BASIC WORD READING INTERVENTION: EFFECTS OF PHONEMIC AWARENESS AND PHONICS INSTRUCTION

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ABSTRACT

This study used a single-subject design to measure the effectiveness of a basic word reading intervention that combined direct instruction of phonemic awareness and phonics skills. It was hypothesized that positive effects would be seen in phonemic awareness, phonics, and word reading efficiency. Positive effects were seen on the following curriculum-based measures: (a) Phoneme Segmentation Fluency, *g index* = +1.67, *PND* = 0.91; (b) Nonsense Word Fluency, *g index* = +1.33, *PND* = 0.73; (c) Word Identification Fluency, *g index* = +1.00, *PND* = 0.73.

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INTRODUCTION

Overview

The importance of children attaining literacy is unprecedented on educational outcomes for students and is paramount to success. Reading skills can be conceptualized into three broad components: (a) basic word reading; (b) fluency; (c) reading comprehension (Berninger & Wagner, 2008; Joseph, 2006). The hierarchy of literacy demands that students must first learn to master basic word reading before they can read fluently or comprehend effectively (NICHD, 2000). Basic word reading involves the use of two important skills, phonemic awareness and phonics (Fletcher, Lyon, Fuchs & Barnes, 2007; NICHD, 2000). Both of these areas can be the focus of intervention and prevention efforts in order to increase reading capacities. The cognitive capacities related to basic word reading include phonological processing, or understanding the sound system of spoken language, as well as orthographic knowledge or the lexical processing of words (Fletcher et al., 2007). Another important cognitive component is the quick retrieval of phonological information from long-term memory or rapid automatic naming (Fletcher et al., 2007). Deficits in any of these areas can cause problems with reading quickly and efficiently.

Phonemic awareness activities such as matching, blending, segmenting and manipulating sounds in words help readers better understand the relationships between letters and their sounds and have been proven successful at improving literacy outcomes for struggling readers (Hosp & MacConnell, 2008; Joseph 2006; 2008; NICHD, 2000).

Phonics activities stress the predictable relationships between letter and sound patterns so that one can apply this knowledge to decode unknown words; these activities have also been proven to improve reading outcomes and efficiency (Fletcher et al., 2007; Joseph, 2008). According to the National Reading Panel, when these activities are used in tandem they are considerably more effective than when used alone (NICHD, 2000).

Reading Components

Reading can be regarded as the process of gaining meaning from print (Fletcher et al., 2007). Learning to read is critical for success in modern society and has implications for both social and economic achievement (Hosp & MacConnell, 2008; NICHD, 2000). Reading successfully requires the reader to use a variety of foundational skills that are successive and increase in complexity as literacy advances (Hosp & MacConnell, 2008; Joseph, 2006; NICHD, 2000). The systematic scope and sequence of these skills require the reader to utilize the reading components skill sets both effectively and in concert with one another (Fletcher et al., 2007; Hosp & MacConnell, 2008). Researchers and literacy professionals suggest reading skills can be categorized into three broad components: (a) basic word reading; (b) reading fluency; and (c) reading comprehension (Berninger & Wagner, 2008; Joseph, 2006). Within these components there are subdivided instructional skill sets that must be mastered by the developing reader (Hosp & MacConnell, 2008). Specifically, the National Reading Panel identified the following components as essential for reading instruction: (a) phonological awareness; (b) phonics; (c) fluency; (d) vocabulary development; and (e) text comprehension strategies (NICHD, 2000).

Reading comprehension. The National Reading Panel considers reading comprehension as a critically important and meaningful skill that involves complex cognitive processes that allow the reader to gain meaning from text (NICHD, 2000). Successful reading comprehension involves the reader using deliberate and active thinking processes and strategies in order to understand the text (Howell, 2008; Joseph, 2006). These processes occur as a result of the interaction between the text and the reader (NICHD, 2000). Reading comprehension involves cognitive processes beyond word recognition, oral language skills, and working memory; reading comprehension involves complex metacognitive strategies including: (a) making inferences; (b) referring to prior knowledge to aid in understanding; (c) self-monitoring; and (d) adjusting reading strategies to match the text and purpose for reading (Fletcher et al., 2007). In the past, reading comprehension was viewed as an innate and passive process, however, recent research suggests reading comprehension is responsive to direct instructional strategies and is a more malleable skill than initially assumed (Howell, 2008; Joseph, 2006; NICHD, 2000). Reading comprehension is composed of two broad reading sub skills: (a) vocabulary knowledge; and (b) text comprehension strategies (e.g., Fletcher et al., 2007; Howell, 2008).

Vocabulary knowledge. Reading vocabulary and comprehension are closely related to both receptive and expressive language development (Joseph, 2006). As the reader continues to develop, they encounter unfamiliar words in print that, when decoded, may be in their repertoire of oral vocabulary and thus easier to comprehend (NICHD, 2000). Children's overall vocabulary knowledge significantly impacts their ability to

comprehend new words in text; the greater exposure to quality vocabulary, the greater the level of comprehension and inferencing power a reader has (e.g., Fletcher et al, 2007; Joseph, 2006; NICHD, 2000). Vocabulary knowledge grows as the student learns new words, can recognize them quickly, and can remember their meaning fluently (Joseph, 2006). Children use prior knowledge, experiences, and context clues in order to comprehend what they read (Joseph, 2006). The developing reader's prior knowledge is especially important in early reading; the importance of prior knowledge diminishes in later grades as children are expected to read about new and more abstract concepts (Howell, 2008). In addition to being able to make inferences, use prior knowledge, and the ability to differentiate between what strategies to use based on the text structure, successful readers are also able to recognize the morphological structures in words while simultaneously relating sentences and paragraphs together in a meaningful way (Fletcher et al., 2007; Joseph, 2006).

Text comprehension strategies. Text comprehension strategies are procedures that can be taught directly and serve to enhance student's overall reading comprehension (NICHD, 2000). Text comprehension strategies generally consist of metacognitive strategies, which are mental strategies that enhance the student's self-awareness of their level of comprehension as they read and write (NICHD, 2000). In general, there are two categories of text comprehension strategies: (a) embedded comprehension strategies; and (b) metacognitive comprehension strategies (Howell, 2008). Embedded strategies are usually task specific strategies that occur as a natural part of the curriculum which aid in comprehension of the text; these include students identifying critical vocabulary from the

text or completing summarizing activities (Howell, 2008). Metacognitive strategies are more complex as they involve the student thinking about their own understanding and monitoring their own level of cognition (Howell, 2008). Some of these strategies include: (a) orienting oneself to the text and choosing an approach based on the purpose of reading; (b) comprehension monitoring; (c) elaborating on the material read to support understanding and promote generalization; and (d) activating prior knowledge (Fletcher et al., 2007; Howell, 2008). The advanced reader's ability to successfully use vocabulary and text comprehension strategies simultaneously allows the reader to attend less to the mechanics of reading and more to the thorough comprehension of material and the learning of new ideas (Howell, 2008).

Fluency. Comprehension is dependent on the reader being able to read words accurately and efficiently; fluency is the skill that allows the reader to move from decoding of individual words to comprehending full texts (Joseph, 2006; 2008; NICHD, 2000). Fluent reading assumes that the reader reads with automaticity; that is the reader has mastered basic word reading and can devote more cognitive resources to the higher order tasks of comprehension (NICHD, 2000). The three main components of reading fluency include: (a) the rate or speed; (b) accuracy; and (c) prosody (Joseph, 2006; NICHD, 2000). Rate deals with the number of words the reader can read successfully and automatically in a given amount of time (Fletcher et al., 2007). Accuracy refers to the reader's ability to read the words correctly; often when measuring fluency, the rate is adjusted considering accuracy and is referred to as a percent correct (Fletcher et al., 2007; Howell, 2008). Readers that demonstrate proper prosody are able to use the appropriate

expression, intonation, and phrasing; as if speaking naturally while reading connected texts (Fletcher et al., 2007). Fluency cannot be accomplished without the developing reader first mastering basic word reading, and yet students may still experience fluency deficits despite success with basic word reading (Fletcher et al., 2007).

Basic word reading. Basic word reading skills include: (a) the ability to identify and manipulate the individual sounds in a spoken language (phonemic awareness); (b) the ability to identify printed letters and their associated sounds (alphabetic principle); and (c) the ability to decode written language (Kaminski, Cummings, Powell-Smith, & Good, 2008; NICHD, 2000). This includes the individual's ability to recognize high frequency words by sight and their ability to apply phonics skills to decode or sound out unfamiliar words (Fletcher et al., 2007; Hosp & MacConnell, 2008; Joseph, 2006; 2008). In order for the reader to comprehend proficiently, or fulfill the purpose of reading, they must be able to decode individual words fluently and with automaticity (Fletcher et al., 2007; Hosp & MacConnell, 2008). Basic word reading is one of the most frequently researched areas in reading due to its foundational importance in attaining literacy (Fletcher et al., 2007; Kaminski 2008; NICHD, 2000). Poor word recognition skills are the most pervasive source of reading difficulties (Hosp & MacConnell, 2008). Basic word reading is composed of two foundational subskills that must be utilized proficiently in order to for readers to successfully decode individual words: (a) phonemic awareness; and (b) phonics (Fletcher et al., 2007; NICHD, 2000).

