

THE EFFECT OF A MORPHOLOGICAL AWARENESS INTERVENTION ON
EARLY WRITING OUTCOMES

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DEDICATION

This dissertation is first and foremost dedicated to my husband, Dave. I would not have accomplished this manuscript or my degree without your loving support. You've made me a better person. I also dedicate this to my niece, Gwendolyn Lily Bardon. May you grow up continuing to love books and jewelry like your Aunt Abby.

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GLOSSARY

Constituent binding: how orthography, phonology, semantics, and grammar are understood together to form cohesive and meaningful representations of words; from Perfetti and Hart's (2002) and Perfetti's (2007) lexical quality hypothesis

Expressive language: ability to communicate using language and words

Morpheme: smallest unit of meaning in a language

Bound morpheme: unit of meaning that must be attached to a free morpheme to have meaning in a language; prefixes and suffixes (e.g., plural -s, re-, -ful, -ing)

Free morpheme: a unit of meaning that can stand alone (e.g., "run", "key")

Derivational morpheme: changes the meaning or word class of a base word (e.g., "farm" to "farmer", "happy" to "unhappy")

Inflectional morpheme: changes the aspect, number, or time of a base word (e.g., "cook" to "cooked", "dog" to "dogs")

Morphology: rules for forming words using morphemes

Orthography: conventions for forming letters and spelling in a language

Phoneme: distinct unit of sound in a language

Phonemic awareness: ability to isolate, segment, and blend individual sounds in a word

Phonics: knowledge of letter-sound correspondence

Phonology: rules for combining sounds in a language; ex: in English, "th" is a sound (as in "this", "these", "tooth"), but "qb" is not

Phonological awareness: ability to recognize and manipulate spoken language; understanding that sentences are made up of words, words are made up of syllables and sounds, being able to combine or isolate sounds in a word

Receptive language: understanding or comprehending spoken or written language

Semantics: meaning of words and phrases in a language

Syntax: rules for combining words into sentences; ex: in English, a simple sentence uses a “subject-verb-object” structure (“The girl chased the cat.”)

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ABSTRACT

The purpose of this study was to investigate the effect of a morphological awareness intervention on the spelling and sentence writing performance and growth of second ($n = 17$) and third ($n = 10$) grade students at risk for writing difficulty. The intervention was provided in 25 minute sessions four to five times per week for five weeks. Students were individually randomly assigned to either the intervention ($n = 13$) or the comparison ($n = 14$) condition. Students were pre- and post-tested using standardized tests of spelling and writing and a curriculum-based measure of sentence writing (CBM-W). Additionally, students were given a working memory index as a covariate and an oral language subtest as a counterfactual measure. All participants were also given the CBM-W task twice weekly as a progress monitoring measure. Intervention effects were measured using a series of t -tests and a multi-variate analysis of covariance (MANCOVA). Growth on the progress monitoring task was measured using hierarchical linear modeling (HLM). Results indicated that students in the intervention significantly improved their spelling as a result of the intervention, but this result was attenuated when controlling for working memory. Student-level characteristics that predicted growth were baseline spelling ability and grade level. Students who were younger and poorer spellers to begin with made the most growth on the CBM-W sentence writing task.

CHAPTER 1

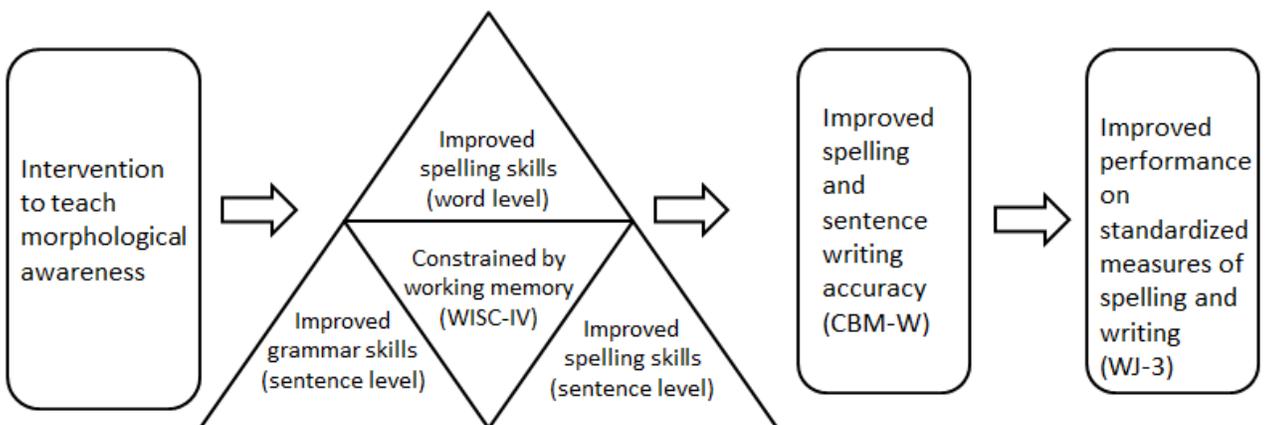
INTRODUCTION AND LITERATURE REVIEW

Problem Statement

Intervention research is needed to improve the writing outcomes of students in the early elementary grades at risk for writing disabilities. Studies have shown that spelling and morphological awareness interventions can have a positive effect on students' word spelling and reading, but no studies have investigated the impact on writing beyond the word level (word spelling) in the early primary grades (1-3). The current study seeks to expand on the existing literature by measuring the effect of a morphological awareness intervention on spelling and sentence writing in the early elementary grades.

This study hypothesizes that providing an intervention targeting morphological skills will result in improved spelling accuracy at the word and sentence level and improved grammar at the sentence level for students identified as at risk in writing. This will in turn improve students' performance on standardized norm-referenced tests of spelling and writing (see Figure 1).

Figure 1. Theory of Change



Study Purpose

The current study will investigate the effects of a morphological awareness intervention on student spelling and writing outcomes as measured by curriculum-based measurement of writing (CBM-W) and standardized writing assessments. Spelling outcomes are defined as the ability to spell words correctly in isolation and in sentences in response to picture prompts. Writing outcomes are defined as the ability to write words with correct spelling and usage in sentences in response to picture and oral prompts.

Research Questions

1. What is the effect of a morphological awareness intervention on the spelling and writing outcomes of second and third grade students identified as being at risk for writing difficulty?
2. What student-level variables predict student growth on spelling and writing outcome measures?

