The Effectiveness of the Wilson Reading System on Multiple Measures of Literacy for a Braille-Reading Student with a Language-Based Learning Disability

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Abstract

Visually driven and braille driven reading share common language attributes, yet the skills, cognitive load, and sensory system processing required to perform either task are dramatically different. Despite the significant differences in the processes of braille and print reading, traditional approaches to developing braille literacy have primarily relied upon adaptations of approaches used to establish sighted literacy. Furthermore, little research has investigated the effectiveness of these strategies for students who read braille. The outcomes, however, are clear; braille readers struggle to develop effective decoding and fluency skills. One promising literacy program, called the Wilson Reading System (WRS), has been adapted for braille literacy development because it emphasizes fluency and comprehension. Recent research suggests positive qualitative outcomes using the WRS for students with visual impairments. However, no quantitative changes in braille decoding and fluency using the WRS have been established. This case study extends previous findings to assess the effectiveness of the WRS on decoding ability, comprehension, oral fluency rate, and reading motivation in a braille-reading student with a language-based learning disability. Results demonstrate an increase in decoding ability, comprehension, reading motivation, but no sign of improvement in oral reading fluency.

Introduction

Print reading instruction involves five key hierarchical areas: phonemic awareness, phonics, fluency, vocabulary, and comprehension of text (National Reading Panel, 2000). In particular, reading fluency represents a combination of reading with speed, accuracy, and expression (Saviano & Hatton, 2013). Therrien and Kubina (2006) show that fluency is positively associated with a number of literacy outcomes to predict reading comprehension even better than direct measures of comprehension, such as questioning and re-telling. Visually impaired braille readers tend to experience difficulties developing reading comprehension and fluency (Savaiano, Compton, & Hatton, 2014), likely as a result of less incidental exposure to written language during early childhood, affecting the development of phonological awareness skills, decoding, and letter-sound recognition (Erickson & Hatton, 2007). Braille readers also lag behind in fluency compared to peers who are print readers because braille requires more cognitive resources as it utilizes tactile processing skills (Wright, Wormsley, & Kamei-Hannan, 2009). The tactile sensory system can only perceive objects one aspect at a time, compared with the visual sensory system that allows for simultaneous perception of objects. Thus, more cognitive resources are devoted to decoding braille, in a one-by-one manner, than print (Pring, 1994). In line with this theory, some research suggests braille readers devote more cognitive resources to word-level processes than print readers (Carreiras & Alvarez, 1999). There are additional challenges for visually impaired students in achieving reading fluency in the transition from reading

uncontracted, or alphabetic, braille, to contracted braille, which adds 189 contractions, or short-form words, to uncontracted braille (Herzberg, Stough, & Clark, 2004; Savaiano & Hatton, 2013).

Despite the significant differences in the processes of braille and print reading, reading intervention strategies for visually impaired students are adapted from strategies for sighted students. Many of these interventions have been shown to be unsuccessful for braille readers. For example, guided reading programs often utilize pictures to scaffold emerging vocabulary and comprehension. For students with visual impairments, this strategy is ineffective and fails to support learning (Kamei-Hannan & Ricci, 2015). The method for teaching phonics to sighted students is another example of an unsuccessful literacy strategy adapted for students with visual impairments. Sighted students first learn to recognize letters of the alphabet, and then use that knowledge to develop decoding skills. However, for students with visual impairments, research suggests teaching uncontracted, or alphabetic, braille alongside common contractions (e.g. "and," "but," "people") leads to improvements in vocabulary, decoding, and comprehension (Emerson, Holbrook, & D'Andrea, 2009; Kamei-Hannan & Ricci, 2015). Therefore, many of the literacy strategies used for sighted students are ineffective for use with students with visual impairments.