Phonemic awareness. Phonemic awareness is the ability to hear, think about, identify, and manipulate the individual sounds or phonemes in spoken words (Berninger

& Wagner, 2008; Fletcher et al., 2007; Joseph, 2008; NICHD, 2000). Phonemes are the smallest units of sound in a spoken word (Hosp & MacConnell, 2008; NICHD, 2000). The English language has approximately 41-44 different recognizable phonemes while there are only 26 letters; phonemes are combined to form syllables and create words (NICHD, 2000). For example, the word *check* has three phonemes, /ch/ /e/ /ck/, even though it has five letters. The ability to attend to the sounds in words is phonemic awareness, while knowing the sounds of individual letters, or phoneme-grapheme relationships, is known as the alphabetic principle (Hosp & MacConnell, 2008; Joseph, 2006; 2008). Phonemic awareness is a component of phonological awareness; phonological awareness is an important cognitive process related basic word reading and deals with the individual's ability to comprehend the sound system of spoken language (Hosp & MacConnell, 2008; Joseph, 2006; 2008). Phonemic awareness is a more refined skill than phonological awareness in that it is related to individual's awareness of the individual sounds or phonemes within words (Hosp & MacConnell, 2008; Joseph, 2006; 2008; NICHD, 2000). Phonemic awareness skills instruction thus enhances the reader's ability to attend to and manipulate the individual sounds or phonemes in a word, which significantly impacts the individual's ability to apply these skills in order to decipher new words (Joseph, 2006, 2008). Phonemic awareness skills have been found to be a robust predictor of how well children attain literacy during the first two years of reading instruction (NICHD, 2000). In a review of the research by Joseph, phonemic awareness was found to be a critical precursor skill to proficient reading and spelling (2006).

Phonemic awareness skills are considered to be mastered within a hierarchy and are best taught systematically while only focusing on one or two of these skills at a time (NICHD, 2000). The skills that comprise phonemic awareness can be taught in sequential manner going from the least complex to the most complex: (a) phoneme alliteration; (b) phoneme blending; (c) phoneme segmenting; and (d) phoneme manipulation (Hosp & MacConnell, 2006; NICHD, 2000). At the simplest level, phoneme alliteration, readers learn to recognize and attend to the initial sounds in words (i.e., Tell me the first sound in cat (/c/); NICHD, 2000). Rhyming activities often are taught along with alliteration activities as children master attending to and matching the final sounds in words (Joseph, 2006; NICHD, 2000). Phoneme blending requires the reader to listen to a sequence of separately spoken sounds and then combine them to form a recognizable word; this is considered perhaps the most influential phonemic awareness skill (Joseph, 2006; NICHD, 2000). This is due to how children decode new words, first sounding out each letter and then blending the phonemes to decipher the word (Joseph, 2006, NICHD, 2000). Phoneme segmentation, on the other hand, requires breaking a word into its smaller sounds (Joseph, 2006; NICHD, 2000). The most complex phonemic awareness skills are those that involve phoneme manipulation; these activities include deleting selected phonemes from words, substituting different phonemes in words, and reversing phonemes to form new words (NICHD, 2000). These phonemic awareness skills are primarily taught in the middle of kindergarten and the beginning of first grade, however phonemic awareness instruction has also demonstrated effectiveness in improving reading abilities with older and disabled readers (Hosp & MacConnell, 2006;

NICHD, 2000). When children have a firm understanding of the individual sounds in words they can then begin to connect the individual phonemes to the written letters of the alphabet or graphemes (Hosp & MacConnell, 2008). Readers can then begin to recognize the predictable relationships that exist between phonemes and graphemes, also known as phonics skills (NICHD, 2000).

Phonics. The National Reading Panel (2000) defines phonics as an instructional strategy that stresses the awareness of letter-sound correspondences as they relate to written words. The awareness of sound-letter correspondences between phonemes and graphemes is referred to as the alphabetic principle (Hosp & MacConnell, 2008; Joseph, 2006, 2008). The instructional method used to teach the alphabetic principle is referred to as phonics (Hosp & MacConnell, 2008). Phonics instruction may include teaching students to recognize new words by analogy to known words, analyzing letter-sound relationships, and segmenting words to into phonemes and blending the sounds into recognizable words (NICHD, 2000). Phonics instruction also relies heavily on the use of word families, or phonograms, which are groups of words with similar onsets or endings which can be read by analogy (i.e., mop, top, stop, etc.; Joseph, 2008). Readers can use phonics knowledge to decode unfamiliar words by utilizing letter-sound correspondence rules and familiar spelling patterns to break down and blend unfamiliar words (Hosp & MacConnell; NICHD, 2000). Typically phonics instruction occurs between the first and third grades and research suggests should be taught explicitly (Hosp & MacConnell, 2008; NICHD, 2000). The earlier phonics instruction begins the more effective it is; phonics produces the biggest impact on reading when it occurs before children have

learned to read independently, which is generally kindergarten or 1st grade (NICHD, 2000).

Phonics instruction generally consists of a sequential set of elements designed to teach letter-sound correspondences and the successful application of these correspondence rules while reading and spelling words (Joseph, 2008; NICHD, 2000). There are many instructional approaches to phonics including: (a) synthetic phonics; (b) analytic phonics; (c) embedded phonics; (d) analogy phonics; (e) onset-rime phonics; and (f) phonics through spelling (NICHD, 2000). Synthetic phonics emphasize converting graphemes to phonemes and then blending phonemes into recognizable words; while analytic phonics emphasizes the analysis of letter-sound relationships after the word is identified (NICHD, 2000). Phonics through spelling programs emphasize the opposite instructional path of synthetic phonics, converting sounds into letters in order to write words (NICHD, 2000). Phonics in context is an instructional strategy children may employ to decode unknown words by applying phonics knowledge along with using background information or context clues (NICHD, 2000). Analogy phonics as well as onset-rime phonics approaches emphasize the decoding of new words by applying knowledge of known words or word families in order to decode new words (NICHD, 2000). All of the above mentioned approaches are effective at improving reading ability and facilitating reading growth (NICHD, 2000). Research shows that explicit phonics instruction leads to significant benefits in children's reading abilities, in particular, their decoding competencies (NICHD, 2000). Phonics instruction was also show to improve children's spelling and reading comprehension significantly in kindergarten and 1st grade

(NICHD, 2000). Once readers are able to successfully apply phonics knowledge, instruction should focus on increasing the rate and accuracy of reading (Fletcher et al., 2007; Hosp & MacConnell; Joseph, 2006).

Cognitive Processing Related to Basic Word Reading

When considering deficits in basic word reading there are two overarching areas of cognitive processes that are thought to be at the root of decoding problems: (a) deficits in phonological cognitive processes; and (b) deficits in orthographic cognitive processes (Fletcher et al., 2007). Cognitive processes directly relate to academic skill deficits and strengths (Fletcher et al., 2007).

Phonological core deficit. Those individuals considered to have a phonological core deficit exhibit weakness in the area of phonological processing, specifically: (a) phonological awareness; and (b) phonemic memory (Beringer & Wagner, 2008; Fletcher et al., 2007). There is a strong, casual relationship between phonological processing skills and learning to read (Beringer & Wagner, 2008; Fletcher et al., 2007; Joseph, 2006). The contribution of phonological awareness is robust, while less evidence exists for the independent roles of phonological memory apart from phonological awareness (Fletcher et al., 2007).

Phonological awareness. As noted previously (2008), phonological awareness is considered the individuals awareness that spoken language can be broken into smaller parts (Hosp & MacConnell, 2008). Phonological awareness develops in a progression of increasingly complex skills (Joseph, 2006). At the lowest level children must become aware that spoken language is a collection of individual words and sentences are made up

of individual words (Hosp & MacConnell, 2008; Joseph, 2006). Then children can begin to differentiate or hear the individual syllables in words, also referred to as developing phonemic awareness (Hosp & MacConnell, 2008; Joseph, 2006). Children first develop rhyming skills, then they begin to hear the initial sounds of words and finally, they begin to hear the sounds within words (Beringer & Wagner, 2008; Joseph 2006). Once children have mastered phonemic awareness skills they can identify the beginning, medial, and final sounds of words, as well as blend, segment, and manipulate the individual sounds in words. (Beringer & Wagner, 2008; Joseph, 2006). Phonological awareness initially can be difficult for children to comprehend because speech is naturally coarticulated or overlapping and does not emphasize individual sounds in words (Fletcher et al., 2007; NICHD, 2000). This concept can also be difficult to master because correspondences between letters and sounds are not always consistent (Fletcher et al., 2007).