Review of Related Literature

The ability to communicate through writing is an essential skill for people in a literate society. However, writing outcomes for students in American schools are poor; nearly three quarters of fourth, eighth, and twelfth graders were not proficient in writing on the National Assessment of Educational Progress (NAEP; National Center for Educational Statistics, 2011; 2003). Students who struggle with writing and literacy skills during their K-12 education have a lack of opportunities and poorer outcomes in postsecondary education and employment (Graham & Perin, 2007). A survey of over 100 major corporations found that two-thirds of salaried employees have some type of writing expected in their jobs and individuals who struggle with writing are less likely to be hired

or promoted in the workplace (National Commission on Writing, 2004). Given the importance of writing skills for academic and employment success, writing is now more integrated across subjects in school curricula with the introduction of Common Core State Standards (CCSS; Calfee & Miller, 2013; Graham & Harris, 2013; National Governors Association, 2010; National Commission on Writing, 2003).

Under the CCSS, students are expected to a) write for multiple purposes, b) use writing across content areas to analyze and interpret information about a topic, and c) produce text by planning, revising, editing, and collaborating (Calfee & Miller, 2013; National Governors Association, 2010). All students, including students with disabilities and those at risk for writing difficulty, are expected to meet these new standards and become proficient and fluent writers. However, in practice writing instruction in American schools has not kept up with the ambitious writing standards of the Common Core. In a series of national surveys of teachers, researchers have found that students write for only 20 minutes per day in school in first through third grade (Cutler & Graham, 2008) and 25 minutes per day in third and fourth grade (Brindle, Graham, Harris, & Hebert, 2015) and fourth through sixth grade (Gilbert & Graham, 2010). Teachers in these surveys varied widely in their consistent use of evidence-based writing practices with their students. The majority of teachers reported using evidence-based practices like teaching basic writing skills (e.g., spelling, grammar), teaching planning strategies, modeling good writing, and using assessments to track progress and guide instruction as often as weekly or several times per week on average (Brindle et al., 2015) to monthly or several times per month (Cutler & Graham, 2008). Teachers also varied in the frequency and type of support they provided to struggling writers. The most frequent adaptation

reported was giving students extra time for conferencing or to complete assignments (Cutler & Graham, 2008; Graham, Harris, Fink-Chorzempa, & MacArthur, 2003), and nearly 20% of teachers surveyed reported making few or no adaptations for struggling writers (Graham et al., 2003).

Elementary teachers also reported feeling inadequately prepared to teach writing (Cutler & Graham, 2008; Gilbert & Graham, 2010; National Commission on Writing, 2004). In a survey of third and fourth grade teachers by Brindle et al. (2015), three out of every four teachers said their college preparation program provided no or minimal training in how to teach writing and 80% of respondents said teaching writing was not part of their student teaching experience. Additionally, Brindle and colleagues (2015) found that teacher preparation and teacher beliefs about teaching writing significantly predicted use of evidence-based practices, time spent teaching writing, and time students spent writing in the classroom. Essentially, teachers who were better prepared to teach writing and felt more positively about teaching writing were more likely to use evidence-based practices and spend more time teaching writing in the classroom.

It appears that teachers do not feel prepared to teach writing and national test results indicate students are not currently proficient in writing. Therefore, it is logical to conclude that some type of instructional support in writing is needed to improve writing outcomes, particularly with struggling writers. One way to address this instructional gap is to better understand how written language develops in the early elementary grades in order to design effective interventions.

Development of Written Language

Writing is a complex task that requires several inter-connected skills. Researchers have modeled writing proficiency and development across the lifespan and have revealed connections between written language, oral language, and reading development. This section will outline: 1) the progression of emergent writing skills, 2) the relationships between oral and written language and writing and reading development, and 3) how these findings impact current models of writing development. A graphical depiction of the development of language, reading, and writing skills is in Figure 2.



Oral Language				
Skill	Phonological awareness		Phonemic awareness	
Explanation	Recognizing, counting, and clapping words in sentences, syllables and sounds in words		Identifying individual sounds and blends in words; rhyming; blending and segmenting sounds	
Example	“Cow-boy. How many syllables did you hear?”		“What sounds are in the word ‘mop’? Let’s say each sound. /m/, /o/, /p/.”	
Written Language: Reading				
Skill	Phonics knowledge		Decoding text	Reading comprehension
Explanation	Sound-letter correspondence; matching a sound with its printed letter and vice versa; identifying words that start with specific letters or sounds		Sounding out words in text	Understanding what one has decoded in text.
Example	“What letter does ‘cat’ start with?”		Reading words, sentences, paragraphs	Retelling or answering questions about text
Written Language: Writing				
Skill	Distinct “writing” marks	Invented spelling	Phonological spelling	Phonetic spelling
Explanation	Writing becomes distinct from picture drawings	Using letters and letter-like forms, often letters seen in the environment	Representing the salient sounds, beginning sounds, and ending sounds in words	Representing all sounds in a word; spelling may still be incorrect but an attempt is made at including all sounds in a word
Example	Scribbling	DTU	“B” for “ball”	“snobol” for “snowball”

Figure 2. Progression of oral and written language development.

Emergent writing skills. Young children initially make no distinction between writing and drawing. An important developmental milestone is when they start to differentiate separate marks as “writing” distinct from their picture drawings around three to five years of age (Cabell, Tortorelli, & Gerde, 2013; Dyson, 1983a; Yang & Noel,

2006). Young children also begin to develop knowledge of the directionality of text, which in English is left-to-right and top-to-bottom (Masterson & Crede, 1999; Treiman, Mulqueeny, & Kessler, 2015; Vukelich & Golden, 1984), and they learn to recognize the shapes and letters in their own name (Treiman, Cohen, Mulqueeny, Kessler, & Schechtman, 2007). The marks young children make may be just scribbles, but they indicate the child's recognition that writing is a function separate from drawing or illustrating. These scribbles eventually take on characteristics of written language like forming distinct characters, which are critical early literacy skills connected to later reading and writing development (Dyson, 1982; National Early Literacy Panel [NELP], 2008). When young children engage in "writing", they still interpret the marks they are making as independent or graphic objects (Dyson, 1983a; Lancaster, 2007). They begin to understand that writing is symbolic for spoken language.

Young children gradually develop the knowledge that writing represents or is connected to words. Treiman, Hompluem, Gordon, Decker, and Markson (2016) found that young children three to five years old who could not yet read were able distinguish between the correct label for a printed word and for a drawing. For example, when the children were read a word ("dog") and then a puppet used a different but related label for that word ("puppy"), the children said the puppet's word was wrong. When this was repeated with drawings instead of written words, the children were more likely to say the puppet's label was correct (saying the drawing of a "dog" was a "puppy" was acceptable). This implies that children understand that a written word has some connection to language and a drawing does not. This marks the understanding that writing is a symbolic representation of language develops.

