Education and Science

Original Article

Vol 47 (2022) No 209 55-67

Determinants of Reading Efficiency of the Students with Visual Impairment

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Abstract

Successive, serial mode of language input during tactile reading has certain limitations compared to reading print and requires a lot of effort during decoding. The aim of this causal-comparative study was to identify some determinants of the students with visual impairment reading efficiency in Serbia. The sample consisted of 35 students of both genders, aged between 13 and 21, who used braille as primary reading medium. Three-dimensional Reading Test was used for the assessment. The measures of reading efficiency were oral reading speed and reading comprehension. Reading technique (one-handed vs. two-handed) and experience in tactile reading were monitored as determinates which could impede reading efficiency. ANOVA and Scheffe's post hoc tests were used to detect differences between various categories of readers who have visual impairment. Results showed that in average students with visual impairment read 51.61 words per minute, with great variability of reading speed. Statistically significant differences were found between the reading speed and reading experience, as well as between the readers who have visual impairment and use different reading techniques. Two-handed readers achieve good reading speed, while one-handed readers are considered as poor readers. The reading comprehension of the students who have visual impairment ranges high regardless of the reading speed, reading experience, or reading techniques. These results indicated that tactile reading does not jeopardize reading comprehension, it only threatens reading rate. Obtained findings could serve as meaningful guidelines for educational approaches to children with visual impairment.

Keywords

Children with visual impairment
Reading efficiency
Tactile reading
Reading technique
Reading experience
Oral reading speed
Reading comprehension

Article Info

Received: 11.08.2020
Accepted: 11.22.2021
Online Published: 01.19.2022

DOI: 10.15390/EB.2022.10271

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Introduction

Reading is a complex activity that involves visual and cognitive processing of written information, which is followed by transforming those visual forms of symbols to their auditory form to comprehend a written message (Fiorello, Hale, & Snyder, 2006; Vučković, 1993; Wetzel & Knowlton, 2000). The perceived letter string could directly activate the abstract cognitive representation of a given word in the reader's mental lexicon which then enables automatic identification of their meaning. The other way of reading is through grapheme-phonemic conversion which also provides access to the words meaning and comprehending the text (Bugarski, 1996; Grbović, 2017). Regardless of how one approaches the symbols' meaning, reading begins with the visual perception of written symbols (graphemes or words). When there are significant problems in visual perception, a way of receiving written information has to be different. People with visual impairment (VI) must use an alternative way of reading i.e. tactile sense.

Process of tactile reading

Tactile reading requires a lot of effort and accommodations and has certain limitations compared to print reading (Papadimitriou & Argyropoulos, 2017; Radojichikj, 2015). In order to recognize the symbol, tactile reading demands continuous movement of hands and fingers, i.e. hand coordination and smooth swiping of fingertips across each character (Knowlton & Wetzel, 1996; Ponchillia & Ponchillia, 1996). Primarily, perception is followed by the synthesis. The next step is the interpretation of individually obtained information (Simón & Huertas, 1998). For example, the reader who has VI perceives a braille cell and recognizes the individual dots, after which the perceived dots are synthesized into symbols at a cognitive level. Only then the dots can be transformed into meaningful information, i.e. letter (Papadimitriou & Argyropoulos, 2017). Also, readers who have VI must keep the individual decoded characters in memory until all the letters that make the word are identified (Daneman, 1988). So, it is clear that differences compared to reading print are primarily conditioned by the successive perception typical for the touch sense, as opposed to the simultaneity that dominates in visual reading (Carreiras & Alvarez, 1999; Simón & Huertas, 1998).

The most obvious external difference between braille readers is the way they use their hands and fingers, which can be defined as reading techniques (one-handed or two-handed reading). Lorimer (2002) found that some of the braille readers use just one hand (left or right) and merely marking the place with the other one, while some of them use both hands at the same time. Additionally, those who read with both hands can do it using hands conjoint (side by side), or using both hands independently, which is considered as most refined pattern (González-García, 2004; Papadimitriou & Argyropoulos, 2017). In general, according to the hand movement patterns, people with VI can be divided into two major categories: those who use one hand and those who prefer reading with both hands.