Phonological awareness is crucial for children to be competent in basic word reading and phonological deficits may have an impact on children's later ability to read fluently and comprehend efficiently (Beringer & Wagner, 2008; Fletcher et al., 2007). Phonological awareness training delivered during early school years has the potential to control for the effects of poverty on children's early reading (Joseph, 2006). Research has found phonological awareness to be the most robust predictor of children's reading ability, even more so than IQ (Joseph, 2006). Once students can successfully attend to and manipulate sounds at a phonemic level, instruction should focus on mapping phonemes to the orthographic or lexical features of words (Hosp & MacConnell, 2008).

Phonological memory. Phonological memory can be conceptualized as the working memory for sound based information (Berninger & Wagner, 2008; Fletcher et al., 2007). Phonological memory deals with the capacity to process and store auditory information for recall (Berninger & Wagner, 2008; Fletcher et al., 2007). Specifically, it involves the individual's ability to temporarily store phonemes or phonological codes in short term and working memory and then later access this information for use in reading (Berninger & Wagner, 2008; Joseph, 2006). This is particularly important as the reader attempts to decode unfamiliar words; however, phonological memory does not seem to be related to decoding familiar words which relies more on the lexical or orthographic processing of words (Beringer & Wagner, 2008; Fletcher et al., 2007). Thus, deficits in phonological memory often lead to the reader to struggle with decoding new words and may hinder vocabulary development (Beringer & Wagner, 2008). Phonological memory does not appear to contribute uniquely to reading ability outside the influence of phonological awareness because it is difficult to assess phonological awareness without including working memory tasks (Fletcher et al., 2007)

Orthographic core deficit. Orthographic knowledge deals with the lexical processing of words (Fletcher et al., 2007; Joseph, 2006). Lexical processing involves analyzing the visual aspects of letters and words and storing these lexical features in memory (Joseph, 2006). Knowing letters or graphemes and understanding grapheme sequences in words involves the individual relying on orthographic knowledge or skills (Fletcher et al., 2007; Joseph, 2006). Orthographic skills include: (a) coding written words into short-term memory and analyzing letter patterns; (b) reproducing written

words in working memory; and (c) long term memory of spelling patterns that correspond to specific sounds, words, and meanings or morphemes (Beringer & Wagner, 2008).

Typically children are able to identify letter names before they can identify the sounds associated with them; this skill typically develops around ages 4 to 5 (Joseph, 2006). The ability to name letters has been found to be related to early reading skills (Joseph, 2006; NICHD, 2000). Orthographic components of words may also contribute to the meaning of words, such as the case for suffixes and prefixes (Bear et al., 2008; Joseph, 2006). Research, however, shows that the relationship between letter naming and word recognition skills to be weaker than that of the relationship between phonemic awareness and word recognition (Fletcher et al., 2007; Joseph, 2006).

In the primary grades children begin to understand letter sequences, spelling patterns, and how letters can be combined to represent certain sounds (Joseph, 2006). Knowledge of orthographic patterns found in words allow the reader to read automatically by analogy, such is the basis for phonics instruction (Joseph, 2006; NICHD, 2000). For example, if a child can read the word *pain* they can easily decode the new word *gain* (Joseph, 2006). Orthographic knowledge is also highly influential on children's ability to write and spell words (Bear, Invernizzi, Templeton, & Johnston, 2008; Joseph, 2006). Those individuals with an orthographic core deficit have been found to exhibit weakness in the area of rapid automatic naming (Beringer & Wagner, 2008; Fletcher et al., 2007; Joseph, 2006).

Rapid automatic naming. Rapid automatic naming refers to the retrieval of phonological information from long-term memory (Joseph, 2006). Rapid naming is the ability to access phonological codes efficiently and quickly (Fletcher et al., 2007; Joseph, 2006). Rapid naming is more related to reading fluency than accuracy (Fletcher et al., 2007). Children with both deficits in rapid automatic naming and phonological awareness experienced more difficulty learning to read than those with a single deficit (Joseph, 2006). Research shows that the relationship between rapid naming and literacy is more pervasive for intermediate grades than for primary grades (Berninger & Wagner, 2008; Joseph, 2006). There is some controversy as to the role of rapid naming independent of phonological processing (Fletcher et al., 2007). If rapid naming is independent, it most likely operates on a timing mechanism that integrates phonological and orthographic information of printed words; that is quickly accessing the sound systems of written language (Berninger & Wagner 2008; Fletcher et al, 2007; Joseph, 2006).

Evidence Based Interventions for Basic Word Reading

While the approaches to teaching and intervening on issues surrounding basic word reading have varied from holistic or meaning-centered approaches to phonics based approaches, research suggests that the two most important areas of intervention for basic word reading include: (a) phonemic awareness; and (b) phonics (Joseph, 2008; NICHD, 2000). According to the National Reading Panel phonemic awareness and phonics instruction activities have a significant impact on a variety of student's reading outcomes and across a multitude of student populations and ability levels (NICHD, 2000). The

three categories of basic word reading interventions include: (a) phonemic awareness instruction; (b) phonics instruction; and (c) a combined approach. Phonemic awareness instruction involves teaching students to attend to and manipulate the individual phonemes in speech and allows children to associate sounds with letters in preparation for decoding (e.g., Hosp & MacConnell, 2006; NICHD, 2000; Reading & Van Dueren, 2007). Phonics instruction differs from phonemic awareness instruction in that it teaches students to use grapheme-phoneme correspondences to read and spell words, while phonemic awareness instruction does not always include a grapheme component (NICHD, 2000). Some instructional approaches combine these concepts and focus both on phonemic awareness and the application of these principles to letters or graphemes, in order to decode new words and increase reading and spelling competency in students (Joseph, 2008; NICHD, 2000). These are often the most successful and make the application of phonemic awareness and phonics knowledge explicit in relating it to reading and writing (NICDH, 2000).

Phonemic awareness intervention. The National Reading Panel conducted a meta-analysis of 52 articles related to phonemic awareness instruction and found that phonemic awareness instruction is not only effective at teaching children to read but also helps to prevent reading difficulties, aids in spelling, and benefits reading comprehension (NICHD, 2000). The National Reading Panel found phonemic awareness instruction significantly better than alternate forms of training with a large overall effect size on phonemic awareness outcomes of $d = 0.86$ and a moderate effect size on reading outcomes of $d = 0.53$. Phonemic awareness instruction is effective for many different

types of students, including those from low SES backgrounds, older disabled readers, and those learning English as a second language (NICHD, 2000). Researchers found that phonemic awareness instruction was effective with short instructional times ranging from 5 to 18 hours; studies that spent longer found less promising results (NICHD, 2000; Reading & Van Deuren, 2007).

Evidence-based instructional approaches and intervention strategies that aid in the development of phonemic awareness skills include: (a) sound manipulation activities; (b) sound boxes; and (c) sound sorts (Joseph, 2008). Sound manipulation activities involve a multitude of activities that aid children in identifying beginning, medial, and ending sounds as well as blending, segmenting, deleting, substituting and reversing the individual the sounds in words (Joseph, 2008; NICHD, 2000). These activities could include segmenting a word by clapping each sound, as well as games that encourage using deletion and substitution to make a variety of words (Joseph, 2008). There are two major types of sound manipulation activities that encourage phonemic awareness; (a) sound sorts; and (b) sound or Elkonin boxes.

Sound sorts are used to help children learn to differentiate between different sounds, categorize sounds with the same beginnings and endings or develop alliteration and rhyming skills, as well as attend to the sound structure and syllables in words or develop phonemic awareness (Bear et al.,2008; Joseph, 2008). Children are generally presented with pictures or words that serve as broad categories. Then children select pictures or words from a pile, say the word, categorize it, and explain their choice. Children may match them to the broad categories on the basis of the same beginning,

medial, ending, or rhyming sounds. For example the child draws a card with a picture of a log, the child says *log*, and is asked to put the picture in the appropriate category; with category pictures of a *cat*, *mouse*, and *frog* the child would categorize the picture of the log with the picture of the frog on the basis of similar endings and explain their choice (Bear et al., 2008; Joseph, 2008).

Sound boxes, also known as Elkonin boxes, allow the student to practice segmenting and attending to the individual sounds in words and also scaffold sound blending skills (Joseph, 2006; 2008). In sound boxes an individual word is represented by a rectangle with lines drawn to segment the different sounds. The boxes within the rectangle represent a distinct sound in the word; tiles or flashcards may be used instead of connected boxes. For example, if the student was provided with the word *sheep,* the rectangle would have three boxes, one slot for the /sh/ sound, one slot for the /ē/ sound, and one slot for the /p/ sound. The instructor first models the task explaining how the boxes represent the individual sounds in words and how these boxes correspond to those sounds, as well as how to move tokens according to the sounds they hear (Joseph, 2006; 2008). The child may be given a token to slide along or be asked to follow with their finger as the individual sounds in the words are slowly and individually articulated or segmented. They also may be asked to follow underneath the boxes with their finger as they blend the sounds in the boxes to create words.