As young children begin to understand that written language reflects spoken language, they develop and refine their phonological and phonemic awareness skills (Justice, Pullen, & Pence, 2008; NELP, 2008). From preschool into Kindergarten, students develop *phonological awareness*, or knowledge that spoken language can be broken into sentences, words, and syllables; *phonemic awareness*, or the knowledge that each word contains individual sounds; and *phonics* knowledge, or the knowledge that each sound is represented by written letters (Anthony & Lonigan, 2004; Flanigan, 2007; Masterson & Crede, 1999). This is reflected in their written language when they start to use letter-like formations in their writing to represent words. Children produce what may appear to be random strings of letters, but in fact they use letter formations that they have been exposed to in their native language and textual environment (Pollo, Kessler, & Treiman, 2009). Treiman and Kessler (2013) found that young children use “statistical learning” wherein they learn the salient features of the graphemes in their language and reproduce them in their writing, even if they do not yet know their letters or know how to read. This has been referred to as the “prephonological” or invented spelling stage, where children use written letters to represent words that do not yet approximate the sounds in the word (e.g., “sbx” for “welcome”; Treiman & Kessler, 2013; Vukelich & Golden, 1984). Invented spellings tend to get more sophisticated over time and students start to use phonological spellings, or letters that can be realistic representations of the sounds in a word (Ouellette, Senechal, & Haley, 2013). Students will often represent the most salient sounds in a word first, such as the beginning sound (e.g., writing “B” for the word “ball”). They gradually learn how to represent more and more sounds with approximations of corresponding letters (e.g., “bl” for “ball”, “sno mn” for “snowman”).

Students then develop phonetic spelling, when they learn to represent all the sounds in a word (Gentry & Gillet, 1993). Students are expected to utilize their developing spelling skills to express themselves in writing in the classroom.

Part of classroom instruction in Kindergarten, first grade, and beyond involves having students responding to writing prompts or open response journal assignments by putting words together to form sentences (Cabell et al., 2013; Cutler & Graham, 2008). Although students are still learning how to represent spoken language in writing accurately at this age, the goal in many classrooms is to get students to write “stories,” even if those stories are only one sentence long. Berninger, Nagy, and Beers (2011) found that the majority (69%) of first graders in their study were able to write a complete sentence when instructed to do so. Because students are expected to write in the early elementary grades, it would be useful to investigate how their oral language develops with and may support the development of their written language.

Oral and written language. Children learn to speak and express themselves verbally before they are able to read and write. Children first learn to recognize and manipulate spoken language and then develop the ability to represent that spoken language in written forms (Justice et al., 2008; Treiman et al., 2016). Oral language develops before written language, however the development of the two domains is not in a neat stepwise fashion. Oral language appears to support the development of writing. Young children often talk as they are writing to help give meaning to their writing by narrating their text, asking questions, and sounding out words (e.g., “How do you spell ‘pop’?” or “That’s my mom’s name?”; Dyson, 1983b). Teachers often ask young students to “tell me about your writing” when they cannot readily decipher the child’s words.

Additionally, there appears to be a great deal of overlap in the areas of the brain that are activated during spoken and written language tasks such as identifying spoken and written words (Constable, Pugh, Berroya, Mencl, Westerveld, & Ni, 2004; Shaywitz, Shaywitz, Pugh, Fulbright, Skudlarski, Mencl, et al., 2001). It appears that the regions of the brain involved in mapping spoken language also play a role in mapping written language (Pugh, Frost, Sandak, Gillis, Moore, Jenner, et al., 2006). It therefore seems logical to conclude that the development of oral language in children provides a foundation or a form of scaffolding for the development of written language. As discussed in the previous section, by Kindergarten and first grade, students are instructed to respond to writing prompts using sentences. Typically-developing students are able to put multiple words together in oral sentences by Kindergarten, but in writing they are only just learning how to represent sounds in writing and to combine words into written sentences (Shanahan, 2006).

It is well established that early oral language ability is strongly correlated with later reading ability (Dunst, Valentine, Raab, & Hanby, 2013; National Reading Panel, 2000; National Institute of Child Health and Human Development-Early Child Care Research Network [NICHD-ECCRN], 2005). However, oral language proficiency can impact proficiency in written expression as well (Shanahan, 2006; NELP, 2008). Gillam and Johnston (1992) found that when third through sixth graders were asked to compose stories orally and in writing, students with a language learning disability told oral stories that were more complex than their written stories, whereas typically developing peers demonstrated written stories that were more complex than their oral stories. Students with oral language deficits had deficits in their writing, which indicates a connection between

oral language and written expression. Berninger and Abbott (2010) found that students' oral language skills (e.g., divergent naming, giving directions, telling oral stories), combined with listening comprehension and reading comprehension skills, uniquely predicted their written expression skills. Kim, Al Otaiba, Puranik, Folsom, Gruelich and Wagner (2011) extended these results and found that when controlling for reading ability, oral language, spelling, and letter writing fluency uniquely predicted variance in writing skills in Kindergarten. Kim, Al Otaiba, Folsom, Gruelich, and Puranik (2014) extended these results and found that students' expressive vocabulary and grammar skills were unique predictors of writing, specifically writing quality, in first grade. While research into modeling written language development and its relationship to oral language and reading is still emerging, we may conclude from the results discussed here that for elementary aged writers, oral language develops simultaneously with and also supports the development of written expression. Another important facet of language and literacy development is the ability to decode or read written text.

Writing and reading development. Reading has been described in simple terms that include one or two dimensions such as decoding and vocabulary knowledge for comprehension (Catts & Kamhi, 1986; Catts, Adlof & Weismer, 2006). These dimensions have been further broken down into component skills such as phonological awareness and phonics, syntactic understanding, and listening comprehension (Foorman, Francis, Fletcher, Schatschneider & Mehta, 1998; Morris, Bloodgood, Lomax & Perney, 2003). Researchers have studied what distinguishes good readers from poor readers. Phonological processing, or the ability to hear and manipulate sounds in language, has been shown to be a significant predictor of reading achievement (Catts, Fey, Zhang, &

Tomblin, 1999; National Reading Panel, 2000). Oral language skills, including expressive and receptive vocabulary, syntax, and morphological skills, are also related to reading achievement (Catts et al., 1999). Catts et al. (1999) found that half of poor readers in second grade had deficits in both phonological processing and expressive language in Kindergarten.