Comprehension, reading speed, and fluency have been identified as essential elements of reading (Aarnoutse & Van Leeuwe, 2000; Kolic-Vehovec & Bajsanski, 2001; Perfetti, 1985, as cited in Kolić-Vehovec, 2013; Vizek-Vidović, Rijavec, Vlahović-Štetić, & Miljković, 2003), regardless of literacy mode. Furthermore, a term reading fluency is often used as a global predictor of overall literacy, which means accurate reading with appropriate reading rate (Wormsley, 1996). But since the reading speed is closely related to reading comprehension capacity, it can be considered as an indication of reading skill and as a significant predictor of reading efficiency (Rončević, 2005).

One striking difference between braille and print reading is the time needed for decoding the input (Carreiras & Alvarez, 1999). Precisely, tactile reading is two to three times slower than reading

print (González-García, 2017; Laroche, Boulé, & Wittich, 2012; Pring, 1994; Simón & Huertas, 1998). The reason for that can be the sequential process of tactile reading (Foulke, 1982; Ponchillia & Ponchillia, 1996; Simón & Huertas, 1998). The main problem of the students with VI who persistently read slow, is that VI hinder the functional application of reading during schooling (Trent & Truan, 1997). If those students' reading speed is not competitive among their classmates, they are at risk of facing academic difficulties (Corn et al., 2002).

The efficiency of reading braille

Comparative analysis showed that even though braille reading rate gradually rises (Foulke, 1991, as cited in Knowlton & Wetzel, 1996), most readers who have VI do not reach the average reading speed of their typically developing peers. It is important to state that the braille reading rate is consistently lower, not only when compared to sighted readers but also to large print users, usually referred to as people who have low vision (Davidson, Appelle, & Haber, 1992; González-García, 2004; Simón & Huertas, 1998; Trent & Truan, 1997). This disparity is especially expressed in higher education levels and throughout life in general (Knowlton & Wetzel, 1996; Mohammed & Omar, 2011; Oshima, Arai, Ichihara, & Nakano, 2014; Simón & Huertas, 1998; Trent & Truan, 1997).

Reading speed is directly related to symbol decoding automatization, and represents a key factor for directing cognitive resources for access to the text meaning (Aarnoutse & Van Leeuwe, 2000; Kolic-Vehovec & Bajsanski, 2001; Perfetti, 1985, as cited in Kolić-Vehovec, 2013; Vizek-Vidović et al., 2003). The readers who have VI are expected to reach a certain level of symbol decoding automatization between the ages of 14 and 18, which enables faster integration of logical information (Foulke, 1991, as cited in Knowlton & Wetzel, 1996; Steinman, LeJeune, & Kimbrough, 2006). According to this, by the end of secondary school less than a quarter of braille readers reach reading speed of 100–120 words per minute (WPM) (Knowlton & Wetzel, 1996; Simón & Huertas, 1998; Trent & Truan, 1997; Williams, 1971). Usually, for readers who have VI aged between 12 to 15 years, the average speed of 60 WPM can be expected, and for students aged 15 to 18 years that value is 80 WPM. More than 90–100 WPM is expected only from experienced adult braille readers (Foulke, 1982; Simón & Huertas, 1998). Contrastingly, Mohammed and Omar (2011) found that the braille reading rate on the secondary education level (from 13 to 19 years) is on average only 33 WPM.

Only a small percentage of braille readers were able to achieve a reading rate within the usual values of typically developed students (Edmonds & Pring, 2006; Mohammed & Omar 2011). Importance of these findings is clear. Appropriate reading speed enables students to complete schoolwork efficiently. Researchers (Corn et al., 2002; Gompel, Jansses, van Bon, & Schreuder, 2003; Lovie-Kitchin & Whittaker, 1999) found that reading at 80 WPM and above are considered to be satisfactory. Oppositely, reading speed less than 60 WPM in higher grades of elementary school could be considered as poor achievement (Nolan, 1966, as cited in Trent & Truan, 1997). Also, it is important to emphasize that reading slower than 20 WPM after the first grade of elementary school is considered ineffective (Hatlen, 2001).