One promising intervention noted in qualitative research for improving literacy for students with visual impairments is the Wilson Reading System (WRS). The WRS is a twelve-step multisensory intensive reading program emphasizing direct instruction in phonics and phonological awareness that utilizes multisensory learning, such as visual, kinesthetic, auditory, and tactile methods of instruction (Ritchey & Goeke, 2006). Each highly structured lesson consists of ten sections that address all five components of reading recommended by the National Reading Panel - phonemic awareness, phonics, fluency, vocabulary, and comprehension of text (2000). The braille adaptation of the WRS is conceivably beneficial for students with visual impairments because it emphasizes fluency and comprehension, which are problematic areas for braille reading training (Savaiano, Compton, & Hatton, 2014). The braille version gradually introduces contractions within each stage of the system (Perkins School for the Blind, 2013), and progresses in difficulty only when automaticity is achieved in the current stage. The WRS takes around two to three years to significantly improve reading to match same-age peers.

For sighted students, quantitative research shows significant improvements in fluency, decoding, and comprehension after using the system (Duff, Stebbins, Stormont, Lembke, & Wilson, 2016; Stebbins, Stormont, Lembke, Wilson, & Clippard, 2012; Wilson & O'Connor, 1995;). In the adaptation of the WRS for the blind, some research has shown a qualitative benefit (Rowley, McCarthy, & Rines, 2014), but no quantitative evidence yet exists to reveal the full benefit of adapting the WRS for braille readers. The current case study will contribute to the emerging evidence of the WRS as an effective reading intervention strategy for students with visual impairments who are struggling braille readers. It is hypothesized that participants will experience an improvement in oral reading fluency rate, decoding, comprehension, and reading motivation following the intervention.

Methods

Participants

Participants were selected using the following criteria: participants 1) were identified as blind or low vision, and were receiving services through a Blind/Low Vision school program, 2) demonstrated average intelligence, 3) used braille as their primary literacy medium, 4) were identified as struggling braille readers according to teachers, and 5) were willing to participate in this study.

It is estimated that sixty-five percent of students with visual impairments also have multiple disabilities (Ivy & Hatton, 2014). Many of the possible participants for this study were disqualified because they had multiple disabilities, including intellectual disabilities. Further, only one student consented to participation in this study. Thus, only one participant fit the criteria for this study. The participant was enrolled in Grade 8, was receiving services from the Blind/Low Vision program in his school district, and used braille as his primary literacy medium. According to the participant's individual education plan, he has been diagnosed with a language-based learning disability, is of average intelligence, and reads at a Grade 6 level.

Experimental Design

A case study design was utilized in this study to examine the effectiveness of the WRS for improving oral reading fluency, comprehension, decoding ability, and reading motivation. The case study design is commonly used in educational research, often in program evaluation (Crossley & Vulliamy, 1984). With a case study design, curriculum can be investigated deeply, focusing not only on the final learning outcome but also on the processes of learning itself (Crossley & Vulliamy, 1984). Furthermore, visual impairment is a low-incidence disability; thus a case study was suitable given the small population size (Hatton, 2014).

Materials

The WRS, including a Level 2B Student Reader, Level 2B supplemental braille worksheets, magnetic print-braille letter tiles, sound cards, and word cards, was used for the baseline measurements and the intervention (Wilson, 2013a; Wilson 2013b). Level 2B was chosen instead of Level 1B, 1A, or 2A due to the participant's age and grade level (Wilson, 2013a). The Wilson Assessment for Decoding and Encoding (WADE) was used for baseline and intervention measurements of decoding ability, and the Motivation to Read Profile – Revised was used for pre- and post-intervention measurements of reading motivation (Malloy, Marinak, Gambrell, & Mazzoni, 2013; Wilson, 1998). The sound cards, word cards, and magnetic braille tiles of the WRS were in uncontracted Unified English Braille (UEB), while the supplemental braille worksheets were in contracted UEB. The WADE was in uncontracted UEB. The Motivation to Read Profile – Revised was delivered orally (Malloy, Marinak, Gambrell, & Mazzoni, 2013). Comprehension was assessed using an uncontracted braille copy of a grade-appropriate novel, I am a Taxi, that the student was reading and discussing in his class at school (Ellis, 2006). Two different passages were used for the baseline measurement and the post-intervention measurement. Additionally, a stopwatch was used to collect data on oral fluency rate.