Reading and writing share common base skills such as phonological processing, vocabulary and word generation, syntax, and morphology. Some researchers have attempted to illustrate the relationship between these skills in the reading and writing domains. Ahmed, Wagner, and Lopez (2014) found a unidirectional relationship between reading development and writing development. Reading skills, including decoding and comprehension at the sentence and passage level, were indicators of growth in writing from grades one through four, but writing was not found to strongly predict growth in reading. Abbott, Berninger, and Fayol (2010), however, found a bidirectional relationship between reading and writing. They found that word-level reading ability and spelling accuracy were related across grades one through seven. Text-level reading comprehension explained unique variance in text-level writing proficiency in grades two through six. They concluded that the reading-writing developmental relationship is reciprocal in that reading development can influence writing development and vice versa. The work of Ahmed et al. (2014) and Abbott et al. (2010) demonstrate the relationship between language, reading, and writing skills. While the domains of language, reading, and writing draw on similar pools of knowledge, these skills develop alongside each other, not in a step-wise fashion. Students draw upon different aspects and levels of language ability to translate their ideas into written words. Based on these findings,

researchers have constructed various models and explanations for how the development of written language progresses within oral language and reading.

Current Writing Models

Many researchers have proposed models of writing development of varying complexity. Some state that writing consists of two dimensions, spelling and ideas (Juel, Griffith & Gough, 1986). Others posit that writing develops in three dimensions: transcription skills (spelling and handwriting), text generation (putting ideas into words, sentences and passages), and self-regulation (goal-setting, revising and editing skills; Berninger, 2000; Berninger & Amtmann, 2003; Hayes, 1996; Hayes & Flower, 1980). Still others characterize writing into multiple dimensions involving productivity, syntactic complexity, and spelling (Kim et al., 2014; Wagner, Puranik, Foorman, Foster, Wilson, Tschinkel, & Kantor, 2011). Wagner et al. (2011) added the dimension of macro-organization, or the ordering of ideas within a text, to their model of writing development, while Kim et al. (2014) added the dimension of substantive quality. What all of these models have in common is the inclusion of spelling or transcription skills.

For developing writers, transcription skills are significantly related to writing quality (Abbott et al., 2010; Graham, Berninger, Abbott, Abbott, & Whitaker, 1997; Kim et al., 2014). Transcription involves having phonological knowledge (sounds) and orthographic knowledge (letter formation) to map sounds onto letters for correct spelling and fluent handwriting (Berninger, 2000; Berninger, Vaughan, Abbott, Brooks, Abbott, Rogan, et al., 1998; Bourassa & Treiman, 2001; Juel et al., 1986; Graham et al., 1997; Kim, Apel & Al Otaiba, 2013; Treiman, 1993; Wagner et al., 2011). Several studies have illustrated the connection between transcription skills and writing quality in the early

elementary grades. Graham et al., (1997) found that spelling and handwriting fluency accounted for 66% of the variance in writing quality in first grade, and Jones and Christensen (1999) found that for first graders, about 53% of the variance in story writing quality was accounted for by speed and accuracy in writing letters. Abbott et al. (2010) found that individual differences in spelling ability accounted for variance in students' text-level composition in grades one through seven. Coker and Ritchey (2010) found that the number of words spelled correctly on a sentence writing task was strongly correlated with teacher ratings of student writing quality in Kindergarten ($r = .82$), and Lembke, Deno, and Hall (2003) found this relationship in second grade as well ($r = .83$). It is clear that transcription, more specifically spelling, is a critical early skill students need to master to become proficient writers. Students who struggle early on with transcription will likely have difficulty with writing later in school.

The Writing of Struggling Students

Students with learning disabilities and students who struggle with writing generally have weaknesses in working memory, self-regulation and executive function which impacts their ability to keep their ideas in their minds long enough to write them down (Bourke & Adams, 2003; Graham & Harris, 2000; Swanson & Zheng, 2013). They also struggle with phonological and orthographic knowledge of letters and sounds and forming accurate representations of written words, which impacts spelling and handwriting fluency (Berninger, Abbott, Nagy, & Carlisle, 2010; Berninger, Winn, Stock, Abbott, Eschen, Lin, et al., 2008; Bourassa & Treiman, 2009; Graham, Harris, & McKeown, 2013). Deficits in working memory and transcription skills mean these students frequently spend their cognitive capacity on the transcription task, leaving few

cognitive resources for higher order aspects of writing like organization and revising (Bourke & Adams, 2003; Kim et al., 2014). Given these difficulties, struggling writers typically produce shorter, less complex and lower quality writing compared to their typically developing peers (Graham et al., 2013).

Although phonological and orthographic awareness are crucial skills in learning to read and spell, they are not sufficient for overall literacy development. Morphological knowledge is also vital in learning how to connect sounds to letters and words.

Morphological Contributions to Spelling

Morphology refers to rules for forming words in a language, which requires knowledge of the smallest units of meaning, including base words and affixes (e.g., prefixes and suffixes). In the English language, there are *inflectional morphemes*, which change the aspect, number, or time of a base word (e.g., “cook” to “cooked”, “dog” to “dogs”) and *derivational morphemes*, which modify the meaning or word class of a base word (e.g., “farm” to “farmer”; Apel, Brimo, Diehm, & Apel, 2013). The term *morphological awareness* refers to the ability to recognize and manipulate the smallest units of meaning in language (Apel & Lawrence, 2011) in spoken and written forms (Apel, 2014). Not all spelling rules are phonological in nature; knowledge of morphological spelling rules is essential for correct spelling (Nunes, Bryant, & Olsson, 2003). For example, a word ending like *-ed* does not always sound the way it is spelled in some words (e.g., “jumped”).

While experts initially suggested that students do not have morphological awareness until the mid- to late-elementary grades, current research has shown that students as young as Kindergarten and first grade have awareness of the morphological

structure of words (Berninger et al., 2010; Bourassa, Treiman & Kessler, 2006; Treiman, 1993; Rubin, 1988; Walker & Hauerwas, 2006; Wolter, Wood & D'zatko, 2009). Apel, Wilson-Fowler, Brimo, and Perrin (2012) found that morphological awareness uniquely predicted spelling ability in second and third grade students. In their study, while four linguistic skills accounted for 36% of variance in spelling (morphology, orthographic knowledge, receptive vocabulary, rapid automatic naming of letters), only morphology made a unique contribution to spelling performance in the hierarchical linear regression model ($\beta = .733, p = .001$). This indicates that while multiple language abilities contribute to spelling, morphology is an important skill that contributes a unique element to spelling proficiency. Nagy, Berninger, Abbott, Vaughan, and Vermeulen (2003) also found that morphological awareness was significantly related to spelling ($r = .25, p < .05$) and reading comprehension ($r = .66, p < .05$) in second graders at risk for reading difficulty. Rubin (1988) found that students in Kindergarten and first grade spelled words differently depending on the number of morphemes in the word. For example, in words with one morpheme and a final consonant blend (e.g., “bind”), students typically left out one of the final consonants, but in words with multiple morphemes that are pronounced as a final consonant blend (e.g., “rained”), students were more likely to write both letters in the word ending. These results were replicated by Wolter et al. (2009) in first grade and by Treiman and Cassar (1996) in first and second grades. Deacon and colleagues (2014) found that first graders with and without specific language impairment were sensitive to morphological regularities in spelling. Participants spelled inflected and derived forms of words (e.g., “wins” and “winner”) more accurately compared to control words that were phonemically similar (e.g., “wink”; Deacon, Cleave, Baylis, Fraser,

Ingram, & Perlmutter, 2014). This suggests that not only do students have awareness of morphology in the early primary grades, but this awareness impacts their ability to transcribe letters and words using correct spelling. In addition to spelling words correctly, knowledge of the morphological structure of English words can impact students' ability to compose written sentences.