Maslanka and Joseph (2002) sought to determine the differential effects of sound sort and sound box instruction techniques. In their study 19 preschoolers were randomly assigned to either sound sort (n = 10) or sound box (n = 9) instructional groups. The

participants had a mean age of 4 years 5 months. The results of sound sort and sound box instruction groups was measured by the *The Phonological Awareness Test*, in particular the Rhyming, Segmentation, Isolation, and Blending subtests. The participants received either sound box or sound sort instruction for 15 minutes a day over a period of 26 consecutive days in small groups of 4 to 5 children. A *MANCOVA* analysis of post-test measures which controlled for initial performance differences was conducted and no significant differences were found between the sound box and sound sort groups (*Wilk's Lambda* = 0.36*; F (1,17)* = .29, $p > .05$). This suggests that both techniques sufficiently teach phonemic awareness skills.

According to Reading & Van Dueren (2007) phonemic awareness instruction is a means rather than an end to successful reading practices. Learning phonemic awareness skills beyond a sufficient level is not necessary or beneficial (NICHD, 2000; Reading & Van Deuren, 2007). In their study the literacy skills of 1st grade children were assessed. One group *(n* = 45*)* of children received no explicit, systematic phonemic awareness instruction in kindergarten while the other group *(n* = 47*)* did receive phonemic awareness instruction in kindergarten. The group that did not receive explicit systematic phonics instruction, or the NPAK group, used the program Getting Ready to Read. The group that received instruction in kindergarten, or the PAK group, used the program Open Court Reading which teaches phonemic awareness in sequential steps and entailed frequent monitoring of skills. Once progressing to 1st grade both groups began receiving the Open Court Reading program. The children's reading skills were assessed using *The Dynamic Indicators of Basic Early Literacy Skills (DIBELS)* and participants were tested

in the beginning, middle, and end of their first grade year. The researchers found that the children who had received instruction in kindergarten (n = 47) performed significantly better on measures of phonemic awareness as measured by the *Phoneme Segmentation Fluency (PSF)* subtest *(d = 0.38, $p < 0.01$).* The children who received early phonemic awareness instruction received a mean score of 36.9 which placed them in the Established category, while the children who did not receive the program until 1st grade received a mean score of 23.7 which placed them in the Emergent category. The researchers also found a significant difference ($x^2 = 4.63$, $df = 1$, $p < .05$) between the number of students in the NPAK (n = 23) group that were assigned to instructional recommendations, or needed additional support, compared to those in the PAK group (n = 13) based on their fall benchmark assessment in 1st grade.

DIBELS measures were repeated again in the winter and spring benchmark periods, with less differences found between the two groups, demonstrating that the Fall benchmark assessment period was the most significantly affected (Reading & Van Deuren, 2007). When DIBELS measures were repeated in the middle of the year, the PAK group again significantly outperformed the NPAK group (d = 0.4000, $p < .01$) on measures of PSF. The PAK group received a mean scores 54.2 while the NPAK group received a mean score of 47.4, although both groups scores were greater than 35 and thus considered in the Established category. No significant differences were found between the groups in the number of students requiring instructional recommendations at the middle of the year. The NPAK group dramatically lowered their number of students needing intervention from the beginning of the year from decreasing from 23 to 10

students, while those in the PAK group remained the same (n =13). Testing at the end of the year revealed no significant differences between the groups on any of the other DIBELS measures including phoneme segmentation fluency, nonsense word fluency, and oral reading fluency. They again found no significant differences between these groups in the number of students requiring intervention, with the NPAK group identifying 8 students in need and the PAK group identifying 10 students in need. This research confirms that while phonemic awareness instruction is most beneficial when delivered early, it can be taught later and is related to overall reading competency.

Yeh (2003) evaluated the effects of two phonemic intervention approaches on the phonemic awareness of children participating in Head Start programs to determine which approach was more effective in teaching this skill. Participants in this study included boys and girls aged 4 to 5 years old. All of the participants came from low-income families and were non-readers with low levels of phonemic awareness. Prior to the study the curriculum only included shared-story reading and did not include phonemic awareness instruction or emphasize sound/symbol relationships.

In that study, (Yeh. 2003), baseline data collection consisted of scores on measures adapted from the *Phonological Awareness Test*. Four measures were combined and transformed to provide a measure of combined phonemic awareness including: (a) Phoneme Blending; (b) Phoneme Segmentation; (c) Phoneme Deletion; and (d) Phoneme Substitution. Phoneme Blending was assessed by asking the children to blend 14 words spoken in individual phonemes with the score being the total number of words correctly blended. Phoneme Segmentation was assessed by asking children to segment the

individual phonemes in 12 words with their score being the total number of correct phonemes. For Phoneme Deletion children were presented with 10 words and were asked to delete a phoneme; the children's score was based on the total number of words where the phoneme was deleted correctly. Phoneme Substitution was assessed by asking children to change the sounds in 14 words to make them different words, the child's score was the total number of words changed correctly.

The children also were assessed on (a) letter-sound matching and (b) oral reading. For Letter-Sound Matching children were shown letters and asked what sounds they made; if the letter made more than one sound children were prompted to provide the additional sounds for a total maximum score of 35 correct sounds (Yeh, 2003). Oral reading was assessed by asking children to read 46 words that formed simple sentences containing mostly consonant-vowel-consonant words (i.e., fat cat sat on mat). The score was based on the total number of words read correctly.

Children were instructed in small groups of 3-5 children for 20-25 minutes twice per week for a period of 9 weeks. Children were divided into two groups, the rhyming group and the segmentation group. The first group ($n = 21$) received a phonemic awareness instructional approach that focused on rhymes and alliteration while the second group ($n = 23$) focused on phoneme segmentation, blending, and substitution in the context of decoding real CVC words. Pre-test scores were subtracted from post-test scores to obtain gain scores. Yeh (2003) found that children who focused on segmentation, blending, and substitution of phonemes produced significantly greater gains in the combined measure of phonemic awareness than children in the alliteration

and rhyming treatment group, $F(1, 40) = 7.33$, $p < .01$, $d = 0.92$, with the largest differences attributed to phoneme substitution abilities. Yeh (2003) also found that the letter-sound knowledge of children who received the segmenting and blending approach was significantly greater than the gains made by the rhyming and alliteration group, $F(1, 40) = 9.55$, $p < .01$, $d = 1.13$. Children who received the alliteration and rhyming focused approach mean scores increased from 1.05 to 2 correct letter-sound correspondences while children who received the blending, segmenting, and substitution approached received mean scores increases of 1.21 to 7.04 correct letter-sound correspondences.

The significant difference between phonemic awareness skills in the two groups intuitively makes sense considering that the alliteration and rhyming are lower order skills in the phonemic awareness hierarchy than are substitution, blending, and segmenting (Yeh, 2003). The group that focused on higher order skills would of course make more gains due to the fact that they were exposed to more complex phonemic awareness tasks beyond that of what the alliteration and rhyming group were exposed to. Furthermore, the greater gains of the children who received the blending and segmenting approach may be largely due to the design of their study. It intuitively makes sense that the alliteration and rhyming group would receive lower scores as they were assessed on skills that they received no direct instruction in while the blending and segmenting group were taught these skills explicitly.

Phonics instruction. The National Reading Panel conducted a meta-analysis of 38 studies related to phonics instruction, from which 66 treatment-control comparison groups were derived for analysis (NICHD, 2000). The analysis found that they majority

of positive effect sizes were in the areas of single word decoding and spelling with 76% contributing to this outcome and 24% demonstrating positive effect sizes for contextual reading. The majority of studies (38%) involved the study of 1st graders. The National Reading Panel (NICHD, 2000) found that overall phonics instruction demonstrated a positive effect size (d = 0.44); and concluded that systematic phonics instruction was more effective when compared to instruction methodologies in a whole language classroom. No significant differences in effect sizes were found between the different phonics approaches. The National Reading Panel also found that phonics instruction when delivered individually (d = 0.57), in small groups (d = 0.43), and within in classrooms (d = 0.39) were all effective and did not differ significantly from one another (NICHD, 2000). The Panel also concluded that phonics instruction was particularly effective in kindergarten and first grade with combined moderate effect sizes of d = .055, but was less effective after 1st grade (d = 0.27). Phonics instruction was moderately effective at improving children's ability to read regularly spelled words (d = 0.67) as well as pseudowords (d = 0.67) but was less effective in improving children's ability to read irregular words (d = 0.40). This may be related to the fact that phonics instruction relies on teaching predictable phoneme-grapheme relationships. Phonics instruction was particularly effective for 1st graders at risk for reading failure with moderate effect, d = 0.74 for basic word reading abilities. Phonics instruction also was found to improve comprehension in young readers before first grade with moderate effect, d = 0.51. The researchers also concluded that systematic phonics instruction had a moderate effect on spelling among students in 1st grade and kindergarten (d = 0.67) but was not effective

after 1st grade (*d* = .09). Programs were most effective when they made explicit how to apply phonics skills in order to read and spell words.

