EVALUATING THE IMPACT OF HEADSPROUT ON THE READING ACHIEVEMENT OF ENGLISH LANGUAGE LEARNERS

by

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(Under the Direction of Scott Ardoin)

ABSTRACT

As the number of English Language Learners (ELLs) in American schools increases so does the need for effective reading interventions for this at-risk population. However, the research in this area is very limited. As such, this study examined the impact of the Headsprout Early Reading program on the reading achievement of kindergarten, first, and second grade ELLs. The Headsprout Early Reading program is a research based program that is computer delivered and appropriate for students who read below a second grade level. Twenty-nine ELLs were assigned to either the control group or the Headsprout Early Reading program treatment group. Results indicated no difference between the treatment group and the control group on three measures of reading achievement.

INDEX WORDS: English Language Learners, Reading, Headsprout

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CHAPTER 1

INTRODUCTION

According to the U.S. Department of Education, the population of English Language Learners (ELLs) in American schools has increased dramatically in the past 30 years. Recent estimates approximate that 21% of school aged children speak a language other English in the home (U.S. Department of Education, 2010). The rising number of students whose English proficiency is limited spawns increasing challenges for educators such as closing the achievement gap that exists between minority English Language Learners (ELLs) and their white, middle class peers (McCardle, Mele-McCarthy, Cutting, Leos, & D'Emilio, 2005). This achievement gap is even more pronounced in students' reading ability than in other academic areas (Klingner, Artiles, & Barletta, 2006; U.S. Department of Education, 2010). Zehler et al. (2003) estimated that 75% of ELL students in the third grade read below grade level. Because low reading achievement is highly correlated with poor educational outcomes (e.g., grade retention, school dropout; Reschly, 2010), it is important to target this skill area and determine what instructional practices are effective for these at-risk students. In order to do so, we must determine whether the effective reading interventions being used across the country with the general population are also effective with a population of ELLs. Headsprout Early Reading is one such intervention that should be evaluated.

This thesis seeks to investigate the impact of the Headsprout Early Reading program on the reading achievement of ELLs. Headsprout Early Reading is a phonics-based, computer delivered reading intervention. Although there is preliminary empirical evidence to support the

use of Headsprout with the general population, its efficacy has yet to be empirically evaluated with ELLs. In order to provide the necessary background information to support the purpose of this thesis, the introduction will first highlight the need for effective reading interventions for ELLs. Then it will summarize extant research pertaining to the necessary components of an effective reading intervention for the general population and for ELLs. Next, the extant research regarding the efficacy of Headsprout Early Reading is summarized. Finally, the introduction will conclude by presenting the research question investigated by this study and the hypothesis pertaining to that question.

Characteristics of and Challenges Facing ELLs

ELLs face compounding challenges when it comes to learning academic material. Not only do they encounter the challenge of learning the material and skills like all other children, but they must also learn the language in which the material is being presented (Bowman-Perrott, Socorro, & Murry, 2010). Additionally, many ELLs lack academic support outside of school since many of their family members have limited English proficiency (Fix, Passel, & De Velasco, 2004). In fact, Fix et al. estimated that 4 out of 5 ELLs have parents whose proficiency in the English Language is limited as well. These barriers contribute to the high dropout rate and low academic achievement that is characteristic of this population (Bowman-Perrott et al.).

The school dropout rate for the ELL population is alarming. ELLs who have difficulty speaking English are five times more likely to drop out of school than their native English speaking peers. Even ELLs who speak English rather fluently are three times as likely to drop out of school than their English dominant peers (August & Shanahan, 2006). Contributing to this high dropout rate is the characteristic low achievement of this population. Despite low academic achievement, a smaller proportion of ELLs are referred to special education as

compared with students who are fluent in English (U.S. Department of Education & National Institute of Child Health and Human Development, 2003). Nonetheless, of those who are referred to special education, a majority are referred for a specific learning disability in reading (56%), further demonstrating the necessity of effective reading interventions for ELLs.

Components of Effective Reading Instruction

Interest in improving reading achievement and pinpointing effective reading instruction has increased recently as a research topic. In the late 1990s, congress solicited the National Institute of Child Health and Human Development (NICHD) to assemble a group of researchers, educators, and educational administrators to assess the efficacy of different methods of reading instruction. In response, the NICHD created the National Reading Panel (NRP). The NRP spent two years reviewing articles and previous research, and in 2000 they compiled their findings into a comprehensive report on how to teach children to read (National Institute of Child Health and Human Development, 2000). The NRP conducted an extensive review of the research literature related to alphabetics (phonics and phonemic awareness instruction), reading fluency, comprehension (vocabulary instruction and text comprehension instruction), teacher education, and computer technology. Through their extensive review, the NRP concluded that phonics, phonemic awareness, fluency, reading comprehension, and vocabulary were all necessary components of effective reading instruction.

The first important component of effective reading instruction identified by the NRP was phonics instruction, which focuses on teaching letter-sound correspondences (National Institute of Child Health and Human Development, 2000). There are two types of phonics instruction: systematic and unsystematic. In systematic phonics instruction, instructors teach elements of phonics in a pre-established sequence (Ehri, Nunes, Stahl, & Willows, 2001). Instruction is

provided on elements such as letter-sound correspondences, long and short vowel sounds, consonant vowel digraphs, and sound blending. Unsystematic phonics instruction follows more of a whole-language approach in which children learn how to read by learning whole words, with phonics taught incidentally when necessary. Educators have long disagreed on whether beginning reading instruction should focus on letter-sound correspondences, as in systematic phonics instruction, or should be meaning centered and focus on whole words as in unsystematic phonics instruction. Despite the debate, there is a large body of research that supports the use of systematic phonics instruction (e.g., de Graaff, Bosman, Hasselman, & Verhoeven, 2009; Ehri et al., 2001).

