KINDERGARTEN LINGUISTIC AWARENESS INTERVENTION: THE EFFECTS OF PHONOLOGICAL, MORPHOLOGICAL, AND ORTHOGRAPHIC INSTRUCTION ON EARLY LITERACY OUTCOMES IN AT-RISK STUDENTS

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ABSTRACT

Jennifer Lynn Zoski: Kindergarten Linguistic Awareness Intervention: The Effects of Phonological, Morphological, and Orthographic Instruction on Early Reading Outcomes in At-Risk Students
(Under the direction of Dr. Karen Erickson)

The primary purpose of this study was to determine if a three-pronged linguistic awareness intervention (i.e., phonological awareness [PA], letter knowledge [LK], & morphological awareness [MA]) was more effective than the commonly implemented two-pronged intervention (i.e., PA & LK) at increasing the early literacy skills of kindergarten students at risk for reading difficulties. The study also investigated the effectiveness of an intervention targeting morphological awareness alone as compared to the two other interventions. Seventeen kindergarten students at risk for reading difficulties completed a pretest and posttest battery that assessed PA, MA, word reading, and morphological spelling and participated in a six-week small group therapy program, for a total of 12 intervention hours. Three groups of five to six students received therapy in one of the following: PA and LK; MA; or a three-pronged linguistic awareness program.

Analyses revealed no significant differences for student literacy outcomes based on the type of linguistic awareness intervention they received; however, such an effect might not have been possible to detect due to reduced statistical power. Students in all intervention groups made large pretest to posttest gains in word reading ($d = 1.79$ to $2.19$). Students who received the PA/LK and the three-pronged interventions made large gains in PA ($d = 1.55$ to $1.59$). Students
who received the PA/LK and MA interventions made large gains in MA ($d = 1.46$ to $3.96$), with the largest effect for the MA group. Finally, large and significant student gains for morphological spelling ($d = 1.33$ to $3.0$) were found for students receiving both the MA and three-pronged interventions.

Additional analyses revealed no significant pretest or gain differences between native Spanish-speaking English language learners (ELLs; $n = 10$) and native English-speaking students ($n = 7$) in the full sample, suggesting that ELLs and native English-speaking kindergarteners with low early literacy skills at pretest benefited similarly from the varied forms of linguistic awareness intervention. Although there were no significant differences in student engagement in instructional activities among groups, when students from the three groups were considered together, the observed level of student engagement significantly predicted gains in morphological spelling, explaining $26.7\%$ of the variance in this outcome.

Additional larger scale research is required to further investigate the differential impact of intervention targeting multiple linguistic areas before conclusive recommendations can be made. However, the results of this study provide preliminary evidence for the feasibility of three-pronged linguistic awareness instruction for kindergarten students at risk for later reading difficulties, including ELLs, in response to intervention (RTI) programs.
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CHAPTER 1: STATEMENT OF THE PROBLEM

In 2008, the National Early Reading Panel (NELP) published a report synthesizing research findings related to the predictive power of early literacy skills on later reading outcomes. Six early literacy skills were found to predict later reading measures above the impact of other known predictors (i.e., IQ and socioeconomic status): alphabet knowledge; phonological awareness; rapid naming of letters and numbers; rapid naming of objects and colors; letter and name writing; and phonological memory (National Institute for Literacy [NIFL], 2008). Since that time, researchers have continued to investigate the early skills that have a strong predictive relationship with reading in young students, including oral language skills. In recent years, researchers have found that morphological awareness (MA), the ability to explicitly think about and manipulate morphemes, uniquely predicts word reading, spelling, and reading comprehension skills in students in the early elementary grades (e.g., Apel, Wilson-Fowler, Brimo, & Perrin, 2012; Nagy, Berninger, Abbott, Vaughan, & Vermeulen, 2003; Wolter, Wood, & D’zatko, 2009). For example, MA uniquely predicts word reading and spelling in first-grade students (Wolter et al., 2009) and pseudo-word reading in kindergarten students (Apel, Diehm, & Apel, 2013), both beyond the influence of phonological awareness (PA). For second-grade students at risk for failing to achieve state reading standards, MA uniquely predicts reading comprehension, beyond the influence of PA, orthographic knowledge, and vocabulary (Nagy et al., 2003). There is also evidence that intervention targeting MA leads to literacy gains for a range of young students, including kindergarten through second-grade students from low
socioeconomic backgrounds (Apel, Brimo, Diehm, & Apel, 2013; Apel & Diehm, 2013), first-grade students with spelling deficits (Wolter & Dilworth, 2013), and English language learners (Filippini, Gerber, & Leafstedt, 2012). Given these promising findings, continued research is needed to determine if MA intervention leads to gains in the literacy outcomes of students from other at-risk populations, such as those who demonstrate delays in early literacy skills during the kindergarten year.

**Multi-Tiered System of Supports**

Public schools in the United States routinely screen students in kindergarten to identify those who are not meeting grade-level literacy expectations and provide them with intervention in key areas related to early literacy achievement in order to prevent persistent reading difficulties. Universal screening is a part of response to intervention (RTI) within the framework of a multi-tiered system of supports (MTSS) that is utilized by many public school systems. Intervention for at-risk students increases in intensity levels, or tiers, such that students who do not make progress are provided with more intensive targeted small-group instruction, which may include special education (Fuchs & Fuchs, 2006; Justice, 2006). Research has shown that about 75% of kindergarten students who receive Tier 2 literacy intervention in addition to high-quality classroom instruction respond well to intervention within seven months and do not require additional services to maintain grade-level literacy skills in the early elementary grades (Coyne, Kame’enui, Simmons, & Harn, 2004).

Targeted literacy intervention in kindergarten has predominantly focused on increasing students’ PA and letter knowledge (LK) skills, two areas that are strongly related to later reading outcomes (National Institute for Child Health and Human Development [NICHD], 2000; NIFL, 2008). Given the recent promising evidence for including MA instruction as part of early
literacy intervention for lower elementary students, including students as young as kindergarteners (Apel, Brimo et al., 2013; Apel & Diehm, 2013), continued research is required to determine whether adding a focus of MA to existing kindergarten RTI programs will allow more students to make adequate progress as a result of Tier 2 intervention. Research in this area could provide valuable information for teachers and administrators on how to most effectively focus Tier 2 instruction for at-risk kindergarten students in order to address students’ needs.

**Importance of Early Literacy**

The kindergarten year is often the first opportunity that schools have to provide instruction and targeted intervention in early literacy skills for students who enter school with low early reading skills. Students who enter kindergarten with low literacy ability tend to continue to stay behind their typically developing peers throughout the school years (Snow, Burns, & Griffin, 1998). By providing students with Tier 2 interventions in targeted linguistic areas, students may be able to increase their rate of literacy growth (Justice, 2006). Thus it is essential that students who are at risk for persistent reading difficulties be provided with early intensive intervention in the linguistic areas that have been shown to predict literacy outcomes.

**Phonological Awareness and Early Literacy**

It is clear from the research over the past several decades that PA, or the explicit awareness of spoken sound segments including individual phonemes, is related to the later reading outcomes of preschool and kindergarten students (e.g., Lonigan, Burgess, & Anthony, 2000; NIFL, 2008; Schatschneider, Fletcher, Francis, Carlson, & Foorman, 2004; Torgesen, Wagner, & Rashotte, 1994). For example, Lonigan and colleagues (2000) found PA to be the most stable and robust predictor of later decoding skills in students who were followed from preschool through first grade. However, once reading has begun, actual word reading influences
the development of phonemic awareness, and the two skills become correlated, such that phonemic awareness no longer contributes unique variance to word reading (Hogan, Catts, & Little, 2005). Thus, PA should be assessed in kindergarten and targeted in Tier 2 interventions for at-risk students; however, from second grade on, phonetic decoding is a better predictor of later word reading outcomes (Hogan et al., 2005).

**Orthographic Knowledge and Early Literacy**

Orthographic knowledge includes the knowledge of letter names and their corresponding sounds, and the awareness of orthographic patterns and rules. Through the use of this knowledge, readers learn to form connections between letters and sounds, and eventually recognize words as larger orthographic units, including irregular words that do not conform to typical letter-sound correspondence conventions (Adams, 1990; Kirby, Roth, Desrochers, & Lai, 2008). Perhaps not surprisingly, orthographic knowledge is related to reading outcomes in emergent and early readers (e.g., Lonigan et al., 2000; NIFL, 2008; Schatschneider et al., 2004). Specifically, the knowledge of letter names and sounds is a unique predictor of later decoding (Lonigan et al., 2000), as well as word identification and reading comprehension (Schatschneider et al., 2004) in kindergarten students. By the end of the kindergarten year, letter name knowledge is no longer a significant predictor of reading outcomes; however, the knowledge of letter-sound relationships continues to predict reading outcomes (Schatschneider et al., 2004). This suggests that letter-sound correspondences should be assessed during the screening of kindergarten students and should be targeted as a part of early literacy interventions for at-risk students.
Morphological Awareness and Early Literacy

Research with struggling readers has highlighted the importance of MA in children’s ability to read and spell complex words, especially in the later elementary grades (Bowers, Kirby, & Deacon, 2010). Specifically, MA is an independent form of linguistic awareness contributing to reading skills above and beyond other known predictors, such as PA and orthographic knowledge (Bryant, Nunes, & Bindman, 2000; Roman, Kirby, Parrila, Wade-Wooley, & Deacon, 2009).

A growing body of research has begun to highlight the importance of MA in reading acquisition, in conjunction with other key early reading skills, such as PA and orthographic knowledge (Apel et al., 2012; Carlisle, 1995; Carlisle & Nomanbhoy, 1993; Deacon, Campbell, Tamminga, & Kirby, 2010; Deacon & Kirby, 2004; Nunes, Bryant, & Bindman, 2006; Wolter et al., 2009). For students in the early elementary grades, the results of several studies suggest that MA makes a unique and significant contribution to variance in single word reading, above and beyond the contribution of PA and other known predictors (Apel et al., 2012; Carlisle & Nomanbhoy, 1993; Deacon et al., 2010; Wolter et al., 2009). Wolter and colleagues, for example, found MA to uniquely contribute to 9% of the variance in the word reading of first-grade children. Others have found MA to be predictive of spelling in the primary grades (Apel et al., 2012; Nunes et al., 2006; Wolter et al., 2009). In second and third-grade students, for example, Apel and colleagues (2012) found MA to be the only unique contributor to variance in spelling performance. Thus, the evidence suggests MA makes a small, but significant contribution to the literacy skills of early elementary students.
Linguistic Awareness Instruction

The skills related to word reading in beginning reading have received a great deal of attention in recent years (NICHD, 2000; NIFL, 2008). The two areas given the most attention have been phonological/phonemic awareness and orthographic/letter knowledge (Casalis & Colé, 2009; Gillon, 2000; Hogan, Catts, & Little, 2005; Lonigan, Burgess, & Anthony, 2000). The National Reading Panel Report lists PA (i.e., specifically phonemic awareness, the awareness of individual sounds) and knowledge of letter-sound relationships as two of six key skills children require in order to learn how to read well (NICHD, 2000). In addition, the report states it is essential to combine PA instruction with the explicit instruction of letter-sound relationships.

The literature clearly suggests instruction in both PA and letter-sound relationships is an effective approach for teaching kindergarten students who are at risk for later reading difficulties.

While instruction in PA in conjunction with letter-sound relationships is crucial, recent work also suggests other linguistic processes should receive attention in efforts to target skills required for early literacy acquisition and later literacy success. Possibly due to the stronger evidence for morphological growth in the later elementary grades when children are exposed to increasing numbers of complex morphological forms (Berninger, Abbott, Nagy, & Carlisle, 2010), few studies have focused on morphological intervention in the early elementary grades. Yet, research has recently suggested the need for this type of intervention. For example, Apel and colleagues provided preliminary evidence with large student gains in the literacy outcomes of kindergarten through second-grade students who were exposed to intervention in MA (Apel, Brimo, Diehm, & Apel, 2013; Apel & Diehm, 2013). Bowers and colleagues (2010) conducted a meta-analysis of morphological interventions with students from preschool through eighth grade and found morphological instruction to be a particular benefit to struggling and younger readers,
especially when it was combined with other areas of literacy instruction. Given preliminary
evidence from intervention studies and the building evidence of MA as a unique and significant
predictor of literacy outcomes, it is a promising area to investigate with children just beginning
their school career.

**Purpose**

Research has suggested MA instruction can be included in existing linguistic awareness
programs without increasing instructional time (Reed, 2008) and is most effective when taught in
conjunction with instruction in PA and LK (e.g., Bowers et al., 2010). An effective kindergarten
literacy program may include linguistic awareness instruction in all three areas. Letter
knowledge and PA have been studied for several decades and are well established as effective
interventions, especially when implemented jointly. However, MA has only recently been
highlighted within the research domain; thus, it is not yet known if this type of instruction
provides benefit to kindergarten students beyond the instruction they are already receiving.

The primary purpose of this study was to determine if a three-pronged linguistic
awareness intervention (i.e., PA, LK, and MA) is more effective than the commonly
implemented two-pronged intervention (i.e., PA and LK) at increasing the literacy skills of
kindergarten students who are at risk for persistent reading difficulties. Additionally, the study
investigated the effectiveness of MA intervention administered alone as compared to the other
two intervention groups. The ultimate goal of this study was to provide information regarding
the effectiveness of three different kinds of linguistic awareness instruction during the
kindergarten year in order to focus RTI efforts towards literacy interventions that target a
combination of linguistic skills that will allow more students to benefit, thus reducing the
number of students who will require prolonged intensive intervention.
CHAPTER 2: REVIEW OF THE LITERATURE

Students who struggle to read in the early elementary grades face challenges across all subject areas in successive grades. They are often unable to access the material necessary to learn, spend a large amount of time playing “catch-up,” and may actually never catch up with their peers (Stanovich, 1986). A report from the National Institute for Literacy (NIFL) states that “approximately 8.7 million fourth through twelfth grade students struggle with the reading and writing tasks that are required of them in school” and that these issues are often a reason for students to drop out of school (p.1, 2007). At-risk students must be identified early and provided with intervention in key areas related to the development of literacy in order to reduce the number of students with persistent literacy difficulties that impact later academic outcomes (Snow, Burns, & Griffin, 1998).

Theoretical Framework

The current investigation is grounded in a combination of theories regarding word reading and linguistic influences on word reading. The following sections will highlight the impact that phonological, morphological, and orthographic processing make on early word reading, and in turn, on the successful literacy and academic outcomes of students in later grades.

The Triangle Model of Word Reading

For reading comprehension to take place, students must first be able to fluently recognize words. The word reading deficits of children with both oral and written language impairments can be explained by the Triangle Model (Seidenberg & McClelland, 1989) of word reading,
which suggests that word reading is accomplished through the development and recognition of connections among spellings, pronunciations, and meanings. Thus, learning to read involves establishing mappings among the orthographic, phonological, and semantic representations of words. According to the *Triangle Model* (Seidenberg & McClelland, 1989), there are two pathways for word recognition, the phonological pathway and the semantic pathway. With reading experience, the semantic pathway becomes favored for familiar words, as well as for exception words; the phonological pathway becomes specialized for reading unfamiliar words that require decoding. Students with dyslexia (i.e., a written language disorder) have difficulty developing and accessing the mappings between orthography and phonology, as is demonstrated by their poor nonword reading, but better word reading skills (Bishop & Snowling, 2004). Children with oral language impairment tend to have difficulty with exception word reading, which can be explained by inefficient access of the mappings between the spellings and meanings of words, required for reading exception words (e.g., Snowling, 2005). Thus, children with dyslexia have an impaired phonological pathway and children with language impairment have an impaired semantic pathway.

Although morphology is not explicitly addressed in this model, it has been posited that morphological structure is created by the relationships among the orthographic, phonological, and semantic word forms that are integral to the *Triangle Model* of word reading (Seidenberg & McClelland, 1989). Thus, the morphological structure of a word provides clues for word meanings and pronunciations, making both the phonological and semantic pathways of word reading more accessible.
A Model of Linguistic Influences on Word Reading

In order to provide successful literacy instruction that prevents persistent problems, it is critical to have an in-depth understanding of the essential underlying components of effective reading intervention for elementary students beginning in kindergarten, and perhaps before. The connections between the spellings, pronunciations, and meanings of words create morphological structure, and students who are able to recognize morphological units are able to more efficiently decode written words (e.g., Seidenberg & McClelland, 1989). Further, learning to read words may be related to the interrelated growth of multiple linguistic awareness areas, including morphological awareness (MA), and children typically utilize multiple linguistic strategies when learning to read words (e.g., Apel & Lawrence, 2011). A weakness in one area may leave children unable to utilize other areas of linguistic awareness during literacy activities. Thus, deficits in the area of morphology or any area of linguistic awareness may impact both a student’s ability to read words and comprehend text. The proposed model (Figure 2.1) posits that literacy growth in kindergarten, as well as later reading and academic outcomes, requires the interrelated growth of several linguistic awareness skills.

This model of the impact of linguistic awareness is grounded in several linguistic theories. For example, according to Siegler’s (1996) Overlapping Waves Theory, children have access to and can utilize multiple forms of linguistic awareness as they learn to read and write. The use of a specific skill varies with the context and complexity of the task. Siegler posits that children will have more success in word reading and spelling tasks if they are taught to utilize multiple strategies, as opposed to singular strategies, even when those strategies are matched to the developmental age of the child. Building on this theory, Repertoire Theory posits that specific linguistic awareness skills develop together, rather than in stages, and that children may
apply a range of linguistic awareness strategies when learning to read and spell, even as they are just beginning literacy instruction (Apel & Lawrence, 2011; Siegler, 1996).

**Figure 2.1.** The Impact of Linguistic Awareness on Reading and Academic Outcomes

Additionally, recent results from combined brain imaging and treatment studies have provided further evidence for the interrelationships among orthography, phonology, and morphology. Through *Triple-Word Form Theory*, it is hypothesized that learning to read and write requires students to attend to the orthography, phonology, and morphology of a word, as well as the relationships among the three word forms (Berninger et al., 2006). Brain imaging has suggested that words are stored in these three distinct forms through the designation of specific brain activation regions and intervention studies have shown that each word form contributes uniquely to reading and writing outcomes (e.g., Berninger et al., 2006; Richards et al., 2006). As orthography, phonology, and morphology may all be related to learning to read and spell words, successful interventions must target these sub-components of literacy, which are not discrete skills but develop simultaneously while building on and reinforcing other skills (Adams, 1990; Apel & Lawrence, 2011). The challenge for educators is to fully understand the parts of the
reading system and their interrelations (Adams, 1990). It is through this depth of understanding that the most effective reading instruction can be developed, targeting not only skills that provide clear pay-off at the moment, but also those skills that may be working under the surface to bolster current skills and therefore pay off down the road.

**Metalinguistic Predictors of Word Reading**

In order to prevent persistent reading difficulties, universal screenings and subsequent emergent literacy interventions for kindergarten students should target metalinguistic skills that have been found to strongly relate to later reading outcomes. Students in the lower elementary grades are capable of substantial growth in their phonological, orthographic, and morphological awareness skills (Berninger, Abbott, Nagy, & Carlisle, 2010), while they are simultaneously learning to read. The concurrent and predictive relationships between phonological awareness (PA), letter knowledge (LK), and reading, and more recently, between MA and reading has been investigated widely. The following sections provide evidence for these metalinguistic skills as predictors of word reading and spelling outcomes.

**Phonological Awareness and Letter Knowledge**

Two areas that seem to play a role in reading as early as kindergarten are PA and LK. PA, or the sensitivity to the sound segments in spoken language, is a unitary construct that is typically developing during the kindergarten year and beyond (Schatschneider, Francis, Foorman, Fletcher, & Mehta, 1999). The tasks used to assess PA vary in difficulty level, and range from recognizing larger sound units, such as rhymes, to identifying and manipulating the smallest sound units, individual phonemes. Thus, it is important to consider the difficulty level of the PA task when screening for students who are at-risk for later reading difficulties during the kindergarten year. Schatschneider and colleagues (1999) investigated the utility of seven
different PA tasks to accurately discriminate PA ability in kindergarten, first, and second-grade students. Using item response theory, these researchers reported that the PA tasks varied in their ability to provide information about students’ PA skills, due to not only the difficulty level of the task but also the developmental level of the student. The easier and earlier developing PA tasks were better at accurately representing the PA skills of the younger (i.e., kindergarten) students, but not the older (i.e., first and second-grade) students. Overall, blending (of onset-rimes and phonemes) and phoneme elision seemed to be the most discriminating tasks of the battery and the PA battery as a whole was most accurate for students from kindergarten through the middle of first grade.

It has been well established over the past several decades that PA in the early elementary grades is related to reading outcomes (e.g., Apel & Lawrence, 2011; Hogan, Catts, & Little, 2005; Lonigan, Burgeess, & Anthony, 2000; NIFL, 2008; Schatschneider, Fletcher, Francis, Carlson, & Foorman, 2004; Torgesen, Wagner, & Rashotte, 1994). Students’ LK and/or awareness of orthographic patterns have also been tied to reading skills (e.g., Apel & Lawrence, 2011; Apel, Wilson-Fowler, Brimo, & Perrin, 2012; Kim, Apel, & Al Otaiba, 2013; Lonigan et al., 2000; Nagy, Berninger, Abbott, Vaughn, & Vermeulen, 2003; NELP, 2009; Schatschneider et al., 2004). For example, Lonigan et al. (2000) followed a group of children from early to late preschool and another group from late preschool to kindergarten or first grade. The results highlighted the predictive power of PA and LK (i.e., knowledge of letter names and letter-sound relationships), as these were the only unique predictors of decoding skills in kindergarten and first grade, above and beyond what would be expected due to the relationship between PA and oral language. Results from a study by Schatschneider and colleagues (2004) provide additional evidence for the predictive validity of LK and PA. These researchers administered multiple
language and literacy assessments to kindergarten students in order to determine the best predictors of first and second-grade reading outcomes. Results suggested that kindergarten students’ PA, letter-sound knowledge, and rapid naming of letters contributed unique variance to later word identification and reading comprehension measures. Letter naming speed was the strongest predictor of reading fluency outcomes. However, the knowledge of letter names was only a significant predictor when measured during the beginning of the kindergarten year; after that there was a ceiling effect for this measure.

