror graphemes is 18.71 points per student, with an average deviation of 3.67, while the average number of points for graphemes with scattered dots is 28.35 points per later blinded student, with an average deviation of 5.47. Finally, if we look at the total number of points that this group of students made for graphemes, the average number of total points for graphemes is 56.61 points per student with an average deviation of 10.22. At the end of the analysis, we can see that this group of students achieved the highest average values for graphemes with scattered dots, followed by simultaneous recognition of letters, and for mirror graphemes and the lowest average values for vertical graphemes. If we look at the average values of congenitally blind and students who went blind later, we can conclude that both groups achieved the highest average values for the same graphemes.

Table 2. Mean values and measures of dispersion for the group of students who went blind later in life

	Total number of points for simultaneous grapheme recognition	Number of points for vertical graphemes	Number of points for mirror graphemes	Number of points for graphemes with scattered dots	Total number of points for graphemes
N	31	31	31	31	31
Mean	28.06	9.55	18.71	28.35	56.61
Mode	30.00	10.00	20.00	30.00	60.00
Standard deviation	4.80	1.34	3.67	5.47	10.22
Range	26.00	7.00	20.00	30.00	57.00
Minimum	4.00	3.00	0.00	0.00	3.00
Maximum	30.00	10.00	20.00	30.00	60.00
P25	28.00	10.00	18.00	30.00	56.00
P50	30.00	10.00	20.00	30.00	60.00
P75	30.00	10.00	20.00	30.00	60.00
Interquartile range	2.00	0.00	2.00	0.00	4.00

Table 3 presents the results in reading abilities for the simultaneous recognition of Braille graphemes between congenitally blind and students who went blind later in life, where we can see that the range of variation in the congenitally blind in the number of points in simultaneous recognition ranged from 7-10, the group median was 9.50. The range of variation in the students who went blind later for the same variable ranged from 1-10, the group median was 10. Also in the congenitally blind in the number of points for the simultaneous recognition of second-order graphemes, the range of variation ranged from 5-10, the group median was 10. The range of variation in students who went blind later for this variable ranged from 1-10, the group median was 10. While for the number of points achieved in the simultaneous recognition of graphemes of the third order, the range of variation ranged from 6-410, the group median was 10. Students who went blind later for the same variable had a range of variation from 2 to 10, the group median was 10. According to the results, we can see that there is no statistically significant difference in the number of points achieved in reading performance for the simultaneous recognition of Braille graphemes in congenitally blind students and students who went blind later in life.

Table 3. Results of the testing of the hypothesis about the existence of a difference in reading ability for the simultaneous recognition of Braille graphemes between congenitally blind students and students who went blind later.

Variables	**Congenitally blind students**	**Students who went blind later**	**Mann-Whitney U test ****	**P**
	Median (rank)	**Median (Rank)**		
Number of points for simultaneous recognition of Braille graphemes - first row	9.50 (7 – 10)	10 (1 – 10)	424.50	0.513
Number of points for simultaneous recognition of Braille graphemes - second row	10 (5 – 10)	10 (1 – 10)	424.00	0.470
Number of points for simultaneous recognition of Braille graphemes - third row	10 (6 – 410)	10 (2 – 10)	448.5	0.699

Looking at Table 4, we can see that the range of variation in the number of points for the congenitally blind when reading Braille vertical graphemes ranged from 7-10, the group median was 10. On the same variable, students who later went blind had a range of variation that ranged from 3-10, the group median was 10. Based on the obtained results, we can see that there is no statistically significant difference in the ability to read Braille vertical graphemes between congenitally blind students and students who went blind later.

Table 4. Results of testing the hypothesis about the existence of a difference in the ability to read Braille vertical graphemes between congenitally blind students and students who went blind later

Variables	Congenitally blind students	Students who went blind later	Mann-Whitney U test **	P
	Median (rank)	Median (Rank)		
Number of points in Braille vertical graphemes	10 (7 – 10)	10 (3 – 10)	440.50	0.583

Looking at Table 5, we can see, based on the results obtained in the examination of the ability to read Braille mirror graphemes between congenitally blind students and students who went blind later, that congenitally blind students had a range of variation on the variable in the success of reading Braille mirror graphemes ranged from 14-20, the group median was 20. Students who went blind later had a range of variation of 0-20 on the variable of reading Braille mirror graphemes, the group median was 20. Looking at table 5, we see that there is no statistically significant difference in the ability to read Braille mirror graphemes between the two groups of students.

Table 5. Results of testing the hypothesis about the existence of a difference in the ability to read Braille mirror graphemes between congenitally blind students and students who went blind later

Variables	Congenitally blind students	Students who went blind later	Mann-Whitney U test **	P
	Median (rank)	Median (Rank)		
Number of points in Braille mirror graphemes	20 (14 – 20)	20 (0 – 20)	404.00	0.296

According to the results shown in Table 6, where the range of variation in the number of points in reading Braille graphemes with scattered dots in the congenitally blind, ranged from 24-30, the group median was 30. The range of variation in the students who went blind later for the same variable ranged from 0-30, the group median was 30. Based on the obtained results, we see that there is no statistically significant difference in the ability to read Braille graphemes with scattered dots between the two groups of students.