Results from numerous studies comparing systematic phonics instruction to unsystematic phonics instruction were evaluated by Ehri et al. (2001), who conducted a meta-analysis as part of the NRP's review (National Institute of Child Health and Human Development, 2000). Ehri et al. included 38 peer-reviewed experimental studies that compared the impact of systematic phonics instruction to unsystematic or no phonics instruction on reading achievement. Results supported the use of systematic phonics instruction over nonsystematic or no phonics instruction to help children learn how to read. Furthermore, they found greater effect sizes for systematic phonics instruction in younger grades than in later grades when students had already received other methods of reading instruction, which highlights the importance of systematic phonics instruction for beginning readers.

To extend the results of Ehri et al. (2001), de Graaff, Bosman, Hasselman, and Verhoeven (2009) empirically evaluated the effects of systematic phonics instruction as compared to unsystematic phonics instruction. De Graaff et al. argued that the results of Ehri et al. supported the use of systematic phonics instruction over an approach that does not include

phonics since many of the articles included in the meta-analysis used a "no phonics" condition as their control. As a result, little could be said about the efficacy of systematic instruction versus that of unsystematic instruction. To address this problem, de Graaff et al. created two computer-based programs that taught the same set of letter-sound correspondences, but one program did so systematically while the other taught the correspondences unsystematically. The systematic program taught the correspondences in a pre-specified order and then provided students with a pre-determined set of activities in which they practiced those correspondences and learned others as they went along. In contrast, the unsystematic program did not present correspondences in a pre-specified order, and instead, students were allowed to choose freely between 10 different letter-sound and phonics exercises. De Graaff et al. randomly assigned 93 Dutch kindergarten students to the systematic group, unsystematic group, or control group, which was a business as usual group. They found that the systematic phonics instruction group advanced more in the areas of phonemic awareness, reading, and spelling as compared to both the unsystematic phonics instruction group and control group. These results also support the use of systematic phonics instruction with beginning readers.

The second key component of reading instruction that the NRP investigated was phonemic awareness instruction (National Institute of Child Health and Human Development, 2000). Phonemic awareness is the ability to manipulate the different phonemes, or individual sounds, in a word. The two main skills associated with phonemic awareness are phoneme segmentation (breaking a word into its separate phonemes) and sound blending (blending different phonemes to form a word). The results of several studies revealed a strong statistical relationship between phonemic awareness and beginning reading success (e.g., Calfee, Lindamood, & Lindamood, 1973; Fox & Routh, 1976; Helfgott, 1976; Stanovich, Cunningham,

& Cramer, 1984). As opposed to looking for a correlation between phonemic awareness and reading skills, Fox and Routh (1984) empirically evaluated this relationship by comparing the impact of three phonemic awareness training programs. Thirty one kindergarten students who were considered "non-segmenters" (i.e., they performed poorly on the Fox-Routh phonemic segmentation task) were randomly assigned to one of three conditions. Students across conditions received letter-sound training in which sounds were paired with letter like symbols as opposed to actual letter-sounds in order to control for previous knowledge of the alphabet. One group was provided with training on phoneme segmentation and phoneme blending, a second group was provided with training only in phoneme segmentation, and the third group was not provided with training beyond the symbol-sound correspondences. Results indicated that the group trained in both segmenting and blending accrued significantly greater gains than the segmenting training alone group and the control group in phonemic segmenting, blending, and word learning. These results suggest that training in phonemic segmentation and blending in combination aid in learning how to decode written words more than either phoneme segmentation training or letter-sound correspondence training alone.

Ball and Blachman (1991) noted that past research in which phonemic awareness and phonics training were provided together resulted in greater gains in early reading and spelling than training programs that included only phonemic awareness instruction. In order to empirically evaluate this relationship, Ball and Blachman conducted a study to determine the differential effects of phonemic awareness instruction through phoneme segmentation training in conjunction with phonics on various early reading and spelling skills in kindergarten students. In their study, one group of students was provided with 7 weeks of segmentation training along with phonics training, another group received broad language training (such as vocabulary

development) and phonics training for 7 weeks, and the third group did not receive any training. Results indicated that students who were provided with segmentation training outperformed the other students, suggesting phonics instruction alone was not sufficient for teaching phonemic awareness. Additionally, the phonemic segmentation and phonics training group performed significantly better on early reading tests (i.e., the Woodcock Reading Mastery Word Identification subtest; Woodcock, 1987; and a phonetically regular word list test selected for this study) and on a spelling test developed for this study.

Quick retrieval of letter-sound correspondences and strong phonemic blending skills are necessary for fluent reading, which is the third necessary component of effective reading instruction as determined by the NRP (National Institute of Child Health and Human Development, 2000). Reading fluency, or the ability to read quickly, accurately, and with proper prosody, is an important aspect of reading. Based on La Berge and Samuels' (1974) theory, fluent reading is necessary for comprehension, which is the ultimate goal of reading and the NRP's fourth necessary component of reading instruction. La Berge and Samuels posited that because reading is a complex task that requires various stages of information processing, it also requires a large amount of attentional resources when not automatic. Once reading becomes automatic (i.e., fluent), cognitive resources are freed and can then be used to comprehend what is being read (Stanovich, 1984). Thus, the decoding aspect of reading must be fluent to free cognitive resources for comprehension. The question then becomes, how do children become fluent readers? Two commonly employed fluency interventions are passage preview (PP) and repeated readings (RR) (Begeny, Krouse, Ross, & Mitchell, 2009).

PP involves allowing students to read a passage (aloud/silently) or listen to another person read the passage while following along (called Listening Passage Preview or LPP) prior

to instruction or testing on the passage (Begeny et al., 2009). Skinner, Cooper, and Cole (1997) conducted a study in which they compared silent PP to LPP with two elementary students with reading difficulties using an alternating treatments design. They further investigated the effect of rapid and slow presentation of the passage by varying the speed at which the experimenter read the passage to the student during LPP. Results indicated that LPP produced greater gains in reading fluency than the silent PP method, meaning that the students read more words correctly in a minute and made fewer errors as a result of LPP. The results also support a slower presentation rate, meaning that when presenting the student with LPP adults should consciously slow their rate of reading.