In another longitudinal study, a large sample of students with and without language impairment were administered measures of PA and letter identification in kindergarten and measures of PA, phonetic decoding, and word reading in second and fourth grades (Hogan et al., 2005). The primary purpose of this study was to determine whether measures of PA in kindergarten and/or second grade were useful for predicting later word reading difficulties. Through path analysis, the researchers determined that kindergarten PA uniquely predicted second-grade word reading, beyond variance accounted for by letter identification. However, second-grade PA did not explain unique variance in fourth-grade word reading; instead, second-grade phonetic decoding was a better predictor of later word reading skills. This study suggests that measures of PA and LK in kindergarten have high utility in predicting later reading outcomes, yet by second grade these measures lose their predictive validity.

In summary, PA and LK are two metalinguistic areas that are predictive of reading outcomes in lower-elementary school students. Phonological awareness tasks that are the most discriminating include blending and phoneme elision; however, the predictive validity of PA is no longer tenable once students reach second grade, when decoding better predicts later word reading outcomes. The predictive power of letter-name knowledge is strong in the beginning of
the kindergarten year; yet the knowledge of letter-sound relationships is a better predictor by the end of kindergarten.

**Morphological Awareness**

Morphological awareness, the ability to explicitly focus on and manipulate morphemes, has a significant relationship with reading ability in school-age children. Specifically, it has been shown to predict word reading (e.g., Carlisle, 1995), pseudo-word reading (e.g., Apel, Diehm, & Apel, 2013), spelling (e.g., Apel & Lawrence, 2011), and reading comprehension (e.g., Carlisle, 2000; Deacon & Kirby, 2004), and to make a unique contribution to reading beyond other known predictors, such as PA (e.g., Deacon & Kirby, 2004). It is often suggested that the conscious and explicit awareness of morphological relationships (i.e., MA) is particularly important for learning to read (e.g., Carlisle, 1995). During the kindergarten and first-grade years, students typically make a shift from an implicit awareness of morphology to metalinguistic ability, by which they begin to be able to think about the morphological properties of language and complete more complex morphological tasks (Carlisle, 1995).

Derivational and decompositional sentence cloze tasks are some of the most commonly used assessments of MA. Most researchers utilize the morphological production tasks that were created by Carlisle (e.g., 1995, 2000), which require a student to either derive a morphologically complex word when given its stem or decompose a complex word to its stem form in order to complete a sentence (e.g., Derivation: *Farm. My uncle is a _____*; Decomposition: *Driver. Children are too young to _____*). Often, an equal number of derived words that are phonologically transparent (i.e., no phonological or orthographic change from the stem to derived word) and phonologically opaque (i.e., phonological and/or orthographic change) are included (e.g., Carlisle, 2000). Others have included both inflected (i.e., involving a
grammatical change) and derived (i.e., involving a change in word class or meaning) forms (e.g., Apel, Diehm, & Apel, 2013; Apel & Lawrence, 2011; Carlisle, 1995). Results from these studies and others suggest that MA predicts word reading, pseudo-word reading, spelling, and reading comprehension in school-age children (e.g., Apel et al., 2012; Apel et al., 2013; Carlisle, 2000).

It is well established that MA is related to word reading in the upper elementary grades, when students must learn how to decode words that are morphologically complex (e.g., Bowers, Kirby, & Deacon, 2010). In recent years, researchers have turned their attention to the relationship between MA and reading in the early elementary grades. Apel and colleagues have a research line that focuses on this relationship in order to inform early literacy instruction for young students who are at risk for later reading difficulties (e.g., Apel et al., 2012; Apel, Diehm, & Apel, 2013; Apel & Lawrence, 2011; Kim, Apel, & Al Otaiba, 2013). The results of these studies suggest that there is a predictive relationship between MA and a variety of reading outcomes in kindergarten through third grade. For example, kindergarten, first, and second-grade students from low socioeconomic status (SES) homes were administered a variety of MA tasks (Apel, Diehm, & Apel, 2013), and the morphological relatives task, which was an oral derivational sentence cloze task, most frequently predicted students’ reading outcomes across the three grades. Specifically, this MA task uniquely predicted pseudo-word reading in kindergarten students, above contributions from PA. Morphological awareness did not uniquely predict any reading outcomes for first-grade students; however, MA uniquely predicted pseudo-word reading, real-word reading, and reading comprehension in second-grade students. For the second graders, a morphological spelling task also explained unique variance in pseudo-word and real-word reading outcomes.
In another study (Wolter et al., 2009) first-grade students completed an oral MA assessment (i.e., a derivational cloze task, as in: Farm. My uncle is a ____) and a morphological spelling assessment, in addition to PA, word reading, and spelling measures in order to determine the relationship between MA and spelling and reading outcomes. Together, MA and PA accounted for 54% of the variance in word reading and 42% of the variance in spelling. Uniquely, MA contributed 9% of the variance to word reading, and 7% of the variance to spelling. Thus, these results suggest that MA makes a small but significant contribution to word reading and spelling outcomes in first-grade students. Importantly, the morphological spelling assessment required students to spell morphological and pseudo-morphological suffixes, which allowed the researchers to determine that students utilized knowledge of morphology in their spelling and did not rely solely on phonological knowledge.

Additional studies provide further evidence that younger elementary school students have access to multiple forms of linguistic awareness when learning to read and spell words (Apel and Lawrence, 2011; Apel et al. 2012; Kim et al., 2013). For example, second and third-grade students were administered measures of MA (with derivational morphemes only), PA, orthographic awareness (OA; i.e., the ability to recognize legal spelling patterns, as in zeg vs. zzeg), receptive vocabulary, and rapid naming (Apel et al., 2012). Of all these measures, MA was the only unique predictor of spelling outcomes and both OA and MA uniquely contributed to word reading. Apel and Lawrence (2011) also found evidence that multiple forms of linguistic awareness are related to word reading and spelling outcomes. First-grade students with and without speech sound disorders were administered a battery of assessments, including multiple measures of linguistic awareness. Along with PA, LK, and nonverbal cognition, MA predicted spelling for both groups of students, but MA predicted word reading for the typically
developing students only. Additionally, Kim and colleagues (2013) found all three forms of linguistic awareness (i.e., PA, MA, and OA) to be unique predictors of word reading, and PA and OA to be unique predictors of spelling in first-grade students.

The results from these studies suggest that MA measured in the early elementary grades is related to a variety of reading outcomes. This highlights the importance of including MA assessment as part of a screening battery in order to better identify students who are at risk for later reading disorders, and suggests that MA should be a target of intervention for at-risk readers with and without language disorders in the early grades and beyond. In addition, it may be beneficial to target multiple forms of linguistic awareness (i.e., PA, LK, and MA) during beginning reading and spelling instruction, including students who are at risk for reading disorders, and those who have identified speech and language disorders, as students may be able to use multiple linguistic strategies when learning how to read and spell words.

**Linguistic Awareness Intervention**

Given the strong evidence that metalinguistic skills predict reading outcomes in lower elementary students, researchers have investigated the effectiveness of instruction and targeted intervention in PA, LK, MA, and combined approaches for students of varying abilities, including those who are at risk for later reading difficulties, those with identified disabilities, and those who are English language learners (ELLs). The following sections will review the metalinguistic intervention research with these populations.

**Phonological Awareness and Letter Knowledge Intervention**

In 2000, the National Reading Panel published a report that synthesized the findings of PA intervention studies in order to determine the effectiveness of PA instruction for increasing reading and spelling outcomes in school-age children (National Institute for Child Health and
Overall, the findings suggested that PA instruction has a large effect ($d = .86$) on PA outcomes and moderate effects on reading ($d = .53$) and spelling ($d = .59$) outcomes in the early grades. Importantly, this meta-analysis provided specific guidelines for the conditions by which PA intervention is most effective. For both typically developing and at-risk students, effect sizes for PA and reading outcomes were larger when instruction was explicit and focused on one or two PA skills (rather than three or more) and was combined with instruction in LK. Students who received intervention in small group settings for less than twenty hours of total instruction (as opposed to more than 20) made greater gains in these areas. Targeted instruction in blending and segmenting resulted in greater reading gains than intervention focused on multiple phonemic awareness skills. Preschool and kindergarten students, and those who were at risk for reading difficulties made the greatest gains overall. SES did not impact student gains in PA; however, students from mid to high SES families made greater gains on reading outcomes than those from low SES families.

The National Early Literacy Panel corroborated many of these findings, specifically for preschool and kindergarten students. Phonological awareness and LK were two of six variables that were correlated with later reading skills, even when IQ and SES were accounted for (NIFL, 2008). Students who received 1:1 or small-group instruction in PA, requiring the detection and manipulation of small sound units such as phonemes, combined with letter-sound instruction made the greatest gains. These interventions resulted in moderate to large effect sizes across a wide range of early literacy skills. These promising results indicate that instruction in PA and LK should be provided in a classroom context to all kindergarten students and in a more intensive small group context to students who have been identified as at-risk for later reading difficulties.
At-risk students should be provided with instruction in blending and segmenting of sound units including individual phonemes, as well as LK, as instruction in these areas results in the greatest student gains (e.g., NICHD, 2000; NIFL, 2008). In a review of best practices in PA intervention, Schuele and Boudreau (2008) offer suggestions for providing explicit instruction in segmenting and blending with at-risk and struggling readers. The goal is for students to independently analyze the sound structure of oral language. Thus, instruction should involve the modeling of skills such as segmenting and blending, with the clinician using a think-aloud strategy to explain what she is doing in order to show students how to complete each PA task. With repeated examples and guided practice, students will be able to develop insights that allow them to be successful without clinician support.

The following sections will review the results of a selection of PA intervention studies with preschool and kindergarten students from at-risk, identified disabilities, and ELL populations.

**Students who are at risk for reading difficulties.** The National Reading Panel synthesis suggested that the students who are at risk for later reading difficulties are likely to benefit the most from combined instruction in PA and LK (NICHD, 2000). While students with low SES backgrounds are at risk for later reading difficulties (e.g., Bowey, 1995), students from low-income households do not appear to benefit as much as students from higher socioeconomic backgrounds when provided with direct intervention in PA and LK (NICHD, 2000). They do, however, benefit to some extent as several intervention studies with low-income preschoolers suggest that PA intervention is effective with this population (e.g., Koutsoftas, Harmon, & Gray, 2009; PASS Research, n.d.) For example, one study investigated the effectiveness of PA intervention with low-income preschoolers with weak PA skills (Koutsoftas et al., 2009).
Students were selected for participation in the intervention based on low performance on a beginning sound awareness screening. The intervention took place twice a week for six weeks in a small-group classroom setting and focused on the concepts of beginning sounds, and ultimately identifying beginning sounds in words. Results indicated that 71% of the children had medium to large treatment effects. Additionally, results from the DIBELS Initial Sound Fluency (Good & Kaminski, 2002) administered in the fall of their kindergarten year suggested that the intervention effects were maintained. Other researchers have found similar results for PA intervention administered in conjunction with instruction in LK for low-income students (PASS Research, n.d.).

**Students with identified disabilities.** Phonological awareness intervention has been shown to result in moderate literacy gains for students who have already been identified with disabilities (NICHD, 2000). For example, children with speech and language disorders are at risk for later reading difficulties (e.g., Bishop & Adams, 1990; Snowling, 2005). Thus, researchers have investigated the effectiveness of both small-group and classroom-delivered PA intervention with preschoolers and kindergarteners with speech and language disorders (e.g., Carson, Gillon, & Boustead, 2013; Gillon, 2005; Roth, Troia, Worthington, & Dow, 2002; Roth, Troia, Worthington, & Handy, 2006). Recently, Carson and colleagues (2013) studied the impact of a 10-week PA intervention program delivered by classroom teachers on the literacy outcomes of 5-year olds with speech and/or language impairment and typical development. Results suggested that children with speech and language impairment differed from typically developing children in how they benefited from the instruction. Specifically, both groups of students gained equally for PA skills that were targeted during instruction, such as phoneme blending and segmentation. However, typically developing students showed more growth with
phoneme deletion, a skill not targeted during instruction, suggesting that typically developing children were better able to transfer PA skills targeted during instruction to related skills. Both groups of children made significant improvement in reading skills; however, typically developing children demonstrated greater gains in pseudo-word reading, pseudo-word spelling, and real-word spelling skills, suggesting that typically developing children were able to transfer PA skills to reading and spelling tasks more effectively. However, it is important to note that students with speech and language impairment had post-instruction scores on measures of phoneme blending, deletion, and segmentation, as well as non-word reading and real-word spelling skills that were not significantly different from typically developing students who did not receive instruction. Thus, these results suggest that it is possible to raise the literacy skills of at-risk students to a typical level following classroom-delivered PA instruction.

Other researchers have reported significant effects of small-group PA intervention on the literacy outcomes of students with speech and language disorders (Gillon, 2000; Gillon, 2005; Roth et al., 2002; Roth et al., 2006). For example, along with instruction in the alphabetic principle, preschoolers with speech and/or language impairments were exposed to the Promoting Awareness of Speech Sounds ([PASS], Roth, Worthington, & Troia, 2012) blending curriculum, which consists of explicit and highly engaging PA lessons designed for students with speech and language impairments (Roth et al., 2006). Treatment effects were analyzed using a single subject design. After instruction, students demonstrated improvement in blending, which was attributed to the curriculum rather than maturational or environmental factors. This group of researchers found similar promising results with the rhyming component of their curriculum (Roth et al., 2002). Further, students with speech and language impairment have benefited from an integrated PA and speech and language therapy approach. Specifically, seven-year-old
students with speech and language impairments who received intervention in PA integrated with speech and language therapy made more gains in PA and reading outcomes than their peers who only received speech and language therapy, and their PA skills improved to levels similar to children with typically developing speech and language skills (Gillon, 2000).

**English language learners.** In 2006, the National Literacy Panel (NLP) published a report synthesizing the results of recent research with ELLs in the areas of prevention and intervention of persistent literacy difficulties (August & Shanahan). It highlighted that the same areas that predict reading skills in native English speakers (i.e., PA, phonics, fluency, vocabulary, and text comprehension) also predict reading in ELLs. Others have found that kindergarten phonological processing skills and LK are the best predictors of ELLs’ later word reading skills across all languages (Gorman, 2009). This suggests that PA and LK instruction should be included as part of literacy instruction for ELLs just learning to read in English, as it is for students who are native English speakers. Additionally, ELLs benefit from instruction in oral language proficiency and from instruction that takes advantage of students’ oral and written proficiency in their native languages (August & Shanahan, 2006). Gorman (2009) reports that although hundreds of languages are spoken by ELLs in the United States, Spanish is the top language, representing 79% of ELLs. Thus, it is important to consider the impact of PA and LK intervention on the reading outcomes of Spanish-speaking ELLs.

When choosing to provide literacy intervention to ELLs it is essential to consider each student’s individual strengths and weakness in English literacy. Although many ELLs receive preventative and remedial literacy instruction, students with certain literacy profiles may be the most in need of literacy intervention (Ford, Cabell, Konold, Invernizzi, & Gartland, 2013). Using cluster analysis, Ford and colleagues (2013) found four distinct literacy profiles for
Spanish-speaking kindergarten students. The kindergarten students who had the weakest skills in LK and phonetic spelling at the start of kindergarten also had the weakest literacy outcomes measured at the end of kindergarten and the beginning of first grade. The two profiles of students with either low or moderate PA skills, both with low LK, were associated with weak later reading outcomes. Thus, the researchers suggested that OA (including LK) should be assessed early and targeted in literacy intervention for Spanish-speaking ELLs who are at risk for later reading difficulties.

Several researchers have found PA intervention combined with a variety of literacy targets to be effective for increasing the literacy skills of ELLs in the early elementary years (e.g., Gunn, Biglan, Smolkowski, & Ary, 2000; Linan-Thompson, Vaughn, Prater, & Cirino, 2006; Simmons et al., 2014; Vaughn, Linan-Thompson, et al., 2006; Vaughn, Mathes, et al., 2006). In one study, first-grade Spanish-speaking ELLs who did not pass early reading screening measures in both English and Spanish were randomly assigned to a control or experimental intervention group (Vaughn, Mathes, et al., 2006). The control group received the school’s existing intervention for struggling readers. Students in the experimental group received instruction in English from bilingual teachers in a small-group setting five days a week for 50 minutes for 7 months. The intervention provided explicit and systematic instruction in PA, letter-sound correspondences, decoding and connected text reading, and reading comprehension, as well as oral language and vocabulary development. Students in the experimental group made significantly greater gains in PA ($d = 1.24$), rapid letter naming ($d = .88$), word attack ($d = 1.09$), and reading comprehension ($d = 1.08$), all measured in English. Of the Spanish literacy outcome measures, gains were only significant for PA ($d = .76$). The same group of researchers investigated the effectiveness of this intervention administered in Spanish,
which was the language of instruction of this sample’s core reading program (Vaughn, Linan-Thompson, et al., 2006). Spanish-speaking first-grade ELLs in the experimental group made significantly greater gains in the following outcomes measured in Spanish: letter-sound identification ($d = .72$), PA ($d = .73$), word attack ($d = .85$), reading comprehension ($d = .55$), and fluency ($d = .58$); there were no significant differences for literacy outcomes measured in English. At the end of first grade, more students who were involved in the experimental intervention (both in Spanish and English) met the end of year reading benchmarks; this finding was maintained through the end of second grade (Linan-Thompson et al., 2006).

Roth and colleagues (PASS Research, n.d.) researched the effectiveness of the rhyming component of their PA curriculum (i.e., PASS, Roth et al., 2012) combined with instruction in LK for preschool ELLs (94% Spanish-speaking) who presented with weak rhyming skills at the start of the intervention. Students received instruction delivered by a speech-language pathologist in a small-group context twice per week for thirty minutes. Compared to a group of native English-speaking preschoolers with low rhyming skills who received the same intervention, the intervention administered to ELLs resulted in greater pre- to post-intervention effects. Specifically, the native English-speaking preschoolers increased their rhyming skills (effect size of $d = 1.15$), but the ELL preschoolers showed even greater gains in rhyming (effect size of $d = 2.07$). Both groups of students exceeded rhyming benchmarks at the end of the intervention. The researchers concluded that the curriculum was particularly effective in improving at-risk ELLs rhyming ability to the level of their native English-speaking peers. Thus, results from several studies with preschool and early elementary ELLs suggest that including PA and LK instruction as part of early literacy intervention for at-risk ELLs is an effective strategy.
Morphological Awareness Intervention

Recently, the importance of providing MA intervention to students at risk for later reading difficulties as early as kindergarten has become a topic of interest for several groups of researchers (e.g., Apel & Diehm, 2013; Ramirez, Walton, & Roberts, 2013; Wolter & Dilworth, 2013). Morphological awareness intervention seems to benefit at-risk and struggling readers, as well as ELLs, and school-age students across grade levels have made gains in PA and MA, as well as gains in word reading, spelling, and reading comprehension (Bowers, Kirby, & Deacon, 2010; Carlisle, 2010; Goodwin & Ahn, 2010; 2013; Reed, 2008). While one study found intervention in MA to be most effective when combined with other types of literacy intervention (Bowers et al., 2010), another study found no differences in effect sizes for interventions with an explicit focus on MA as compared to multiple areas of literacy instruction (Goodwin & Ahn, 2013). In this most recent meta-analysis of MA intervention studies, Goodwin and Ahn (2013) investigated the moderators of MA intervention across a broad range of students and contexts. The overall effect size for MA intervention across studies was small ($d = .32$), with different literacy outcomes ranging in effect sizes from not significant (reading comprehension and fluency) to moderate (PA, MA, and decoding). The hours of intervention ranged from 0-5 total hours to 20 or more hours. Although the largest gains were reported for interventions totaling at least 20 hours, there were no significant differences in intervention effects, with even the shortest interventions resulting in some moderate effects. Additionally, no significant differences were found based on delivery model (i.e., individual, small-group, or whole-class), although the effects for individual treatment were slightly larger. Overall, interventions that were administered to preschool and early elementary students yielded significantly greater gains than those administered to older students. Although reading comprehension outcomes were not
statistically significant overall, MA intervention did significantly impact the reading comprehension of early elementary students receiving interventions that lasted more than 20 hours and were administered in small-group settings. These results suggest that one way to increase a broad range of literacy skills for young students who are at risk for developing reading difficulties is to provide MA intervention, either alone or as part of a more comprehensive literacy intervention program.

The following section will review the research on MA intervention implemented alone or combined with vocabulary instruction for kindergarten through second-grade students who are at risk for later reading difficulties. Morphological awareness intervention combined with other linguistic awareness areas (i.e., PA and OA) will be discussed in a later section, which will include descriptions of research with students with identified disabilities and with ELLs.

**Students who are at risk for reading difficulties.** In a feasibility study, kindergarten through second-grade students from low SES backgrounds received nine weeks of small group instruction in MA four times per week for 25 minutes a day (Apel, Brimo, Diehm, & Apel, 2013). Students were guided in their practice of the identification, production, and deduction of morphological patterns orally and in print. The instruction targeted inflectional and derivational affixes and focused on meaning (in kindergarten) and meaning and print (in first and second grades). Students from all grades made significant gains in MA, with effect sizes ranging from large to very large ($d = .74$ to 2.96). Comparison of pretest and posttest measures also revealed significant gains for kindergarten students in decoding (kindergarten: $d = .97$, first grade: $ns$, second grade: $ns$), kindergarten and first graders in PA (kindergarten: $d = .61$, first grade: $d = .76$, second grade: $ns$), all students in word identification (kindergarten: $d = .85$, first grade: $d = .58$, second grade: $d = .50$), and all students in reading comprehension (first grade: $d = .57$, 2013).
second grade: $d = .87$). This suggests that MA intervention is appropriate for students beginning in kindergarten, as it can result in large gains in MA and moderate gains across a variety of reading outcomes. Further research is required to determine if these reading and MA gains are maintained over time.

Given these promising results, Apel and Diehm (2013) conducted an efficacy study for their MA intervention. Kindergarten through second-grade students from low SES backgrounds were randomly assigned to a small group intervention and were provided eight weeks of MA instruction four times per week for 25 minutes a day. Students were taught how to analyze oral and written words to discover the patterns and meanings of eleven inflectional and derivational affixes. The control group did not receive intervention outside of typical school district instruction. Students from all grades who received the MA intervention showed significantly greater gains in MA skills ($d = .67$ to $1.26$), with kindergarten students demonstrating the largest effect; however, students in the experimental group did not make significantly greater gains than students in the control group for other literacy outcomes (i.e., decoding, word reading, reading comprehension). The researchers suggested that although students did not make significantly greater gains, the small sample size lacked the sufficient power to detect group differences. However, small positive effects for first-grade reading comprehension and second-grade decoding indicate important gains with practical significance. Apel and Diehm also analyzed their results to determine if students of varying levels of MA ability at the start of the intervention responded similarly to the intervention. Overall, they found that the students with the lowest MA skills at the start of the intervention benefited as much as students with higher initial MA skills. Further, low-ability kindergarten students demonstrated significantly larger gains on sight word reading than students with average skills, suggesting that the students who
are most at risk for later reading difficulties may benefit the most from MA intervention in kindergarten.