Some studies (Davidson et al., 1992; Gompel et al., 2003; Wright, 2009) were focused on the examining differences between tactile readers. The results show that independent use of both hands represents the most efficient method of tactile reading (Lorimer, 2002; Papadimitriou & Argyropoulos, 2017; Ponchillia & Ponchillia, 1996; Wright, 2009; Wright, Wormsley, & Kamei-Hannan, 2009). Two-handed readers use fingers of both hands to perceive braille symbols. Such reading shortens the time spent on recognizing individual symbols, reduces the number of regressive hands movements, and

enables an individual to scan twice as many symbols compared to one-hand reading technique (Davidson et al., 1992), which has significant influence on reading speed (Lorimer, 2002). The most efficient braille readers use both hands simultaneously and they also achieve the highest reading rates (Radojichikj, 2015).

The reading speed in general population is closely related to reading comprehension (Rončević, 2005), and speed of 250 WPM is considered a perquisite of successful reading comprehension (Perfetti, 1985, as cited in Kolić-Vehovec, 2013). The reason for such connections between reading speed and reading comprehension is limited capacity of working memory. As long as the reader is focusing on the processing of input information (recognizing the connection between perceived symbols and mental representation of this concept), his attention cannot be focused on the content (Grbović, 2017). In this regard, fluent oral reading at a rate equal to natural speech, indirectly indicates the comprehension level (Milatović, 1996), although it does not represent a guarantee of good text understanding (Kolić-Vehovec, 2013). Different studies point out that, despite the low reading speed, readers who have VI do not have comprehension difficulties (Emerson, Holbrook, & D'Andrea, 2009; Gompel et al., 2003; Trent & Truan, 1997). More precisely, Mohammed and Omar (2011) reported no difference in reading comprehension between children with VI and typical development (TD), while Papastergiou and Pappas (2019) as well as Edmonds and Pring (2006) found even better reading comprehension of children with VI.

Although most studies have suggested that two-handed pattern is better than the one-handed one in terms of reading speed, there are some ambiguities whether there is advantage related to the reading technique on comprehension of readers who have VI. Also, there is insufficient research data on if and how braille reading patterns affect reading comprehension. For example, Lowenfeld, Abel, and Hatlen (1969, as cited in Mason, 2012) stated that more two-handed braille readers scored in the upper quartile on the reading comprehension test in a comparison with one-hand readers. But González-García (2004) stated that there were no significant differences between readers who have VI who uses one or two hands for reading.

Based on results of aforementioned studies, it is clear that people with VI reading rate is usually low, but that does not indicate difficulties with reading comprehension. Also, a great number of studies refer to English braille, while only a few (Chen, Liang, Lu, Potměšil, & Zhong, 2019; Jarjoura & Karni, 2014; Papadimitriou & Argyropoulos, 2017) have braille reading in other languages in their focus. Further, insufficient number of research examining factors that could affect reading efficiency of the people with VI is noticeable.

In accordance with the above, the research problem is: which aspects of the tactile reading can interfere with its efficiency? The aim of this study was to identify some determinants of students with VI reading efficiency in Serbia. The operationalization of such a formulated aim was performed as follows: the effects that reading techniques and reading experience (years of using braille) have on main indicators of reading efficiency, which are reading speed and reading comprehension, were monitored.