Morphological Contributions to Writing

Morphology plays a role in word choice and sentence construction in writing. In order for writers to find the correct and precise words they want to use, they must understand what words mean. Part of a word's meaning is contained in its semantic properties, or a description of the item's quality, kind, number, etc. However, the meaning of a word is also contained in its morphological structure, or its form (Carlisle, 2000; Carlisle & Fleming, 2003; Perfetti, 2007). The morphological structure of a word can tell a writer the word's grammatical category, acceptable forms, and proper usage (e.g., the suffix *-ly* can only be attached to verbs, not nouns). Being able to recognize morphological relationships between words gives students access to different word forms and vocabulary choices when writing text (Bowers, Kirby, & Deacon, 2010; Green, McCutchen, Schwiebert, Quinlan, Eva-Wood, & Juelis, 2003; Nagy, Carlisle, & Goodwin, 2014). Perfetti and Hart's (2002) lexical quality hypothesis stated that words are represented by orthography, phonology, and semantics or meaning (see definitions in Glossary). Perfetti (2007) later expanded this hypothesis to include the notion that words are also represented by grammar and *constituent binding*, or how the previous four parts are combined together to create cohesive and meaningful representations of words. While

this hypothesis is mainly discussed in terms of how people comprehend written text while reading, it has implications for how people produce written text as well.

Understanding the morphological structure of words provides grammatical cues that can guide writers in creating cohesive sentences using their chosen vocabulary (Berninger et al., 2011; Bowers et al., 2010; Green et al., 2003; McCutchen & Stull, 2015; Nagy et al., 2014). For example, knowing that *teach* is a verb but that attaching *-er* to the end creates a noun will then dictate how that word is used within a sentence (“My *teacher* was absent” instead of “My *teach* was absent”). Students need to be able to use morphological knowledge to create varied sentence structures (Nagy et al., 2014). Berninger et al. (2011) found that morphological skills predicted sentence combining ability in first grade. The authors concluded that morphology served as a “bridge” between word-level affixes that indicate grammatical function and sentence structure. McCutchen and Stull (2015) asked fifth graders to combine a series of short sentences: “The snake was slow. The snake moved his coils down the tree. The tree had moss. The coils glistened.” McCutchen and Stull (2015) noted that students would have to rely on their morphological knowledge to accurately combine the statements into a longer complex sentence using phrases such as “moved slowly” or “the coiled snake”. They found that fifth graders’ morphological awareness predicted their accurate word production and sentence combining. Additionally, McCutchen, Stull, Herrera, Lotas, and Evans (2013) found that teaching fifth graders the morphological structure and relationships of science curriculum words resulted in students using more complex multi-morphemic words in their writing and sentence combining. Morphological knowledge

impacts writing beyond spelling ability; it allows students access to a variety of word choices and more complex syntax, which are important skills for young writers.

Summary

Writing skills develop in tandem with oral language and reading skills in elementary-aged children. In the early grades, transcription ability, or spelling and handwriting, are important foundational skills that are related to writing accuracy and quality. Students who struggle with writing, especially early in their academic careers, typically spend their mental capacity on transcribing words onto the page, leaving little time or energy for addressing other aspects of writing. Linguistic factors that contribute to transcription skills are phonological knowledge, orthographic knowledge, and morphological knowledge. Emerging research suggests that morphological awareness contributes unique knowledge to spelling ability and also influences word choice and syntax in writing. Because early intervention is critical in addressing writing difficulty in the primary grades, and transcription is an important early skill, developing interventions in transcription, with particular attention paid to spelling and morphological knowledge, is key.

Intervention Research

Limited research exists on spelling and morphological awareness interventions in the early elementary grades. Studies of phonologically-based spelling interventions and morphological awareness interventions will be discussed separately.

Spelling interventions. Most research in spelling interventions has focused on fourth grade and above and included outcomes measures of spelling and word identification (Wanzek, Vaughn, Wexler, Swanson, Edmonds & Kim, 2006). Wanzek

and colleagues (2006) found that studies that explicitly taught spelling rules and provided immediate feedback produced gains in spelling ability for students identified with LD or struggling with spelling ($ES = .42-1.76$). Of the nine studies included in this portion of the meta-analysis, only one study included participants below fourth grade. It is necessary to further investigate the effects of spelling interventions specifically in grades K-3 and how those interventions were delivered.

Studies were included in the current synthesis if they included participants in first, second, or third grade that were either identified with a disability in writing or classified as “at risk” for writing difficulty. Studies had to involve a direct intervention in the underlying linguistic skills that contribute to spelling ability, such as teaching sound patterns, syllable patterns, letter-sound correspondence, etc. Because the current study is focusing on teaching students the linguistic skills related to spelling rather than strategies or methods for correcting existing spelling errors, studies involving strategies such as Cover-Copy-Compare are not discussed here because students were not directly taught spelling rules or patterns. Any study that included other components with the spelling intervention (e.g., handwriting instruction, composition instruction, orthographic instruction) were included, but the study had to include a spelling intervention component and had to report results for each intervention condition separately. Studies had to include word spelling outcome measures at a minimum. Additional outcome measures such as word reading, reading comprehension, and composition writing were deemed acceptable.