In another recent study, kindergarten students from low SES neighborhoods were provided classroom-teacher delivered instruction in vocabulary and MA (Ramirez et al., 2013). Teachers received professional development in strategies for teaching vocabulary and MA. Specifically, teachers learned to choose high-utility vocabulary words for instruction (Beck, McKeown, & Kucan, 2002) and to highlight the meanings of compound words and their morphemes when reading with their students. Teachers received a resource kit including ten picture books with lists of words to explicitly target, including compound words, for each book. They also learned how to extend opportunities for learning from shared reading experiences with a variety of full-class activities. Over three months, teachers implemented strategies for the explicit teaching of vocabulary and MA for at least 24 30-minute sessions. Morphological awareness (i.e., in this study, a measure of students’ ability to combine single-morpheme words to create compound words) and expressive vocabulary were assessed before and after the intervention for all students. Overall, the students made significant gains in MA (partial $\eta^2 = .61$) and vocabulary (partial $\eta^2 = .53$). Additional analyses revealed that students with the lowest MA and expressive vocabulary skills at pretest made the greatest gains in these respective areas. Although preliminary, results from these studies provide promising evidence for the efficacy of MA intervention for at-risk students in the lower elementary grades, particularly for students with low MA and vocabulary abilities.

**Multi-Linguistic Awareness Intervention**

Given the importance of morphology, orthography, and phonology in learning to read (e.g., Berninger et al., 2006), it may be beneficial to provide young elementary students at risk
for later reading disabilities with instruction in all three linguistic awareness areas starting as early as the kindergarten year, and perhaps before. Interventions provided to students as young as preschoolers have resulted in crossover effects among linguistic domains (e.g., Apel, Brimo, Diehm, & Apel, 2013, Casalis & Colé, 2009; Kirk & Gillon, 2007; Lyster, 2002). For example, training in MA has led to moderate to large gains in PA for kindergarten through second-grade students (Apel, Brimo, Diehm, & Apel, 2013). The reverse has also occurred; preschoolers with speech and language impairment who received training in PA and LK were shown to have greater ability in MA (i.e., morphological spelling and decomposition) several years after the intervention than their peers who did not receive PA and LK intervention (Kirk & Gillon, 2007).

The differential effects of MA versus PA intervention on the literacy outcomes of lower elementary students are unclear at this time. In one study, Norwegian kindergarteners received either MA or PA intervention 30-40 minutes per week for 17 weeks in a small group setting (Lyster, 2002). Both types of linguistic awareness training appeared to have lasting effects, as the two experimental groups outperformed a control group on reading measures administered to students at the end of first grade. Interestingly, the MA intervention had the strongest effect on first-grade word reading, as students who received this intervention outperformed the PA group. Additionally, children of mothers with less education benefited more from the PA intervention, while children of mothers with more education benefited more from the MA intervention. It is important to note, however, that as the Norwegian language has a more transparent orthography, these results may not be generalizable to linguistic awareness interventions delivered in English. Nonetheless, this study and others provide evidence that linguistic awareness intervention in one domain may lead to gains in other related linguistic awareness and literacy areas. However, at this time, it is unclear whether one area has a greater impact on the reading skills of students;
thus, it is essential to further investigate the impact of separate and combined interventions in these areas on the metalinguistic and early reading skills of young students.

The following sections will review current research on the impact of multi-linguistic awareness (i.e., PA, OA, and MA) intervention for lower elementary students who are at risk for reading difficulties, students with identified disabilities, and for ELLs.

**Students who are at risk for reading difficulties.** In one study, second-grade students at risk for persistent reading difficulties based on low decoding, word reading, spelling, and sentence comprehension scores with no prior reading intervention experience received individual tutoring by trained teachers (Vadasy, Sanders, & Peyton, 2006). The tutoring sessions were 30 minutes, four days per week for a total of 20 weeks and focused on structural analysis, including explicit instruction in letter-sound correspondences, linking phonological units to orthographic patterns, segmenting and blending morphological affixes, and reading and spelling practice. The students receiving the intervention outperformed the control group on measures of word reading, spelling, comprehension, and fluency ($d = .75$ to $1.06$), with the largest effect size in spelling. Due to promising results, these researchers repeated this study with a group of second and third graders (Vadasy et al., 2006). Again, these students presented with low reading scores but had no identified reading disorders and had not received reading intervention previously. Specifically, intervention students outperformed control group students in measures of word reading ($d = 1.06$) and fluency ($d = 1.09$). The results of this study replicated the prior findings, suggesting that second and third-grade students with low reading skills benefit from 1:1 reading tutoring that includes explicit teaching of orthographic and morphological analysis of words during reading and spelling.
**Students with identified disabilities.** Recently, researchers have investigated the effectiveness of two multi-component literacy interventions for first and second-grade struggling readers (Morris et al., 2012). Four groups of students with reading disabilities received a total of 70 hours of instruction by trained teachers in a small group setting. The two experimental interventions targeted instruction in phonological analysis and phonics, including teaching letter-sound and spelling-pattern-sound correspondences. One of these interventions was combined with instruction in word analysis, including strategies such as word identification by analogy, and “peeling off” prefixes and suffixes in multisyllabic words. The second intervention was combined with reading instruction that highlighted the orthographic, semantic, syntactic, and morphological aspects of words in addition to phonology. For example, children in this group learned to “chunk” words based on spelling and meaning-based (i.e., morphological) patterns. Thus, both experimental interventions included explicit instruction in phonological, orthographic, and morphological reading strategies. Compared to students in the two control groups (who received intervention in math and phonological decoding), students participating in both multi-dimensional intervention programs demonstrated significantly greater skills after the intervention and at a one-year follow up in all literacy skills measured (i.e., decoding, word reading, spelling, fluency, and comprehension). There were no significant differences in gains based on IQ, race, or SES, suggesting that multi-component reading interventions that include emphasis in phonological, orthographic, and morphological strategies are effective for first and second-grade students with reading disabilities across a range of demographic variables.

In another study, second-grade students with spelling deficits received either a multi-linguistic awareness intervention with a phonological and orthographic focus, or with a combined focus in PA, OA, and MA (Wolter & Dilworth, 2013). At the time of this study, all
students were receiving special education services in speech/language and/or resource service in reading and spelling. The interventions took place during summer literacy camps, for 90-minute sessions over nine consecutive weekdays. The first intervention focused on PA and OA, and included guided practice with word sorts and word building to help students to reflect on orthographic patterns and their phonological pronunciations. The second intervention focused on all three areas of linguistic awareness and included word sorts and word building activities that encouraged students to reflect on inflectional and derivational morphological patterns and word meanings, in addition to orthographic patterns. Both interventions also incorporated practice with decoding and reading comprehension. Students in both groups significantly improved their sight-word reading ($d = .29$ to $.76$) and decoding skills ($d = .42$ to $.99$), and there were no differences between groups. However, students who received the intervention that included MA showed greater gains in reading comprehension ($d = 1.49$) and for a standardized spelling measure ($d = .66$); students in the other intervention group did not make significant gains in these areas. A non-standardized spelling measure was also given, in order to assess students’ growth in spelling patterns that do and do not include morphological units. Both groups made significant gains for the spelling of orthographic-only spelling patterns ($d = .85$ to $.99$), and there were no differences between groups. As expected, students who received the intervention including MA instruction made greater gains on the spelling of words with morphological patterns ($d = 1.41$); students who received the other intervention did not make significant gains in this area. In summary, these results suggest that training in all three areas of linguistic awareness has greater effects on the spelling and reading skills of second-grade students with spelling deficits.
**English language learners.** Little research is currently available on the effectiveness of MA intervention, either implemented alone or within a multi-linguistic awareness framework, with ELLs in the lower elementary grades. An exception is a recent study conducted by Filippini and colleagues (Filippini, Gerber, & Leafstedt, 2012) with first-grade students from low SES backgrounds who were predominantly Spanish-speaking ELLs. Students received instruction in one of the following: (a) PA and decoding; (b) PA and decoding combined with vocabulary instruction focused on morphology; or (c) PA and decoding combined with vocabulary instruction focused on semantics. The students in the two groups receiving the added vocabulary component received PA and decoding instruction for 30% of the time and vocabulary instruction for the remaining time. All students received small-group instruction within a push-in classroom context by trained researchers for an average of 15 minutes of instruction per day, four days per week for eight weeks. The instruction focused on the reading of grade-level expository science texts; for the vocabulary groups, Tier II (i.e., high-utility) words were targeted for explicit instruction (Beck et al., 2002). The semantic group instruction explicitly highlighted the meanings of words and their relationships; students were taught to identify, classify, and categorize words by semantic features. The morphology group instruction had a focus of morphological analysis; students identified and manipulated roots and affixes, learning the meanings of morphemes and word formation rules. Results revealed no significant between-group differences in vocabulary or decoding; however, students in the two experimental groups made larger gains than the control group for measures of vocabulary ($d = .28$ to $.56$; control $d = .04$) and phonetic decoding ($d = .33$ to $.40$; control $d = .17$). Additionally, students with the lowest phonetic decoding skills at pretest improved the most ($d = .69$) regardless of intervention condition compared to the highest performing students ($d = .26$). When analyzed separately,
differences between groups were not significant for the lower performing students; yet, it is interesting to note that the MA group made the greatest gains in decoding \( (d = 1.01) \) compared to the semantic \( (d = .65) \) and control \( (d = .61) \) groups. Overall, these results provide preliminary evidence for the effectiveness of MA intervention implemented in conjunction with PA and decoding for ELLs, particularly for students with the lowest decoding skills.

This review of the research in linguistic awareness intervention for preschool and lower elementary students indicates that providing students with targeted instruction in PA, OA, and MA, alone or combined with other forms of literacy instruction, has led to gains across a variety of literacy outcomes, including PA, MA, word reading, decoding, reading comprehension, and spelling (e.g., Bowers et al., 2010; Goodwin & Ahn, 2010; 2013; NICHD, 2000). Linguistic awareness intervention is effective for a wide range of students, including those who are at risk for later reading difficulties, those with identified disabilities, and those who are ELLs (e.g., August & Shanahan, 2006; Bowers et al., 2010; Goodwin & Ahn, 2010; 2013). Recent results have suggested that adding MA intervention to other linguistic awareness areas (i.e., PA and OA) may increase the literacy gains, including the word reading, reading comprehension and spelling, of both ELLs and students with identified reading difficulties (e.g., Filippini et al., 2012; Morris et al., 2012; Wolter & Dilworth, 2013). Further, multi-linguistic awareness instruction for students, including ELLs, with the lowest literacy skills before treatment has resulted in gains that are as large, if not larger, than students with initially higher skills (e.g., Apel & Diehm, 2013; Filippini et al., 2012; Ramirez et al., 2013). Additional research is required to replicate these findings and to determine the impact of these interventions independently and in combination; however, the evidence is building that multi-linguistic
awareness intervention is an effective means for remediating and perhaps preventing persistent reading difficulties in students in the lower elementary grades.

**Multi-Tiered System of Supports**

Public schools in the United States now regularly identify students who are at risk for reading difficulties in order to provide targeted early intervention, thereby reducing the number of students with persistent reading difficulties whose academic performance is impacted in later years (Averill & Rindali, n.d.; Justice, 2006; Fuchs & Fuchs, 2006). This paradigm, known as a multi-tiered system of supports (MTSSs), allows educators to provide research-based interventions that explicitly target students’ areas of need at increasingly more intensive levels, or tiers of intervention (Averill & Rinaldo, n.d.). The MTSS that is relevant for the early identification and prevention of reading disorders is response to intervention (RTI), which aims to ensure that all students receive high-quality reading instruction in the classroom while additional supports are provided to students who are not making progress. RTI models are designed to identify students early, in preschool or kindergarten when possible; however, students who demonstrate low early reading skills or limited progress as a result of reduced or limited early literacy experiences are given the chance to experience high-quality literacy instruction before being placed in higher intensity interventions. Typically, high-quality instruction in the general education classroom is called Tier 1 instruction, and the first round of intensive instruction is delivered as part of a Tier 2 small-group intervention for students who are not making expected progress. This Tier 2 intervention aims to accelerate the pace of students’ learning so that they may be able to catch up to their peers with typically developing early reading skills (Justice, 2006). Students’ progress is monitored frequently and students are exited from Tier 2 intervention when they meet grade-appropriate reading benchmarks. Students who
do not make adequate progress in this level of intervention receive increasingly more intensive interventions, which may include special education, in what is called Tier 3 intervention.

**The Impact of High-Intensity Early Literacy Interventions**

As PA and LK intervention have been well established as effective areas to target in order to increase the early literacy skills of kindergarten students (e.g., NIFL, 2008), intervention in these areas has been a major focus of RTI efforts in kindergarten (e.g., Coyne, Kame’enui, Simmons, & Harn, 2004; Justice, 2006; O’Connor, Fulmer, Harty, & Bell, 2005; O’Connor, Harty, & Fulmer, 2005). Recently, researchers have also begun to explore the effectiveness of MA intervention with at-risk students in Tier 2 interventions as early as kindergarten (Apel & Diehm, 2013). Students who participate in high-intensity Tier 2 interventions in kindergarten have benefited from intervention targeting linguistic awareness. For example, Coyne and colleagues (2004) found that 75% of kindergarten students who received a seven-month Tier 2 intervention targeting PA and LK in conjunction with reading words and connected text were deemed “strong responders,” as they demonstrated grade-level or above literacy skills by the end of the intervention. Further, these students maintained grade-appropriate skills in decoding, word reading, and reading comprehension through the middle of first grade without receiving literacy intervention outside of high-quality classroom instruction, suggesting that strong responders to kindergarten linguistic awareness intervention can continue to make progress without additional intervention.

Kindergarten students who received high-intensity linguistic awareness Tier 2 intervention have shown stronger later literacy skills than those who did not, even when both groups received the same high-quality Tier 1 classroom literacy instruction (e.g., O’Connor, Fulmer, et al., 2005). Further, research shows that when students receive this type of early Tier 2
intervention for reading, the number of students requiring special education services is reduced (O’Connor, Harty, et al., 2005). For example, O’Connor, Fulmer, and colleagues (2005) investigated the long-term reading effects of participation in a kindergarten or first-grade Tier 2 intervention for at-risk students. Kindergarteners received small-group instruction for 10 to 15 minutes a day, three days per week in PA and LK. First-grade students received a similar small-group intervention for 20 to 25 minutes a day, three days per week, focused on letter-sounds and decoding. Classroom teachers also received professional development in effective literacy practices for Tier 1 instruction. Students were followed longitudinally and the literacy outcomes for those students who had received the small-group intervention and for those whose teachers had received professional development only were compared to a control group. Students whose teachers had received professional development scored higher than control group students on decoding, fluency, and reading comprehension outcomes at the end of second grade. Compared to the control group, students in the Tier 2 intervention scored higher on all reading measures (including word identification) at the end of both second and third grades. These results suggest that providing at-risk students with research-based Tier 1 classroom literacy instruction in conjunction with high-intensity targeted literacy intervention in Tier 2 can have a strong positive impact on later reading skills.

Given the recent promising findings that MA intervention may be beneficial for at-risk kindergarten students (Apel, Brimo, et al., 2013; Apel & Diehm, 2013), further research with Tier 2 intervention for at-risk students incorporating multiple areas of linguistic awareness instruction in kindergarten (i.e., PA, OA, and MA) is warranted. Students may benefit from multiple kinds of linguistic strategies for learning to read and spell words (e.g., Siegler, 1996) and evidence suggests that all three types of linguistic awareness in the lower elementary grades
uniquely predict word-reading outcomes across all tiers of instruction (Kim et al., 2013). Thus, it is possible that a three-pronged linguistic awareness intervention will lead to positive word reading outcomes for kindergarteners at risk for later reading difficulties. Research suggests that 25% of at-risk students do not respond well to Tier 2 intervention, requiring intervention that is longer and more intensive (Coyne et al., 2004). Through the existing model of RTI, targeted intervention in three linguistic awareness areas may attenuate the reading difficulties of some of these “poor responders,” even further decreasing the number of students who require prolonged intensive intervention.

**Factors That Influence Intervention Effectiveness**

There are several factors that may influence the effectiveness of an intervention that need to be considered when interpreting the results of intervention studies. The content of the program may be efficacious, yet the program may not lead to increased literacy outcomes if it has not been implemented as designed or if students are not appropriately engaged during instruction. Further, the setting in which the intervention is delivered and the opinions of the teachers who will eventually be delivering the intervention may impact student literacy gains, as well as the sustainability of the program. These factors will be explored in greater detail in the following sections.

**Fidelity of Implementation**

Type II error occurs when the conclusion is made that an intervention is ineffective when the lack of significant findings may reflect an inadequate implementation of an otherwise effective intervention program (see e.g., Kalafat, 2007). In order to avoid this erroneous conclusion, it is essential for researchers to track implementation fidelity for the intervention programs they are investigating. Not surprisingly, research suggests that literacy programs that
are implemented with low fidelity are less effective at increasing language and literacy outcomes than are those interventions that are implemented with high fidelity (e.g., Hamre, Justice, Pianta, Kilday, Sweeney, Downer, & Leach, 2010; Wasik & Hindman, 2011). Further, fidelity of implementation is a dynamic variable that may change over time, and thus should be monitored regularly (Odom et al., 2010). Fidelity of implementation is often broken up into three components: duration of the intervention, adherence to intervention guidelines, and quality of delivery (e.g., Hamre et al., 2010).

Hamre and colleagues (2010) investigated the variability by which teachers implemented a classroom curriculum based on duration of the intervention, adherence to intervention guidelines, and quality of delivery. They found that teachers implemented the curriculum with fidelity for the duration required and followed the curriculum’s lesson plans appropriately. However, the quality of delivery, which was defined as the use of evidence-based, teacher-child interactions, was lower and varied by teacher. Preschool students, including those who did not speak English at home, who received intervention that was deemed higher in quality made greater gains in early literacy skills than students who received lower quality instruction. Others have found that students who have the lowest skills before intervention benefit the most from high-quality delivery (Odom et al., 2010). This suggests that literacy interventions for at-risk students should include methods to track implementation fidelity over time in order to accurately measure the effectiveness of the content of the program and ensure positive outcomes for students.

**Student Engagement**

Student engagement during instructional activities refers to a student’s ability to respond actively to learning opportunities, and to continue to engage with persistence and concentration
even during challenging tasks (Greenwood, Horton, & Utly, 2002; Skinner & Belmont, 1993). Students who are highly engaged during academic instruction are better able to focus on tasks, meet classroom expectations, and interact appropriately with learning materials (Robinson & Mueller, 2014). It is not surprising that student engagement positively relates to academic achievement across all grade levels, even in students as young as kindergarteners (e.g., Marks, 2000; Robinson & Mueller, 2014; Wanzek, Roberts, & Al Otaiba, 2014). For example, Wanzek and colleagues (2014) observed kindergarten students during Tier 1 reading instruction delivered by their classroom teachers. Specifically, students’ opportunities to respond academically during teacher facilitated reading instruction included reading print and responding (i.e., responding to reading-related questions, requests, or commands from the teacher). Kindergarten students who spent more time responding academically during reading instruction had higher reading achievement outcomes at the end of the year, suggesting that student engagement, as measured by academic responding, is related to kindergarten students’ ability to benefit from teacher instruction in literacy. In another study, researchers investigated the relationships among student engagement, instructional quality, and student achievement in literacy (Ponitz, Rimm-Kaufman, Grimm, & Curby, 2009). The quality of classroom instruction (as measured by an observational rating scale) did not directly predict kindergarten reading achievement. Instead, classroom quality predicted achievement indirectly, through student engagement. This suggests that the quality of literacy instruction is an important, but not sufficient, measure of the effectiveness of a literacy curriculum. Students who are able to engage appropriately in instructional actives are better able to benefit from high-quality literacy intervention.
In-Class vs. Pull-Out Instruction

Students who require intensive intervention in early reading in addition to high-quality classroom literacy instruction are often instructed in small groups with students who have similar needs and abilities (Justice, 2006). These interventions can take place in a small group within a larger classroom context or in a separate room away from the students’ classrooms (Woodward & Talbert-Johnson, 2009). The benefits of providing this instruction in a separate environment include making instruction highly individualized to meet students’ needs and increasing student confidence by giving them the opportunity to practice reading skills in a setting with others who have similar literacy skills. However, children who are pulled out of the classroom setting for literacy services may be missing valuable classroom instruction, and separate Tier 2 intervention tends not to be integrated with regular classroom instruction (Bean, 2009). The results of a survey of classroom teachers and reading specialists in one school system revealed a variety of pros and cons for both types of delivery, but did not provide conclusive findings regarding the most effective model for reading intervention (Woodward & Talbert-Johnson, 2009). Although decisions about service delivery should certainly consider the individual needs of each child, further research is required to investigate whether the effectiveness of a Tier 2 literacy program is impacted by whether it is delivered in a separate or classroom environment.

Intervention Sustainability

The ultimate goal of school-based literacy intervention research is for all students to receive the support required to be successful in their reading, and thus academic pursuits. In order to accomplish this goal, literacy intervention research must include research that is translational in nature, which explicitly addresses issues of implementation and intervention sustainability (Justice, 2010). Before reaching this stage, one must determine the efficacy of an
intervention with a representative sample of students. Yet, it is also important during this stage to involve the teachers who will ultimately be implementing the intervention, in order to determine if they value and hence will be more likely to sustain the intervention after the research study has concluded. Social validity measures participants’ perceptions about the goals, procedures, and/or effects of a practice; collecting this kind of data from teachers provides researchers with valuable information regarding potential obstacles that might impede future larger scale implementation and sustainability of an effective intervention (Lindo & Elleman, 2010). Unfortunately, Lindo and Elleman found that most experimental reading instruction studies did not report feedback from teachers. Future studies that incorporate social validity data at the end of the intervention, as well as stakeholder input as the intervention is being developed, will provide information regarding teacher and/or administrator concerns that if addressed may increase the chances that the intervention will be implemented and sustained on a larger scale.