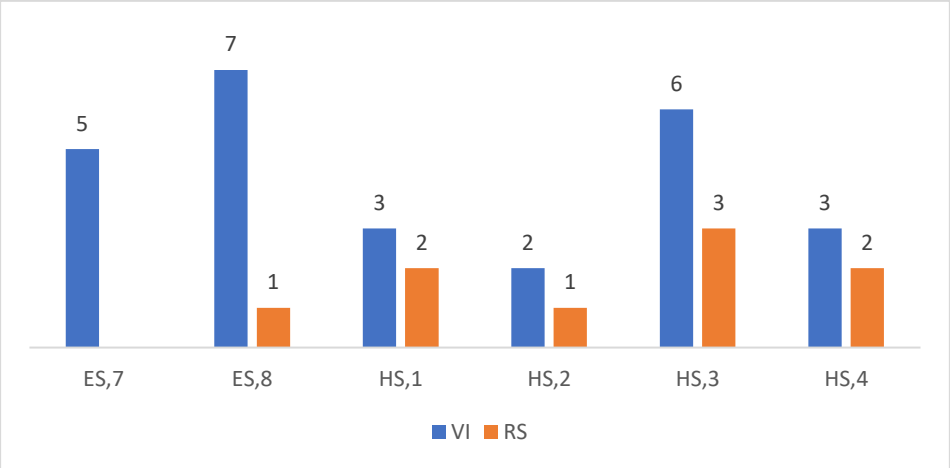
Method

This descriptive study with causal-comparative research design was used to determine possible causes or consequences of differences in groups of students with VI regarding reading efficiency. Aforementioned method is chosen because of the fact that questioned categorical variables cannot be manipulated (Fraenkel, Wallen, & Hyun, 2012; Johnson, 2001).

Research group

For this study purposive sampling as a non-probability sampling method was used. In forming the sample, the following criteria was met: VI according to the World Health Organization (2013) without any additional impairments. All participants were students older than 12 years and Serbian native speakers. Since in Serbia there are two elementary and two high special education schools for the children with VI, all students (N = 26) who, at the time of the research, were studying there, were included in the study. In addition to this, the researchers have contact with the Association of the Blind of Serbia (ABS), in order to gain information about children with VI attending in regular schools/inclusive educational settings. According to the information obtained from ABS, there were totally 20 children from different cities of Serbia who enrolled in regular schools. Eight students out of those 20 were speaking language of national minority (Hungarian), which caused them to be excluded from the sample since the reading test used in the research was in Serbian language. Also, two children whose parents did not give consent for participation in the research, as well as one child who did not want to participate in the research were excluded (11 children in total excluded).

Final sample of the study consisted of 35 students (26 from the special education schools and nine from the regular schools) with VI, both genders, who were diagnosed as legally blind (according to the WHO's criteria) and could only read braille. There were almost twice as many boys (n = 22; 63%) than girls who participated in the study. Students' age range was from 13 to 21, with an average of 16.97 years (SD = 2.01). The sample structure according to the grades and the schools they attend is represented in Figure 1.



ES - elementary school*, HS - high school, VI - school for the children with visual impairment, RS - regular school

Figure 1. Sample structure according to the grades and school respondents attend

* In Serbia elementary schools include the classrooms from 1st grade till 8th grade.

All participants (n = 13) from elementary schools (except one) and 13 (out of 22) high school students attended the schools for the children with VI. Most of the students from the sample attended the third grade of high school. At the time of the research, all of the participants were tactile readers, and on average they used braille for eight years (M = 8.31; SD = 2.56). The maximum experience with braille in our sample was 12 years (n = 5) and the minimum was 3 years (n = 3). Groups of children with VI in this research differ according to reading experience (duration of using braille during education), and students' reading technique (one-handed or two-handed scanning methods).

Data collection tool

In this study, the Three-dimensional Reading Test (Kostić, Vladisavljević, & Popović, 1983) was used to determine braille reading efficiency. This instrument is an adapted version of the Helen Sax reading test, which is regularly used in speech and language clinical practice in Serbia from 1980 (Janić & Stokić, 2019), although there is no psychometric verification (Čolić & Vuković, 2018). This reading test have a version for young children (up to 12 years old) and another version for older children and adults

(suitable for 5th-grade students – 12 years old and older). In the absence of standardized reading tests for Serbian language (Vukovic, Vukovic, & Stojanovik, 2010), this one was selected because of its availability, ease of use and the fact that it has been in use for 40 years. Aforementioned instrument enables the assessment of reading speed, reading accuracy, and reading comprehension, which are three dimensions that characterize good reading. In this study, version for older children and adults printed in braille was used. Text was in the form of daily newspaper article, it contained 157 words (title included), and it was unfamiliar to all participants.