Phonics instruction focuses specifically on learning letter-sound correspondences so readers can decode new words by relying on learned grapheme to phoneme relationships. Evidence-based instructional strategies that aid in developing phonics include: (a) Onsets and Rhymes; (b) Word Boxes; and (c) Word Sorts (Joseph, 2006; 2008).

Onsets and rhymes also are referred to as word families or phonograms; there are 286 phonograms or word families (Joseph, 2006). Onsets refer to the beginning of the word or the part of the syllable before the vowel while rhymes refer to the ending of the word or the part of the syllable from the vowel onward. Onsets and rimes help the reader by allowing the reader to decode new words by analogy; once a child can read *pill* they can easily decode words from the same rhyme family such as *hill*, *will*, and *bill* (Joseph, 2006; 2008).

Word Boxes are similar to Sound Boxes except word boxes always include a grapheme component and go a step further by requiring children to match graphemes to the individual phonemes in a spoken word (Joseph, 2006; 2008). Word boxes move beyond differentiation of sounds to applying the alphabetic principle to the individual sounds in the word. The child still has a rectangle with lines drawn to represent the individual sounds in a given word except instead of tokens the child manipulates letters. A word written on an index card is placed in front of the child, with respective letters provided, and the child is instructed to slide the letters into the appropriate boxes as they

slowly articulate the individual grapheme-phoneme correspondences. Word Boxes are made increasingly difficult by replacing solid lines with dotted lines and eventually fading away the lines and the box completely. This task can also include a writing component by requiring children to write the letters in the connected boxes as they articulate the individual sounds in the word. This activity may enhance spelling and writing skills.

Word Sorts involve sorting words on index cards according to phonograms or word families and spelling categories provided by the instructor (Joseph, 2006; 2008). Word sorts help children understand, recognize, and differentiate between different and similar spelling and sound patterns in words. For example a child is given the categories of *-ake* and *-ain* and is asked to sort various words on cards accordingly, placing words like bake, take, make. with the -ake category and words like pain, gain, train, with the -ain category. In this activity, children sort words based on similar appearance and sounds, thus increasing lexical and phonological understanding of words and how they relate to one another. According to the National Reading Panel (NICHD, 2000) activities such as these enhance phonics skills by emphasizing the phonological and orthographical patterns in words and word families. These activities also enhance spelling competencies (NICHD, 2000).

Combined approach. According to the National Reading Panel, phonemic awareness instruction was considerably more efficient when it used letters, or incorporated phonics principles, than when this grapheme component was not included (NICHD, 2000). Phonemic awareness interventions that were explicit in how to apply

phonemic awareness skills in reading or writing, as is done when combining phonemic awareness and phonics, were more effective than ones that did not. The Panel also found that many of the phonemic awareness programs that included letter-sound manipulation components would qualify as phonics studies as well, but were not included in the phonics analysis to prevent duplication of studies. The National Reading Panel also concluded in their meta-analysis of phonics instruction that in order for phonics instruction to be effective it should be introduced in the early grades and should incorporate letter knowledge and phonemic awareness (NICHD, 2000).

The methods of the individual phonemic awareness programs differ considerably regarding whether the approach includes a grapheme component or combine phonics principles into instruction (Joseph 2006; 2008; NICHD, 2000). A number of researchers also have found that teaching phonemic awareness combined with letters or graphemes, or a combined approach, is considerably more effective than teaching phonemic awareness by sounds alone. Knowledge of the alphabetic principle including letter shapes, names, and sounds allows maximum gains to occur from phonemic awareness instruction (Joseph, 2008; NICHD, 2000). hus, interventions that are proposed to be most successful utilize both phonemic awareness and phonics skills in tandem in order to help children attain literacy (NICHD, 2000).

Ryder, Tunmer, and Greaney (2007) examined the effects of explicit instruction within a combined approach of phonemic awareness and phonemically based decoding skills as an intervention strategy for struggling readers in a whole language classroom. The study included 24 children who were 6 and 7 years old and struggled with reading.

The intervention group (n = 12) received explicit instruction in phonemic awareness and phonics tasks while the control group (n = 12) continued to receive standard whole language instruction. The intervention group was divided into four groups of children with 3 children each. The intervention was delivered in a series of 56 lessons over the period of 24 weeks and focused on phonemic awareness and alphabetic recoding skills; lessons typically lasted about 25 minutes. The lessons generally began with a short recap of previously learned material followed by 5 minutes of phonemic awareness exercises and then 10 to 15 minutes of phonics activities stressing letter-sound correspondences. Participants usually received 4 lessons per week that typically lasted 25 minutes. The lesson concluded with an activity requiring the students to practice what they just learned. After lesson 28 storybooks also were read two times a week between lessons.

In their study, both groups received pre and post-test measures of phonemic awareness, phonological decoding, word recognition without context clues, accuracy within connected text, and reading comprehension (Ryder et al., 2007). The researchers used four subtests from the *Phonological Awareness Test* to measure the participant's growth in phonemic awareness; including the phoneme segmentation, phoneme blending, phoneme deletion, and phoneme substitution subtests. Phonological decoding was measured by a pseudoword decoding task that required students to read 30 monosyllabic pseudowords. Their ability to read words in isolation was measured by the *Burt Word Reading Test* and their ability to read in connected text was measured by the *Neale Analysis of Reading Ability Revised* through the use of the Accuracy and Comprehension

subtests. There were no significant differences between the groups in any of the pre-test measurements.

Ryder and colleagues (2007) found that explicit instruction in phonemic awareness caused the intervention group (n = 12) to significantly outperform the control group (n = 12) on all post-test measures with a large effect sizes for measures of phonemic awareness (d = 1.71), nonsense word reading (d = 1.69), and reading words in isolation (d = 0.88). The experimental groups ability to ready words in connected text was also significantly better than that of the control group with moderate effect sizes of (d = 0.70) and large effect sizes of (d = 0.98) for comprehension.

A 2 (group) x 2 (time) *ANOVA* was performed for each of the measures which revealed a significant Group x Time interaction effect for phonological awareness, $F(1,22)$ = 60.76, p < .001(Ryder et al., 2007). This interaction also was significant for nonsense or psuedoword decoding, $F(1,22)$ = 64.79, p < .001 and for reading words in isolation, $F(1,22)$ = 13.95, p < .001. In all three of these interactions the post-test mean was higher for the children who received the intervention than that of the children who did not receive the intervention. The researchers concluded that the intervention successfully improved phonological awareness, decoding, and reading words in isolation. While all participants were considered struggling readers, at the beginning of the study, the intervention group was on average performing only 2 months below normative age levels while the group that did not receive intervention was performing 10 months below age level. The same interaction effects were not found to be significantly different between the groups in post test scores of comprehension $F(1,22)$ = 3.54, p = .073.

Two-year follow-up data was obtained for 10 of the 12 matched pairs and revealed that children in the intervention group continued to outperform the control group in measures of reading words in isolation with a moderate effect size of (d = 0.72) as well as reading words in connected text with a large effect size (d = 0.81, Ryder et al., 2007). The group who received the intervention were 7 months behind age appropriate levels of reading words in isolation and 1 month behind in reading words in connected text whereas the group who did not receive the intervention were 17 months and 16 months behind respectively. This suggests that the gains made by the group who received intervention were maintained and these gains generalized to increased word recognition in connected text.

Joseph (2000) also used a combined approach in his research comparing the effectiveness of two phonics approaches on children's phonemic awareness, word identification, and spelling performance. Although Joseph (2000), coined these approaches as phonic approaches they are actually combined due to the sequencing of activities that focus first on phonemic awareness activities that parallel sound boxes and sound sorts.

The participants included 42 Caucasian 1st grade children including 19 females and 23 males (Joseph, 2000). These children were divided into 3 groups; those who received word box instruction (n = 14), those who received word sort instruction (n = 14), and those who received traditional classroom instruction (n = 14). All of the students were equal in their initial levels of word recognition as measured by the Letter-Word Identification subtest of the *Woodcock-Johnson Achievement Battery-Revised.* The

students received 50 daily sessions of instruction within a 12 week period. The children in both the Word Sort and Word Box group received 20 minute daily lessons. The words taught primarily contained consonant-vowel-consonant (CVC) patterns and the words taught from previous sessions were reviewed. For those children receiving word box and word sort instruction teachers provided systematic guidance and feedback until the students were able to perform tasks alone.