Measurements

There were four dependent variables measured within this case study: 1) oral fluency rate, 2) decoding ability, 3) comprehension, and 4) reading motivation. These variables were chosen because they are consistently measured in literacy studies, particularly in studies on the effectiveness of the WRS (Duff, Stebbins, Stormont, Lembke, & Wilson, 2016; Stebbins, Stormont, Lembke, Wilson, & Clippard, 2012; Wilson & O'Connor, 1995).

Oral reading fluency was represented as the number of read words per minute (wpm). Experienced braille readers tend to read around 70-100 wpm (Pring, 1994). The participant read two different uncontracted braille passages from I am a Taxi, an age-appropriate novel he was reading and discussing at school, one passage during the baseline phase, and a different passage after the intervention period (Ellis, 2006).

Decoding ability was measured using the WADE (Wilson, 1998). The WADE is made up of three sections: 1) sounds, 2) reading, and 3) spelling. In the sounds section, the participant was asked to identify the sound of various graphemes, including consonants, digraphs and trigraphs, vowels, and welded sounds. In the reading section, the participant was asked to read from three progressively challenging lists of real words and nonsense words – words that did not follow the rules of the English language. In the spelling section, the participant was asked to orally spell words and the percentage correct score was reported.

Comprehension was defined in this study as the percentage of content words provided by the participant in an oral retelling following the participant reading a passage from I am a Taxi (Ellis, 2006). Content words were nouns, adjectives, or verbs chosen by the researcher for their relevance to the understanding of the passage (Savaiano & Hatton, 2013). The oral retelling consisted of the participant telling the researcher about the preceding passage in as much detail as possible.

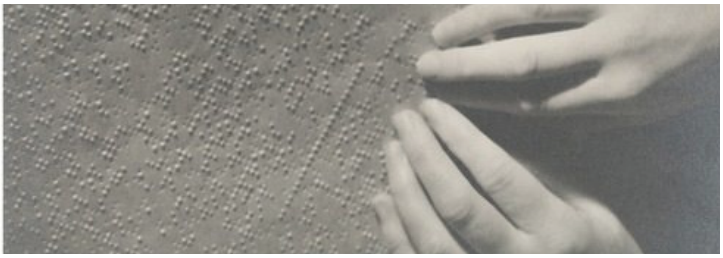
Reading motivation was orally assessed using the Motivation to Read Profile – Revised, which consisted of twenty questions regarding the participant's value and self-concept as a reader. The value and self-concept scores were both scored out of a maximum of 40 points. The two scores together represented the reading motivation score, out of a possible 80 points (Malloy, Marinak, Gambrell, & Mazzoni, 2013). The participant declined to answer one question in the Motivation to Read Profile – Revised; therefore, the reading motivation score in this case study was out of a possible 76 points.

Procedure

In the baseline phase, data were collected on oral fluency rate and comprehension. The participant read passages from I am a Taxi for the collection of these data (Ellis, 2006). The participant would read three to five passages that were timed by the researcher and was asked to retell the passage using great detail. The baseline phase consisted of three sessions, approximately thirty minutes each.

Intervention

In the intervention phase, the participant was guided through Level 2B of the WRS (Wilson 2013a). The session would begin with a sound cards drill using the Wilson Level 2B sound cards, focusing on phonemic awareness and phonics. These cards would be in both uncontracted and contracted UEB. Then the participant would read aloud the Wilson Level 2B word cards to improve automaticity and fluency, in uncontracted and contracted braille. The participant would then read a list of contracted words from the Wilson Level 2B supplemental braille worksheets. After reading the words, the participant would read sentences from the Wilson Level 2B Student Reader in contracted braille. Finally, the participant would read a passage in contracted braille from the Wilson Level 2B Student Reader, and then would answer comprehension questions regarding the passage from the Wilson Level 2B supplemental braille worksheets. Each lesson took approximately one hour to complete. The data were collected over eight sessions, and was constrained to the academic year. Following the last lesson in the intervention phase, data were collected to measure changes in oral reading fluency, decoding, comprehension, and reading motivation.