Reading assessment procedure

Each student was tested individually, in a quiet room within the child's school. Before the recruitment, consent was obtained from the school principals, psychologists, classroom teachers as well as from parents. Additionally, oral consent was obtained from each child. The data were treated confidentially and all children were granted anonymity. The researcher informed the student about the task: to read the text aloud at their usual pace. According to the test protocol, reading was followed with retelling the story and answering 10 questions, without consulting the text. The number of correctly reproduced facts from the text represents a precise indicator of reading comprehension. Only completely appropriate answers were taken into consideration. The reading speed was measured with a stopwatch, and it was calculated as the number of words read per minute (WPM). In case of reading error (like skipping letters in words), the respondents immediately corrected themselves. These self-corrections were not counted as errors, but they led to a slight decrease in reading speed. During the reading, the scanning method i.e. reading technique of the students with VI was observed and they were noted as one-handed or two-handed readers.

The study was approved by the Ethical committee of the University of Belgrade, Faculty of Special Education and Rehabilitation.

Data analysis

For statistical analysis, the parametric tests were used, because it is considered robust enough to existence of eventual deviation from the normality of the distribution (Rasch & Guiard, 2004). In line with that, in this study central tendency measures (arithmetic mean, standard deviation, minimum, maximum), analysis of variance (ANOVA) and Scheffe's post hoc tests were used to detect differences between various categories of readers who have VI. Analyses were performed by using IBM SPSS 20.

Results

Reading speed

The average oral reading speed of braille readers from this research was 51.61 WPM (SD = 33.14). The lowest result was 10.2 WPM, and the highest one was 130.8 WPM. Considering that there are no formal criteria for the braille reading speed in Serbia, the evaluation was performed based on the evaluation criteria for literacy of children with typical development (TD) *(A priori evaluation criteria*, http://www.edu-soft.rs), as follows: oral reading speed less than 15 WPM is considered to be insufficient, while reading 35–40 WPM in the first grade is treated as excellent. Furthermore, oral reading speed in the first grade of elementary school in Serbian language can be expected to be even up to 82 WPM (Čolić, 2018) and at the end of elementary school up to 156 WPM (Pavlović-Babić, 1998). Based on the aforementioned research data (Čolić, 2018; Foulke, 1982; Pavlović-Babić, 1998; Simón & Huertas, 1998; Trent & Truan 1997), respondents from the sample were categorized according to achieved oral reading speed. The individual results are presented in Figure 2.

Legend: Category 1 - Low proficiency readers; Category 2 - Poor readers; Category 3 - Good readers; Category 4 - High proficiency readers

Figure 2. Braille reading speed - individual results

Group of low proficient braille readers (n = 11; 31.4%) included students who were reading between 10 and 24 WPM (Category 1). Group of poor braille readers (n = 10; 28.5%) included students who were reading between 38 and 52 WPM (Category 2). Group of good braille readers (n = 9; 25.7%) included students who were reading of 60–75 WPM (Category 3). Group of high proficient braille readers (n = 5; 14.2%) included students who were reading from 103 to 120 WPM (Category 4). In this research there were no participants who read between 80 and 100 WPM. If the situation was different, they would have been classified in the aforementioned category (Category 4).

Possible difference between the reading speed and the reading experience is questioned and the results are shown in Table 1. In reference to the reading speed, Table 1 clearly shows the change from the low proficient reader (after almost 7 years of using braille) to a good reader, which is achieved after ten years. More specifically, the seventh year of learning braille seems to be the key point in achieving reading fluency. Further analyzes showed that there are statistically significant differences between the reading speed and the reading experience ($F_{(3,31)} = 7.75$, $p = .001$) and that 43% of the variance in reading speed can be explained by the years of learning and using braille.

