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Spelling accuracy and students with visual impairments: A quantitative and qualitative approach of spelling errors

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ABSTRACT

The present study investigates braille spelling accuracy in forty-nine Greek students with visual impairment in relation to students' type of blindness, age at loss of sight, level of education and educational setting, via a standardized test, which evaluates spelling accuracy in Greek language. Miscue analysis revealed that participants performed a statistically significant number of etymology type errors in braille spelling. Moreover, adventitiously blind students and students who were taught braille in primary mainstream educational settings performed significantly larger number of etymological type of errors compared to the rest of the participants. Qualitative analysis of spelling errors may help special teachers to perceive more profoundly the nature and characteristics of etymology errors, in order to implement effective strategies in instruction.

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1. Introduction

Spelling constitutes a critical component of literacy, which occupies a pivotal role in the understanding of the relationship between graphemes and phonemes (Moats, 2005). In essence, spelling is a developmental process and consists of stages, which are compatible with students' understanding of letter sound relationships (Beers, 2003; Templeton, 2002). These letter sound relationships become more meaningful to students as their understanding transcend from a lower level to a higher level. Spelling is considered to be a more difficult task for students who are blind because they have to learn to read and write signs, abbreviations and contractions in braille and yet need to learn by heart the full spelling of a word to produce a print copy (Arter, 1997). There is evidence that children with severe visual impairment are more likely to experience difficulties in achieving levels of accuracy in spelling of their sighted peers (McCall, 1999).

Braille writing is a tactile code of raised dots that enables individuals with low or no vision to access information by touch. Its fundamental element is the braille cell, which consists of six raised dots distributed into the scheme of two columns and three rows. The pattern of the raised dots creates a total of 63 distinct combinations indicating an alphabet letter, a numeral or a punctuation mark. For the time being, there is a small piece of information concerning the mechanical and conceptual process of braille writing. Students with visual impairment (VI) are expected to use the same cognitive processes with their sighted peers during writing tasks (Clark-Bischke & Stoner, 2009). As for the mechanical process, it has been supported that characters are initially stored as shapes (i.e. schemata: intellectual structures constituted by haptic memory) in students' mind (Argyropoulos & Martos, 2006). In turn, when students write braille through a brailler (i. e. a device with keys corresponding to each of the six dots of the braille code, a space key, a backspace key, and a line space key) or through a

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braille notetaker (i.e. portable device with an incorporated refreshable braille display that enables people with visual impairment to read and write in braille), these shapes (schemata) are retrieved and rendered by specific finger movements (Wells-Jensen, Schwartz, & Gosche, 2007).

Miscue analysis of spelling errors is a rich source of information, because it sheds light not only on cognitive mechanisms of spelling but also on specific type of difficulties that individuals are facing during the writing process (Protopapas, Fakou, Drakopoulou, Skaloumbakas, & Mouzaki, 2013). The main categories of spelling errors concern phoneme-grapheme correspondence, grammar and etymology. It seems that phonological type errors in braille writing are due to a. similarity of braille characters (Erin & Wright, 2011), b. misplaced key strokes (Grudin, 1981), and c. failure to master the braille code (Koenig & Ashcroft, 1993). Spelling also depends on morphemes and etymological spelling (Caravolas, 2004). More specifically, it has been reported that grammar errors reveal difficulties regarding suffixes (Aidinis, 2010). Students with visual impairment are likely to experience more difficulties with irregularities and more complex orthographic rules compared to their sighted peers (Erin & Wright, 2011). On the other hand, etymological errors depict difficulties in memorizing the orthography of the word or inadequate awareness of the common orthography of the stem of the word. These errors may be due to limitation or exclusion of children who are visually impaired from a wide range of environmental stimuli and experiences (Tulumović & Huremović, 2012) such as reading maps or watching a film at the cinema.

Several studies have shown that the performance of students with VI in spelling accuracy was similar to the performance of sighted either in individual words (Clark & Stoner, 2008; Dodd & Conn, 2000; Gillon & Young, 2002; Grenier & Giroux, 1997) or text (Clark-Bischke & Stoner, 2009). On the contrary, some researchers claimed that students with VI fall short of their sighted peers' performances due to lack of vision (Arter & Mason, 1994; Arter, 1997; McCall, 1999). These researchers claimed that images of many words are imprinted on the memory of sighted children, while many of them learn to read and write before starting school (Arter, 1997).

In a sample of 36 students with VI ranging from the first to fourth grade Emerson, Sitar, Erin, Wormsley, and Herlich (2009) found that the vast majority of the participants performed satisfactorily or higher than it was expected. In addition, Clark-Bischke and Stoner (2009) assessed the spelling accuracy of 20 students with VI through the Test of Written Spelling (TWS-4) and two braille writing samples. They focused on the quantity of the correct spelled words and suggested that spelling accuracy did not increase in proportion to the increase of students' age. Argyropoulos and Martos (2006) conducted a detailed qualitative and quantitative mapping of spelling errors of 16 Greek students who were visually impaired. All errors were categorized into phonological (PT) and non-phonological types (NPT) that met the peculiarities of the Greek language. Students' performance was highly accurate. The elementary school students (aged 11–12) made more PT and NPT errors. PT errors were attributed to lack of experience towards spelling. However, the most important finding was that the lyceum (lyceum corresponds to 10th-12th grade) students with VI made more PT and historic type errors compared to high school students (high school is equivalent to 7th-9th grade). According to the researchers, this finding may have depicted excessive use of aural reading during lyceum by secondary students which minimized the degree of consolidation of their schemata (Argyropoulos & Martos, 2006).

Based on relevant literature review, it could be deduced that the vast majority of the aforementioned studies focused mainly on quantitative methods, describing results on a descriptive basis. The present study attempts to encompass aspects of spelling combining quantitative and qualitative methods in order to depict a more clarified categorization of the non-phonological errors into grammatical and etymological errors. Hence, it is argued that the present research approached holistically the braille spelling performance of students with VI with the assistance of an appropriate research tool.

1.1. Research questions

The first research hypothesis supports an association between the amount of correct answers in braille spelling and a. the type of blindness (congenital blindness versus acquired blindness), b. the level of education (primary versus secondary), c. the degree of blindness (total versus partial) and d. the educational setting where students were taught braille (special versus mainstream setting) (Hypothesis 1). In parallel, a qualitative analysis of the spelling errors was conducted, where spelling errors were categorized in phonological, grammatical and historic/etymological. The second hypothesis was based on the suggestion that sighted Greek students are more prone to etymological errors (Protopapas, Simos, Sideridis, & Mouzaki, 2012). Proportionally, it was assumed that students with VI would perform significantly more etymological errors compared to phonological and grammatical errors as well (Hypothesis 2). Finally, researchers attempted to find out potential correlations among the error categories on the basis of the type of blindness, level of education, degree of blindness and educational setting where students were taught braille.

2. Method

2.1. Participants

The authors followed the ethical principles of the Declaration of Helsinki and obtained signed consent from the participants using the appropriate forms and procedures suggested by the World Medical Association. The authors obtained consent from the Greek Ministry of Education and the Greek Institute of Educational Policy (GIEP) which was established in 2011 with Public Law 3966 (Government Gazette A′ 118/24-05-2011). GIEP operates for the benefit of public interest as an

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