Another well researched method of improving reading fluency is the RR procedure, which was first introduced by Samuels in 1979. He described the RR method as rereading a short passage until an acceptable level of fluency is achieved. Results of numerous studies provide empirical support for RR as an effective intervention for increasing reading fluency (e.g., Dowhower, 1987; Herman, 1985; Rasinski, 1990). Not only is RR effective in increasing fluency for students in the general population but it also appears to be effective for students with learning disabilities. For example, results of Sindelar, Monda, and O'Shea (1990) found RR to increase reading fluency and comprehension in a population of elementary students with learning disabilities as well as in a population of non-disabled readers.

In order to gain a better understanding of overarching findings concerning RR, Therrien (2004) conducted a meta-analysis that sought to determine the essential components of a successful RR program as well as the effect of RR on reading fluency and comprehension. Results supported the use of RR with nondisabled children as well as with those who have a learning disability to increase reading fluency and comprehension. Therrien also found that RR

was not only effective in increasing fluency and comprehension on the passage used during the RR procedure (non-transfer), but also on transfer passages that were not read multiple times. Thus, it appears that RR may also have generalization effects to other passages and helps improve overall reading fluency and comprehension.

Although the extant literature provides strong empirical support for the use of PP and RR, results of Begeny and Silber (2006) suggests that when used in combination PP and RR can produce greater gains in reading fluency than either intervention alone. Begeny and Silber investigated the effects of various combinations of RR, PP, and word list training (WLT) on the number of words read correctly in a minute for 4 third grade students using an alternating treatments design. Results suggested that combining PP with RR produced greater gains in reading fluency than PP and RR alone. However, the intervention that produced the greatest gains was a combination of all three interventions: WLT, RR, and PP.

The final component necessary for an effective reading program is vocabulary instruction. The NRP (National Institute of Child Health and Human Development, 2000) acknowledged the importance of vocabulary instruction in promoting reading comprehension. As Perfetti (1985) theorized, not only is fluent reading necessary for comprehension, but fluent retrieval of word meaning is also important. The NRP identified key aspects of vocabulary instruction including the incorporation of definitional and contextual information for words that are taught, repetition and multiple encounters in different situations of words that are taught, and instruction that engages students in the lesson. Three studies in particular highlight the importance of these key aspects of vocabulary instruction and verify their efficacy in teaching new vocabulary words. These studies also demonstrate how vocabulary development aids in

increasing reading comprehension (Beck, Perfetti, & McKeown, 1982; McKeown, Beck, Omanson, & Perfetti, 1983; McKeown, Beck, Omanson, & Pople, 1985).

Beck et al. (1982) developed a long-term vocabulary intervention, which included the key aspects identified above. Beck et al. varied the amount of exposure to different sets of words (i.e., some words were exposed many times - between 26-40 exposures - others sometimes - between 10 and 18 exposures - and others were never exposed throughout the program), allowing them to compare the experimental group's performance across different levels of exposure. The intervention also included contingencies for using the instructed words outside of the classroom in order to increase the engaging property of the lessons. Beck et al. randomly assigned one classroom to the experimental group and placed another classroom in the control condition. The experimental group demonstrated increased gains in basic word knowledge, fluency of word knowledge, recall of text, and comprehension. In addition, they found that these skills transferred to non-instructed words. Furthermore, students in the experimental group often performed better with the words that were exposed many times as compared to those exposed sometimes. Results supported the notion that repetition and multiple encounters are important to vocabulary instruction. McKeown, Beck, Omanson, and Pople (1985) expanded Beck et al. findings by directly comparing different number of exposure to words (12 times versus 4 times) and intensity of instruction (i.e., mere association between word and definition as opposed to presenting elaborate word meanings in different contexts and encouraging the use of vocabulary words outside of the classroom). Results further supported the use of diverse contexts, repeated exposure, and increased engagement in vocabulary instruction. Additionally, these studies suggest that vocabulary instruction can positively affect reading comprehension supporting Perfetti's hypothesis (1985).

Reading Interventions and ELLS

Although relatively little research exists on what constitutes an effective reading intervention for ELL students, available evidence suggests that reading development in ELLs is similar to that of the general population (Chiappe & Siegel, 1999; D'Angiulli, Siegel, & Maggi, 2004). Thus, it is logical that the same types of instruction found to be effective for the general population of students would also be effective for ELL students.

Gunn, Biglan, Smolkowski, and Ary (2000) examined the effects of supplemental phonic and phonological awareness instruction on a group of ELLs and native English speakers. Students were randomly assigned to an intervention or a business as usual control group. First and second grade students in the intervention group received instruction using *Reading Mastery*, and students in third and fourth grade received instruction from the *Corrective Reading* program (Englemann, 1999), both of which focus on phonological awareness, letter-sound correspondences, decoding, and fluency. In addition, parents of the students in the intervention group received skills training. Data were collected after approximately 5 months of intervention and again after approximately 15 months of intervention. Gunn et al. found that both ELL and native English speakers benefited from supplemental instruction in phonics and phonemic awareness after 15 to 16 months of intervention. Results indicated significant growth in decoding skills, fluency, and reading comprehension for both populations, highlighting the importance of phonics and phonemic awareness training for ELLs. A rather large limitation of this study was the practicality of the intervention. Intervention effects after 4 to 5 months were only significant for word attack skills, not word identification nor fluency. The feasibility of providing students with two scholastic years of intense supplemental intervention is questionable as is involving the students' parents in the intervention.

Haager and Windmueller (2001) also produced gains in the reading achievement of ELLs with a one year instructional period. Teachers were provided with professional development in effective reading instruction that included phonemic awareness, alphabetic principle, oral reading fluency, and English language development. They then provided these instructional methods to 335 ELLs. Although results indicated upward growth in the areas of decoding skills, reading fluency, rapid letter naming, and language fluency, at the end of the one year period the students' scores continued to fall below benchmark.