Table 1. The average reading speed concerning the reading experience

Reading experience	N	$\bar{X}$	SD	SE $\bar{X}$	Min	Max
Less than 7 y.	8	15.48	5.26	1.86	10.20	22.40
7-8 y.	10	52.06	10.53	3.33	35.50	63.30
9-10 y.	10	62.64	38.66	12.23	16.50	126.60
11-12 y.	7	76.50	33.40	12.62	37.02	130.80

The next observed parameter was the usage of tactile scanning methods. It was found that eight students (23%) used only one hand of them for scanning the text. Usually, they used their right index finger while no cells were scanned with the left index finger. However, the majority of the sample (77%) used their two hands together for reading. Descriptive data of reading technique and oral reading speed are shown in Table 2. The average reading speed achieved by one-handed readers is much lower compared to the speed achieved by the two-handed technique (30 WPM vs. 58 WPM respectively), and observed differences were statistically significant ($F_{(1,33)} = 5.15$, $p = .030$).

Table 2. Reading technique and reading speed of braille readers

	Reading technique	N	$\bar{X}$	SD	SE $\bar{X}$	Min	Max
WPM	One-handed	8	29.57	19.56	6.91	10.20	68.20
	Two-handed	27	58.14	33.75	6.50	10.30	130.80

Reading comprehension

Based on the number of correct answers (see *Test protocol*), it was found that all ten facts were correctly stated by nine respondents (25.7%), while seven respondents (20%) could not name only one fact related to the text. This finding pointed out that the largest percentage of the students from the sample (45.7%) showed a high level of reading comprehension. Twelve participants (34.3%) stated six to eight facts, while 20.1% (n = 7) were able to name five or fewer facts. In this study, there were no students who reproduced less than three facts. The average number of correctly stated facts from the read text was 7.77 (SD = 2.03).

Next analysis were related to the differences in reading comprehension in relation to defined categories of readers according to the monitored variables: reading speed, reading experience, and reading techniques. The descriptive results are shown in Table 3. ANOVA has shown that there were no statistically significant differences between reading comprehension and monitored variables: reading speed, reading experience and reading techniques.

Table 3. Average reading comprehension in relation to reading speed, reading experience and reading technique

	Reading comprehension	N	$\bar{X}$	SD	SE $\bar{X}$	Min	Max
Reading speed	Low proficiency	11	8.18	1.47	.44	6.00	10.00
	Poor readers	10	7.50	2.64	.83	3.00	10.00
	Good readers	9	7.44	2.07	.69	5.00	10.00
	High proficiency	5	8.00	2.12	.95	5.00	10.00
Reading experience	< 7 y.	8	8.25	1.39	.49	6.00	10.00
	7-8 y.	10	7.50	2.17	.69	4.00	10.00
	9-10 y.	10	7.10	2.03	.64	3.00	10.00
	11-12 y.	7	8.57	2.44	.92	5.00	10.00
Reading technique	One-handed	8	7.13	2.10	.74	4.00	10.00
	Two-handed	27	7.96	2.01	.39	3.00	10.00

Discussion, Conclusion and Suggestions

In this causal-comparative study, we aimed to identify some determinants of students with VI reading efficiency. The study was conducted with 35 students, both genders, aged between 13 and 21, in Serbia. According to Pavlović-Babić (1998) a great deal of attention in Serbian teaching practice is given to reading, not only during the first grade (the first year of training period), but until the end of elementary school. Most of the attention is given to the achievement of fluent, expressive reading aloud. In our country, studies that examine reading speed are rare, and they are showing only the results from the students with TD. According to such practice, this research is, as far as it is known, the only one which has a focus on the reading of those children.

This study showed that the oral reading speed of the participants is on average 51.61 WPM. That result confirms the data from different studies which showed that most students with VI exhibit low reading speed (Foulke, 1982; Knowlton & Wetzel, 1996; Simón & Huertas, 1998; Trent & Truan, 1997; Williams, 1971). Less than 15% of the sample read more than 80 WPM, which is considered to be appropriate for finishing school assignments within a satisfactory time frame. This result is similar and

confirms the assertions of several research papers (Knowlton & Wetzel, 1996; Simón & Huertas, 1998; Williams, 1971) which pointed out that, by the end of high school, less than 25% of students with VI read at the appropriate reading speed. However, such findings are a bit unanticipated. Unlike other languages (i.e. English, French, German), in Serbian language, one grapheme denotes one, always the same phoneme, which means that decoding process is very easy (Bugarski, 1996; Grbović, 2017). Due to the phonetic nature of the Serbian language which simplifies the reading process, it was already expected that those students would have better results.