For the Word Box instruction group, the lesson was presented in three stages and due to this sequencing can be considered a combined phonemic awareness and phonics approach (Joseph, 2000). In order to solidify the connection between phonemic awareness, phonological recoding, and orthographic skills lessons were presented in three stages. The first stage emphasized phonemic awareness with children differentiating sounds with sound chips as seen in sound boxes. The second stage emphasized phonological recoding by replacing sound chips with letter chips and having the children match the sounds in the words to their respective letters as seen in word boxes. The third and final stage emphasized orthographic processing by having the children write the letters in the divided sections for the word.

For the Word Sort instruction group, the lesson was again presented in three stages (Joseph, 2000). Children were presented with three CVC words written on index cards in front of them and chorally read all three index cards. In the first stage, which again facilitated phonemic awareness, the instructor would say a word and the children were asked to place a chip below the index card that represented the word category similar to sound sorts. In the second stage, children were asked to sort the words based

on similar spelling patterns and then read the words aloud to hear the similarities as seen in traditional word sorts. In the third stage the children again categorized words except this time they wrote the word instead of it being presented on an index card, which again emphasized orthographic processing.

Joseph (2000) measured phonemic awareness using the Phonemic Blending and Phonemic Segmentation subtests from the standardized, norm referenced, *Phonological Awareness Test*. Word identification was measured by providing the child with a list of 60 randomly selected consonant-vowel-consonant patterned words and the total number correct served as the score. Psuedoword naming was measured to determine the decoding or phonics skills; The *Word Attack* subtest from the *Woodcock-Johnson Achievement Battery-Revised* was used to measure psuedoword naming, a skill that requires phonics knowledge. In order to measure spelling a traditional spelling test of twenty words randomly selected from words taught was administered and the total number correct served as the score. Using a multivariate test, researchers concluded that they type of instruction significantly influenced the results of the groups (*Wilks Lambda* = .43, $F(2, 39) = 3.66$, $p < .001$).

Joseph (2000) found that the Word Box instruction group significantly outperformed the control group on measures of phonemic blending ($p < .01$), phonemic segmentation ($p < .001$), psuedoword naming ($p < .05$), and word identification ($p < .001$). The Word Sort group significantly outperformed the control group receiving traditional instruction on measures of phoneme segmentation ($p < .01$), word identification ($p < .05$), and spelling ($p < .01$). No significant differences were found

between the Word Sort and the Word Box instructional groups, suggesting both when sequenced and combined as they are in this study are adequate means of teaching phonemic awareness, phonological recoding, and orthographic skills.

Summary

Attaining literacy is complex, multifaceted, and involves the successive individual components of basic word reading, fluency, and comprehension (Berninger & Wagner, 2008; Joseph, 2006). These areas also serve as points of intervention when a reader is struggling. Young readers first must learn to master basic word reading through phonemic awareness skills and applying phonics knowledge (Fletcher et al., 2007; Joseph, 2008; NICHD, 2000). Some readers may be more naturally attune to phonological cues than others and some may need explicit training in phonemic awareness and phonics in order to comprehend the underlying sound and written systems of language (Joseph, 2008; NICHD, 2000). When these components are taught explicitly through multisensory activities, as is done with sound boxes and sound sorts, children become more attune to the individual sounds in words (Bear et al., 2008; Joseph 2008). These predictable patterns and relationships are taught through explicit phonics instruction (Joseph, 2006; 2008). Activities to foster phonics knowledge, such as word boxes and word sorts, build on phonemic awareness skills and incorporate knowledge of the written system of language, letters or graphemes and combinations thereof, so that words may be decoded when words are unfamiliar (Joseph, 2008). These activities involve using knowledge of relationships that exist between phonemes and graphemes in order to decode new words (Bear et.al, 2008; Joseph, 2006; 2008). When phonics

instruction is combined with phonemic awareness instruction it is more effective than these strategies used alone and leads to a more complete understanding when reading (NICHD, 2000).

Purpose of the current study. The purpose of the current study was to determine the effectiveness of a combined phonemic awareness and phonics approach using an individualized reading intervention with a student who is struggling in reading. The student received an evidence-based, multisensory, systematic interventions in phonemic awareness and phonics. The curriculum-based measures were used to measure progress and determine effect sizes for the combined intervention approach.

Hypothesis 1. This study hypothesized that the participant would demonstrate a positive rate of improvement (ROI) in response to the intervention. This effect would be evidenced by visual inspection of graphed data that will show increasing trends on progress monitoring probes toward the goal for each of the three progress measures. Specifically, it was hypothesized that the participant would have the most dramatic ROI for phonological awareness, followed by phonics, followed by word reading efficiency.

Hypothesis 2. It was hypothesized that there would be positive effect sizes as indicated by g-index scores and percent of non-overlapping data (PND) for the three progress monitoring measures. Specifically it was hypothesized that the participant would make the greatest gains in measures of phonological awareness, followed by phonics, followed by word reading efficiency measures.

CHAPTER II

METHODS

Participant

The participant was a student who had just completed the 1st grade. In an interview with the participant's mother, she indicated that he had been struggling with reading since kindergarten. Based on the pre-intervention baseline data collection, his phonemic awareness skills were below the 10th percentile using national norms. His phonics skills were also found to be below the 10th percentile. His reading efficiency on 1st grade words was found to be below grade level, the benchmark for 1st grade is 50 correct words per minute.

Measures

Progress monitoring curriculum-based assessments.

Phonological awareness. To monitor progress of phonemic awareness skills the Phoneme Segmentation Fluency (PSF) subtest from DIBELS (Good & Kaminski, 2002) was used. The Phoneme Segmentation Fluency probe measures the individual's ability to hear a word and then articulate the individual sounds within the word. To administer this subtest, the examiner read words with two to five phoneme sequences and the examinee then pronounced the individual sounds in the word (ex. Tell me the sounds in *bat*; */b/ /a/ /t/*). This probe was timed for 1 minute and the correct number of phonemes segmented was recorded.

Phonics. To monitor progress of phonic skills, the Nonsense Word Fluency (NWF) subtest from DIBELS (Good & Kaminski, 2002) was used. This probe measures

the student's ability to apply the alphabetic principle, or understanding correct letter-sound correspondences, as well as the ability to blend the letters into words based on phonics knowledge. It provides a quick measure of how well students can decode. To administer this probe, the participant was provided a list of nonsense words (ex. bap) and was asked to read the words or individually produce the letter sounds of the nonsense word for 1 minute.

Word reading efficiency. In order to measure word reading efficiency the Word Identification Fluency probe was used (Hosp et al., 2007). This task measures the students decoding skills with grade level words as well as their sight word skills. Students are provided with a list of 50 grade level words and asked to read or decode as many as they can in one minute. The words chosen sample the reading skills the student is expected to master at that grade level.

Pre/post perception surveys. In order to determine how perceptions about reading were affected as a result of the intervention the participant completed a survey pre and post intervention. The questions on the survey were brief and were answered in a 4 point likert-scale. The questions addressed attitudes and dispositions about reading as well as perceptions of the intervention. There were two forms of the survey, one to be administered before the intervention. The questions on the surveys were derived and adapted from McKeena & Kear (1990).

Intervention

Design. This study used a single subject A-B design. Single subject A-B experimental designs consist of two phases; in the first part (A) there is no intervention

(i.e., baseline) and in next phase (B) the intervention takes place (Brown-Chidsey, Steege, & Mace, 2008). The three curriculum based assessments served as the dependent variable and were measured before the intervention (phase A) and during the intervention (phase B) to determine if changes in reading ability were due to the intervention (the independent variable). Single-subject designs are well suited for educational purposes due to their practicality, problem solving emphasis, and established scientific rigor (Brown-Chidsey et al., 2008; Marchant, Renshaw, & Young, 2006). These designs also have strong internal validity. A case-study approach is valid for experimental purposes when the baseline data are stable and the intervention effects are measured through repeated, objective measurements that are administered systematically and frequently (Brown-Chidsey et al., 2008; Marchant et al., 2006). This is accomplished by the gathering at least 7 to 10 data points during the intervention phase (Christ, 2006). The success of the intervention is judged through examination of level and slope or rate of improvement (ROI; Brown-Chidsey et al., 2008). Level is critical as it helps to determine whether or not a participant has met a performance standard. Slope (ROI) is also important in that it shows how quickly the participant is improving and if they are likely to meet the intervention and individual performance goals.

Pre-intervention baseline. An important component of single subject AB designs is that baseline data is stable, or there is a narrow range of values (Marchant et al., 2006). This helps to ensure that changes in reading skills are due to intervention itself. In the current study, three probes of each curriculum-based measure were administered prior to

the start of the intervention. This data was used to inform the selection of the intervention materials.