Conclusion

Intervention research with school age children who are just learning to read has focused primarily on the early reading skills that have been shown to predict later reading outcomes, including PA and LK (NICHD, 2000; NIFL, 2008). Intensive Tier 2 intervention that targets these skills in the kindergarten year results in literacy gains that are maintained during the early elementary years for about 75% of students who are identified as at-risk for persistent reading difficulties (Coyne et al., 2004). However, recent research suggests that at-risk kindergarten students may also benefit from instruction that targets MA (Apel, Brimo, et al., 2013; Apel & Diehm, 2013). Linguistic and word reading theories suggest that students are capable of utilizing strategies that are based in phonological, morphological, and orthographic knowledge (Apel & Lawrence, 2011; Berninger et al., 2006). Thus, intervention in all three areas may reduce the
number of students who do not make adequate progress, and thus require prolonged intervention throughout their school years. However, it is not known at this time if providing at-risk kindergarten students with a multi-linguistic approach during Tier 2 literacy intervention will be more effective than traditional PA and LK approaches. This goal of this study was to provide preliminary evidence for the effectiveness of a three-pronged linguistic awareness intervention for kindergarten students who are at risk for persistent literacy difficulties by comparing it to intervention in PA and LK, as well as intervention that targets MA alone.
CHAPTER 3: METHODS

The primary purpose of this study was to investigate the effectiveness of a three-pronged linguistic awareness intervention (i.e., phonological awareness [PA], letter knowledge [LK], and morphological awareness [MA]) at increasing the early literacy skills of kindergarten students who are at risk for later reading difficulties. Specifically, a three-pronged linguistic awareness intervention was administered to students and gains in four early literacy areas were compared to gains students made in two other intervention groups (i.e., PA and LK administered alone, and MA administered alone). The six major research questions are listed below.

Research Questions

Research Question 1. Do students make significant gains in word reading, PA, MA, and/or spelling of morphological endings after exposure to six weeks of intervention in: PA and letter-sound knowledge; MA; and/or three-pronged linguistic awareness (i.e., PA, LK, and MA)?

Research Question 2. Do students receiving a three-pronged linguistic awareness intervention (i.e., PA, LK, and MA) make greater gains in word reading, PA, MA, and/or spelling of morphological endings than students receiving intervention in either PA/LK alone or MA alone?

Research Question 3. Do students receiving MA intervention make different gains in word reading, PA, MA, and/or spelling of morphological endings than students receiving PA and LK intervention?

Research Question 4. Do English Language Learners (ELLs) have different word reading, PA, MA, and/or morphological spelling skills than non-ELL students at pretest?
Research Question 5. Do ELLs make different gains after exposure to linguistic awareness intervention on word reading, PA, MA, and/or morphological spelling than non-ELL students?

Research Question 6. Does the amount of time students are engaged in lesson activities predict student gains in word reading, PA, MA, and/or morphological spelling?

Participants and Setting

Setting

The participants were drawn from the kindergarten classes of one elementary school in a large school system in rural, North Carolina. The elementary school served 633 students, 117 of whom were enrolled in kindergarten during the time of the study (North Carolina Department of Public Instruction [NCDPI], 2014). According to data from the previous year, 63% of students were eligible for free and reduced lunch at the school level, as compared to 42% at the district level (NCDPI, 2013). Refer to Table 3.1 for the ethnic representation of students at the grade, school, and district levels.

Table 3.1
Ethnic Representations by Grade, School, & District

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>Grade</th>
<th>School</th>
<th>District</th>
</tr>
</thead>
<tbody>
<tr>
<td>American Indian</td>
<td>-</td>
<td>0.2%</td>
<td>0.3%</td>
</tr>
<tr>
<td>Asian</td>
<td>0.9%</td>
<td>0.5%</td>
<td>0.7%</td>
</tr>
<tr>
<td>Hispanic</td>
<td>36.8%</td>
<td>42.2%</td>
<td>16.6%</td>
</tr>
<tr>
<td>Black</td>
<td>22.2%</td>
<td>11.1%</td>
<td>15.5%</td>
</tr>
<tr>
<td>White</td>
<td>37.6%</td>
<td>42.5%</td>
<td>62.6%</td>
</tr>
<tr>
<td>Multi-Racial</td>
<td>2.6%</td>
<td>3.6%</td>
<td>4.2%</td>
</tr>
</tbody>
</table>

Note. Data retrieved from NCDPI (2014).
Participants

Seventeen kindergarten students and five classroom teachers participated in the study. Consent forms were sent home to all kindergarten students who met the following initial eligibility qualifications: (a) no older than 6 years, 11 months at the time of recruitment; and (b) do not meet the middle of the year benchmark level on the mClass: Reading 3D DIBELS Next (Good & Kaminski, 2011) subtests of First Sound Fluency (FSF) and/or Phoneme Segmentation Fluency (PSF). A third eligibility requirement was screened for during the initial testing: (c) produce at least 3 of 4 word final consonants (/t/, /d/, /s/, /z/) as demonstrated by the Rice/Wexler Test of Early Grammatical Impairment (TEGI) Phonological Probe (Rice & Wexler, 2001).

Seventeen of the twenty-one students whose parents consented were included in the study. Two of the original twenty-one students were erroneously included in the initial testing although they had met the mid-year benchmarks for both of the DIBELS subtests, and thus were not included in the remainder of the study. One student did not meet the speech production requirement, and one student was unable to participate in the study due to scheduling conflicts.

Appropriateness of sample size. A power analysis was conducted with the G*Power 3.1 software to determine a minimum sample size, in order to reduce the risk of Type II error. With four predictor variables, the alpha set at .05, and the power set at .80, a minimum of 51 total participants was suggested to detect an effect size of .40 (large effect size for MANOVA analyses). However, this number of participants would have increased the group size to 17 students per group, which is not supported by the research as an optimum group size for linguistic awareness intervention (National Institute of Child Health and Human Development [NICHD], 2000). Furthermore, serving the 51 students in a total of nine groups (three for each condition) was not feasible given the scope of the current study. Therefore, one group of 6-7
participants was targeted for each condition, thus keeping with the recommendations for small group instruction and keeping within the scope of the current study. However, reduced power to detect an intervention effect was expected. Fortunately, a review of the literature revealed that average univariate and multivariate effect sizes for morphological and phonological awareness interventions ranged between large and very large (e.g., Apel, Brimo, Diehm, & Apel, 2013; Kirk & Gillon, 2007), indicating that even with reduced power it may be possible to find an intervention effect with 17 total participants.

**Participant demographics.** Students ranged in age from five years, six months to six years, eleven months during screening and pre-treatment testing (mean = 72.1 months; standard deviation = 4.8 months). Table 3.2 displays the gender, eligibility for special education, and ELL status of the sample population. All ELLs spoke Spanish as a native language.

<table>
<thead>
<tr>
<th>Sample Characteristics</th>
<th>Number</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>8</td>
<td>47.1%</td>
</tr>
<tr>
<td>Male</td>
<td>9</td>
<td>52.9%</td>
</tr>
<tr>
<td>Students Receiving Special Education Services</td>
<td>2</td>
<td>11.8%</td>
</tr>
<tr>
<td>Students Identified as English Language Learners</td>
<td>10</td>
<td>58.8%</td>
</tr>
</tbody>
</table>

**Participant characteristics by group.** There were several participant characteristics that were important to ascertain at the start of the intervention in order to later interpret potential group differences. For each group, the English language proficiency of ELLs and the percentage of obligatory contexts in which students produced word-final morphemes were determined and analyzed for potential group differences.
English language learner proficiency. The total number and percentage of students who were English Language Learners (ELLs) in each group is displayed in Table 3.3. In order to determine if the groups differed by the English language proficiency of ELLs, a new variable was added to the data set. The WIDA-ACCESS Placement Test (W-APT) (Center for Applied Linguistics, 2013), a combined measure of speaking and listening ability, was administered by the school district to all students who spoke English as a second language at the beginning of the school year. These scores were entered for all ELL students in the current study. Students are considered “English Language Proficient” in the state of North Carolina if they receive a score of 27 or greater on this screening test (NCDPI, 2011). The descriptive statistics for English language proficiency by group are displayed in Table 3.4.

Table 3.3
English Language Learner Status by Group

<table>
<thead>
<tr>
<th>Student Status</th>
<th>PA/LK (n=6)</th>
<th>MA (n=6)</th>
<th>PA/LK/MA (n=5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELL</td>
<td>4(66.7%)</td>
<td>4(66.7%)</td>
<td>2(40%)</td>
</tr>
<tr>
<td>Non-ELL</td>
<td>2(33.3%)</td>
<td>2(33.3%)</td>
<td>3(60%)</td>
</tr>
</tbody>
</table>

Note. PA/LK = phonological awareness and letter knowledge group; MA = morphological awareness group; PA/LK/MA = three-pronged linguistic awareness group (phonological awareness, letter knowledge, and morphological awareness).

Table 3.4
English Language Proficiency by Group

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean and SD</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>PA/LK (n=4)</td>
<td>20.50(2.65)</td>
<td>18</td>
<td>24</td>
</tr>
<tr>
<td>MA (n=4)</td>
<td>18.25(7.59)</td>
<td>8</td>
<td>26</td>
</tr>
<tr>
<td>PA/LK/MA (n=2)</td>
<td>16.50(3.54)</td>
<td>14</td>
<td>19</td>
</tr>
</tbody>
</table>

Note. Standard deviations are in parentheses.
The Kruskal-Wallis test revealed no significant main effect of group for English language proficiency of ELLs, $\chi^2 (2) = 1.021, p = .600$, suggesting that there were no differences among groups for this variable.

*Production of word-final morphemes.* An essential component of the morphological awareness and three-pronged interventions was the production of morphological suffixes. Thus at the start of the intervention, it was important to consider the proficiency by which students were producing obligatory morphemes in word-final placement. The proficiency level was calculated in order to detect any potential group differences that would impact the interpretation of study results, but students were not excluded from the study based on this assessment. The TEGI (Rice & Wexler, 2001) word-final morpheme (i.e., third person singular and past tense) probes were given to all students during pre-treatment testing. A percentage was then calculated for each student based on the number of morphemes produced correctly out of all obligatory contexts for word-final morphemes –s and –ed. It was not possible to use raw scores for this measure, as the number of obligatory contexts per student varied based on their descriptions of picture prompts. The average percentage of production for each group was 62.7% for PA/LK, 55% for MA, and 82% for PA/LK/MA. Each student’s percentage score is presented by group in Table 3.5.

<table>
<thead>
<tr>
<th>Group</th>
<th>Student 1</th>
<th>Student 2</th>
<th>Student 3</th>
<th>Student 4</th>
<th>Student 5</th>
<th>Student 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>PA/LK</td>
<td>14%</td>
<td>43%</td>
<td>66%</td>
<td>70%</td>
<td>86%</td>
<td>97%</td>
</tr>
<tr>
<td>MA</td>
<td>14%</td>
<td>41%</td>
<td>49%</td>
<td>59%</td>
<td>78%</td>
<td>89%</td>
</tr>
<tr>
<td>PA/LK/MA</td>
<td>57%</td>
<td>73%</td>
<td>88%</td>
<td>95%</td>
<td>97%</td>
<td>-</td>
</tr>
</tbody>
</table>
Analysis of variance (ANOVA) suggested that there was not a significant difference among groups for grammatical morpheme production, \( F(2,14) = 1.56, p = .245 \). In summary, the three intervention groups included students who were English language learners and native English speakers; however, groups did not differ significantly on English language proficiency of ELLs. Additionally, no differences were detected among groups for students’ ability to produce word-final morphemes in obligatory contexts.

**Literacy Instruction in the Classroom**

To provide information about the overall literacy instruction this sample of students was receiving, each of the five classrooms was observed during one week in the middle of the intervention. The literacy block was structured similarly across classrooms and included a writing workshop and a reading workshop. The writing workshop activity often began with a full class reading of a book by the teacher, followed by students breaking off into small groups to write a reaction to the story. For example, in one class, students were read a fictional storybook about rain, then wrote a sentence and drew a corresponding picture about something they like to do in the rain. During this time, the teacher and assistant teacher provided individual support and feedback to students. Feedback included asking students to read the sentence aloud, emphasizing sounds in words to encourage students to hear a sound and write the corresponding letter, asking students to stretch out words and write down the letters they hear, encouraging students to reference the word wall for the spelling of common words, asking students how they know a sentence is completed to encourage them to use a period, and providing positive reinforcement when students stretched out words independently. After writing workshop was completed, students transitioned to the rug and were invited to share their sentence and picture with the group. During this sharing time, positive reinforcement was given for strategies that
During reading workshop, students were broken up into small groups, each participating in a different activity based on student skill level. For example, one group of students would work with the classroom teacher, who was leading a guided reading lesson. The teacher and students all had one copy of a book and students were encouraged to follow along with their copies. The teacher encouraged students to look at words and sound them out. The teacher also asked them: (a) what sound/letter they heard in certain word placements (e.g., “What do you hear in the middle of the word weather”); (b) to describe pictures; (c) to notice punctuation (e.g., “What’s at the end of rain or shine?”); and (d) to make connections between the story they were reading and their lives (e.g., “Would today be a rain day or a shine day?”). A separate group of students would be working with the assistant teacher on a similar type of lesson, while other students would be reading quietly, or working on literacy related computer games. Overall, the main areas of focus in reading and writing workshops during the observed week seemed to be the use of strategies to help students to sound out words for both writing and reading, reference to the word wall to help with the spelling of common words, the use and awareness of correct punctuation at the end of sentences, and making connections between texts and real life. During the week of observations, no explicit instruction targeting morphological awareness was noted.

**Procedures**

**Recruitment and Screening**

All kindergarten teachers administered the *mClass: Reading 3D DIBELS Next* (Good & Kaminski, 2011) kindergarten screening in January to each student in their class, as required by the school district. Consent forms were sent home to the families of all students who fell below
the benchmark score on the First Sound Fluency (FSF), and/or Phoneme Segmentation Fluency (PSF) subtests. Families spoke either English or Spanish as a native language, and thus received consent forms in one of these languages. All students who were 6 years, 11 months or younger and whose families returned signed consent forms participated in the initial screening and pre-treatment testing. Students who met the speech production requirement (i.e., produce at least 3 of 4 word final consonants: /t/, /d/, /s/, /z/) also participated in the intervention and post-treatment testing phases of the study. One student who met these requirements was unable to participate in the study due to scheduling constraints.

Testing

During the initial testing phase of the study, students participated in a pretest battery that assessed: (a) phonological awareness; (b) morphological awareness; (c) word reading; and (d) spelling of morphological suffixes. Students were also screened for the production of word-final consonants and word-final morphemes. At the end of the six-week intervention, students completed the same battery of assessments (excluding screening measures) as a posttest battery. All assessments were given by either the researcher or by trained speech-language pathology graduate students, supervised by the researcher. All graduate student clinicians had completed the required training in human research ethics, were enrolled as either first or second-year students in the University of North Carolina Master of Science program in Speech and Hearing Sciences, and had either prior or concurrent experience working with school-aged children. The student-clinicians participated in a three-hour training session facilitated by the researcher. During this training, student-clinicians were instructed in general testing guidelines, procedures for administering all subtests, and procedures for scoring all subtests except the spelling measure. Students then practiced independently administering and scoring subtests and were
provided with corrective feedback. All graduate students were deemed competent in the administration and scoring of the screening and testing measures prior to working with the children in the current study. During the testing, one clinician worked with one kindergarten student and provided the student with several opportunities for breaks as needed. Total combined pretest and posttest time ranged between 1.5 hours and 2.5 hours per student. The scored tests were reviewed by the researcher and raw scores were checked for accuracy. Classroom teachers also completed a survey to rate each of their participating students’ literacy skills at the start and the end of the intervention.

**Assignment to Intervention Condition**

True random assignment was not possible due to scheduling constraints. The process of assignment to intervention began with the selection of three group times based on teacher feedback regarding times that would work for most of their students. Teachers then provided the researcher with the time(s) each student was able to participate without knowledge of which intervention condition would be employed in each time slot. The list of student participants was then randomized. Using this list, students were placed in groups starting with the first available time slot that they could attend, and then moving to the first available slot for the next student in the list. In this way, students were randomly assigned to groups to the extent that was feasible. The resulting composition of the groups appeared balanced across classrooms (refer to Table 3.6). Classroom teachers were blind to their students’ group assignments in order to increase the validity of any potential treatment effect. All therapy sessions took place in a separate room in the school building. Therapy sessions had at least five minutes built in to the beginning and ending to ensure adequate transition time from the classroom to the intervention location.
Assessment Measures

Two subtests from the *DIBELS Next* (Good & Kaminski, 2011) were administered by classroom teachers as required by the school district and were included as part of the eligibility requirements for participation in this study. Two probes from the *TEGI* (Rice & Wexler 2001) were administered only at pretest as part of screening and description of the sample population. A battery of subtests was administered at pretest and posttest to measure growth in the four dependent variables (i.e., phonological awareness, morphological awareness, word reading, and the spelling of suffixes). Refer to Table 3.7 for a complete listing of all subtests utilized in this study.

Screening Measures

Two subtests from the *DIBELS Next* (Good & Kaminski, 2011) were administered by teachers as required by the school district no more than nine weeks before the start of the intervention and served as part of the initial screening for inclusion in the study. Students who did not meet the mid-year benchmark for one or both of these subtests met this eligibility requirement. The *First Sound Fluency (FSF)* subtest is intended for kindergarten students and assesses the student’s ability to isolate the first sound in a word. On this subtest, students are given 1 point if they isolate the onset, or onset plus a vowel, and 2 points if they are able to isolate the individual phoneme. Students must achieve a raw score of 30 or more to meet the mid-year kindergarten benchmark. The *Phoneme Segmentation Fluency (PSF)* subtest is intended for kindergarten and first-grade students and assesses the student’s ability to segment three and four-phoneme words into individual phonemes. For this task, the examiner orally presents a word and the student is asked to produce the individual phonemes for each word. To meet the mid-year kindergarten benchmarks, students must achieve a raw score of at least 20.
The PSF subtest was also administered to students at the end of the year, no more than two weeks after the end of the intervention; these data were collected for later analysis.

Table 3.6
Composition of Intervention Groups by Classroom Teacher

<table>
<thead>
<tr>
<th>Group</th>
<th>Teacher A</th>
<th>Teacher B</th>
<th>Teacher C</th>
<th>Teacher D</th>
<th>Teacher E</th>
</tr>
</thead>
<tbody>
<tr>
<td>PA/LK Group (n=6)</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>MA Group (n=6)</td>
<td>3</td>
<td>-</td>
<td>1</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>PA/LK/MA Group (n=5)</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 3.7
Assessment Protocol

<table>
<thead>
<tr>
<th>Area</th>
<th>Assessment Tool</th>
<th>Subtest(s)</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>PA</td>
<td>DIBELS Next</td>
<td>First Sound Fluency</td>
<td>Screening</td>
</tr>
<tr>
<td>PA</td>
<td>DIBELS Next</td>
<td>Phoneme Segmentation Fluency</td>
<td>Screening</td>
</tr>
<tr>
<td>Phonological Production</td>
<td>TEGI</td>
<td>Phonological Probe</td>
<td>Screening</td>
</tr>
<tr>
<td>Morphological Production</td>
<td>TEGI</td>
<td>Third Person Singular Probe; Past Tense Probe</td>
<td>Description of the Sample</td>
</tr>
<tr>
<td>PA</td>
<td>CTOPP</td>
<td>Ellison; Blending Words</td>
<td>Pretest/Posttest</td>
</tr>
<tr>
<td>MA</td>
<td>Kindergarten Oral Morphological Production Task</td>
<td>-</td>
<td>Pretest/Posttest</td>
</tr>
<tr>
<td>Word Reading</td>
<td>TOWRE</td>
<td>Sight Word Efficiency; Phonetic Decoding Efficiency</td>
<td>Pretest/Posttest</td>
</tr>
<tr>
<td>Spelling</td>
<td>Single Word Morphological Spelling Test</td>
<td>-</td>
<td>Pretest/Posttest</td>
</tr>
</tbody>
</table>
Students who met this initial eligibility requirement and whose parents provided consent participated in the pretesting phase of the study. As part of this testing, all students were administered the *TEGI Phonological Probe* (Rice & Wexler, 2001). This tool served as a screening measure to determine if students were able to produce the word-final phonemes /t/, /d/, /s/, and /z/ in single morpheme words. These word-final phonemes were of interest as the two intervention groups that included morphological awareness instruction required students to produced word-final morphemes –ed, and –s, which each require the production of two of these phonemes in the word-final placement. Given picture prompts, students were asked to produce words that included these sounds. Correct productions, sound substitutions, and distortions were scored as correct; omissions were scored as incorrect. Thus, this was a measure of the marking of word-final phonemes. One student who did not achieve a raw score of 4 out of 5 points for at least three of the four phonemes was excluded from the study, thus screening out students who did not mark word-final phonemes with at least 80% accuracy for the majority of target phonemes.

**Morphological Production Probe**

During pretesting, students were also administered the *TEGI Third Person Singular* and *Past Tense Probes* (Rice & Wexler, 2001). Students were not excluded from the study due to their performance on these probes; however, these data were utilized as part of the description of the sample and were useful in interpreting the results of this study. Given picture prompts, students were encouraged to produce phrases and/or sentences that included the target word-final morphemes. For example, for the *Past Tense Probe*, students were shown two pictures, one of a boy raking, and one of a boy who had finished raking the leaves. The students were encouraged to describe the second picture as “He raked the leaves” to elicit the past tense –ed morpheme.
The irregular past tense was also elicited, as in “She caught the ball.” Similarly, the Third Person Singular Probe required students to produce the third person singular morpheme (e.g., “She teaches”). As this was an open-ended task, students did not always independently produce responses that required the obligatory morphemes (e.g., “She is teaching” for the third person singular picture prompt). Thus, the number of correct productions out of all obligatory contexts for the given morphemes was calculated. Students received a percentage score that ranged from 0 to 100, representing the proficiency by which they produced the third person singular and past tense morphemes.

**Phonological Awareness**

The Ellison and Blending Words subtests of the Comprehensive Test of Phonological Processing (CTOPP; Wagner, Torgesen, & Rashotte, 1999) were administered to assess students’ phonological awareness. These were included as part of both the pretest and posttest battery as a means to determine growth in phonological awareness from the start to the end of the intervention. This elision task required students to delete words, syllables, onsets, and phonemes (e.g., “Say toothbrush. Now say toothbrush without saying tooth”; “Say cup. Now say cup without saying /k/”). The blending task required students to blend syllables and phonemes into words (e.g., “/m/…/u/…/n/…Put the parts together to make a whole word”). Students’ raw scores from these two subtests were combined for the purposes of analysis as a phonological awareness composite.