Table 6. Results of testing the hypothesis about the existence of a difference in the ability to read Braille graphemes with scattered dots between congenitally blind students and students who went blind later

Variables	Congenitally blind students	Students who went blind later	Mann-Whitney U test **	P
	Median (rank)	Median (Rank)		
Number of dots in Braille graphemes with scattered dots	30 (24 – 30)	30 (0 – 30)	462.50	0.961

The results of the statistical processing of the data shown in Table 7, where we can see that students who later went blind compared to congenitally blind students were significantly better at understanding the read text, which can be seen on the SHVAT-SADR-ISPR-ODG variable

(The child completely understood the content and sense of what was read and gave correct and complete answers to all questions) 24 of them (77.42%), respectively, and congenitally blind 15 of them (50.00%), while on the variable DJEL-RAZ-PROČ (The child partially understands what is read, gives incomplete explanations, but manages to give the correct answer to auxiliary questions) congenitally blind students were slightly more represented, 8 of them (26.67%), while students who went blind later, 6 of them (19.35%) were less represented. Looking at the table, it can be seen that the students who went blind later fully understood the read text compared to the congenitally blind students, where 2 of them (6.67%) were not able to understand the read text. Also 5 of them i.e. (16.67%) were not able to understand the read sentence. Based on everything, this is also shown by the p-value, which is less than $p < 0.05$, and we conclude that there is a statistically significant difference between the ability to read and understand the read text between congenitally blind students and students who went blind later. It can be seen that among congenitally blind students there are more of them who partially understand what was read, while among students who went blind later there is a greater representation of those who fully understood the content and meaning of what was read and gave a correct and complete answer.

Table 7. Differences in the ability to read and understand the read text in congenitally blind students and students who went blind later

Variables	Congenitally blind students		Students who went blind later		Total	
	f	%	f	%	f	%
SHVAT-SADR-ISPR-ODG	15	50.00	24	77.42	39	63.93
DJEL-RAZ-PROČ	8	26.67	6	19.35	14	22.95
NE-RAZ-PROČ	2	6.67	0	0.00	2	3.28
NE-RAZ-PROČ-REČ	5	16.67	0	0.00	5	8.20
NE-RAZ-PROČ-RIJ	0	0.00	1	3.23	1	1.64
TOTAL	30	100.00	31	100.00	61	100.00
$\chi^2 = 10.349;\ \nu = 4;\ p < 0.035;$						

DISCUSSION

Blind students have a hard time mastering the reading process, which indicates that the students are not tactilely "matured". Difficulties in reading are caused by the wrong reading of letters, i.e. those letters that are processed the latest or not enough time is devoted to determining them: dž, ć, nj, đ, which belong to the vertical projection and due to poor perception and insufficiently developed and undifferentiated voice image of the letters such as: č-ć, đ-đ, š-s, n-nj. The consequence of these difficulties, which is reflected in reading, is that during reading the student pays more attention to the perception of letter recognition, and loses the orientation of the order in reading. Tulumovic (2007) investigated the existence of a difference in the success of reading and writing Braille vertical graphemes in congenitally blind students and students who went blind later, who were integrated in regular schools of the Tuzla Canton, the results showed that there is no statistically significant difference i.e. that the groups of congenitally blind students and students who went blind later do not differ in the success of reading and writing Braille vertical graphemes. However, statistically significant differences were shown in the success of reading and writing Braille mirror graphemes and Braille graphemes with scattered dots between the two groups of students. Carreiras and Alvarez, (1999) examined the process of understanding the reading of Braille on a sample of 26 congenitally blind people, and it was shown that reading Braille directly depends on the length of the word, the frequency of occurrence and the repetition of that word in the text. Long and rare words are less understood (Cunningham, 1993). Baker et al. (1995) examined the relationship between the variables of the Test for Assessment of Learning Success and Braille Reading Comprehension on a sample of 30 respondents. The obtained results showed that success is significantly related to chronological age, duration of damage, intelligence and educational achievement. Tulumovic et al. (2011) examined the educational achievements of students with visual impairment, in the area of

reading and writing, through the application of individualized educational programs in a regular school. The aim of the research was to examine: reading quality, reading speed, intonation, pace, rhythm and understanding of what was read, along with a text adapted to the child's individual abilities. In the initial phase, the child read the text correctly, but much slower, with irregular tempo and intonation, and disregarding the intonation meaning of punctuation. Furthermore, the results showed that the child understands the read words, sentences and text, but omits parts of the content when retelling independently. Furthermore, the systematic flow of the plot is missing; the introductory, main and final parts of the text are replaced. The child names the characters correctly, but omits the characters' traits when describing them. The child looks at the text while retelling. Reading the text is aimed at obtaining data on the understanding of what is read (Medenica, 2003). Tactile ability is very important for the tactile recognition of Braille's six dots as a symbol with a specific meaning (Tulumovic, 2008). Persons with reduced intellectual abilities are unable to successfully master reading and writing Braille (Nolan, 1969).

CONCLUSION

Based on the results of the research, we can see that there was no statistically significant difference in reading ability for simultaneous recognition of Braille graphemes, Braille vertical graphemes, Braille mirror graphemes, Braille graphemes with scattered dots between congenitally blind students and students who went blind later in life. These two groups differ in understanding the text read in Braille. Congenitally blind students were less successful in reading and reading comprehension compared to the students who went blind later. The reason for the better achievements of students who went blind later in life compared to the congenitally blind group should be sought first of all in a well-developed tactile-kinaesthetic perception.

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