Phonemic awareness instruction. The evidence-based reading program *Sounds Abound: Listening, Rhyming, and Reading* (Catts & Williamson, 1993), served as the phonemic awareness intervention. This program was designed for use with children aged 4 to 7 in pre-kindergarten through 2nd grade. *Sounds Abound* teaches important lessons related to phonemic awareness including the application of the alphabetic principle, rhyming, segmenting, blending, and manipulating sound segments. The program contained five sections: (a) speech sound awareness; (b) rhyme; (c) beginning and ending sounds; (d) segmenting and blending; and (e) putting sounds together with words. The speech sound awareness section is used for young readers and introduces them to the sound system of language through sound repetition activities and games. The rhyming section emphasizes similar sounds by having the individuals categorize similar sounding words and producing rhymes. The beginning and ending sounds section requires the individual to put words in categories based on similar beginning and ending sounds and to produce words with similar sounds. The activities used in the speech sound awareness, rhyme, and beginning and ending sound sections are techniques very similar to sound sorts and fosters phonemic awareness in a homologous way. The segmenting and blending section sections requires individuals to blend the sounds in words first by segmenting and blending syllables and then eventually individual phonemes. The final section, putting sounds together with words, requires them to put together letters to make words. The activities in the last two sections are akin to sound boxes which focus more

on segmenting and blending the individual phonemes in words as well as creating words with given letters. The lessons initially use pictures to foster understanding and later progress to listening activities without picture assistance. The organization of lessons closely follows the phonemic awareness hierarchy, beginning with the easier tasks of alliteration and rhyming following by the higher order manipulation activities. The individual first learns rhyming, followed by identifying initial and final sounds and matching these sounds, then segmenting and blending activities, and finally putting sounds together with letters or using letters to make words.

Phonics instruction. The evidence-based phonics program, *Explode the Code* (Hall, 2004), was used for the phonics intervention. This Orton-Gillingham, research-based, multisensory program provides direct and systematic phonics instruction to children in pre-kindergarten through 4th grade. This program helps build early literacy skills by enhancing phonological awareness, decoding abilities, and spelling. Some of the activities in this program require students to match pictures with words while attending to similar phonetic sounds and word patterns, similar to the requirements in word sorts. Other activities resemble the tasks of word boxes by giving children a picture of an item and then having them write the word that corresponds to the picture, choosing the appropriate graphemes within a box for each letter of the word, and sounding these letters out as they encode the word. Many of the activities present words in the same word family and progress to having children choose letters to match pictures and eventually require them to encode or write the whole word.

Procedure

After IRB approval was granted (see Appendix A), parent consent and student assent were obtained. Then baseline data was collected. During each session the student participated in 30 minutes of phonemic awareness activities followed by 30 minutes of direct phonics instruction, in accordance with the combined approach using the materials described above. Progress was monitored using the three different curriculum-based measures discussed.

CHAPTER III

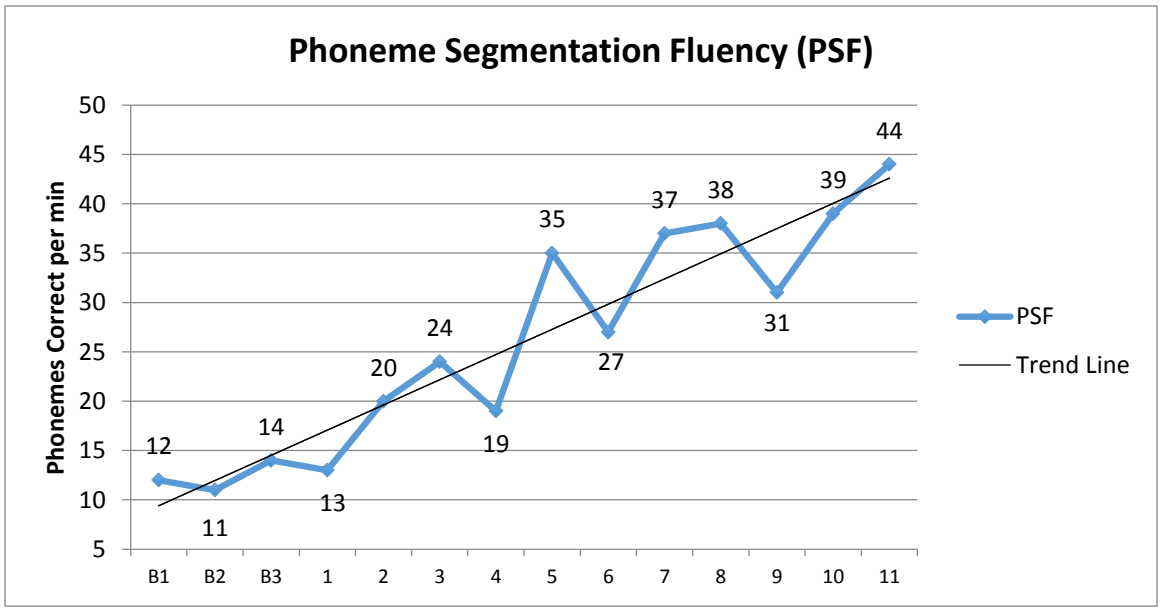
RESULTS

Hypothesis 1

It was hypothesized that the participant would have a positive rate of improvement (ROI) in response to the intervention on phonemic awareness, phonics, and word reading efficiency skills. As can be seen in Table 1, 2, and 3 the student's rate of improvement on the PSF, NWF and WIF probes showed a positive trend.

Table 1.

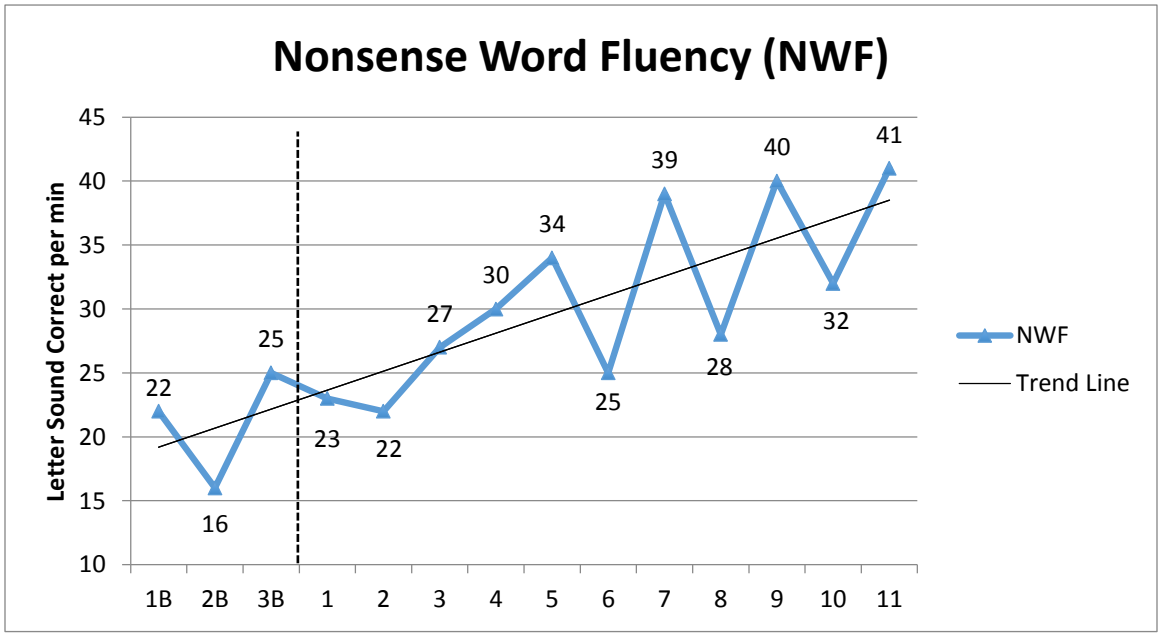
Rate of Improvement for Phoneme Segmentation Fluency (PSF)



Note. Benchmark goal was 35 phonemes segmented correctly per min.

Table 2.