One limitation of Gunn et al. (2000) and Haager and Windmueller (2001) is that they investigated the long term impact of effective instruction. Gunn et al. provided instruction for 2 years before they saw positive gains for ELLs. Although Haager and Windmueller provided instruction for a shorter period than Gunn et al. and produced positive effects, the instructional period was still rather long, lasting an entire academic year. Following generally accepted data-based decision rules for weekly progress monitoring, instruction should change after as few as 3 weeks of intervention if practical gains in reading skills are not demonstrated (Deno, 1986). Additionally, because of the achievement gap that exists between ELLs and their English dominant peers, interventions that produce a steep rate of growth for ELLs are needed to attempt to close the gap. Thus, effective interventions resulting in reading gains in a shorter period of time are imperative for ELLs who are struggling to learn how to read.

One study with ELLs at-risk of reading failure produced gains in reading after providing only 10 weeks of explicit phonological awareness instruction in English to 16 kindergarten students (Leafstedt, Richards, & Gerber, 2004). Students were provided with intervention twice a week, with sessions lasting 15 min. Intervention activities progressed from instruction in rhyming and identifying initial sounds to blending and segmenting and finally to reading and

spelling words. With only 300 hours of intervention over a 10 week period, students in the experimental condition exhibited increased performance in the areas of phonological awareness and word reading as compared to those in the control group who received only general classroom instruction.

Other important aspects of reading instruction, such as vocabulary and fluency instruction can result in reading gains for ELLs in short intervention periods. Using a multiple baseline design across five ELL students, Tam, Heyward, and Heng (2006) found that adding vocabulary instruction and error correction to the RR procedure increased reading accuracy and rate as well as reading comprehension. Similarly, Linan-Thompson, Sharon, Hickman-Davis, and Kouzekanani (2003) provided 29 ELLs with 58 sessions of intensive instruction 5 days a week for 13 weeks. Each session included (a) 5 min of repeated readings; (b) 5 min of phonological awareness instruction; (c) 10 min of instructional level reading in which students practiced decoding, comprehension, and vocabulary through passage preview and corrective feedback; (d) 5 min of explicit instruction in the alphabetic principle and word analysis strategies; and (e) 2 to 3 min of writing practice. After 13 weeks of intervention, students performed significantly better in reading fluency and comprehension as compared to their pretest scores. However, because these data were collected as part of a larger study, data from a control group was not included in the analysis, which weakens implication of the findings.

In order to condense the existing data concerning effective literacy instruction for ELLs, the U.S. Department of Education compiled the available empirical evidence on this topic in their 2007 Institute of Education Sciences (IES) practice guide (Gersten et al.). One main aspect of effective reading instruction highlighted within the IES practice guide was intense small group instruction in the five areas identified by the NRP – phonological awareness, phonics, reading

fluency, vocabulary, and comprehension (National Institute of Child Health and Human Development, 2000). Small group instruction should be explicit and provide students with several opportunities to respond to questions as well as practice reading both single words and sentences. Furthermore, students should be provided with immediate corrective feedback when errors are made. Other recommendations included regular screening for reading problems, extensive vocabulary instruction that helps develop academic English, and regular use of peer-assisted learning opportunities.

Headsprout Early Reading

The Headsprout Early Reading program has potential to be an effective intervention for ELLs based on the guidelines outlined by IES (Gersten et al., 2007). It incorporates many of the characteristics identified as important to improving ELLs' reading achievement. First of all, it includes instruction in the five main areas of reading as recognized by the NRP (National Institute of Child Health and Human Development, 2000). Although the main focus of the Headsprout Early Reading program is explicit phonics instruction, the other areas of reading (i.e., phonemic awareness, fluency, vocabulary and comprehension) are also addressed. Secondly, instruction through Headsprout Early Reading is individualized since it was created to adapt the pace of instruction to accommodate each individual's learning needs. In addition, it adapts to individuals' responses by providing additional response opportunities for skill areas in which students consistently respond incorrectly to items. Thirdly, it provides students with various types of opportunities to practice the instructed skills (including single word reading and sentence reading), and it provides corrective feedback when appropriate. Finally, built into the program are scattered benchmark assessments to monitor student progress.

The creators of Headsprout Early Reading conducted multiple studies testing the efficacy of their program and found positive results across several studies. These studies were, however, published in a book chapter and therefore were not peer reviewed (Layng, Twyman, & Stikeleather, 2004). One study they conducted as part of in-house developmental testing resulted in a grade level increase in the reading skills of the 20 preschool participants after only completing half of the program, which amounts to less than 15 hours of instruction. Another study found that all 23 of the kindergarten participants were reading at grade level and 82% were above grade level after having completed the entire program. In previous years only 50% of kindergarteners at the same elementary school had performed at grade level and 0% above grade level. Additionally, the program has received positive feedback from various users of Headsprout Early Reading praising its efficiency and effectiveness (Layng et al.).

The What Works Clearinghouse (WWC), an initiative of the Department of Education Institute of Educational Sciences to evaluate instructional programs, reviewed the extant literature regarding the Headsprout Early Reading program and found it to be "possibly efficacious" in increasing the oral language skills and print knowledge of young readers (U.S. Department of Education, 2009). WWC identified 13 studies evaluating the Headsprout Early Reading program, but only 1 study met the WWC's evidence standards (U.S. Department of Education, 2009). Nine of the 13 manuscripts were studies conducted or reported by the creators of Headsprout, 1 of which was the book chapter previously mentioned (Layng et al., 2004). Four of the identified manuscripts were case studies from schools that used the Headsprout Early Reading program. All schools found statistically significant gains in the reading achievement of kindergarten and first grade students after having participated in the program. However, 2 of the 4 schools did not have a control group comparison. The creators of Headsprout also found

positive results for students who used the program in their homes, but again no control group was available for comparison. Interestingly, another one of Headsprout's studies included ELLs in the sample. Results support the use of Headsprout Early Reading with this population as they found that students in kindergarten through 2nd grade improved on average an entire grade level after completing only the first half of the program. ELLs in 3rd through 5th grade improved on average 1.6 grade levels after completing only the first half of the program. Unfortunately, results were not disaggregated before analysis; therefore, it is unknown whether these results were statistically significant ("Results count: Outcome Data and Case Studies," 2007). Results from these studies should be interpreted with extreme caution for multiple reasons. First, these studies utilized quasi-experimental designs and often did not include a control group; thus, a causal relationship between the program and increased reading achievement cannot be inferred from the results. Second, the results of these studies were not published in peer refereed journals, but rather in books or on the Headsprout website. Lastly, the results are questionable given the potential bias as the studies were all conducted and published by the developers of Headsprout.