**Morphological Awareness**

The Kindergarten Oral Morphological Production Task (adapted from Wolter, Wood, & D’zatko, 2009; see Appendix A) served as a measure of pretest and posttest morphological awareness. Wolter and colleagues adapted this task from a written morphological production
task developed by Carlisle and Nomanbhoy (1993), which required students to write a morphologically complex word to complete a sentence. In the version adapted by Wolter et al., the student is orally given a base word (e.g., farm) and is asked to orally complete a sentence (e.g., “My uncle is a _______.”) by providing a form of the base word that fits in the given sentence (in this case, farmer; Wolter et al., 2009). The task was further adapted for this study so that only the morphemes that were targeted in the morphological instruction (i.e., -ed, -s, -ing, -er, -y) were included in the assessment. There were an equal number of sentences per morpheme. All original and adapted targeted morphological transformations were transparent, such that there were no phonological changes in the base words from the bases to the derived or inflected forms. For example, the pronunciation of the base word jump does not change when it is transformed to the inflected word jumped. For the purpose of this study, students received a raw score between zero and fifteen.

**Word Reading**

To measure students’ word level reading, two subtests of the *Test of Word Reading Efficiency* (TOWRE; Torgesen, Wagner, & Rashotte, 1999), *Sight Word Efficiency* (SWE) and *Phonetic Decoding Efficiency* (PDE), were administered at pretest and posttest. The SWE subtest required students to read as many real words (e.g., is, up, cat) as possible within 45 seconds, thus assessing word reading ability. The PDE subtest required students to read as many pseudowords (e.g., ip, ga, ko) as possible within 45 seconds, thus assessing phonetic decoding ability. Raw scores were combined and analyzed as a word reading composite in the current study.
Spelling

The Single Word Morphological Spelling Test (Wolter et al., 2009; See Appendix B) served as a pretest and posttest morphological spelling measure. Wolter et al. adapted this measure from a task originally published by Treiman and Cassar (1996). For this task, children were asked to spell single-morpheme and two-morpheme words. The multimorphemic words included four of the five morphemes that were targets in the MA and three-pronged interventions (i.e., -s, -ed, -er, -y). Half of the words included a true morpheme as a suffix (e.g., sweaty), and half of the words included a pseudo-morpheme (i.e., the word ending sounds the same and is often spelled the same as a morphological suffix, as in ready). Students received 1 point for each item for which they represented the target morpheme or pseudo-morpheme with an appropriate letter for each phoneme. Partial credit was not given. Voiced and voiceless cognates were given full credit, as the –s and –ed morphemes can be realized as both. For example, students would have received credit for spelling rained as “rand” as the final /d/ phoneme was represented. Students would also have received credit for spelling kicked as “kikt” or “kikd” as in both cases a variant of the –ed morpheme is represented. The spelling of the base or pseudo-base was not considered in scoring. Refer to Appendix C for the scoring directions for this measure, including spelling variants accepted for all morphemes and pseudo-morphemes.

The names were removed from all spelling assessments and were scored by the graduate student clinician, who had received training by the primary researcher with practice examples and was deemed competent in scoring according to the directions (see Appendix C). The primary researcher independently coded a randomly selected 23.5% of all spelling assessments (i.e., 4 from pretest and 4 from posttest) to determine inter-rater agreement for this measure. Inter-rater agreement was high at 95.4%. Any disagreements were resolved with consensus
coding. As originally intended, this assessment provided two raw scores, one representing pseudo-suffixed words and one representing true suffixed words. However, this spelling measure was utilized as means to determine growth in the spelling of both word-final morphemes and pseudo-morphemes. Thus, for the purposes of the research questions, these raw scores were combined and counted as one composite spelling score.

**Intervention Programs**

Each group received intervention four times per week for thirty minutes for a period of six weeks by the researcher, who is also a licensed speech-language pathologist. One graduate student clinician assisted in 29% of all lessons (i.e., seven lessons per group). The interventions took place outside of the classroom in order to provide intensive intervention and to ensure that the classroom teachers were blind to the group membership of participants. The speech-language pathologist had over nine years of experience as a licensed clinician in the areas of child language and literacy intervention. Refer to Appendix D for a sequence of lesson targets for the three intervention groups.

**Phonological Awareness and Letter Knowledge Intervention**

This program was adapted from the *Promoting Awareness of Speech Sounds (PASS)* lessons created by Roth, Worthington, and Troia (2012), and targeted: (a) blending; (b) segmenting; (c) and letter-sound relationships. Students were presented with engaging materials and activities, such as puppets and manipulatives. The lessons were 30 minutes in total and were broken up into two parts. For the first five to ten minutes of the lesson, students were introduced to the target letter(s). The letters S, G, D, R, and Y were targeted for consistency across groups as they corresponded with morpheme targets for the three-pronged intervention lessons. Students were shown letter cards, which were placed in a pocket chart displayed on the table, and
were encouraged to be “sound detectives” by listening for the sound(s) the target letter can make. As an introduction to the concept, students raised small magnifying glasses when they heard the target sound(s). The magnifying glasses were later faded from instruction, as they became a distraction; instead students raised their hands or put their fingers on their noses to show that they heard a sound. The Goldie puppet from the PASS curriculum (Roth et al., 2012), an engaging stuffed dog, was utilized during this instruction in order to increase motivation and attention. For example, in the first lesson Goldie “said” several words, some of which contained the sound /s/, and some of which did not. Students raised their magnifying glasses when they heard the “S” sound and the clinician facilitated discussion around whether they heard the sound at the beginning, middle, or ending of the word. As the lessons progressed, students took turns “playing Goldie” and came up with their own words that did or did not contain the target letter/sound, while other students raised their hands when they heard the target.

During the remaining 20 to 25 minutes of each lesson, students engaged in either a blending or a segmenting lesson from the PASS curriculum (Roth et al., 2012). These lessons utilized shared reading and games to encourage practice of targeted goals. For example, during the tenth lesson, the focus was on blending three phonemes into words. First, the students played a blending game in which Goldie said a type of food in “small parts” (i.e., phonemes as in, /s/…/u/…/p/) and students blended the sounds to make a whole word. After blending the word (with assistance as needed), students received a corresponding picture card, which they placed in Goldie’s dish for her to “eat.” After this activity, students took turns blending more consonant-vowel-consonant (C-V-C) words without picture reinforcement. The remaining time was spent continuing to play the “feed Goldie” game with more picture exemplars. If there was any remaining time after the PASS lesson, students took turns listening for the target letter/sound.
again, raising their hands when they heard it in example words. Students were reinforced for participation with stickers after each lesson.

**Morphological Awareness Intervention**

The morphological awareness intervention program was adapted from strategies described by Wolter and Green (2011; 2013) and Apel, Brimo, Diehm, & Apel (2013). The focus of this intervention was the awareness of morphological suffixes and their derived and inflected forms. Students were encouraged to be “word detectives,” by which they were active participants in identifying suffixes and discovering the meanings of words and suffixes. Similar to the concept of “sound detectives” with the PA/LK group, students were provided with magnifying glasses and were instructed to raise them when they heard target suffixes; these props were also faded for this group as the lessons progressed. The five target suffixes (plural – *s*, present progressive –*ing*, past tense –*ed*, agentive –*er*, and adjectival –*y*) have been found to be commonly occurring in kindergarten oral language (Zoski, 2013), and have been successfully utilized as target morphemes in kindergarten MA intervention in previous research (Apel, Brimo, et al., 2013). Irregular plurals and past tense forms were introduced during the last lesson with the respective target suffixes. Activities addressed the following areas: (a) identifying target suffixes during shared reading and oral presentations of words; (b) sorting words by suffix; (c) discovering meanings of suffixes; and (d) creating new words with target suffixes. For all activities, words were presented orally and with the written form, but the focus was on students’ ability to recognize morphemes in oral language.

Lessons were 30 minutes in total and included three distinct activities. For the first five to ten minutes, students were introduced to the concept of listening for the target morpheme through a guided word sort. For example, during the first lesson, the Goldie puppet (from the
PASS curriculum) “read” words, some of which included the target morpheme plural -s and some of which did not include the target morpheme. Students raised their magnifying glasses when they heard –s at the ends of words. Word cards were then sorted as a group in a pocket chart that was displayed on the table. Students helped Goldie to place words in a row labeled “-s” and a row labeled “not –s.” Each morpheme was targeted for four lessons; after the introductory lesson for a given morpheme, the meaning of the morpheme was discussed and word contrasts were presented to reinforce this concept. For example, for the present progressive –ing target, word contrasts were provided such as dancing and wing; students were encouraged to identify the words that end in –ing that also mean “doing something” and words were sorted into “doing something” and “not doing something” categories.

During the next ten to fifteen minutes of the lesson, students were engaged in a shared reading activity, in which they continued to identify the target morpheme. Words that students identified and some foils that the clinician identified were sorted into categories as a group during the shared reading. For example, during an –ing lesson, students listened to the book Polar Bear, Polar Bear, What Do You Hear? (Martin & Carle, 1992). Students listened for the –ing morpheme at the ends of words and raised their hands when they heard it. Words that were correctly identified as ending with the –ing morpheme were sorted in an “-ing” row on the pocket chart (e.g., hissing, roaring, snorting, trumpeting). The clinician also periodically stopped on words that did not include –ing (e.g., bear, zebra, children) and asked the students if they heard –ing at the end of these words. These words were sorted in a row labeled “not –ing.” A discussion was then facilitated whereby students became aware that all of the –ing words were words describing something that animals were doing. Students then came up with more
examples of things animals might be doing, which were written on word strips and sorted on the pocket chart.

During the last five to ten minutes of the lesson, students worked in pairs or individually with their own small pocket charts and sorted additional words. For example, during the fourth lesson targeting –ing, the focus was sorting words ending in the true –ing morpheme and those ending in the pseudo-morpheme. A symbol of a man running was introduced to represent “doing something words.” Students were given word strips with both written words and pictures representing both types of words. In groups or individually, students sorted words into two categories, one representing “doing something” words (e.g., speaking, dancing) and one representing “not doing something” words (e.g., ring, wing). The concept was discussed that even though the word endings look the same, they do not share the same meaning. If any time was remaining after this word sort, the shared reading book was reintroduced and students practiced identifying words that end in the target morpheme. As with the first group, students were reinforced for participating in each lesson with a sticker.

Three-Pronged Linguistic Awareness Intervention

The final group received a three-pronged linguistic awareness (PA, LK, and MA) intervention. Students in this group received an integrated approach in which they received instruction in all three areas of linguistic awareness. Lessons from the two-tiered group and the MA-only group were shortened to 15 minutes by reducing the number of targets and activities that students completed in a given lesson. During each 30-minute session, students were exposed to 15 minutes of PA/LK instruction and 15 minutes of MA instruction. When feasible, two of these areas were integrated with the same activities and word targets, thus reducing transition time between activities and providing students with multiple strategies for the same
target words. For example, the letter-sound relationships were chosen to closely match the morpheme targets. Thus, during a plural –s lesson, the letter S was also targeted.

These lessons were 30 minutes long and were broken up into three ten-minute activities. The introduction activity closely mirrored the introduction from the other two groups, during which the Goldie puppet said words and students were asked to raise magnifying glasses (or hands, after the magnifying glasses were discontinued) when they heard a target letter/sound or morpheme. As an example for this group, both the letter S and the morpheme –s cards were presented to the students. Goldie “read” word strips and students raised their hands when they heard the S sound at the beginning, middle, or ending of words. The focus then shifted to the S sound at the end of words, and the meaning of –s at the end of words was discussed (i.e., it means more than one). As with the MA intervention, students were encouraged to sort words into categories on the pocket chart.

A shared reading activity and a group word sort followed, as described for the MA intervention. There were no individual word sorts for this group of students. Instead, the last ten minutes of the lesson included activities from a PASS (Roth et al., 2012) lesson. The clinician facilitated a transition to the phonological awareness target by having the Goldie puppet say words that were on the pocket chart from the morpheme word sort, encouraging students to either blend syllables or phonemes into words or to segment words. For example, after sorting –ing words from Polar Bear, Polar Bear, What Do You Hear (Martin & Carle, 1992), Goldie “said” some of the animal names in “small parts,” (i.e., phonemes or syllables, as in /b/…/ɛ/…/r/) and encouraged students to blend phonemes to say the whole word. The PASS (Roth et al., 2012) lesson then followed, but was cut short due to time constraints. Using an example already described for the PA/LK intervention, students engaged in the “feed Goldie”
game, and then completed as many examples as possible of blending C-V-C words without picture prompts until the session was over. There was not extra time for this group during any of the lessons. As with the other two interventions, student received stickers as reinforcement for their participation.

Fidelity of Intervention

The fidelity of the intervention was closely monitored within and across groups. An intervention fidelity checklist was created for each group and was filled out after each lesson (See Appendix E for a sample fidelity checklist). The graduate student clinician independently scored a fidelity checklist for all lessons she attended (29% of all lessons, or seven lessons per group) and inter-rater agreement was calculated for all measures. Both student and session data were collected. First, attendance and engagement level were tracked for students; engagement level was defined as “time spent on task, whether the student is engaged with a book, materials, or related conversation.” Session data included the number of exact minutes per lesson, the amount of lessons that met a 25-30 minute length range, and the number of targeted goals that were addressed per session. Additionally, space was available to list specific activities, and general observational notes.

Session data. The total intervention time for all groups ranged from 11.5 to 11.8 hours. For all lessons, the three groups met the session length range of 25 to 30 minutes and addressed all targeted goals. The descriptive statistics for the exact lesson length per group are listed in Table 3.8. The average session length time was the greatest for the three-pronged intervention group; however there were no significant differences in exact session length, $\chi^2 (2) = 5.281, p = .071$. Inter-rater reliability was high with 90% agreement for targets addressed, 95% agreement
for exact time within two minutes, and 100% agreement for the 25 to 30 minute session length range.

Table 3.8
Descriptive Statistics for Exact Lesson Length by Group

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean and SD</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>PA/LK</td>
<td>28.67(1.99)</td>
<td>25</td>
<td>30</td>
</tr>
<tr>
<td>MA</td>
<td>28.67(1.93)</td>
<td>25</td>
<td>30</td>
</tr>
<tr>
<td>PA/LK/MA</td>
<td>29.58(1.21)</td>
<td>25</td>
<td>30</td>
</tr>
</tbody>
</table>

Note. Standard deviations are in parentheses.

Student data. The number of lessons out of a total 24 possible lessons that students attended was calculated by group (See Table 3.9 for descriptive statistics). As a group, students who received the three-pronged intervention attended more lessons; however there were no significant differences among groups in student attendance, $\chi^2 (2) = 5.57, p = .062$. The mean percentages of attended sessions that students were fully, mostly, and infrequently engaged were calculated by group (see Table 3.10). These data suggest that students in the PA/LK group were more highly engaged for a greater percentage of lessons attended than students in the other two groups. Inter-rater agreement was 100% for both student attendance and engagement level.

The number of lessons during which students were fully engaged (i.e., engaged for at least 25 minutes) was calculated by group (see Table 3.11) and was analyzed for potential group differences. From the data presented in Table 3.11, it appeared that on average students in the first group were fully engaged for more lessons than the other two groups. However, analysis of variance (ANOVA) suggested that there was not a significant difference among groups for the number of sessions students were fully engaged, $F(2,14) = .533, p = .598$. The number of lessons during which students were at least mostly engaged in lesson activities (i.e., engaged for
at least 20 minutes) was also calculated by group (see Table 3.12). With the exception of one student in the three-pronged intervention group, all students were either fully or mostly engaged during all lessons they attended; thus it is important to note that this variable was influenced by attendance. Thus, although students appeared to be more engaged in the third group, this is due to the fact that there were fewer absences in the third group. There were no significant differences among groups in the number of sessions students were at least mostly engaged, $\chi^2(2) = 2.59, p = .274$.

Table 3.9
*Descriptive Statistics for Student Attendance by Group*

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean and SD</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>PA/LK (n=6)</td>
<td>20.00(3.03)</td>
<td>15</td>
<td>23</td>
</tr>
<tr>
<td>MA (n=6)</td>
<td>21.17(2.14)</td>
<td>17</td>
<td>23</td>
</tr>
<tr>
<td>PA/LK/MA (n=5)</td>
<td>23.2(1.30)</td>
<td>21</td>
<td>24</td>
</tr>
</tbody>
</table>

*Note.* Standard deviations are in parentheses.

Table 3.10
*Percentage of Attended Sessions Students Were Fully, Mostly, and Infrequently Engaged by Group*

<table>
<thead>
<tr>
<th>Group</th>
<th>Fully Engaged (26-30 minutes)</th>
<th>Mostly Engaged (20-25 minutes)</th>
<th>Infrequently Engaged (6-19 minutes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PA/LK (n=6)</td>
<td>81.4%</td>
<td>20.2%</td>
<td>-</td>
</tr>
<tr>
<td>MA (n=6)</td>
<td>61.4%</td>
<td>38.6%</td>
<td>-</td>
</tr>
<tr>
<td>PA/LK/MA (n=5)</td>
<td>59.2%</td>
<td>39.0%</td>
<td>1.7%</td>
</tr>
</tbody>
</table>
Table 3.11
*Descriptive Statistics for Number of Sessions Students Were Fully Engaged by Group*

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean and SD</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>PA/LK (n=6)</td>
<td>16.17(5.12)</td>
<td>9</td>
<td>23</td>
</tr>
<tr>
<td>MA (n=6)</td>
<td>13.33(5.24)</td>
<td>4</td>
<td>19</td>
</tr>
<tr>
<td>PA/LK/MA (n=5)</td>
<td>13.60(5.22)</td>
<td>5</td>
<td>19</td>
</tr>
</tbody>
</table>

*Note.* Standard deviations are in parentheses. The number of sessions students were fully engaged = number of sessions students were engaged in lesson activities for at least 25 minutes.

Table 3.12
*Descriptive Statistics for Number of Sessions Students Were At Least Mostly Engaged by Group*

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean and SD</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>PA/LK (n=6)</td>
<td>20.00(1.24)</td>
<td>15</td>
<td>23</td>
</tr>
<tr>
<td>MA (n=6)</td>
<td>21.17(2.14)</td>
<td>17</td>
<td>23</td>
</tr>
<tr>
<td>PA/LK/MA (n=5)</td>
<td>22.6(1.95)</td>
<td>20</td>
<td>24</td>
</tr>
</tbody>
</table>

*Note.* Standard deviations are in parentheses. The number of sessions students were at least mostly engaged = number of sessions students were engaged in lesson activities for at least 20 minutes.

In summary, fidelity data suggests that all targeted goals were addressed in all lessons for each of the intervention groups. Session lengths varied slightly, but there were no significant differences among groups. Lesson length across groups ranged between 25 and 30 minutes, for a total of 11.5 to 11.8 lesson hours. Regarding student fidelity data, there were no significant differences among groups for student attendance or engagement level.
Planned Data Analyses

A combination of parametric and non-parametric statistics was utilized to answer the study’s six research questions. First, to address the differences between pretest and posttest measures within groups, paired samples $t$-tests were chosen to analyze potential treatment effects for the following dependent variables: phonological awareness, morphological awareness, word reading, and spelling. Next, multivariate analysis of variance (MANOVA) was used to detect potential group differences for two groups that met the assumptions for parametric statistics. The distribution of the data for the third group did not meet univariate normality assumptions; thus the *Kruskal-Wallis* non-parametric test was chosen to detect potential differences among the three groups for this variable.

Initial analysis suggested that there were no differences in the English language proficiency of ELL students across the three groups. However, it was not known if groups differed in the average level of English language proficiency when ELL and non-ELL students were considered together. Thus, independent $t$-tests were conducted to determine if there were differences in the pretest scores and/or gain scores of ELL and non-ELL students. Additionally, linear regression was utilized to detect a potential relationship between level of student engagement and student gains on the four dependent variables. Initial analyses suggested there to be no differences between groups; this additional analysis was employed based on clinical judgment. Although differences in student engagement were not statistically significant, the researcher judged students in the PA/LK group to be more highly engaged in lesson activities overall than the other two groups. Finally, teacher survey data and the year-end results of the *DIBELS Next* (Good & Kaminski, 2011) *Phonetic Segmentation Fluency* subtest were analyzed to provide external validity to study findings.
Summary

This study utilized a repeated measures group design to investigate the effectiveness of three different types of linguistic awareness interventions with kindergarten students who were at risk for later reading difficulties. Three groups of students were exposed to six weeks of linguistic awareness intervention focused on one of the following: (a) PA and LK; (b) MA; or (c) three-pronged linguistic awareness (addressing PA, LK, and MA). Students’ pretest and posttest PA, MA, word reading, and spelling skills were assessed in order to detect potential intervention effects and group differences to inform best practice for providing intervention to kindergarten students who are at-risk for later reading difficulties. More than half of the students who participated in this study were ELLs; thus, data were collected to determine if ELL status had an effect on the outcomes of this study. Additionally, student and session fidelity data were recorded for the purpose of later analysis. A combination of parametric and non-parametric statistical analysis was utilized to address these questions.
CHAPTER 4: RESULTS

The primary purpose of this study was to determine if a three-pronged linguistic awareness intervention (i.e., phonological awareness [PA], letter knowledge [LK], and morphological awareness [MA]) is more effective than the commonly implemented two-pronged intervention (i.e., PA and LK) at increasing the early literacy skills of kindergarten students who are at risk for later reading difficulties. Additionally, the study investigated the effectiveness of intervention targeting MA alone as compared to the two other interventions.

The first step in determining the differential effectiveness of these interventions was to analyze the impact each had on the students. This analysis was completed with paired samples $t$-tests for each of the following variables: word reading, PA, MA, and spelling of morphological endings. Next, multivariate analysis of variance (MANOVA) and non-parametric analyses were employed to determine if there were differences in these four variables due to the type of intervention students received.

Given the large number of English Language Learners (ELLs) in the sample, independent $t$-tests were conducted in order to assess any possible group differences due to ELL status. Additionally, as student engagement may have impacted intervention effects, linear regression was employed to determine if this factor significantly predicted student gains. Finally, external validity was assessed in two ways. First, teachers completed a survey at the start and the end of the intervention rating their students on three of the outcome variables (reading, PA, and spelling). In each group, the mean gains teachers reported students to make from the start to the finish of the intervention were computed. In addition, paired samples $t$-tests were used to
compare student performance in each group from the start to the end of the intervention on the
Phoneme Segmentation Fluency (PSF) subtest given by the school district. These results will be
discussed in light of major study findings to establish external validity.

Analyses were conducted in IBM SPSS Statistics 22 for Mac. The results are described in
the following sections in reference to the study’s six major research questions. An alpha level
was set at .05 for all analyses.