Seven studies met these criteria (Abbott, Reed, Abbott & Berninger, 1997; Berninger, Vaughan, Abbott, Begay, Coleman, Curtin, et al., 2002; Berninger, Vaughan, Abbott, Brooks, Begay, Curtin, et al., 2000; Berninger, Abbott, Whitaker, Sylvester &

Nolen, 1995; Berninger et al., 1998; Graham, Harris & Chorzempa, 2002; Roberts & Meiring, 2006). All studies included standardized tests of word spelling as an outcome measure. Other outcome measures included writing fluency, length of writing, and writing quality. Writing fluency was measured as words written per minute on a story prompt (Abbott et al., 1997; Berninger et al., 1995) or the Writing Fluency subtest of the Woodcock-Johnson Test of Achievement-Revised (number of sentences constructed in 7 minutes when provided target words; Berninger et al., 2002; Graham et al., 2002). Length of writing was measured as total words written on a story prompt (Abbott et al., 1997; Berninger et al., 2000; Berninger et al., 1998; Graham et al., 2002; Roberts & Meiring, 2006). Writing quality was measured by a holistic rating of a story prompt (Berninger et al., 2002; Graham et al., 2002) or as a score of the number of story parts included in the final product (Berninger et al., 1995). Berninger and colleagues (2002, 1995) defined quality as writing that was organized (e.g., for example, including declarative statements, comparison statements, and a conclusion in an informative essay) and on topic with regards to a given writing prompt. Graham and colleagues (2002) scored quality using a holistic rating scale from one to eight; scorers were told to consider organization, grammar, syntax, and word choice when assigning a holistic score. Spelling interventions in these studies consisted of explicitly teaching letter-sound correspondence, word families and syllable patterns, and whole word recognition. Spelling skills were practiced during the intervention with word dictation tasks. Studies that included composition instruction taught students to plan, write, review their work, and make revisions.

Effect sizes are reported here when available from the published studies and magnitude is interpreted according to Cohen's standards (1988). Results from all studies

indicated that for students identified as at risk for writing difficulty or diagnosed with a learning disability in writing in first through third grade, participation in spelling interventions that included explicit instruction in sound and syllable patterns resulted in small to large effects in spelling (Abbott et al., 1997; Berninger et al., 2002, $d = .19$; Berninger et al., 2000, $d = .84$; Berninger et al., 1995; Berninger et al., 1998, $d = .34$; Graham et al., 2002, $d = .30$; Roberts & Meiring, 2006, $d = .51$). Spelling interventions appeared to have a small to medium effect on writing fluency (Abbott et al., 1997; Berninger et al., 2002; Berninger et al., 2000; Berninger et al., 1995; Graham et al., 2002, $d = .78$; Roberts & Meiring, 2006, $d = .45$) but no effect on writing quality (Berninger et al., 2002; Graham et al., 2002), although when a spelling intervention was paired with instruction in the composition process in third grade, gains were noted in writing quality (Berninger et al., 2002). Graham et al. (2002) also found that six months post-intervention students' fluency gains were not maintained. Impact on writing length was mixed. Some studies reported gains in writing length (Abbott et al., 1997; Berninger et al., 1998) while others did not (Berninger et al., 2002; Graham et al., 2002).

Across studies, results indicated that after spelling interventions, struggling writers in second and third grade wrote faster but not necessarily more and the overall quality of their writing did not improve. Berninger et al. (2002) and Graham et al. (2002) used holistic rating scales to evaluate the quality of student writing and found that improved spelling had no effect on overall writing quality. This is intriguing considering that correlational studies of curriculum-based measurement of writing (CBM-W) suggested that holistic teacher ratings of student sentence writing quality were strongly correlated with student spelling ability (Coker & Ritchey, 2010; Lembke et al., 2003).

We should expect then that improvements in spelling ability would translate into improvements in holistic writing quality for young writers, however this is not a definite conclusion based on available research. We can hypothesize four explanations for this lack of improvement in quality: 1) the gains in spelling observed in the intervention studies were not practical or meaningful enough to translate into improved writing quality; 2) the interventions might produce gains in writing quality in younger students where quality ratings are more highly related to spelling ability than in older students; 3) the spelling interventions perhaps were not powerful enough on their own to impact writing quality regardless of the grade level; and 4) the holistic quality ratings used by Berninger et al. (2002) and Graham et al. (2002) may not have been sensitive enough to detect smaller changes in student writing quality and perhaps a trait-based rubric would have been more appropriate. Whatever the speculation, there is not enough data to make definitive conclusions about the effectiveness of spelling interventions on young students' connected writing. Clearly there is a need for additional research to determine the impact of such interventions on writing outcomes in the early grades.

Morphological awareness interventions. Literature reviews of morphologically-based interventions have revealed that morphological awareness interventions positively impacted spelling and word identification (Apel & Werfel, 2014; Bowers et al., 2010; Carlisle, McBride-Chang, Nagy, & Nunes, 2010; Goodwin & Ahn, 2013; Reed, 2008), vocabulary (Bowers et al., 2010; Reed, 2008), and reading comprehension (Bowers et al., 2010; Goodwin & Ahn, 2010; Reed, 2008), but no studies included outcome measures of connected writing. Bowers and colleagues (2010) found that morphological awareness interventions positively impacted spelling ($d = .49$), word reading ($d = .41$), and

vocabulary ($d = .35$) in preschool through ninth grade. They also found that morphological awareness impacted spelling, reading, and vocabulary more for lower performing students ($d = .57-.99$) and younger students in preschool through second grade ($d = .27-1.24$) compared to higher performing and older students. Reed (2008) found that morphological awareness interventions positively impacted spelling ($d = .91$), word identification ($d = .60-.79$), and reading comprehension ($d = .22-.39$) in grades two through nine. Goodwin & Ahn (2010) found that morphological instruction produced gains in spelling ($d = .20$), vocabulary ($d = .40$), and reading comprehension ($d = .24$). Their 2010 study and a 2013 follow up revealed that gains were greatest for students with LD ($d = .22-.37$) and reading difficulties ($d = .35-.46$) compared to typical learners ($d = .29$; Goodwin & Ahn, 2013) and that morphological instruction benefitted younger students in early elementary compared to older students ($d = .68$). It is important to further review the literature on morphology instruction that specifically focuses on grades K-3.

Studies were included in the current synthesis if they included participants in Kindergarten, first, second, or third grade who were identified with a disability in writing or “at risk” for writing difficulty. The studies had to include direct instruction in morphological awareness in English and at least one outcome measure related to written language (e.g., spelling). Any other outcome measures were accepted if the study included instruction in morphological awareness and an outcome measure of written language or spelling.

Eight studies met these criteria. Three were conducted with a combined sample in Kindergarten, first, and second grades (Apel & Diehm, 2014; Apel et al., 2013;

Devonshire, Morris & Fluck, 2013). One was conducted with a combined sample of second and third grade (Vadasy, Sanders & Peyton, 2006), and another studied a sample of third through fifth graders (Kirk & Gillon, 2009). This study was included because it involved third graders. The remaining studies focused on second grade (Nunes et al., 2003; Wolter & Dilworth, 2013), and third grade (Parel, 2006). An additional study at the fifth grade level will be discussed separately because although it did not meet the grade level criteria, it was the only study at the elementary level to include connected writing as an outcome (McCutchen et al., 2013).