In addition to those studies published by Headsprout, four studies were conducted by outside researchers (U.S. Department of Education, 2009). One of these is an unpublished doctoral dissertation and unavailable for review (Clarfield, 2006). Clarfield and Stoner (2005) did not meet WWC evidence standards because it employed a single subject design, for which the WWC did not have evidence standards at the time of the review. Clarfield and Stoner utilized a multiple baseline design across three kindergarten and 1st grade students with Attention Deficit/Hyperactivity Disorder to investigate the effects of Headsprout on reading skills and on-task behavior. Participation resulted in gains in reading fluency as well as higher rates of on-task

behavior while engaged in the program for all three students. In contrast, results from Compuzano et al. (2009) suggest that the Headsprout program is not effective in increasing reading achievement. Importantly, this study was conducted as part of a larger study to examine the effects of various computer programs conducted by the IES National Center for Education Evaluation and Regional Assistance; thus details regarding methodology of the study were sparse in the report. Therefore, these results should be interpreted with caution as well.

The only study that met the WWC's evidence standards was another unpublished doctoral dissertation (Huffstetter, 2005; U.S. Department of Education, 2009) that was unavailable for review. Based on the report from the WWC, Huffstetter randomly assigned 62 pre-school students to either the Headsprout intervention or to a control group, which received mathematics instruction. Results indicated significant gains in oral language and print knowledge for students who participated in the Headsprout program. No other results were discussed with in the WWC report.

Although a few existing studies suggest that Headsprout Early Reading effectively increases the reading achievement of students in the general population, it lacks evidence to support its use with ELLs. The purpose of the current study was to investigate the impact of Headsprout Early Reading on the reading achievement of a population of ELLs. This study seeks to address the questions: Is Headsprout Early Reading effective in increasing the reading achievement of ELL students? Based on the information obtained through the review of the literature it is hypothesized that Headsprout Early Reading will be effective in increasing ELLs reading achievement.

CHAPTER 2

METHODS

Participants and Setting

Participants were 29 ELL students enrolled in one of three elementary schools in a suburban Southeastern school district in the United States. Twenty two participants attended elementary school A, which served approximately 580 students in pre-kindergarten through 2nd grade. Four participants attended elementary school B, which served approximately 560 students in pre-kindergarten through 5th grade. Three participants attended elementary school C, which served approximately 600 students in pre-kindergarten through 5th grade. Students were selected to participate in the study if they were receiving or had received ESOL services. The study began with 41 participants, but due to attrition 12 participants were lost across the 15 week study for various reasons. Six students were excluded from the study because their reading achievement was above the cutoff for the Headsprout Early Reading program; thus, they tested out before beginning the program. Three students changed schools. One student opted not to continue participating, another student was unable to attend the intervention sessions before school, and another control group student was placed on the Headsprout program as part of his Individualized Education Plan.

Of the 29 participants who completed the study, the majority were male (n = 16) and Hispanic (n = 23). Other ethnicities represented included Caucasian, Middle Eastern, Asian, and Caribbean students. The sample consisted of 10 kindergarten students, 10 first grade students, and 9 second grade students, with ages ranging from 5 years, 5 months to 9 years, 11 months (M = 7.12, SD = 1.14).

Measures and Materials

Woodcock Johnson III- Tests of Achievement Form A and Form B. The Word Identification, Reading Fluency, and Reading Comprehension subtests from the Woodcock-Johnson III- Achievement Test (WJ-III-ACH) were administered to all participants prior to (Form A) and following (Form B) the intervention to evaluate students' academic growth in reading (Woodcock, McGrew, & Mather, 2001). A Broad Reading Composite score was calculated from these three subtest scores, which represents an estimate of overall reading ability. This composite has a median reliability of .95 for ages 5 to 9. All subtest scores and composite scores have a mean of 100 and a standard deviation of 15

WJ-III-ACH Letter Word Identification. The Letter-Word Identification subtest from the WJ-III-ACH was administered to all participants prior to and following the intervention period following standardized administration procedures. This subtest requires students to identify letters and read a list of both phonetically consistent and phonetically inconsistent words. It is a measure of an individual's knowledge of the alphabet, single word decoding skills, and sight word vocabulary. The median reliability for ages 5 to 9 for this subtest is .97

WJ-III-ACH Reading Fluency. The Reading Fluency subtest from the WJ-II-ACH was administered to all participants prior to and following the intervention period following standardized instructions provided in the WJ-III-ACH manual. Thus, the test items were not administered to students who were unable to answer the sample items. These students received a raw score of 0. Additionally, normative data is unavailable for children under 6 years of age, so these students do not receive a standard score on this subtest. The Reading Fluency subtest requires the participants to quickly read a series of sentences and decide whether or not they are

true. Participants are given 3 min to answer as many items as they can. For this subtest, the median reliability for ages 6 to 9 is .98.

WJ-III-ACH Reading Comprehension. Reading comprehension was measured using the Reading Comprehension subtest from the WJ-III-ACH prior to and following intervention. Examiners used the standardized administration procedures provided in the WJ-III-ACH manual. This subtest requires students to read a sentence with one word missing and choose a word to fill in the blank. It has a median reliability of .96 for ages 5 to 9.

Curriculum-Based Measurement (CBM). CBM procedures were used to measure students' oral reading fluency (CBM-R) and nonsense word fluency (NWF).