Descriptive Statistics

The data were initially analyzed with univariate descriptive statistics. Specifically, the
means, standard deviations, minimums, and maximums for the reading, PA, MA, and spelling
variables were computed for each group (See Tables 4.1 & 4.2). Next, all pretest and posttest
variables were visually inspected with boxplots (See Appendix F) and possible outliers were
identified in each group. The first two groups (PA/LK and MA) presented with no apparent
univariate outliers for any of the variables. Several outliers were found for the third group
(three-pronged intervention); it was verified that these outliers were related to student
characteristics, rather than incorrect data entry. Specifically, one student had pretest and posttest
reading scores that were more than 3 interquartile ranges greater than the upper quartile and a
pretest PA score that was more than 1.5 interquartile ranges greater than the upper quartile. An
additional student had a posttest MA score that was more than 1.5 interquartile ranges less than
the lower quartile of the distribution. Given that the third group had one less participant than the
other two groups and that these scores reflected true scores for students identified as at-risk for
later reading difficulties, the decision was made to retain the data for all students in subsequent
analyses regardless of their performance as outlier scores and adjust the plan for analyses
accordingly.
Table 4.1
*Descriptive Statistics for Pretest Outcomes by Group (N=17)*

<table>
<thead>
<tr>
<th>Measure</th>
<th>Mean and SD</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pretest Reading</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PA/LK Group</td>
<td>3.83(3.71)</td>
<td>0</td>
<td>9</td>
</tr>
<tr>
<td>MA Group</td>
<td>4.67(2.07)</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>PA/LK/MA Group</td>
<td>7.80(8.70)</td>
<td>1</td>
<td>23</td>
</tr>
<tr>
<td><strong>Pretest PA</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PA/LK Group</td>
<td>9.83(2.40)</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>MA Group</td>
<td>12.33(5.39)</td>
<td>4</td>
<td>19</td>
</tr>
<tr>
<td>PA/LK/MA Group</td>
<td>8.20(5.07)</td>
<td>5</td>
<td>17</td>
</tr>
<tr>
<td><strong>Pretest MA</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PA/LK Group</td>
<td>8.17(3.60)</td>
<td>4</td>
<td>14</td>
</tr>
<tr>
<td>MA Group</td>
<td>8.17(2.99)</td>
<td>3</td>
<td>11</td>
</tr>
<tr>
<td>PA/LK/MA Group</td>
<td>8.00(5.15)</td>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td><strong>Pretest Spelling</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PA/LK Group</td>
<td>8.67(3.88)</td>
<td>3</td>
<td>13</td>
</tr>
<tr>
<td>MA Group</td>
<td>9.17(4.92)</td>
<td>3</td>
<td>16</td>
</tr>
<tr>
<td>PA/LK/MA Group</td>
<td>7.20(4.15)</td>
<td>4</td>
<td>14</td>
</tr>
</tbody>
</table>

*Note.* Standard deviations are in parentheses.
Table 4.2
*Descriptive Statistics for Posttest Outcomes by Group (N=17)*

<table>
<thead>
<tr>
<th>Measure</th>
<th>Mean and SD</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Posttest Reading</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PA/LK Group</td>
<td>12.33(4.46)</td>
<td>5</td>
<td>18</td>
</tr>
<tr>
<td>MA Group</td>
<td>11.17(4.45)</td>
<td>6</td>
<td>19</td>
</tr>
<tr>
<td>PA/LK/MA Group</td>
<td>19.80(14.75)</td>
<td>11</td>
<td>46</td>
</tr>
<tr>
<td><strong>Posttest PA</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PA/LK Group</td>
<td>17.17(3.43)</td>
<td>12</td>
<td>21</td>
</tr>
<tr>
<td>MA Group</td>
<td>14.50(4.51)</td>
<td>9</td>
<td>20</td>
</tr>
<tr>
<td>PA/LK/MA Group</td>
<td>15.20(3.70)</td>
<td>10</td>
<td>19</td>
</tr>
<tr>
<td><strong>Posttest MA</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PA/LK Group</td>
<td>11.00(2.28)</td>
<td>9</td>
<td>14</td>
</tr>
<tr>
<td>MA Group</td>
<td>11.67(2.25)</td>
<td>9</td>
<td>14</td>
</tr>
<tr>
<td>PA/LK/MA Group</td>
<td>10.80(4.55)</td>
<td>3</td>
<td>14</td>
</tr>
<tr>
<td><strong>Posttest Spelling</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PA/LK Group</td>
<td>13.50(4.46)</td>
<td>8</td>
<td>18</td>
</tr>
<tr>
<td>MA Group</td>
<td>12.00(4.82)</td>
<td>5</td>
<td>19</td>
</tr>
<tr>
<td>PA/LK/MA Group</td>
<td>13.60(4.83)</td>
<td>7</td>
<td>20</td>
</tr>
</tbody>
</table>

*Note.* Standard deviations are in parentheses.

**Within-Group Intervention Effects**

The first research question investigated the effect of the linguistic awareness interventions on four literacy outcomes. Specifically, the first research question was:
1. Do students make significant gains in word reading, PA, MA and/or spelling of morphological endings after exposure to six weeks of intervention in: (a) PA and LK; (b) MA; and/or (c) three-pronged linguistic awareness (i.e., PA, LK, and MA)?

Paired samples t-tests were utilized to determine whether students from each group made gains from pretest to posttest on one or more of the dependent variables. First the data were examined to verify that the assumptions of parametric statistics have been met. Paired samples t-tests require interval data and for the sampling distribution of the differences between scores (i.e., gain scores) to be normal. To meet the assumptions of interval level data, raw scores were used for the analysis of all variables. To check for the assumption of normality, gain scores were computed based on pre- and post-test raw scores and the distributions of the gain scores were examined by group for each of the four dependent variables.

**Normality Assumptions by Group**

Distributions of the gain scores for the group receiving instruction in PA and LK were examined for skewness and kurtosis. Z-scores for skewness and kurtosis fell below a cut-off of 1.96, suggesting normal distributions for each variable. The PA gain scores, $W(6) = .875$, $p=.245$, reading gain scores, $W(6) = .933$, $p=.607$, MA gain scores, $W(6) = .912$, $p=.452$, and spelling gain scores, $W(6) = .959$, $p=.810$, were all normally distributed, per the *Shapiro-Wilk* test. Visual inspection of the data with histograms and Q-Q plots also suggested normal distributions for each variable.

Distributions of the gain scores for the group receiving instruction in MA were also examined for skewness and kurtosis. Z-scores for skewness and kurtosis fell below a cut-off of 1.96, suggesting normal distributions for each variable. The PA gain scores, $W(6) = .903$, $p=.390$, reading gain scores, $W(6) = .912$, $p=.446$, MA gain scores, $W(6) = .867$, $p=.215$, and
spelling gain scores, \( W(6) = .958, p = .801 \), were all normally distributed, per the Shapiro-Wilk test. Visual inspection of the data with histograms and Q-Q plots also suggested normal distributions for each variable.

Finally, distributions of the gain scores for the group receiving the three-pronged linguistic awareness instruction were examined for skewness and kurtosis. Z-scores for skewness and kurtosis fell below a cut-off of 1.96, suggesting normal distributions for each variable. The PA gain scores, \( W(5) = .891, p = .361 \), reading gain scores, \( W(5) = .894, p = .379 \), MA gain scores, \( W(5) = .826, p = .129 \), and spelling gain scores, \( W(5) = .905, p = .436 \), were all normally distributed, per the Shapiro-Wilk test. Visual inspection of the data with histograms and Q-Q plots also suggested normal distributions for each variable.

**Visual Depiction of Student Gains by Group**

Next, differences between pretest and posttest measures were visualized with error bars. Bar charts were created with adjusted error bars (See Appendix G) to reflect the increased sensitivity of a repeated-measures design (Field, 2009). The bar graphs were inspected to determine where error bars for pretest and posttest conditions did not overlap, suggesting an intervention effect. Visual inspection suggested that students in the first group (i.e., PA and LK intervention) made gains in reading, PA, and MA. Students in the second group (i.e., MA intervention) appeared to make gains in reading, MA, and spelling. Finally, students in the third group (three-pronged linguistic awareness intervention) appeared to make gains in reading, PA, and spelling.

**Paired Samples t-tests**

Paired samples t-tests confirmed suspected treatment effects for each variable by group. For the group receiving PA and LK intervention, students demonstrated significantly greater
skills after intervention in reading, \( t(5) = -5.36, p = .003, d = 2.19 \), PA, \( t(5) = -3.81, p = .013, d = 1.55 \), and MA, \( t(5) = -3.59, p = .016, d = 1.46 \). Students in the second group, receiving intervention in MA, demonstrated significantly greater skills after intervention in reading, \( t(5) = -5.06, p = .004, d = 2.07 \), MA, \( t(5) = -3.96, p = .011, d = 3.96 \), and spelling, \( t(5) = -3.0, p = .03, d = 3.0 \). Finally, the students who received the three-pronged intervention demonstrated significantly greater skills after intervention in reading, \( t(4) = -4.0, p = .016, d = 1.79 \), PA, \( t(4) = -3.55, p = .024, d = 1.59 \), and spelling, \( t(4) = -2.97, p = .041, d = 1.33 \).

In summary, students in each of the groups made significant gains in three of the four outcome variables. However, students receiving PA instruction did not make progress in morphological spelling, students receiving MA instruction did not make progress in PA, and students receiving the three-pronged instruction did not make progress in MA. Students in all groups made significant gains in word reading.

**Post-Intervention Outcome Differences Across Groups**

The next analyses addressed the primary purpose of this study, to determine if the type of linguistic awareness intervention provided to at-risk kindergarten students affects gains made in early reading outcomes. Specifically, the second and third research questions were:

2. Do students receiving a three-pronged linguistic awareness intervention (i.e., PA, LK, and MA) make greater gains in word reading, PA, MA, and/or spelling of morphological endings than students receiving intervention in either PA/LK alone or MA alone?

3. Do students receiving MA intervention make different gains in word reading, PA, MA, and/or spelling of morphological endings than students receiving PA and LK intervention?
To answer these questions, a MANOVA was planned to compare differences among groups on a linear combination of variables. Before a formal analysis was conducted, all data were screened for the univariate assumptions of MANOVA. These assumptions include the absence of univariate outliers, normal distributions of each dependent variable for each group, and homogeneity of variance.

**Univariate Assumptions**

Box plots (See Appendix F) were inspected for univariate outliers. As noted during the discussion of the descriptive statistics, there were univariate outliers for the third group (receiving three-pronged linguistic awareness intervention) in pretest reading, posttest reading, pretest PA, and posttest MA.

Next the distributions of all pretest and posttest variables were examined by group for the assumption of univariate normality. The data for all variables for the group receiving PA and LK approximated a normal distribution. Skewness and kurtosis z-scores fell below a cut-off of 1.96, indicating normal distributions for each variable. Visual inspection of the data with histograms and P-P plots suggested normal distributions for each variable. The pretest reading scores, \( W(6) = .811, p = .073 \), posttest reading scores, \( W(6) = .956, p = .791 \), pretest PA scores, \( W(6) = .891, p = .324 \), posttest PA scores, \( W(6) = .945, p = .697 \), pretest MA scores, \( W(6) = .946, p = .711 \), posttest MA scores, \( W(6) = .815, p = .079 \), pretest spelling scores, \( W(6) = .912, p = .452 \), and posttest spelling scores, \( W(6) = .838, p = .126 \) were all normally distributed, per the Shapiro-Wilk test.

The data for all variables for the second group, receiving MA intervention, also approximated a normal distribution. Skewness and kurtosis for z-scores fell below a cut-off of 1.96, indicating normal distributions for each variable. Visual inspection of the data with
histograms and P-P plots suggested normal distributions for each variable. The pretest reading scores, \( W(6) = .918, p = .493 \), posttest reading scores, \( W(6) = .910, p = .434 \), pretest PA scores, \( W(6) = .927, p = .560 \), posttest PA scores, \( W(6) = .922, p = .516 \), pretest MA scores, \( W(6) = .901, p = .378 \), posttest MA scores, \( W(6) = .842, p = .135 \), pretest spelling scores, \( W(6) = .931, p = .585 \), and posttest spelling scores, \( W(6) = .984, p = .971 \) were all normally distributed, per the Shapiro-Wilk test.

Finally, the data for the third group were analyzed for the assumption of univariate normality. Z-scores for skewness and kurtosis fell below a cut-off of 1.96, indicating normal distributions for four of eight distributions. The normal distributions were for posttest PA, pretest MA, and both pretest and posttest spelling. Visual inspection of the data with histograms and P-P plots suggested normal distributions for these variables. The posttest PA scores, \( W(5) = .943, p = .687 \), pretest MA scores, \( W(5) = .806, p = .090 \), posttest MA scores, \( W(5) = .780, p = .055 \), pretest spelling scores, \( W(5) = .842, p = .171 \), and posttest spelling scores, \( W(5) = .990, p = .980 \) were all normally distributed, per the Shapiro-Wilk test.

For this third group, several variables did not meet the assumption of univariate normality. Large positive z-scores for skewness and kurtosis suggested that pretest reading and posttest reading were positively skewed and leptokurtic, indicating too many low scores in the distribution, clustered closely around the mean. Pretest PA was also positively skewed, as indicated by a large positive z-score for skewness. The Shapiro-Wilk test confirmed significantly non-normal distributions for pretest reading, \( W(5) = .753, p = .032 \), posttest reading, \( W(5) = .661, p = .004 \), and pretest PA, \( W(5) = .735, p = .022 \). Finally, although posttest MA approximated a normal distribution as determined by a non-significant Shapiro-Wilk test, a large negative z-score
suggested that this distribution was negatively skewed, with too many high scores in the
distribution.

Next, the distribution of the variables was checked for the assumption of homogeneity of
variance. The variances were equal for students across the three intervention groups for all
variables:  pre_reading, $F(2, 14) = 2.85, p = .091$, post_reading, $F(2, 14) = 3.28, p = .068$,
pre_pa, $F(2, 14) = 1.38, p = .284$, post_pa, $F(2, 14) = .70, p = .514$, pre_ma, $F(2, 14) = 2.06, p =
.165$, post_ma, $F(2, 14) = .905, p = .427$, pre_spell, $F(2, 14) = .178, p = .839$, and post_spell,
$F(2, 14) = .024, p = .977$.

**Data Transformation**

One way to correct for the lack of univariate normality for several distributions in the
group receiving the three-pronged intervention is to transform the data. Square root and log10
data transformations were attempted due to the large positive skew and extreme outliers of the
reading variables in the third group (receiving three-pronged linguistic awareness intervention).
After both transformations, there were still deviations from normality for the post_reading
variable (i.e., it was positively skewed and leptokurtic). The data transformations were also
unsuccessful at removing the outliers on pre_reading and post_reading. Thus, even with
transformations, the data could not meet the assumption of univariate normality and the
conclusion was drawn that MANOVA was not an appropriate analysis for these data.

**MANOVA with Two Groups that Met Normality Assumptions**

While it was not possible to use MANOVA to test for differences among the three
groups, it was still possible to use MANOVA to analyze differences between Group 1, receiving
PA and LK intervention, and Group 2, receiving MA intervention. As the data from these
groups met univariate normality and homogeneity of variance assumptions, a MANOVA was
planned to analyze group differences. These data were screened for the multivariate assumptions of MANOVA. First, there was no multicollinearity between any set of two variables, as assessed by Pearson correlation. Next, the scatterplot matrices were inspected to determine if there were linear relationships between each pair of dependent variables for each group. There were linear relationships between each pair of variables, with the exception of the reading-MA and spelling-MA pairs. The decision was made to conduct the analysis with MANOVA, even though these two pairs of variables were not linearly related; however, a reduction of power to detect a significant result was expected. There were no multivariate outliers in this data, as assessed by Mahalanobis Distance ($p > .001$). Finally, the multivariate assumption of homogeneity of the covariance matrices was investigated with Box’s test. The variance-covariance matrices were the same in the two groups, $F(10,478)= .897, p = .535$; thus the matrices were equal and the assumption of multivariate homogeneity was met.

Next, analysis of variance (ANOVA) was utilized to determine if there were any differences between groups at pretest for the four dependent variables. There was not a significant difference between groups on pretest reading skills, $F(1,10) = .231, p = .641$, pretest PA skills, $F(1,10) = 1.077, p = .324$, pretest MA skills, $F(1,10) = 0.0, p = 1.0$, or pretest spelling skills, $F(1,10) = .038, p = .849$. Thus, any differences in outcome variables after treatment could be attributed to the type of intervention. However, the MANOVA suggested that there was not a significant effect of the type of intervention on early literacy skills, $F(4,7) = .645, p = .648$. Thus, no omnibus differences were detected between students who received intervention in PA and LK and students who received intervention in MA, and no follow-up analysis were warranted.
Kruskal-Wallis Test

The fact that no significant differences were found between Group 1 (PA and LK intervention) and Group 2 (MA intervention) does not address the research question regarding the three-pronged linguistic awareness intervention and whether it was more effective at increasing early literacy outcomes than the other two interventions. Since data from the group receiving the three-pronged intervention did not meet the assumptions of MANOVA, non-parametric analysis was employed in order to determine if a group effect might exist in order to inform further larger-scale research in this area. Using the Kruskal-Wallis test to compare the three intervention groups, there was no significant main effect of treatment type for post-treatment reading, $\chi^2 (2) = 2.642, p = .267$, post-treatment PA, $\chi^2 (2) = 1.389, p = .499$, post-treatment MA, $\chi^2 (2) = 0.326, p = .850$, or post-treatment spelling, $\chi^2 (2) = 0.505, p = .777$.

In summary, the results from this study did not detect any differences in gains made in early literacy skills based on the type of linguistic awareness intervention at-risk kindergarten students received.

English Language Learners

Over half of the students in this study were ELLs. To determine if pretest literacy skills and/or literacy gains after intervention were different for ELLs, the full sample was split in two and independent t-tests were utilized to analyze potential group differences between students who spoke English as a first language and ELLs. Specifically, the fourth and fifth research questions were:

4. Do ELLs have different word reading, PA, MA, and/or morphological spelling skills than non-ELL students at pretest?
5. Do ELLs make different gains after exposure to linguistic awareness intervention on word reading, PA, MA, and/or morphological spelling than non-ELL students?

Assumptions for Independent t-tests

Before analysis, the data were screened for the assumptions of normality and homogeneity of variance. For the ELL group, z-scores for skewness and kurtosis fell below 1.96, suggesting normal distributions for all variables. This was confirmed with non-significant Shapiro-Wilk test results for all pretest and gain variables.

For the non-ELL group, z-scores for skewness and kurtosis fell below 1.96 for all variables except pretest reading, reading gain, and pretest MA. For the reading variables, large positive z-scores suggested positively skewed and leptokurtic distributions. The pretest MA variable was negatively skewed and leptokurtic. The Shapiro-Wilk test confirmed non-normal distributions for pretest reading, \( W(7) = .686, p = .003 \), and reading gain, \( W(7) = .768, p = .019 \). However, results for pretest MA were non-significant, \( W(7) = .865, p = .167 \), suggesting that the data approximates a normal distribution for this variable. Additionally, although z-scores fell within a normal range, Shapiro-Wilk results suggested that pretest spelling, \( W(7) = .792, p = .034 \), was not normally distributed. Levene’s test suggested equal variances for all variables across non-ELL and ELL groups. These tests indicated that pretest reading, reading gain, and pretest spelling failed to meet the assumptions required to conduct a t-test. As a result, non-parametric analysis was employed to analyze differences between groups for these variables.

Group Differences

Independent t-tests were utilized to determine if differences between ELL and non-ELL students existed for gain scores in PA, MA, and spelling, as well as pretest scores in phonological and MA. Differences between groups for the remaining variables were analyzed.
with the Mann-Whitney $U$ non-parametric test. There were no significant differences at pre-treatment testing between the ELL and non-ELL students on PA, $t(15) = .037, p = .971$, or MA, $t(15) = 2.094, p = .054$. The Mann-Whitney $U$ test did not detect significant differences between groups at pretest for reading, $U(15) = 42, p = .536$, or spelling, $U(15) = 37.5, p = .813$.

Additionally, ELL and non-ELL students did not demonstrate significantly different gains in reading, $U(15) = 35.5, p = 1.0$, PA, $t(15) = -1.541, p = .144$, MA, $t(15) = .616, p = .588$, or spelling, $t(15) = .971, p = .213$.

**Student Engagement**

A record was taken of each student’s engagement level for all sessions attended. As this variable may have impacted student gains on the dependent variables, simple linear regression was employed to determine if level of engagement predicted gains on one or more of the variables. Specifically, the sixth research question asked:

6. *Does the amount of time students are engaged in lesson activities predict student gains in word reading, PA, MA, and/or morphological spelling?*

As a first step for this analysis, the number of total sessions that students were either fully or mostly engaged (i.e., attending and participating for at least 20 minutes of a 30 minute session) in lesson activities was computed and entered as a new variable into the data set. It should be noted that this variable encompasses both engagement level and attendance, as students were not given an engagement score for sessions they did not attend. The four outcome variables (i.e., word reading gain, PA gain, MA gain, and spelling gain) were individually analyzed with the number of sessions either fully or mostly engaged as a predictor variable. Visual inspection of histograms and P-P plots suggested that the assumption of normality of the
residuals was met for the outcome variables. Scatterplots of the standardized residuals revealed a random array of points, suggesting no heteroscedasticity or non-linearity.

Engagement level significantly predicted spelling gains, $b = .959, t(16) = 2.34, p = .034$. A scatter plot showing the relationship between student engagement and spelling gain scores is shown in Figure 4.1. Level of engagement also explained a significant proportion of variance in spelling gain scores, $R^2 = .267, F(1,15) = 94.18, p = .034$. Thus, engagement was a significant predictor of spelling gain scores, explaining 26.7% of the variance. Engagement level was not a predictor of word reading, PA, or MA gain scores.

![Figure 4.1. Relationship Between Student Engagement and Spelling Gains](image-url)
External Validity

In order to increase the generalizability of the study results, data from teacher rating scales and district-wide test results were analyzed. Specifically, teachers were asked to rate their students’ word reading, PA, LK, and spelling skills on a 1 to 5 rating scale at the beginning and end of the study. MA was not included in this rating scale as it is not an outcome typically measured by classroom teachers. Teacher report of student gains from the beginning to the end of the intervention will be discussed in light of study gains reported in these areas by group. Additionally, the district-wide Phoneme Segmentation Fluency (PSF) subtest results were analyzed with paired samples t-tests from the middle to the end of the year (which corresponds with the pretest and posttest dates) to determine if this measure detected growth in PA similar to study results across the three intervention groups.