Furthermore, the results of this research showed that the students with VI reading speed, although low on average, increases with time. It is important to indicate that 43% of the variance in reading speed can be explained by learning braille and using it in education, which means that an individual's reading experience is considered to be a significant predictor of appropriate braille reading speed achievement. A sudden change from a low proficient reader to a good reader happens after seven years of using braille, and this confirms Lusk and Corn's (2006) claims that six to seven years of practicing were necessary for reading braille efficiently. Additionally, this research indicates that students with VI required more than 10 years for mastering the reading skill, i.e. for becoming a high proficiency reader.

Besides an individual's experience as a braille reader, hand movement patterns during reading are highlighted as a determinant of successful braille reading, too. Literature (Davidson et al., 1992; González-García, 2004; Lorimer, 2002; Mousty & Bertelson, 1985; Wright et al., 2009) supported the superiority of two-handed reading in reference to reading speed. Obtained findings also confirmed that students who used two hands for scanning braille could read in average 58 WPM, while those who read with one hand achieved less than 30 WPM, and those differences were statistically significant. These data confirmed Davidson et al.'s (1992) research results which has been found that two-handed braille readers read almost twice as more braille cells compared to readers who used only one hand, which in most cases lead to permanently low reading proficiency.

Although researchers pointed out (Gompel et al., 2003) that the reading speed and reading techniques of children with VI individually vary greatly, their reading comprehension is generally at a high level. Also, the hand movement patterns do not lead to differences at the reading comprehension level of those students (González-García, 2017). It is confirmed that most of the students with VI from this research, showed a high level of reading comprehension, regardless of reading speed, reading technique, or reading experience. The high level of comprehension could be explained by the advantages in the domains of auditory attention and memory of the children with VI who often rely on hearing (Chen et al., 2019), but also by the fact that comprehension was measured by memorizing and stating explicit facts from the text and not by implicit inference (Edmonds & Pring, 2006). At the conclusion, it should be pointed out that tactile reading does not jeopardize reading comprehension, it only threatens reading rate. The reading rate is in a close relationship with a reading technique and reading experience, but reading comprehension of those students is not compromised by any of those determinants.

As a result of this research, there are some practical implications. It has been confirmed that, for efficient tactile reading in terms of achieving braille reading rate which allows completion of most of the school demands, long-term learning and minimum seven years of experience are required, as well as the use of the two-handed reading technique. Teachers in inclusive schools should bear in mind that even some of the students with VI who are considered good readers, might need more time to complete school tasks. This information is significant for providing equal and fair educational opportunities for all students. Furthermore, in order to improve those students' educational success and given the fact

that children with VI who start reading with one hand rarely include the other hand later during schooling (Wright et al., 2009), it is crucial to highlight importance of two-handed reading technique from the start of formal literacy process and to motivate teachers to apply the above.

Although small sample size is common for the research in the field of VI, it is considered as the limitation of this study. Also, low level of reliability and high level of bias are related to purposive sampling method and that is the reason why generalization of the results obtained and drawing conclusions should be carried out cautiously. Additionally, unequal gender sample structure is noticeable, so the recommendation for future research is to examine whether gender differences are present. Another limitation is not recording the testing procedure which is why it was not possible to obtain more complete data on the students with VI reading technique in terms of using fingers, not hands.

Conflict of Interest

The authors did not indicate a possible conflict of interest for this study.

Acknowledgments

This article is related to the research which performed in projects "Protocol Creation for Assessment of Educational Potentials of Children with Disabilities as Criteria for Creation of Individual Educational Programs", No. 179025, and "Social participation of persons with intellectual disabilities", No. 179017, financially supported by the Ministry of Education, Science and Technological Development-Serbia.

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