Oral Reading Fluency (CBM-R). Three CBM-R passages were administered prior to and following intervention as well as weekly throughout the intervention period. CBM-R requires students to read three passages out loud for a minute each while an examiner marks reading errors. The resultant score is words read correctly in a minute (WRCM). The pre- and post-test probes were taken from the Dynamic Indicator of Basic Early Literacy (DIBELs) first grade benchmark materials (Good & Kaminski, 2002). The median of the three scores was used in data analysis as pre and post-test measures. The progress monitoring probes were taken from the DIBELSs and EasyCBM first grade progress monitoring materials (Alonzo, Tindal, Ulmer, & Glasgow, 2006). Probes were taken from two different sources because neither provided a sufficient number of passages to monitor progress over 15 weeks without repeating passages. The progress monitoring passages alternated between DIBELS and EasyCBM passages from week to week. The median score from the three passages was used to monitor progress. Inter-rater agreement and procedural integrity was calculated on 15% of the progress monitoring sessions. Inter-rater agreement was calculated by dividing the number of agreements by the

number of disagreements and agreements. The average inter-rater agreement was 97.20%, ranging from 80.77 to 100%. The average procedural integrity for progress monitoring was 97.39%, ranging from 33 to 100%.

Nonsense Word Fluency (NWF) Probes. Three NWF probes were administered prior to and following intervention to measure gains in phonics. The NWF task requires participants to read a series of pseudowords that consist of three letters each. Students are given credit for correctly pronouncing letter sounds. The resulting score is the number of correct letter-sounds per minute. The median of the three scores was used in data analysis. These probes were taken from the DIBELs First Grade Benchmark materials (Good & Kaminski, 2002).

Assessing Comprehension and Communication in English State to State for ELLs (ACCESS for ELLS). ACCESS for ELLs test scores were obtained from the three schools at the end of the intervention period. The ACCESS for ELLs test is administered to all ELL students once a year to progress monitor English proficiency. The test assesses listening, reading, speaking, and writing and is appropriate for students in 1st to 12th grade. The test yields scores from 1 to 6, representing overall language proficiency (World-Class Instructional Design and Assessment, 2004).

Procedure

Before data collection began, all researchers participated in a training session conducted by a Headsprout employee. The training session lasted approximately 1.5 hours. The purpose of the training session was to ensure all researchers knew how to use the computer program properly. All researchers were also required to watch the professional development videos provided by the creators of Headsprout.

Undergraduate and graduate researchers administered pre-test measures to all participants a week before intervention began. Every participant completed all pre-test measures within one day. Pre-test measures included the three reading subtests from the WJ-III-ACH Form A, three CBM-R probes, and three NWF probes. All pre-test measures were administered in approximately 30 min. After all participants had completed pre-testing, they were matched by grade and their WJ Broad Reading Composite score and then randomly assigned to one of the two treatment groups.

Participants in the experimental group underwent further testing to determine their start point in the Headsprout program using the placement test provided by Headsprout. As stated previously, three participants tested out of the program based on their score on the placement test. Thus, these students and their matched control group counterparts were excluded from the study. Before beginning the program, all students in the experimental group completed Headsprout's computer training program called "Mousing Around." This program was created to ensure that all students understand how to use a computer and mouse. Student's whose native language was Spanish completed the Mousing Around program in Spanish then in English. No other languages were available, thus all other students completed the program only in English. After participants completed all pre-testing and training sessions, the intervention period began.

Students in the experimental condition participated in the Headsprout program four to five days a week over approximately 15 weeks before the school day began. Although the intervention spanned 15 weeks, participants received approximately 14 weeks of intervention due to school holidays. Additionally, all second grade students received fewer weeks of intervention than the other participants (i.e., they reached the end of the program before the 15 week period ended) since they all started on episode 57 of 80 based on their placement test

scores. Although Headsprout suggests using the program only three days a week, more days were offered to these students to ensure they participated in the program a minimum of three days a week. Students were also allowed to participate for 30 min a day instead of the recommended 20 min a day to ensure that the 20 min minimum was met. Students were provided with an incentive to participate and arrive on time every day. All other procedures were followed as recommended by Headsprout.

Each week, researchers administered three CBM-R probes to all participants in both treatment conditions. This occurred either during the intervention period before school started or in the morning within the first hour of the school day. These data were used to monitor students' reading progress across the 15 weeks of intervention.

Second grade students were administered the post-test measures within a week of completing the last episode. All other students were administered the post-test measures after the 15 week intervention period had ended. Form B of the WJ-ACH-III was used at post-testing to avoid possible practice effects. All other measures were the same as the pre-test measures.

Independent Variables and Treatment Condition

Prior to intervention, students were matched based on their Broad Reading Composite score from the WJ-ACH-III then randomly assigned to one of two conditions. The control condition was a business as usual condition with weekly progress monitoring, meaning that students were not provided with instruction beyond their regular classroom instruction. Students in the experimental condition participated in the Headsprout Early Reading program four to five days a week for approximately 30 min a day.

The Headsprout Early Reading program is composed of 80 episodes aimed at teaching phonemic awareness, phonics, fluency, comprehension, and vocabulary. The episodes follow a

storyline to increase the engaging quality of the program. While telling a story, the program teaches skills and provides opportunities for students to practice the taught skills. For example, when the program teaches digraph sounds, it first presents the letter-sound correspondence. Then it provides students with opportunities to identify the digraph (e.g., "ch") by flashing a series of words on the screen while the student listens to the words being pronounced and clicks on words that contain the targeted digraph. As the student correctly identifies words that contain the targeted digraph, they help the character in the story achieve some task (e.g., climb a mountain). The program also provides students with the opportunity to read and practice letter-sound correspondences out loud. Students are verbally and visually prompted to speak out loud by the computer. When students are supposed to practice reading out loud a small icon appears at the bottom of the screen. This allowed the researchers to know when students should be reading out loud. While the students were participating in the program, researchers monitored whether students were speaking when appropriate and encouraged the students to speak if they were not.