Results

Decoding Ability

Decoding ability is a measure of letter-sound recognition (Erickson & Hatton, 2007), and results are presented in Table 1. In the sounds portion of the WADE, there was an increase in the percentage correct score for consonants and vowel sounds, while there was no change in digraphs/trigraphs or welded sounds. In the reading portion of the WADE, there was an increase in the percentage correct score for Reading List 2 and Reading List 3, while there was no change in Reading List 1. In the spelling portion of the WADE, there was no change in the percentage correct score from the baseline to after the intervention. Overall, the participant experienced an increase of 3.5% in decoding ability.

Table 1. Results of the Wilson Assessment of Decoding and Encoding

	Baseline (percent correct)	Post-intervention (percent correct)	Percent Change
Consonants	91.6	95.8	4.2
Digraphs/Trigraphs	83.3	83.3	0
Vowel sounds	83.3	100.0	16.7
Welded sounds	100.0	100.0	0
Reading List 1	100.0	100.0	0
Reading List 2	93.3	100.0	6.7
Reading List 3	80.0	93.3	13.3
Spelling	81.8	81.8	0

Comprehension

During the baseline phase, the participant retold an average of 58.6% (range 41% - 75%) of content words. Following the intervention, the participant retold an average of 72.7% (range 67% - 80%) of content words, for an increase of 14.1%.

Reading Motivation

During the baseline phase, the participant scored 62 out of 76 on the Motivation to Read Profile – Revised (Malloy, Marinak, Gambrell, & Mazzoni, 2013). Following the intervention, the participant scored 71 out of 76, for an increase of 11.8%.

Oral Fluency Rate

Oral reading fluency was represented as the number of read words per minute (wpm). The participant had a baseline oral fluency rate of 61 wpm in uncontracted braille reading after three sessions. Following the intervention, the participant had an oral fluency rate of 47 wpm in uncontracted braille reading, for a decrease of 22.9%.

One unexpected improvement not previously identified within the experiment was the participant's improvement in contracted braille. Prior to the intervention, the participant knew a few braille contractions, but through the intervention, the participant experienced a qualitative improvement in his knowledge of contractions.

Discussion

The results of this study indicate that the WRS may be effective for struggling braille readers in improving comprehension, decoding ability, and reading motivation. The participant experienced a 14.1% increase in comprehension, an overall increase of 3.5% in decoding ability, and an 11.8% increase in reading motivation following the eight sessions. These results demonstrate that the WRS, adapted to visually impaired readers, does indeed quantitatively benefit improvement in areas of literacy where braille-reading students lag behind sighted peers (Erickson & Hatton, 2007; Savaiano, Hatton, & Compton, 2014).

Results revealed no sign of improvement, and in fact, a slight decrease, in oral reading fluency after the intervention. It is important to note that the participant was concurrently receiving uncontracted braille training at school during the course of the intervention. Although the participant's oral reading fluency did not improve, a more salient result of this study was the participant's increased understanding of contractions. While there is no quantitative evidence to support this claim, the participant frequently noted that he perceived a greater fluency in his ability to read contractions as a result of the intervention. Since fluency was measured using uncontracted braille passages, contracted braille fluency was not accurately measured to quantify this improvement. Additionally, qualitative measures of the WRS for braille-reading students revealed improvements in fluency over longer periods of time, such as two years, suggesting similar quantitative results could be achieved in an extended time frame (Rowley, McCarthy, & Rines, 2014). Furthermore, despite the decrease in oral reading fluency, the participant did experience an increase in three out of the four measures.

Limitations

Although the case study design is useful in investigating instructional strategies more in-depth than larger quantitative studies, the research is limited in its generalizability (Crossley & Vulliamy, 1984). Furthermore, the population of braille readers is small and heterogeneous, so the WRS may vary in its effectiveness for students with other needs or disabilities (Hatton, 2014). The only other case study conducted on the use of the WRS for braille readers had two participants, so although the research base is small, this study has contributed to its growth (Rowley, McCarthy, & Rines, 2014).