Teacher Survey Data

Teachers were asked to rate their students on a scale from 1 to 5, with 5 being the highest skill level, on word reading, PA, LK, and spelling. The average student gains from the start to the end of the study by intervention group were computed and are presented in Table 4.3. The mean gain scores reported by teachers were then compared to effect sizes for significant intervention effects from the study findings by group (also reported in Table 4.3). Although LK was not an outcome variable of this study, it was included in the teacher rating data as the first intervention group received instruction in both PA and LK. Across all of the intervention groups, teachers reported no gains in LK.

In the PA and LK group, teachers saw gains in reading and PA, consistent with study findings. However, teachers saw spelling gains that were not captured by the morphological spelling measure given in the study. It is important to note that spelling gains reported by
teachers may be reflected by study gains in PA for this group because gains in these areas would be reflected in improvements in representing letter-sound relationships in spelling in the classroom differently than they might be reflected in the spelling measure used in the study that specifically targeted the spelling of morphological endings.

Teachers saw gains in reading and spelling for the group that received MA intervention that were consistent with study results. However, teachers saw gains in PA that were not captured by the PA measure. Teachers reported students to make the most gains in spelling, which may be partially explained by a large effect size in spelling of morphological endings.

Finally, teachers reported gains in reading, PA, and spelling skills that were consistent with study results for the third group. Gains reported for this group were lower than gains reported for the other two intervention groups, particularly for reading skills.

Table 4.3  

<table>
<thead>
<tr>
<th>Group</th>
<th>Reading</th>
<th>PA</th>
<th>LK</th>
<th>Spelling</th>
</tr>
</thead>
<tbody>
<tr>
<td>PA/LK</td>
<td>.75(2.19)</td>
<td>.83(1.55)</td>
<td>-.08</td>
<td>.75(ns)</td>
</tr>
<tr>
<td>MA</td>
<td>.58(2.07)</td>
<td>.58(ns)</td>
<td>-.17</td>
<td>.75(3.0)</td>
</tr>
<tr>
<td>PA/LK/MA</td>
<td>.20(1.79)</td>
<td>.42(1.59)</td>
<td>-.17</td>
<td>.40(1.33)</td>
</tr>
<tr>
<td>Total Sample</td>
<td>.53</td>
<td>.65</td>
<td>-.15</td>
<td>.65</td>
</tr>
</tbody>
</table>

*Note. Study effect sizes in parentheses; ns = not significant; MA effect sizes not included in this table.*

**DIBELS Data**

The PA variable included in the analysis thus far is a composite of phonological elision and blending. Another way to measure PA skill is through a student’s ability to segment words into their corresponding phonemes. Thus to provide an additional measure to capture potential growth in PA, the middle of year and end of year *Phoneme Segmentation Fluency (PSF)* scores
were analyzed with paired samples *t*-tests to determine if there were significant gains by intervention group. First, the PSF gain scores were screened for the assumption of normality and the distributions of the scores for each group were visually inspected with box plots and histograms. Across the three intervention groups, there were no outliers and the data approximated normal distributions. Paired samples *t*-tests revealed significant gains for all intervention groups, suggesting that students had greater phoneme segmentation skills at the end of the year (after the intervention) as compared to the middle of the year (before the intervention). Table 4.4 presents these results, including effect sizes.

<table>
<thead>
<tr>
<th>Group</th>
<th><em>t</em></th>
<th>df</th>
<th><em>p</em></th>
<th><em>d</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>PA/LK</td>
<td>-9.47</td>
<td>5</td>
<td>.000</td>
<td>3.87</td>
</tr>
<tr>
<td>MA</td>
<td>-4.64</td>
<td>5</td>
<td>.006</td>
<td>1.90</td>
</tr>
<tr>
<td>PA/LK/MA</td>
<td>-4.35</td>
<td>4</td>
<td>.012</td>
<td>1.95</td>
</tr>
</tbody>
</table>

The first group, receiving instruction in PA and LK, showed the greatest growth in PA, as indicated by *PSF* test results. The groups receiving MA instruction and three-pronged linguistic awareness instruction also showed large gains in PA per this measure. These results provide support for study findings that students in the PA and three-pronged groups made significant gains in PA after exposure to six weeks of intervention in these areas. Although study results did not find significant gains in PA for the group receiving MA instruction, results from the *PSF* test suggest that this group also made progress in PA, on a measure that was not included in the study’s composite variable.

Overall, teacher-rating scores suggested that students in all groups made gains in word reading, PA, and spelling. Additionally, results from the district-wide *PSF* subtest suggested that
students in all groups made gains in PA, specifically phoneme segmentation, from the start to the end of the intervention.

**Summary of Findings**

The results of the analyses conducted for this study revealed several findings regarding the effectiveness of linguistic awareness intervention for second semester kindergarten students who are at risk for later reading difficulties. First, students who received all three types of intervention made gains in word reading skills. Students who received intervention in PA and LK also made gains in PA and MA. Students who received MA intervention also made gains in MA and spelling. Students who received intervention in all three linguistic awareness areas made additional gains in PA and spelling. Thus, each type of linguistic awareness intervention was effective at increasing three of the four early literacy skills targeted in this study. No overall differences in early literacy skills were found based on the type of intervention that students received.

Additional analyses were conducted to determine if ELL status and/or student engagement level affected student gains. ELL and non-ELL students had similar pretest skills and did not demonstrate significantly different gains in word reading, PA, MA, or spelling. Regarding student engagement, only spelling was affected by the amount of time students were engaged in intervention sessions. Specifically, level of student engagement explained 26.7% of the variance in spelling gain scores.

Finally, teacher survey data and results from the district-wide *Phoneme Segmentation Fluency (PSF)* test were analyzed to determine if study results were consistent with teacher and district reported data. The teacher rating scores suggested that students in all groups made gains in word reading, PA, and spelling. Morphological awareness was not included on the teacher
rating scale, as this outcome is not typically measured by teachers. The analysis of PSF test indicated that students in all groups made gains in PA, specifically phoneme segmentation. Thus teacher and district-wide data were consistent with some of this study’s findings, yet spelling gains reported by teachers were not detected by the spelling of morphological endings measure for the PA/LK group, nor were gains in PA detected by study measures for the MA group.
CHAPTER 5: DISCUSSION

This study investigated the effectiveness of three different kinds of linguistic awareness intervention for increasing early literacy outcomes in kindergarten students who were at risk for later reading difficulties. The first goal was to determine if students in the three intervention groups made gains from pretest to posttest in word reading, phonological awareness (PA), morphological awareness (MA), and the spelling of morphological endings. Results revealed significant gains for students in each group for word reading (i.e., a composite of nonsense word and real word reading). Students who received intervention in PA and letter knowledge (LK) also made gains in PA and MA. Students receiving intervention in MA made additional gains in MA and morphological spelling. Finally, students in the group who received intervention in all three linguistic awareness areas also made gains in PA and morphological spelling. Effects sizes for significant results were large ($d = 1.33$ to $3.96$) for all outcome variables, indicating that large intervention effects are possible when at-risk kindergarten students receive linguistic awareness intervention in a small-group setting for a total of 12 intervention hours.

The main purpose of this study was to investigate the potential differences in treatment effects when students receive intervention with a focus on different linguistic awareness domains. In particular, the goal was to determine if a three-pronged linguistic awareness intervention was more effective than intervention in either PA/LK or MA alone at increasing the early literacy skills of at-risk kindergarten students. Non-parametric statistics revealed no main group effect, suggesting that there were no significant differences in student outcomes based on
the type of linguistic awareness intervention they received. As the data for the groups receiving PA/LK intervention and MA intervention alone met the assumptions for parametric statistics, multivariate analysis of variance was utilized to test for significant differences between these two groups; however, no group effect was found, detecting no significant differences in the literacy outcomes of students who received combined PA/LK intervention as compared to students who received intervention in MA.

Since more than half of the students in the sample were English language learners (ELLs), additional goals for this study were to determine if the ELLs had different skills at pretest and/or made different gains in early literacy skills across the intervention groups. Analyses revealed no significant pretest or gain differences, suggesting that native Spanish-speaking ELLs and native English-speaking kindergarteners with similar early literacy skills at pretest benefited equally from the different forms of linguistic awareness intervention.

Finally, although there were no significant differences in student engagement level by group, when students from the three groups were combined into a single group for analysis, there was a noticeable difference in engagement level, with some students fully engaged during as few as 4 sessions and others as many as 23 sessions. Thus, the relationship between student engagement level and literacy gains in the full sample was analyzed with linear regression. Of the four dependent variables, the level of student engagement significantly predicted gains in morphological spelling, explaining 26.7% of the variance in this outcome. No other literacy outcomes were significantly predicted by student engagement level. This suggests that as a whole, students who were more engaged in linguistic awareness lesson activities made the greatest gains in morphological spelling.
In the following sections, these results will be discussed in relation to previous research, culminating in suggestions for future research that could replicate and expand upon these findings.

**Literacy Gains Within Intervention Groups**

Previous research has shown that students who are at risk for reading difficulties in the early elementary grades benefit from targeted intervention in linguistic awareness (e.g., Bowers, Kirby, & Deacon, 2010; NICHD, 2000; NIFL, 2008). The results of the current study suggest that at-risk kindergarten who are provided with PA, LK, and MA intervention increase their word reading, PA, MA, and morphological spelling skills, thus adding evidence for the effectiveness of three different kinds of linguistic awareness intervention with at-risk populations during the kindergarten year.

**Phonological Awareness and Letter Knowledge Intervention**

Students who received the PA/LK intervention made large gains from pretest to posttest in their word reading and PA skills, with the largest gains in word reading. Given that PA intervention focused on blending and segmenting combined with instruction in letter-sound relationships has been clearly shown to result in the greatest gains in student PA and reading outcomes (NICHD, 2000; NIFL, 2008), this was an expected finding. Students in this group also made large gains in their MA, indicating that intervention in one linguistic domain had a crossover effect on another domain, even when the second domain was not directly addressed in the intervention. This result replicates Kirk and Gillon’s (2007) findings that preschoolers with speech and language impairment who received PA/LK treatment had greater MA outcomes than their peers who did not receive this intervention. Further, this crossover effect provides evidence for linguistic awareness and word reading paradigms that call for the interrelationships of
multiple areas of linguistic awareness and word reading outcomes (e.g., Berninger, Abott, Thomson, Wagner, Swanson, Wijsman, & Raskind, 2006).

**Morphological Awareness Intervention**

Students who were provided with intervention focused on MA also made large gains from pretest to posttest on several literacy outcomes. Students made large gains in word reading, MA, and the spelling of morphological suffixes, with the greatest effect on MA. This replicates previous findings that at-risk kindergarten students make large gains in MA, word reading, and decoding after being exposed to targeted MA intervention (Apel, Brimo, Diehm, & Apel, 2013). Although kindergarten students were not administered a morphological spelling measure in the previous study, large student gains were found for morphological spelling for first and second grade students in prior research. Unlike the findings from the previous study, however, the current sample of students did not make significant gains in PA as measured by the experimental assessment battery. This may be explained by the fact that Apel and colleagues (2013) found moderate student gains in PA with a measure of phonological elision. In the current study, PA was measured as a composite variable of elision and blending, and a significant treatment effect was not found for students who received the MA intervention. However, it is interesting to note that the district administered *DIBELS Next* (Good & Kaminski, 2011) phoneme segmentation subtest did reveal significant student gains from pretest to posttest, suggesting that phoneme segmentation might be more sensitive to student growth during the kindergarten year than phoneme blending combined with elision as a measure of PA.

**Three-Pronged Intervention**

Students who received intervention in three areas of linguistic awareness (i.e., PA, LK, & MA) made large gains from pretest to posttest in word reading, PA, and morphological spelling
outcomes, with the greatest effect on word reading. Past research that has investigated the impact of multi-linguistic intervention (i.e., PA, MA, and orthographic awareness) for students in the lower elementary grades has suggested that students make significant gains in word reading, spelling, and reading comprehension (Filippini, Gerber, & Leafstedt, 2012; Morris, Lovett, Wold, Sevcik, Steinbach, Frijters, & Shapiro, 2012; Wolter & Dilworth, 2013). Further, research that has focused on either PA/LK or MA intervention administered alone has revealed crossover effects between linguistic awareness domains, with MA intervention positively affecting PA outcomes (Apel, Brimo, et al., 2013) and PA/LK intervention positively impacting MA outcomes (Kirk & Gillon, 2007). However, although it is clear that MA intervention administered alone results in student gains in MA (e.g., Apel & Diehm, 2013), previous research in this area has yet to assess the impact of three-pronged linguistic awareness intervention on MA and PA outcomes. The results of the current study provide further evidence for significant pretest to posttest gains in word reading and spelling outcomes for students who receive a three-pronged intervention, as well as preliminary evidence for PA gains. The large student gains in PA are likely due to a combination of direct instruction in PA and a crossover effect from MA instruction on PA. However, significant MA gains for students in this group were not detected in the current study. Given that students in the MA-only group did make significant gains in MA as a result of 12 hours of MA-only instruction, and that MA was targeted for approximately 4 hours during the three-pronged instruction, it is possible that student gains in MA require additional instructional time in this area. Further research efforts should focus on determining the amount of MA instruction that is required in order for students to achieve greater MA skills as part of a multi-linguistic awareness intervention program.
Differences in Literacy Gains Across Groups

Prior to this investigation, it was not known whether intervention that targets three linguistic awareness areas (i.e., PA, LK, & MA) is more effective than combined PA/LK approaches for at-risk students during the kindergarten year. Recently, research in this area has suggested that adding instruction in MA to literacy intervention that targets PA and phonics in the first and second grades leads to greater literacy outcomes for students with identified reading and spelling disabilities (Morris et al., 2012; Wolter & Dilworth, 2013) and ELLs (Filippini et al., 2012). Further, when the results of MA intervention are compared with PA intervention with kindergarteners, students who receive MA intervention have demonstrated greater word reading skills (Lyster, 2000). Thus, preliminary evidence from previous research suggests that kindergarten students who are at risk for reading difficulties may benefit more from receiving intervention that provides instruction in all three linguistic awareness areas, as compared to the more commonly implemented PA and LK intervention. Although large effect sizes indicated that all the interventions were effective, the current study did not detect group differences among students who received the three-pronged intervention and students who received the other two interventions. A group effect was also not detected between the MA and PA/LK groups. This does not necessarily suggest that there were no differences in student outcomes among the three intervention groups, as the study likely lacked the statistical power to detect a main effect, due to a small sample size. Prior to conducting the current study, a power analysis for the MANOVA that tested for differences between groups indicated that a sample size of 51 students was required to detect a main effect with four dependent variables and three intervention groups; however, this sample size was not possible given the scope of the current study. As a result, the sample size was maximized given the resources available for the study. A post-hoc power
analysis with the final sample size confirmed that the power for a MANOVA was small at .20. Thus, although no group effects were detected, it is still unknown whether intervention in three-pronged linguistic awareness is more effective than PA and LK intervention for kindergarten students at risk for later reading difficulties. A study with a larger sample is required to make a claim with more confidence in either direction.

**English Language Learners**

Phonemic awareness and LK are the best predictors of later word reading difficulties for kindergarten ELLs (Gorman, 2009). Further, Spanish-speaking ELLs have been shown to benefit from literacy intervention in both English and Spanish that targets PA and LK, in addition to oral language proficiency and other literacy areas (Vaughn, Linan-Thompson, et al. 2006; Vaughn, Mathes et al., 2006). Recent research in the area of MA intervention has also suggested that ELLs benefit from adding MA instruction to intervention in phonetic decoding (Filippini et al., 2012). The results of these previous studies suggested that the Spanish-speaking ELLs would not have significantly different literacy gains than the native English-speaking kindergarteners after exposure to the three different kinds of linguistic awareness intervention that were the focus of the current study. Analyses revealed that ELLs and native English-speaking students (both of whom were identified as at-risk) were not different in any of the outcome variables at pretest, indicating similar literacy levels. Further analyses confirmed no differences between student gains, suggesting that ELL and non-ELL students who were at risk for later reading difficulties benefited similarly, regardless of the type of linguistic awareness intervention that they received. It is possible that there might have been an interaction between ELL status and intervention group, such that ELL students who received a certain type of linguistic awareness intervention might have made different gains than the native English-
speaking kindergarteners; however, the study lacked the statistical power to detect such an effect. Future research, with larger sample sizes, might investigate potential interactions between ELL status and the type of literacy intervention that students receive.

**Student Engagement**

The degree to which students are engaged in instructional activities has a positive impact on academic outcomes in students as early as the kindergarten year (e.g., Marks, 2000; Robinson & Mueller, 2014; Wanzek, Roberts, & Al Otaiba, 2014). In particular, students who are more highly engaged may be more able to take advantage of high-quality instruction (Ponitz, Rimm-Kaufman, Grimm, & Curby, 2009). Further, the amount of intervention that students receive is likely to impact student outcomes (e.g., Hamre, Justice, Pianta, Kilday, Sweeney, Downer, & Leach, 2010; Wasik & Hindman, 2011). Thus, it is important to assess both student attendance and the level of student engagement when investigating potential differences between types of literacy intervention. Although there were no significant differences in student engagement among the three intervention groups in this study, the engagement level of students varied and from the researcher’s perspective students who received the PA/LK intervention appeared to be more highly engaged than students in the other two groups. There were no significant differences among groups for attendance; however, attendance varied for the sample as a whole, ranging between 15 and 24 sessions attended across groups. Thus a variable that considered both the engagement level and the attendance of the students, regardless of the type of intervention they received, was utilized to test for a predictive relationship between attendance/engagement and the four outcome variables. The number of sessions during which students were at least mostly engaged (and thus were also in attendance) significantly predicted student outcomes on the spelling of morphological suffixes, explaining 26.7% of the variance in this measure. No
other literacy outcomes were significantly predicted by this variable. This suggests that students who attended more sessions and were at least mostly engaged in the instruction during those sessions were better able to benefit from instruction that impacted gains in morphological spelling.

As the degree of student engagement did not differ by intervention group, it is unlikely that the content of one intervention was more highly engaging than the others. The relationship between student engagement and morphological spelling is most likely the result of the combined variability in student attendance and engagement across the full sample. Although there were no significant differences among groups, the fact that students in the PA/LK intervention were, on average, fully engaged during more of the intervention sessions that they attended is worth discussion. This was likely due to a combination of student factors and the time of the intervention session. Students in this group received intervention during the earliest time slot, at the start of the school day, and in general were judged to be more compliant and eager than the students in the other two intervention groups. The MA and three-pronged interventions took place at the end of the day, after students had come in from their recess, and students in these groups were in general more distracted and active. Although the student engagement level did not significantly differ by group, it is possible that differences were not detected because of the small sample sizes. Providing interventions to groups of students at the same time of day could reduce potential student differences in engagement level across groups that are being compared, and thus should be considered in future research.

**External Validity**

External validity data were collected and analyzed during this study in order to increase the generalizability of the findings. First, the *DIBELS Next* (Good & Kaminski, 2011) Phoneme
Segmentation Fluency (PSF) subtest was administered by the school district no more than nine weeks before the start and no more than two weeks after the end of the study interventions. Analyses revealed that students in all three intervention groups made large gains from pretest to posttest on this measure, suggesting that all students made significant gains in PA. As phoneme segmentation was not part of the PA composite variable that was used to primarily assess student gains in PA, this measure provided another source of evidence for student PA gains. Students who received the PA/LK intervention made the largest gains on this measure, indicating that this intervention was particularly effective for increasing a variety of PA skills. Further, the results from the PSF analyses confirm the study findings that students who received both the PA/LK intervention and the three-pronged intervention made gains in their PA. As discussed previously, students in the MA group did not make gains on the study PA measure, which included phoneme elision and blending. As the PSF task did show growth for this group, it is possible that future research in this area should include a measure of phoneme segmentation, as it may be more sensitive to student growth in kindergarten.

Teacher survey data were also collected at the start and the end of the intervention to provide another source of evidence for potential student growth. This data also served as a measure of social validity, in order to judge teacher beliefs about student growth in literacy domains after exposure to intervention targeting linguistic awareness. As teachers’ beliefs about student outcomes could potentially impact teachers’ willingness to implement and sustain interventions in the future (e.g., Lindo & Elleman, 2010), this information could influence future research efforts in this school district and others. In general, teachers seemed to view the intervention positively, as teachers reported students on average to make gains in word reading, PA, and spelling that were consistent with the start and end of the interventions. Teachers were
not asked to rate their students on their MA skills, as this is not typically an area that is part of literacy instruction in the kindergarten; however, the gains teachers reported for the other three outcome variables increase the generalizability of study findings. For each of the three intervention groups, teachers corroborated study results for significant student gains. Teachers also noted student gains in areas that were not detected as significant gains with the study assessment measures. For example, teachers reported that students in the PA/LK group made gains in spelling. Although students in this group did not make significant gains in morphological-specific spelling as measured by the Single Word Morphological Spelling Test (Wolter, Wood, & D’zatko, 2009; See Appendix B), it is possible that they did make general gains in spelling that were influenced by their instruction in PA and LK. Additionally, teachers reported that students in the MA group made gains in PA. Although this was not detected by the combined phonological elision and blending measure that was utilized to detect intervention effects, students in this group did make gains in phonological segmentation as indicated by the PSF. Teacher data provides another source of evidence that MA intervention may result in a crossover effect on PA for kindergarten students who are at risk for reading difficulties.

**Limitations**

This was the first known study to compare the potential treatment effects of three-pronged linguistic awareness intervention with intervention in PA/LK or MA for kindergarten students at risk for later reading difficulties. The study was small in scope and its aim was to provide preliminary evidence for the effectiveness of a three-pronged linguistic awareness intervention program for this population of students. All three interventions resulted in large effect sizes, suggesting that these interventions were effective with at-risk kindergarten students,
including ELLs. However, there were several limitations that might have impacted the results of this study and should be considered when designing future research in this area.

First, the total sample size included 17 students, which reduced the power of the study to detect group differences for multivariate analyses. For this reason, it is possible that although a group effect was not detected, there could have been differences in outcome variables based on the type of intervention students received. Additionally, there may have been interactions between the effects of the type of intervention and students’ ELL status and/or engagement level that would not have been possible to detect with the reduced power of the current study.

The realities of school-based intervention research make true random assignment difficult due to scheduling constraints. To the fullest extent possible, random assignment was attempted for this study, and the groups appeared to be balanced, but it is possible that potential differences in students’ classroom instruction might have influenced the study results. Additionally, scheduling constraints and the small scope of the study did not allow for all groups to receive intervention at the same or similar time of day, which likely influenced student engagement level across the groups. Future larger scale studies would be able to control for these factors through the use of multiple interventionists who could deliver instruction at the same time of day to each group of students.