Students in the experimental condition were instructed to go to the computer lab at their school as soon as they arrived in the morning. Steps were taken to ensure that the students' computer time was maximized. For example, the researchers arrived at the school before students to turn on computers and log into the Headsprout program. Students were also instructed to raise their hand when they completed an episode. This allowed researchers to check their progress and read any stories Headsprout provides and recommends reading before moving onto the next episode. Students read these stories out loud while a researcher listened and immediately corrected any reading errors. If more than 5 min were left in the session, students started a new episode. When it was time for the students to go back to their classroom, they

were released from the computer lab as a group. Researchers were responsible for logging off the computers and putting away all materials. Again, this was done to maximize the amount of time students participated in the program.

Various independent variables were used in the analysis of the data as covariates: grade, language proficiency, pre-test scores, and condition. The students' grade level was included as a covariate to investigate whether the Headsprout Early Reading program is more effective with one grade than with others. Language proficiency was measured using ACCESS for ELLs test scores. It was included in the analysis to investigate whether the efficacy of the Headsprout Reading Program differs for students with different language proficiency. Broad Reading Composite, CBM-R, and NWF pretest scores were entered as covariates to take into consideration the students' reading ability before intervention in determining growth after intervention.

CHAPTER 3

RESULTS

A one way analysis of covariance (ANCOVA) was conducted on each of the dependent variables (Broad Reading Composite Pos-test, CBM-R Post-test, and NWF Post-test) and on the progress monitoring data to determine the effects of the Headsprout program on the reading achievement of ELLs. Before analysis of the post-test data, box plots of all the post-test reading scores were created to examine the data for non-normality and outliers. One extreme outlier was found; however, it was not removed from the data set because it was determined to be accurate and representative of the variation found in the population. Results of Levene's test indicate that the assumption of equal variances was met. Independent samples t-tests were conducted on pre-test measures to ensure that the two treatment groups were equivalent prior to intervention on all three measures of reading achievement.

For each dependent variable, grade, English proficiency (ACCESS scores), and pre-test scores were included as covariates in the ANCOVA procedure. Initially, interaction terms were included in the analysis to test the homogeneity of slopes assumption. For all three analyses the interaction terms were insignificant; thus they were removed from the analysis. Means and standard deviations for pre-test, post-test, and progress monitoring data can be found in Table 1.

Results of the ANCOVA for post-test CBM-R suggest that there were not significant differences in outcomes between the control and treatment groups when controlling for pre-test scores, English proficiency, and grade, $F(1,21) = .525$, $p = .477$. Similarly, no significant

differences were found for post-test NWF when adjusting for the same covariates, $F(1,21) = 2.584$, $p = .123$, or for post-test Broad Reading Composite, $F(1,21) = .388$, $p = .540$.

In order to analyze the progress monitoring data, the median CBM-R score for each week was plotted and a slope was calculated for each participant. Then an ANCOVA was conducted to determine whether the treatment group differed from the control group on rate of reading growth. Grade and ACESS scores were included as covariates in the analysis. Results of the ANCOVA indicate no significant differences between the treatment and control condition, $F(1,26) = .931$, $p = .343$.

After determining that the groups did not differ on reading achievement after intervention, post-hoc data analyses were conducted to determine whether the participants in this study as a whole made progress in reading achievement. Paired samples t-tests were used to compare pretest scores to post test scores on the three outcome measures: Broad Reading Composite, CBM-R, and NWF. Results suggest that students in this study did make significant gains on these three measures. Pre-Broad Reading Composite ($M = 90.14$, $SD = 16.39$) scores were significantly different from Post-Broad Reading Composite scores ($M = 96.48$, $SD = 15.718$), $t(28)=-4.437$, $p=.000$. Pre-CBM-R scores ($M = 27.45$, $SD = 27.501$) were significantly different from Post-CBM-R scores ($M = 38.72$, $SD = 32.01$), $t(28)=-8.533$, $p=.000$. Finally, Pre-NWF scores ($M = 41.62$, $SD = 26.13$) were significantly different from Post-NWF scores ($M = 48.92$, $SD = 27.98$), $t(28)=-2.186$, $p=.037$. Thus, although the two groups did not significantly differ from each other on the outcome measures, the students did demonstrate gains in reading achievement.

CHAPTER 4

DISCUSSION

ELLs are at high risk of academic underachievement, especially in the area of reading (Klingner et al., 2006; U.S. Department of Education, 2010). As the number of ELLs in American schools increases so does the need for effective reading interventions for this population. However there is a dearth of research in this area. As such, this study examined the impact of the Headsprout Early Reading program on the reading achievement of kindergarten, first, and second grade ELLs.

Results of the ANCOVA analyses suggest that the Headsprout Early Reading program did not have a significant effect on the reading achievement of kindergarten, first, or second grade ELLs on any of the three measures of reading achievement (i.e., Broad Reading Composite from the WJ-III-ACH, CBM-R, and NWF). The experimental group and the control group did not differ on post-test scores on any of the measures when taking into consideration their pre-test scores, English proficiency, and grade. Furthermore, the analysis of the progress monitoring data suggests that the two groups showed similar progress in reading fluency in that the two groups had similar slopes in weekly CBM-R scores across the 14 weeks of intervention. Overall, the experimental group and the control group did not differ significantly on any of the four measures of reading achievement, which suggests that the Headsprout Early Reading program may not be effective in increasing the reading achievement of ELL students.

Findings of the current study are somewhat surprising based on the extant research in the area of effective reading instruction and on the Headsprout Early Reading program. Based on

the NRP report, effective reading instruction must include five necessary areas: phonics, phonemic awareness, fluency, reading comprehension, and vocabulary (National Institute of Child Health and Human Development, 2000). The Headsprout Early Reading program includes lessons in all the areas identified by the NRP and provides multiple opportunities to practice the taught skills throughout the program. Furthermore, the program provides immediate corrective feedback and additional practice on skills that prove to be difficult for the user, allowing it to adapt to the learning pace of each individual user. These two features of the program are also characteristics of effective instruction. Theoretically, the Headsprout Early Reading program is research based and characterized by many components of effective instruction; therefore, it is expected to be an effective tool in teaching young students how to read. Additionally the existing research on the program suggests that it is effective in increasing the reading achievement of beginning readers (e.g., Clarfield & Stoner, 2005; Layng et al., 2004) and even a sample of ELLs ("Results count: Outcome Data and Case Studies," 2007). The case study conducted by the creators of Headsprout even found favorable results for a sample of ELLs; however, due to methodological limitations, the results of this case study should be interpreted with extreme caution. Nonetheless, the results of the current study do not support previous claims.