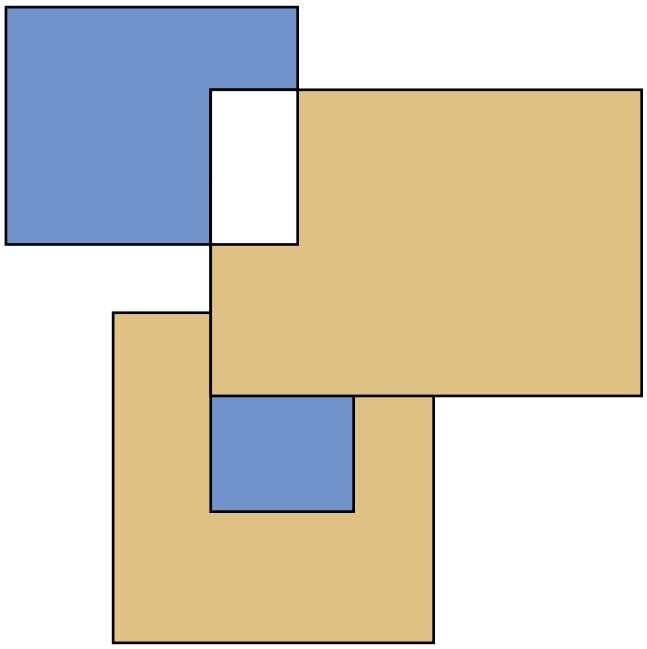
The positive results in comprehension in this case study may also be limited. The improvement in comprehension may have been influenced by classroom instruction the participant was receiving regarding I am a Taxi, in the form of discussions of the novel's themes. Although the comprehension assessments in the intervention asked the participant to recall specific details, not necessarily overall themes, from a two- to three-minute passage read by the participant, it is still plausible that outside instruction could have affected the results.

Another major limitation was the time constraint of this study. As this research was confined to an academic year, the WRS could not be completed in its entirety. Since the WRS takes two to three years to complete, a longer time frame would have increased the study's validity (Wilson & O'Connor, 1995). The WRS has demonstrated to be effective for sighted students when examined for one to two years, and qualitative results using braille-reading students yielded similar results (Duff, Stebbins, Stormont, Lembke, & Wilson, 2016; Rowley, McCarthy, & Rines, 2014; Stebbins, Stormont, Lembke, Wilson, & Clippard, 2012; Wilson & O'Connor, 1995). Even over a short period of time, the improvements in comprehension, decoding ability, and reading motivation in this study reveal the positive impact of the adapted WRS for the visually impaired.

Implications for Future Research

The results of this study suggest the WRS is an effective practice for use with braille-reading students with language-based learning disabilities. The WRS has been quantitatively demonstrated to be an effective strategy for improving fluency, decoding, and comprehension (Duff, Stebbins, Stormont, Lembke, & Wilson, 2016; Stebbins, Stormont, Lembke, Wilson, & Clippard, 2012; Wilson & O'Connor, 1995). Fluency, comprehension, and decoding are key measures of literacy for both print and braille readers (Savaiano & Hatton, 2013). Qualitative evidence has shown that the WRS may be effective in improving comprehension, decoding ability, and oral reading fluency for struggling braille readers (Rowley, McCarthy, & Rines, 2014). The current case study enhances these findings by adding

quantitative measurements of comprehension, decoding ability, oral reading fluency, and an added component of reading motivation, which is a key predictor of overall literacy achievement (National Reading Panel, 2000). An unexpected result of the current case study was the effect of the WRS on qualitatively improving contracted braille reading fluency. Further research should be conducted using a larger sample, over a longer period of time, to accurately measure the effectiveness of the system on a more diverse sample of braille readers. If the current research were to be replicated, greater quantitative focus should be paid to the effectiveness of the WRS in oral reading fluency for contracted braille. Such a focus would have implications for using the WRS for struggling, beginning braille readers.



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