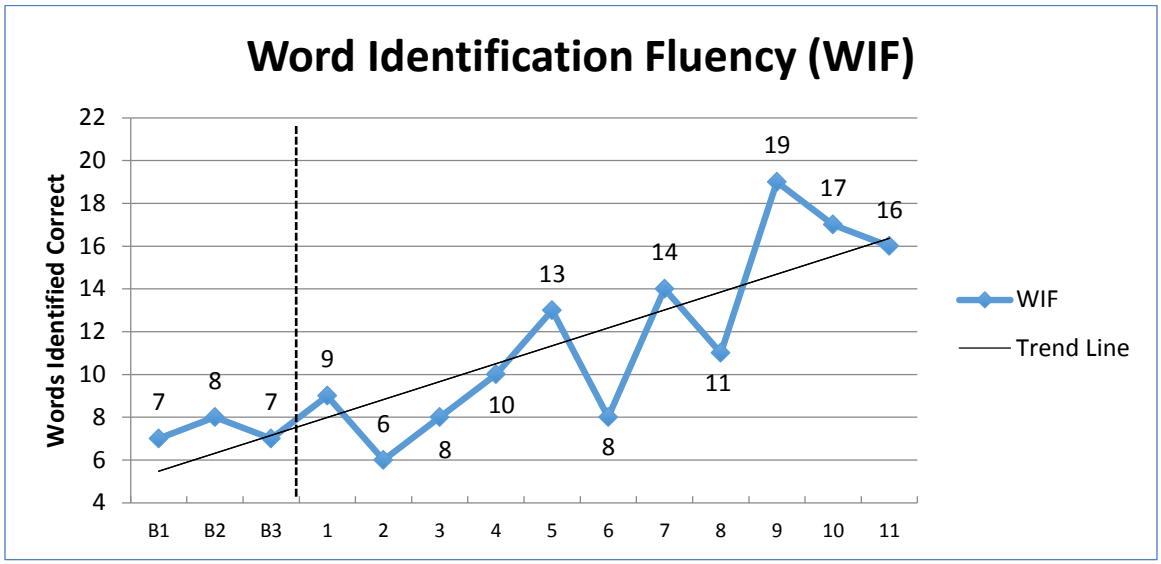
Rate of Improvement for Nonsense Word Fluency (NWF).



Note. Benchmark goal was 71 correct letter sounds per min.

Table 3.

Rate of Improvement for Word Identification Fluency (WIF).



Note. Benchmark goal was 50 words read correctly per min.

Hypothesis 2

As hypothesized all *g-index* scores were positive and all PND scores were in the moderately effective (70%-90%) to highly effective (90+%) range indicating that the intervention was effective across all three skills. Specifically, the effect sizes for phonemic awareness as measured by PSF indicated that the intervention was highly effective for increasing his skills in this areas, *g index* = 1.67, *PND* = 0.91. He exceeded the benchmark goal (35 phonemes segmented correctly per min.) on PSF. He also made gains in his phonics skills as measured by NWF, *g index* = +1.33, *PND* = 0.73. This PND score falls within the moderately effective range. Although he made significant gains in this area he was still far below the benchmark goal (71 correct letter sounds per min.). Additionally, positive effects were found on measures of WIF, *g index* = +1, *PND* = 0.73. Again the PND score indicated that this intervention was moderately successful in helping the student make increases in reading 1st grade sight words. Similar to what was found with NWF, although he made gains his scores in this area were still well below benchmark (50 words identified correctly per min.).

Additional Analyses

The participant completed a survey exploring his perceptions about reading and the intervention. As can be seen in Table 4, his perceptions about reading changed specifically in regard to more positively reported scores about reading alone, completing reading activities in class, reading out loud, and asking for help from pre to post assessment. His perception of the intervention was very positive.

Table 4.

Pre- Post Perception Survey

Items	Pre	Post
How do you feel about reading for fun at home?	2	2
How do you feel about getting a book as a present?	2	2
How do you feel about reading alone, or without help?	2	3
How do you feel about spending free time reading?	2	2
How do you feel about doing reading activities in class?	3	4
How do you feel when someone asks you to read aloud?	2	3
How do you feel when you have to take a reading test?	2	2
How do you feel about asking for help when reading?	3	4
I feel proud when I read.	4	4
How did you feel when it's time for reading intervention?	--	4
How did you feel about working with the interventionist?	--	4
I enjoy reading more now than before the intervention.	--	4

Note. 1 (*very negative/ strongly disagree*) to 4 (*very positive/ strongly agree*)

CHAPTER IV

DISCUSSION

The attainment of basic word reading skills, or literacy, underlies individual success in a modern society. It is the foundation for all further reading competencies including reading fluency and reading comprehension (NICHD, 2000). Furthermore, basic word reading is essential to an individual's ability to acquire and share knowledge in general (Hosp & MacConnell, 2008; NICHD, 2000). The importance of attaining literacy, in particular basic word reading skills, is well documented in regard to numerous educational, economic, and social outcomes related to success (Hosp & MacConnell, 2008; NICHD, 2000). Basic word reading involves both phonemic awareness and phonics (Fletcher et al., 2007; NICHD, 2000). Findings from the National Reading Panel suggest that both phonemic awareness and phonics are reading skills that can be successfully intervened upon to help attain basic word reading in struggling readers. Furthermore, the National Reading Panel found that phonemic awareness instruction was considerably more effective when phonics components were included, or a combined approach was used (NICHD, 2000).

Phonemic Awareness

Phonemic awareness instruction has been found to be effective in teaching children to read, preventing reading difficulties, enhancing spelling, and reading comprehension (NICHD, 2000). As hypothesized, the participant had a positive rate of improvement in phonemic awareness performance as measured by PSF (phoneme segmentation fluency) progress monitoring probes. He reached the benchmark goal in

this area. Evidence-based instructional approaches or intervention activities that have been shown to be effective in developing phonemic awareness skills include sound manipulation activities, such as sound boxes and sound sorts (Joseph, 2008; NICHD, 2000; Yeh, 2003). The activities and lessons in the *Sounds Abound: Listening, Rhyming, and Reading* (Catts & Williamson, 1993) program used in this study were closely related to the sound manipulation techniques, sound boxes and sound sorts, which foster phonemic awareness.

Phonics

The National Reading Panel found that phonic instructions had positive effects on reading ability including enhanced single word decoding, word identification, spelling, and contextual reading (NICHD, 2000). As hypothesized, the participant had a positive rate of improvement in word decoding ability as measured NWF (Nonsense Word Fluency). The participant also had a positive rate of improvement in WIF (Word Identification Fluency), which measured the participant's ability to read real words presented individually or out of context. Although he did not reach the benchmark goals on these probes, based on the effect size date, the intervention was moderately effective in increasing his phonics skills. Evidence-based instructional strategies proven to enhance phonics competencies include onsets and rhymes, word boxes, and word sorts (Joseph, 2006; 2008; NICHD, 2000). The multisensory activities and lessons in the evidence-based phonics program, *Explode the Code* (Hall, 2004), that was used in this study were closely related to the above instructional strategies.

Limitations

Single case study designs are practical and effective designs for evaluating intervention effectiveness, however, some limitations exist. Specifically, it may not account for all of the possible reasons for the student's reading progress and therefore it is not possible to conclude precisely that the improvement is direct result of the intervention (Brown-Chidsey et al., 2008). Collectively, these are thought of as threats to internal validity (Brown-Chidsey et al., 2008). Other threats inherent to the single-subject design's internal validity, relative to this study, include (a) maturation; (b) testing; and (c) regression (Brown-Chidsey et al., 2008). Maturation refers to increased performance that normally follows exposure and practice outside of the intervention (Brown-Chidsey et al., 2008). Testing effects regards the student's familiarity with the test materials and naturally increased performance with repeated exposure to similar instruments such as progress monitoring probes (Brown-Chidsey et al., 2008). Regression refers to the chance that improved performance is attributable to the case study beginning at the student's low point (Brown-Chidsey et al., 2008).

Future Directions

One direction of future research is to extend the duration of the intervention and data collection so more longitudinal inferences can be made regarding reading progress. Another direction would be to include more participants in future research; a larger sample size will allow results to be generalizable to more diverse student populations. In future research more diverse student populations should be studied including those that are in language acquisition programs, grant-funded programs, and those receiving special

education services for reading related disabilities. The collection of demographic information would be useful in determining whether interventions are equally effective among diverse populations.

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APPENDICES

APPENDIX A

IRB APPROVAL

INSTITUTIONAL REVIEW BOARD
Office of Research Compliance,
010A Sam Ingram Building,
2269 Middle Tennessee Blvd
Murfreesboro, TN 37129
IRBN001 Version 1.3 Revision Date 03.06.2016

IRBN001 - EXPEDITED PROTOCOL APPROVAL NOTICE

Investigator(s): Aimee Holt (PI),
Investigator(s') Email(s): *aimee.holt@mtsu.edu*
Department: Psychology
Protocol ID: **16-2237**

Dear Investigator(s),
The above identified research proposal has been reviewed by the MTSU Institutional Review Board (IRB) through the **EXPEDITED** mechanism under 45 CFR 46.110 and 21 CFR 56.110 within the category *(7) Research on individual or group characteristics or behavior* A summary of the IRB action and other particulars in regard to this protocol application is tabulated as shown below:

IRB Action APPROVED for one year from the date of this notification
Participant Pool **Minor participants**
Exceptions Signature waiver for assent forms from minors less than 9 years of age
Restrictions **Signed parental consent and child assent process**
Comments NONE
Post-approval Amendments NONE

Refer to the following schedule to plan your annual project reports and be aware that you may not receive a separate reminder to complete your continuing reviews. Failure in obtaining an approval for continuation will automatically result in cancellation of this protocol. Moreover, the completion of this study MUST be notified to the Office of Compliance by filing a final report in order to close-out the protocol.