Given the large number of ELLs in this sample, it was important to determine if the level of English language proficiency differed across groups. Although the ELLs across groups did not differ in their English language proficiency, one consistent measure of English language proficiency was not given to all students. Thus, it was not possible to determine if the groups differed when considering both ELLs and non-ELLs. For this reason, future research that
includes ELLs should incorporate an English language proficiency screening measure that is administered to all students.

The primary purpose of this study was to determine if intervention in three linguistic awareness areas (i.e., PA, LK, & MA) is more effective than more commonly implemented interventions for at-risk kindergarten students. Literacy outcomes from students in the three-pronged intervention group were thus compared to the outcomes of students who received the other two interventions. However, the finding that students within each group made significant gains in literacy outcomes would be strengthened if these results could have been compared to literacy gains made by a control group not receiving linguistic awareness intervention, thus controlling for maturational and classroom instructional factors. Moving on to larger scale research in this area, efficacy studies for intervention in multiple linguistic awareness areas that include a control group would expand upon the findings from this study, providing further evidence that all three forms of linguistic awareness intervention result in significant student gains for a variety of literacy outcomes.

Despite these limitations, the current investigation provides important evidence that three different linguistic awareness programs, including a three-pronged (i.e., PA, LK, and MA) program, resulted in large intervention effects for kindergarten students who were at risk for later reading difficulties, including ELLs. This suggests that at-risk students may benefit from interventions targeting all three linguistic awareness areas, and calls for continued research in this area in order to provide further evidence for the effectiveness of this type of intervention.

**Directions for Future Research**

Future research is necessary to expand on the findings from the current study and to determine if three-pronged linguistic awareness intervention would be beneficial to provide as
part of Tier 2 RTI for kindergarten students who are at risk for reading difficulties. A larger scale study might include at least 51 students with four outcome variables, which would require multiple interventionists and several groups of each kind of intervention, thus allowing for adequate power to detect a main group effect for intervention type, as well as possible interactions. Further, future studies with larger sample sizes and greater power might include additional dependent variables. Several dependent variables from the current study were composite variables. The PA variable, for example, included measures of phoneme elision and blending. As the teacher survey data and school-delivered phoneme segmentation task suggested student growth in PA that was not detected by this measure, it would be interesting for future studies to include a measure of phoneme segmentation, and break up the composite PA variable into separate outcome variables. Similarly, teachers reported student growth in spelling that was not detected by the morphological spelling measure. Given that this growth in spelling might have been due, in part, to intervention in PA and letter-sound relationships, it would be interesting to include a spelling variable to assess knowledge of orthographic-only spelling patterns.

It is possible that the three-pronged intervention did not provide students with an adequate amount of intervention in the three linguistic awareness areas. Students in this group did not make significant gains from pretest to posttest on MA, although they did show gains in reading, PA, and morphological spelling. This intervention was designed to match the total instructional time of the other two groups, which reduced the amount of focus each area received. Although some research suggests that MA can be added to already existing literacy intervention programs without increasing the instructional time (Reed, 2008), a future study might further investigate this issue to determine the range of time that is required. One possible
way to address this question would be to include a fourth group that receives three-pronged intervention with individual sessions that are longer in duration. Another approach would be to keep the session length consistent, but to extend the total duration of the intervention for one three-pronged intervention group, which would make programmatic designs such as an alternating treatment focus possible. Still other approaches might employ repeated probes that allow researchers to determine the number of sessions required to begin to detect increases in student performance. These types of studies would allow researchers to determine if the total instructional time of a three-pronged linguistic awareness intervention significantly impacts literacy outcomes, thus providing suggestions for school districts for the scope and duration of the most effective program.

Although it has been shown that many kindergarten students who receive RTI with a focus on PA and LK maintain their skills into the early elementary grades (Coyne, Kame’enui, Simmons, & Harn, 2004), it is not currently known if gains reported by kindergarten students who receive MA intervention (e.g., Apel, Brimo, Diehm, & Apel, 2013; Apel & Diehm, 2013) are maintained over time. Thus, future studies might follow groups of students who receive linguistic awareness intervention in MA and three-pronged interventions longitudinally from kindergarten through second grade. This would provide valuable information regarding the effectiveness of Tier 2 RTI programs that include MA on the later word reading and reading comprehension outcomes of at-risk kindergarten students.

As research in this area moves from efficacy to effectiveness studies, it will be important to consider factors that might influence the larger scale implementation of efficacious linguistic awareness programs. For example, the differential impact of small-group Tier 2 interventions delivered in a classroom setting and in a separate setting might be explored. Although it is not
Currently known which context is best for increasing student outcomes (Woodward & Talbert-Johnson, 2009), it is possible that targeted intervention of this kind might be more effectively implemented in one of these settings. Additionally, it would be helpful to collect social validity data from teachers and administrators in order to increase the likelihood that the intervention will be implemented and sustained on a larger scale. The current study collected data regarding teachers’ perceptions of the outcomes of the interventions; however, future research should collect more varied social validity data, including measures that assess stakeholders’ perceptions of the goals and procedures of interventions (Lindo & Elleman, 2010).

Conclusion

The current study investigated whether three-pronged linguistic awareness intervention (i.e., PA, LK, & MA) is more effective than more commonly implemented linguistic awareness programs (i.e., PA and LK) with kindergarten students who are at risk for later reading difficulties. As research has shown that students are able to take advantage of reading strategies that are grounded in PA, orthographic awareness, and MA (Apel & Lawrence, 2011; Berninger et al., 2006), it was hypothesized that intervention in all three areas would result in increased literacy outcomes for at-risk students. Student gains from pretest to posttest within individual treatment groups, as well as group differences in literacy outcomes were analyzed in order to detect potential intervention effects. Students’ ELL status and engagement level were included in further analyses to determine the role these factors may have played in literacy gains.

The results of this study revealed large and significant gains from pretest to posttest for a variety of literacy outcomes for all three groups, indicating an intervention effect. No between-group differences were detected, which suggested that student literacy gains did not differ based on the type of linguistic awareness intervention students received, although it is important to note
that reduced power may have negatively influenced the ability to detect group differences in this study. Additional analyses revealed that there were no significant differences between students who were native Spanish-speaking ELLs and those who spoke English as a native language for either pretest literacy skills or literacy gains, regardless of intervention group. Thus, ELLs and non-ELL students of similar linguistic and literacy abilities seem to benefit from linguistic awareness intervention. Further, the combination of student attendance and engagement level predicted student gains in morphological spelling for the sample as a whole, suggesting that students who attended more sessions and were more fully engaged during those sessions benefited more from instruction that impacted morphological spelling skills.

Although conclusive evidence for the effectiveness of three-pronged linguistic awareness intervention for at-risk kindergarten students was not detected with this study, the results do provide preliminary evidence for the feasibility of this type of intervention for a similar population of students. Students who received this type of intervention made large and significant gains in linguistic and literacy domains after only 12 intervention hours, as did the other two groups. This warrants further investigation regarding the efficacy of this intervention for increasing student literacy outcomes during the kindergarten year and beyond. Future research will provide valuable information for school professionals regarding the most effective domains and targets to include in Tier 2 intervention programs, thus decreasing the number of students who go on to have persistent reading difficulties that impact their academic pursuits.
APPENDIX A: KINDERGARTEN ORAL MORPHOLOGICAL PRODUCTION TASK

(Adapted from Wolter et al., 2009)

Instructions: “I am going to give you a word and then a sentence. Use the word I give you to make a new word that fits in the blank in the sentence. For example, I’ll give you the word ‘farm.’ Now I want you to use ‘farm’ to make a new word to fill in the blank. ‘My uncle is a _________.’”

1. jump: As he crossed the street, Paul ___________. (jumped)
2. car: My family has two ____________. (cars)
3. dance: Someone who dances is called a ____________. (dancer)
4. swim: Kim wanted to improve her ____________. (swimming)
5. cloud: When we can’t see the sun, the sky is ____________. (cloudy)
6. walk: I missed the bus yesterday, so I ____________. (walked)
7. pig: We went to the farm and saw three tiny ____________. (pigs)
8. point: Look at where I am ____________. (pointing)
9. run: Laura is a fast ____________. (runner)
10. smell: The dog who rolled in the garbage was very ____________. (smelly)
11. skip: Sara didn’t run down the hall, she ____________. (skipped)
12. hand: I have two ____________. (hands)
13. sing: Jim practiced every day to improve his ____________. (singing)
14. paint: My friend is a talented ____________. (painter)
15. slime: The eggs looked ____________. (slimy)
APPENDIX B: WORDS AND SENTENCES FOR THE SINGLE-WORD MORPHOLOGICAL SPELLING TASK

(Wolter et al., 2009)

1. Mars: Mars is the fourth planet from the sun.
2. collect: I like to collect baseball cards.
3. rained: Yesterday, it rained for two hours.
4. writer: To be a good writer, you should practice writing stories.
5. ready: Are you ready to go?
6. tuned: Tom tuned his guitar.
7. blind: The old horse was blind.
8. faced: She turned around and faced her teacher.
9. brand: What brand of cereal should we buy?
10. feast: We ate a Thanksgiving feast.
11. spider: The spider had eight legs.
12. party: Will you come to my birthday party?
13. cloudy: The sky is cloudy today.
14. sweaty: After P.E., Jan was tired and sweaty.
15. reader: Ben is a good reader.
16. kicked: I kicked the ball.
17. beard: Kim’s dad has a long beard.
18. quarter: That candy costs a quarter.
19. duty: It was Tyler’s duty to take out the trash.
20. bars: She likes to play on the monkey bars.
21. shared: He shared his ice cream with his brother.
22. dirty: This room is very dirty.
APPENDIX C: MORPHOLOGICAL SPELLING TASK SCORING DIRECTIONS

*Directions for scoring:* Students are given full credit (1 point) for each morphological or pseudo-morphological segment that is represented in their spelling as listed below.

Students MUST represent the critical segment as the last letter(s) in their spelling of the word to receive credit. Do not score any other segments. Critical segments omitted, spelled with a different letter, or represented somewhere other than word-final placement receive 0 points. Add up all points to calculate the total raw score.

<table>
<thead>
<tr>
<th>Morpheme</th>
<th>Pseudo-Morpheme</th>
<th>Spelling accepted</th>
</tr>
</thead>
<tbody>
<tr>
<td>-s</td>
<td>-s</td>
<td>S, Z</td>
</tr>
<tr>
<td>-ed</td>
<td>-d/t</td>
<td>ED, D, T</td>
</tr>
<tr>
<td>-er</td>
<td>-er</td>
<td>ER, R</td>
</tr>
<tr>
<td>-y</td>
<td>-y</td>
<td>Y, E, I</td>
</tr>
</tbody>
</table>
APPENDIX D: LESSON TARGETS

**Phonological Awareness and Letter Knowledge Lesson Targets**

<table>
<thead>
<tr>
<th>Lesson</th>
<th>Phonological Awareness Target(s)</th>
<th>Letter Target(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><em>Begin Blending.</em> Recognize blended sounds given pictures (5)</td>
<td>S</td>
</tr>
<tr>
<td>2</td>
<td>Judge blending given picture and text clues (7)</td>
<td>S</td>
</tr>
<tr>
<td>3</td>
<td>Judge blending given picture and text clues (10)</td>
<td>S</td>
</tr>
<tr>
<td>4</td>
<td>Judge blending (11)</td>
<td>S</td>
</tr>
<tr>
<td>5</td>
<td>Judge blending (12)</td>
<td>G</td>
</tr>
<tr>
<td>6</td>
<td>Blend phonemes into syllables and words (17)</td>
<td>G</td>
</tr>
<tr>
<td>7</td>
<td>Blend phonemes into syllables and words (18)</td>
<td>G</td>
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<tr>
<td>8</td>
<td>Blend phonemes into syllables and words (20)</td>
<td>G</td>
</tr>
<tr>
<td>9</td>
<td>Blend three phonemes into words (21)</td>
<td>D</td>
</tr>
<tr>
<td>10</td>
<td>Blend three phonemes into words (22)</td>
<td>D</td>
</tr>
<tr>
<td>11</td>
<td>Blend three phonemes into words (23)</td>
<td>D</td>
</tr>
<tr>
<td>12</td>
<td>Blend three phonemes into words (24)</td>
<td>D</td>
</tr>
<tr>
<td>13</td>
<td><em>Begin Segmenting.</em> Choose pictures that begin with the same sound given matching cues (6)</td>
<td>D, G</td>
</tr>
<tr>
<td>14</td>
<td>Choose the picture that does not have the same initial/final sound given matching cues (7)</td>
<td>D, S, G</td>
</tr>
<tr>
<td>15</td>
<td>Judge whether pictures have the same initial/final sound given text cues (10)</td>
<td>R</td>
</tr>
<tr>
<td>16</td>
<td>Judge whether words have the same initial/final sound (15)</td>
<td>R</td>
</tr>
<tr>
<td>17</td>
<td>Judge whether words have the same initial/final sound (17)</td>
<td>R</td>
</tr>
<tr>
<td>18</td>
<td>Produce a word with the same initial/final sound (21)</td>
<td>R</td>
</tr>
<tr>
<td>19</td>
<td>Produce a word with the same initial/final sound (22)</td>
<td>Y</td>
</tr>
<tr>
<td>20</td>
<td>Produce a word with the same initial/final sound (24)</td>
<td>Y</td>
</tr>
<tr>
<td>21</td>
<td>Segment a word into sounds (25)</td>
<td>Y</td>
</tr>
<tr>
<td>22</td>
<td>Segment a word into sounds (26)</td>
<td>Y</td>
</tr>
<tr>
<td>23</td>
<td>Segment a word into sounds (27)</td>
<td>Y, R</td>
</tr>
<tr>
<td>24</td>
<td>Segment a word into sounds (28)</td>
<td>G, Y</td>
</tr>
</tbody>
</table>

*Note. PASS Curriculum (Roth et al., 2012) Blending & Segmenting Lesson Numbers in Parentheses.*
Morphological Awareness Lesson Targets

<table>
<thead>
<tr>
<th>Lesson</th>
<th>Morpheme Target(s)</th>
<th>Shared Reading Book</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Plural</td>
<td><em>He Bear, She Bear</em> (Berenstain &amp; Berenstain)</td>
</tr>
<tr>
<td>2</td>
<td>Plural</td>
<td><em>He Bear, She Bear</em> (Berenstain &amp; Berenstain)</td>
</tr>
<tr>
<td>3</td>
<td>Plural</td>
<td><em>Bears on Wheels</em> (Berenstain &amp; Berenstain)</td>
</tr>
<tr>
<td>4</td>
<td>Plural (and irregular plural)</td>
<td><em>Feet and Puppies, Thieves and Guppies</em> (Cleary)</td>
</tr>
<tr>
<td>5</td>
<td>-ing</td>
<td><em>Polar Bear, Polar Bear, What Do You Hear?</em> (Martin &amp; Carle)</td>
</tr>
<tr>
<td>6</td>
<td>-ing</td>
<td><em>It’s Raining, It’s Pouring</em> (Eagle)</td>
</tr>
<tr>
<td>7</td>
<td>-ing</td>
<td><em>The Aunts Go Marching</em> (Manning)</td>
</tr>
<tr>
<td>8</td>
<td>-ing</td>
<td><em>Brown Bear, Brown Bear, What Do You See?</em> (Martin &amp; Carle)</td>
</tr>
<tr>
<td>9</td>
<td>-ed</td>
<td><em>D.W. All Wet</em> (Brown)</td>
</tr>
<tr>
<td>10</td>
<td>-ed</td>
<td><em>I Know an Old Lady Who Swallowed a Fly</em> (Bernard Westcott)</td>
</tr>
<tr>
<td>11</td>
<td>-ed</td>
<td><em>Big Red Barn</em> (Wise Brown)</td>
</tr>
<tr>
<td>12</td>
<td>-ed (and irregular past)</td>
<td><em>Curious George Gets a Medal</em> (to page 15) (Rey &amp; Rey)</td>
</tr>
<tr>
<td>13</td>
<td>Review Inflection (-ed, -ing)</td>
<td><em>Andy and the Lion (Part 1)</em> (Daugherty)</td>
</tr>
<tr>
<td>14</td>
<td>Review Inflection (ed, -s, -ing)</td>
<td><em>Busy, Busy Mouse</em> (Kroll &amp; Kosaka)</td>
</tr>
<tr>
<td>15</td>
<td>-er</td>
<td><em>Beast Feast (Anteater, Grasshopper)</em> (Florian)</td>
</tr>
<tr>
<td>16</td>
<td>-er</td>
<td><em>Whose Hat Is This?</em> (Katz Cooper)</td>
</tr>
<tr>
<td>17</td>
<td>-er</td>
<td><em>Whose Vehicle Is This?</em> (Katz Cooper)</td>
</tr>
<tr>
<td>18</td>
<td>-er</td>
<td><em>Whose Tools Are These?</em> (Katz Cooper)</td>
</tr>
<tr>
<td>19</td>
<td>-y</td>
<td><em>One Snowy Night</em> (Butler &amp; Macnaughton)</td>
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<tr>
<td>20</td>
<td>-y</td>
<td><em>One Snowy Night</em> (Butler &amp; Macnaughton)</td>
</tr>
<tr>
<td>21</td>
<td>-y</td>
<td><em>Hairy, Scary, Ordinary</em> (Cleary)</td>
</tr>
<tr>
<td>22</td>
<td>-y</td>
<td><em>One Rainy Day</em> (Butler &amp; Macnaughton)</td>
</tr>
<tr>
<td>23</td>
<td>Review Derivation (-y, -er)</td>
<td><em>Beast Feast (Walrus, Anteater, Grasshopper, Camel, Bat)</em> (Florian)</td>
</tr>
<tr>
<td>24</td>
<td>Review MA (-ing, -y)</td>
<td><em>The Very Busy Spider</em> (Carle)</td>
</tr>
<tr>
<td>Lesson</td>
<td>Phonological Awareness Target(s)</td>
<td>Morpheme Target(s)</td>
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<tr>
<td>1</td>
<td><em>Begin Blending.</em> Recognize blended sounds given pictures (5)</td>
<td>Plural</td>
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<td>2</td>
<td>Judge blending given picture and text clues (7)</td>
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<tr>
<td>3</td>
<td>Judge blending given picture and text clues (10)</td>
<td>Plural</td>
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<tr>
<td>4</td>
<td>Judge blending (11)</td>
<td>Plural (and irregular plural)</td>
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<tr>
<td>5</td>
<td>Judge blending (12)</td>
<td>-ing</td>
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<tr>
<td>6</td>
<td>Blend phonemes into syllables and words (17)</td>
<td>-ing</td>
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<td>7</td>
<td>Blend phonemes into syllables and words (18)</td>
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<td>Blend phonemes into syllables and words (20)</td>
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<td>Blend three phonemes into words (21)</td>
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<td>-ed</td>
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<tr>
<td>11</td>
<td>Blend three phonemes into words (23)</td>
<td>-ed</td>
</tr>
<tr>
<td>12</td>
<td>Blend three phonemes into words (24)</td>
<td>-ed (and irregular past)</td>
</tr>
<tr>
<td>13</td>
<td><em>Begin Segmenting</em> – Choose pictures that begin with the same sound given matching cues (6)</td>
<td>Review Inflection (ed, -ing)</td>
</tr>
<tr>
<td>14</td>
<td>Choose the picture that does not have the same initial/final sound given matching cues (7)</td>
<td>Review Inflection (ed, -s, -ing)</td>
</tr>
<tr>
<td>15</td>
<td>Judge whether pictures have the same initial/final sound given text cues (10)</td>
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<td>16</td>
<td>Judge whether words have the same initial/final sound (15)</td>
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<td>Judge whether words have the same initial/final sound (17)</td>
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<td>Produce a word with the same initial/final sound (21)</td>
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<td>Segment a word into sounds (25)</td>
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<td>Segment a word into sounds (27)</td>
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</tr>
<tr>
<td>24</td>
<td>Segment a word into sounds (28)</td>
<td>Review MA (-ing, -y)</td>
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</tbody>
</table>

*Note. PASS Curriculum (Roth et al., 2012) Blending & Segmenting Lesson Numbers in Parentheses; See Morphological Awareness Lesson Targets for corresponding Shared Reading Books.*
**APPENDIX E: SAMPLE INTERVENTION FIDELITY CHECKLIST**

*Engagement* is defined as time spent on task, whether the student is engaged with a book, materials, or related conversation. Level Codes: (F)ully engaged (26-30 mins); (M)ostly engaged (20-25 mins); (I)nfrequently engaged (6-19 mins); (N)ot engaged (0-5 mins)

<table>
<thead>
<tr>
<th>Group C</th>
<th>Date:</th>
</tr>
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<table>
<thead>
<tr>
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<table>
<thead>
<tr>
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<th>Tardy</th>
<th>Absent</th>
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**Brief Description of Activities**  

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1. The overall session time was:
   - [ ] 25-30 minutes
   - [ ] 20-24 minutes
   - [ ] 15-19 minutes
   - [ ] Less than 15 minutes

2. The session included explicit instruction in (check all that apply):
   - [ ] Phonological awareness (blending, segmenting, and/or identifying sounds in words)
   - [ ] Letter-sound relationships (children are presented with a letter and discuss the sound it makes)
   - [ ] Morphological awareness (identifying and/or discovering the meanings of word endings (suffixes) in oral and/or written language)
   - [ ] Other: __________________________________________________________

   Notes/Comments:
   ______________________________________________________________________
   ______________________________________________________________________
   ______________________________________________________________________
   ______________________________________________________________________
Figure F1. Distributions of Pretest and Posttest Scores for the Phonological Awareness & Letter Knowledge Group
Figure F2. Distributions of Pretest and Posttest Scores for the Morphological Awareness Group
Figure F3. Distributions of Pretest and Posttest Scores for the Three-Pronged Linguistic Awareness Group
APPENDIX G: BAR CHARTS WITH ADJUSTED ERRORS BARS BY VARIABLE

Figure G1. Pretest and Posttest Reading By Group

Error Bars: 95% CI
Figure G2. Pretest and Posttest PA by Group
Figure G3. Pretest and Posttest MA by Group
Figure G4. Pretest and Posttest Spelling by Group
REFERENCES


Wasik, B. & Hindman, A. (2011). Improving vocabulary and pre-literacy skills of at-risk
preschoolers through teacher professional development. *Journal of Educational Psychology, 103*(2), 455-469.