Morphological awareness training in these studies explicitly taught base words, affixes, and morphological rules for spelling in oral and written forms (Apel & Diehm, 2014; Apel et al., 2013; Devonshire et al., 2013; Parel, 2006). Students were asked to listen to words and sentences and signal when they heard words containing the lesson's target affix. Participants also categorized words based on their morphemes (Apel & Diehm, 2014; Apel et al., 2013; Kirk & Gillon, 2009; Nunes et al., 2003; Wolter & Dilworth, 2013). Words were presented orally and on written word cards and students had to determine whether the word contained or did not contain the lesson's affix. Word building and application exercises were used to provide practice opportunities. Students had to create and use words containing the lesson's morphological pattern or affix (Apel & Diehm, 2014; Apel et al., 2013; Devonshire et al., 2013; Kirk & Gillon, 2009; Parel, 2006; Vadasy et al., 2006; Wolter & Dilworth, 2013). For example, Devonshire and colleagues (2013) had participants complete the following oral sentence: "Today I play football. Yesterday I _____ football." Participants in this study also used personal whiteboards to construct sentences given a base word plus an affix (play + ful). Literacy

outcome measures included spelling (Apel & Diehm, 2014; Apel et al., 2013; Devonshire et al., 2013; Kirk & Gillon, 2009; Nunes et al., 2003; Vadasy et al., 2006; Wolter & Dilworth, 2013), word-level reading (Apel & Diehm, 2014; Apel et al., 2013; Devonshire et al., 2013; Kirk & Gillon, 2009; Nunes et al., 2003; Vadasy et al., 2006; Wolter & Dilworth, 2013) and reading comprehension (Apel & Diehm, 2014; Apel et al., 2013; Parel, 2006; Vadasy et al., 2006; Wolter & Dilworth, 2013). No studies in first through third grade looked at connected writing as an outcome measure.

Effect sizes are reported for the studies that provided them. Studies found that morphology instruction resulted in medium to large effects in spelling (Apel & Diehm, 2014, $d = .82$; Apel et al., 2013, $d = 1.34-2.08$; Devonshire et al., 2013, $d = .65-.75$; Kirk & Gillon, 2009, $d = .70$; Nunes et al., 2003; Vadasy et al., 2006, $d = 1.06$; Wolter & Dilworth, 2013, $d = .66$). More specifically, participants improved their ability to spell multi-morphemic words (e.g., *dresses*, *plainest*) as measured by researcher-designed spelling tests (Apel et al., 2013; Apel & Diehm, 2014; Devonshire et al., 2013; Kirk & Gillon, 2009; Nunes et al., 2003; Wolter & Dilworth, 2013) and improved their overall spelling ability as measured by standardized tests of spelling (Devonshire et al., 2013; Kirk & Gillon, 2009; Vadasy et al., 2006; Wolter & Dilworth, 2013). Medium to large effects were also reported for word recognition as measured by standardized tests of word reading (Apel et al., 2013, $d = .21-.81$; Devonshire et al., 2013, $d = .65$; Kirk & Gillon, 2009, $d = .62$; Nunes et al., 2003; Vadasy et al., 2006, $d = .86$; Wolter & Dilworth, 2013, $d = .76$). Lastly, medium to large effect sizes were detected on standardized tests of reading comprehension (Apel et al., 2013, $d = .52-.71$; Vadasy et al., 2006, $d = .75$; Wolter & Dilworth, 2013, $d = 1.49$).

The only study to find no effect was by Parel (2006), who did not find any effect on spelling or reading outcomes as a result of a morphology intervention. He does note, however, that this is possibly due to time constraints imposed by the schools in which the interventions were held, potentially limiting the effectiveness of the intervention.

Of particular note is a study by Nunes et al. (2003), who found that second and third grade students in a morphological awareness intervention demonstrated gains in spelling only when provided with practice opportunities to write the words they had learned. Participants in the “with writing” intervention group received morphological spelling instruction and practiced writing down the target words they learned. The comparison groups that received the intervention without writing instruction participated in the same intervention activities orally. Nunes and colleagues (2003) concluded that the practice of writing the target words down played a role in the increased spelling ability of the “with writing” group. To further explore the role of writing instruction and morphological awareness, we must look at upper elementary studies.

McCutchen et al. (2013) studied morphological instruction in fifth grade science classes. Students were taught the morphological structure of the vocabulary terms in a science curriculum unit. They were given opportunities to identify stems, match words to definitions, use target words to complete sentences, and construct original sentences using the target words. The authors found that students receiving the morphology intervention used significantly more morphologically complex words when combining sentences ($d = 1.21$) and when writing extended response science essays ($d = .89$) compared to students in the comparison condition. This study did not target the grade levels of interest to the current study; however, it provides evidence about including

writing activities in morphological instruction. Along with results from Nunes et al. (2003), evidence is emerging about the importance of incorporating instruction and practice opportunities for writing with morphological targets.

It seems that teaching children to identify and manipulate morphemes in spoken and written words can improve their spelling ability. However, the studies cited in this section, with the exception of Nunes et al. (2003), did not require students to write words or sentences themselves, but rather to identify morphemes in printed words. Therefore, additional research into morphological instruction paired with writing instruction is needed to determine if gains in spelling and morphological awareness transfer to increased writing accuracy.

Assessing Student Writing

In order to effectively intervene with students at risk for learning disabilities and writing difficulties, it is essential to correctly identify students who struggle in writing and to monitor their progress on an ongoing basis. Educators must have access to reliable, valid, and easy-to-use assessments to screen and monitor student writing. Common methods of classroom assessment include indirect assessments like multiple choice tests, writing samples scored with holistic ratings and trait-based rubrics (Cutler & Graham, 2008), and curriculum-based measures of writing (CBM-W; Deno, 1985). The research base supporting each type of assessment will be discussed further as well as the rationale for why an educator might choose to use one type over another.

Multiple choice tests. Indirect assessment of writing involves testing students on their knowledge of sub-skills of writing, like grammar and mechanics, with multiple choice test items. Multiple choice tests were the primary way writing was assessed on

college entry exams since the late 1930s until the Educational Testing Service started including actual essay writing on its large scale assessments in the 1960s (Behizadeh & Engelhard, 2011; Crusan, 2015). The intent behind using multiple choice tests of writing was to provide a fair and objective measure of written language knowledge and to avoid students having their essay read by a harsh or bad scorer (Behizadeh & Engelhard, 2011). This type of assessment can be seen in end-of-unit tests as well as large-scale standardized assessments such as college placement exams (Calfee & Miller, 2013). The advantages of this approach are a more objective and reliable assessment that is easier to score and the ability to design test items that target specific concepts and skills (Cooper, 1984; Huot & Neal, 2006). While this type of assessment does not measure whether a student can apply what they have learned in a real writing assignment and may not be useful on its own for educational decision making (Calfee & Miller, 2013), test items can be written to assess procedural knowledge. This allows educators to attempt to measure application while retaining the quick and easy scoring of multiple choice tests (Ackerman & Smith, 1988). However well-designed, multiple choice tests do not actually measure what students are able to write. In order to address these shortcomings, performance-based writing assessments were developed that use two different scoring methods: holistic scoring and rubrics.