One possible explanation for the finding that the Headsprout program was not effective in increasing the reading achievement of this sample beyond the gains achieved by the control group is that the Headsprout Early Reading Program is not actually effective with a population of ELL students. Although the instructional needs of ELL students in terms of reading are seemingly the same as those for the general population, little research has been conducted in this area. It is possible that the five necessary components of effective reading instruction identified

by the NRP (National Institute of Child Health and Human Development, 2000) are not exactly the same for ELL students. Perhaps ELLs have different needs or additional needs that the Headsprout program does not address. For example, the IES Practice Guide on literacy instruction for ELLs stresses the importance of vocabulary instruction when teaching ELLs to read (Gersten et al., 2007). Even though some vocabulary instruction is included in the program, it is not a main focus. It is possible that Headsprout does not include enough vocabulary instruction to effectively teach students how to read.

Although the results of the current study may indicate that the Headsprout Early Reading program is not effective with ELLs, such a decisive conclusion cannot be made from these results alone as limitations of the study may better account for the results. The most pronounced limitation of this study is its small sample size and the high rate of attrition, which affects the generalizability of the results. With such a small sample size, it cannot be concluded that the program is not effective for all ELLs. It can only be concluded that the program was not effective in increasing the reading achievement of this sample of ELLs. Additionally, a small sample size reduces the power of the analysis to detect a significant difference between the two groups; however, the author does not consider this to be a problem for this particular study because there was practically no difference in post-test scores between the two groups. Even though a larger sample size would produce greater power to detect a statistically significant difference between the groups at post test, this miniscule difference would not have practical importance. Furthermore, differences between the two groups were in the opposite direction than expected for two outcome measures (CBM-R and NWF) in that the control group scored higher on average on these two measures at post-testing than the intervention group. More importantly, the control group made greater gains in reading based on Broad Reading Composite scores and

NWF scores, although as previously stated, these differences were not statistically significant. Of note, data were not collected on the type of instruction the control group was receiving from their school. Teachers were not instructed to only give these students their regular classroom instruction. Students in the control group may have received supplemental instruction from the school during the intervention period, possibly explaining the greater increase in reading achievement for this group.

Another significant limitation of the study is the number of episodes each student in the experimental group completed. The creators of Headsprout suggest that students complete a minimum of three episodes per week in order to reap benefits from the program. Even though precautions were built into the methodology of this study to ensure that the students in the experimental group completed at least three episodes per week (e.g., 30 min a day rather than 20, five days a week rather than just 3, and having experimenters log in and out of computers before and after the 30 min intervention period), only 6 of 17 students completed an average of three or more episodes a week. Based on informal observation during the intervention periods, it is hypothesized that ELLs require more time to complete episodes than do students in the general population as determined by the creators of Headsprout. Rough estimates based on the number of sessions each student participated in and the average time spend on the program per session indicate that the students in this study required on average 26 minutes to complete each episode (SD=7.75). Headsprout estimated that episodes take only 20 minutes to complete on average (Layng et al., 2004). Additionally, there was a high rate of absenteeism among the students in the experimental condition, further reducing their episode completion. One of the requirements set forth by Headsprout to guarantee results is that students complete a minimum of three

episodes per week. This requirement was only met by six students in the experimental group, thus Headsprout would not guarantee results for the other students.

An additional limitation of this study was the use of second grade students in the sample. All second grade students in the experimental group started on the 57th episode of 80 based on their placement scores. Thus, these students spent less time on the program and received fewer weeks of intervention than the other students in the program because they finished the program before the end of the 15 week intervention period. Most second grade students received only 6-7 weeks of intervention, which is less than half of the amount of intervention the other students received. This shortened intervention period for 9 of the 29 participants may have diluted the effects of the Headsprout Early Reading program. Additionally, the Headsprout program is designed to increase students reading levels to a mid-second grade level. Since these students were already reading well, there was less room for growth during the intervention period. Although an analysis of the results for only the kindergarten and first grade students who received all 15 weeks of intervention would be interesting, the sample size of this sub-sample is too small for statistical analysis.

Future research can easily address these limitations and help determine whether the Headsprout Early Reading program is truly ineffective with ELLs. A future study should allow students as much time as they need on the program to complete at least three episodes per week. This not only would follow the suggestion made by Headsprout, but it might also allow for the determination of how much time ELLs need in order to complete the episodes. Headsprout has created guidelines for how long each episode should take based on their preliminary research on the program. However, the sample used to create the guidelines was drawn from the general population. It is likely that ELLs require more time to complete the episodes since there may be

a language barrier to understanding the instructions and language used in the program. Additionally, ELLs may require more practice on the skills taught, elongating the time required to complete each episode. Furthermore, Headsprout Early Reading should be empirically compared to other reading interventions, especially those with a greater focus on vocabulary to determine whether intensive vocabulary instruction is truly a necessary component of reading instruction for ELLs. In general, more research is needed to determine what effective reading instruction entails for this population considering effective programs cannot be created without this knowledge.

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TABLE

Table 1

Descriptive Statistics: Mean (Standard Deviation)

Group	Broad Reading Composite		CBM-R		NWF		Progress Monitoring
	Pre	Post	Pre	Post	Pre	Post	Slope
Treatment	91.89 (14.05)	97.24 (14.87)	25.71 (26.52)	37.35 (32.17)	37.50 (22.38)	41.48 (15.61)	0.83 (1.04)
Control	87.67 (19.63)	95.42 (17.47)	29.92 (29.84)	40.67 (33.12)	47.46 (30.76)	59.47 (37.83)	-0.14 (2.31)