Holistic scoring. Holistic scoring involves assigning a composition or writing portfolio a single score on a fixed numerical scale, for example on a scale of zero to four. Educators can score student work that was completed in an authentic context (Ackerman & Smith, 1988). The writing sample can be in any genre or reflect any content taught in the classroom and, in the case of portfolios, can be administered over a longer period of

time to reflect progress. Holistic scoring is common in large-scale assessments like state tests and college-entry exams (Huot & Neal, 2006). During these large-scale assessments, raters are given extensive training and frequently review “anchor papers” that illustrate typical work at each level of proficiency (Calfee & Miller, 2013). This extensive training results in relatively high levels of interrater reliability. However, when holistic scores are used with district writing prompts or classroom writing assessments, this level of training is rarely conducted. This can lead to unreliable scores across teachers, which makes comparing and identifying students at risk within a school difficult. While assigning a holistic score seems easy as there is only one score to attend to, it is largely subjective and does not provide information about where or how the student struggled, which means the score has little instructional utility. Holistic scores also do not provide a significantly greater degree of classification accuracy than other methods of writing assessment, meaning the time and training costs do not offset or offer any greater advantage in identifying students struggling with writing (Wilson, Olinghouse, McCoach, Santangelo, & Andrada, 2016). The score does not give the student information about whether the content or the quality of their writing was problematic. To address this, analytic or trait-based rubrics were developed to assess student writing quality.

Rubrics. Trait-based rubrics were created to more clearly define facets of writing quality beyond a single holistic score and to provide a way to rate these elements individually to increase objectivity, reliability, and validity of scores (Ackerman & Smith, 1988; Crusan, 2015). For example, the 6 + 1 Traits rubric includes the following dimensions of writing quality: Ideas, Organization, Voice, Word choice, Sentence fluency, Conventions, and Presentation (Northwest Educational Laboratory [NWEL],

2012). A student's writing is evaluated in each of these areas on a five-point scale and the teacher is provided with bulleted examples at the five, three, and one ratings in each trait (e.g., under the five rating in Sentence fluency: "The writing has an easy flow, rhythm, and cadence. Sentences are well constructed"). Rubrics provide the opportunity for educators to see student strengths and weaknesses within a writing sample and are useful in tracking progress (Panadero & Jonsson, 2013). Rubrics also give students the opportunity for transparency so they know how they will be evaluated (Crusan, 2015). One study even found that performance-based writing assessment with rubric scoring was more equitable for students from low income backgrounds as they found smaller differences between those students and their higher economic peers than on a multiple choice test of writing (Heck & Crislip, 2001). While this type of writing assessment addresses the weaknesses in holistic scoring, it is not without problems.

Being able to rate each trait individually provides more information to both the student and the teacher, however it also provides more opportunities for a mismatch in scores between raters. Despite the category descriptions for each trait, it is still a subjective method of scoring and is frequently unreliable across teachers, grade levels and even within classrooms, making student comparisons challenging (Calfee & Miller, 2013; Gansle, VanDerHeyden, Noell, Resetar & Williams, 2006), and identifying students in need of intervention requires making such comparisons. Others argue that rubrics narrow the scope of "good writing" (Weigle, 2007). Some studies have found that the traits used in such rubrics are not actually measuring unique dimensions of writing (Gansle et al., 2006; Kim et al., 2014), which limits the instructional utility of the rubric score. Additionally, educators must be aware that not all published rubrics are suited for

measuring all genres of writing. For example, when assessing a student's narrative writing, the scoring rubric should include traits related to story grammar (e.g., characters, setting, initiating event, reactions, etc.) to measure that student's mastery of the narrative genre (Calfee & Miller, 2013). While trait-based rubrics provide valuable information about a student's writing performance, there exists a need for more objective methods of assessment and scoring that can be used with more authentic performance-based writing tasks, and assessment methods that are supported by research. The benefit of this combination is twofold: the objective scoring is more reliable than subjective ratings, and scoring student's actual writing product is more authentic than a standardized test. One method that attempts to combine these two facets of writing assessment is curriculum-based measurement.

Curriculum-based measurement (CBM). CBM refers to a set of procedures that allow an educator to directly observe and score student performance on standardized tasks drawn from the grade level curriculum. CBM of writing (CBM-W), which typically involve students writing sentences or stories in response to prompts or dictated single words, offers several advantages over other methods of writing assessment. CBM-W is more sensitive to smaller increments of student growth over time as compared to yearly standardized assessments or rubrics and therefore can be used to track the progress of students in interventions (Deno, 2003). This is especially important for students struggling in writing as they often grow at a slower pace compared to their typically developing peers and their progress may not show up on broader tests of writing (McMaster, Du, Yeo, Deno, Parker, & Ellis, 2011). The scoring methods used with CBM-W tasks are also advantageous because they are relatively easy to use. Countable

indices like words written or words spelled correctly are straightforward and often more reliable across scorers than more qualitative or ratings-based scoring methods (Gansle et al., 2006). CBM-W scoring can also be used diagnostically; for example, when looking at words spelled correctly or correct letter sequences on a word dictation task, educators can see not only how many words a student got correct but what types of word patterns were missed. This information can be used to plan instruction and interventions (Fuchs, Fuchs, Hosp, & Hamlett, 2003). CBM-W is not without its disadvantages, however. The CBM-W tasks are timed, meaning the writing task is not as realistic as other writing tasks and students who are slow to transcribe text may be at a disadvantage.

Summary

The progression of writing assessment development has given the field an array of options with varying objectives, scoring reliability, and efficiency. Indirect multiple choice tests of writing allow educators to objectively score and measure student knowledge of writing concepts, but do not indicate whether a student can apply that knowledge to actual writing assignments. Holistic scoring of essays addressed the need for more applied performance-based writing assessments, but the scoring method is rather unreliable and not detailed enough to be instructionally useful. Trait-based rubrics provide more specific feedback on aspects of student writing but are also relatively unreliable across raters. CBM-W attempted to combine more applied writing tasks with objective scoring procedures, but the timed nature of the test is less authentic than allowing a student time to plan and revise their work.

Because the purpose of this study is to address the writing of struggling young students, and CBM-W has the research base to support its use in screening and progress

monitoring struggling students in interventions, the following assessment research review will focus on CBM-W.

Research in Curriculum-Based Measurement in Writing (CBM-W)

Tasks. Thirty years of CBM-W research has shown that for young writers in Kindergarten through third grade, tasks that involve dictating or writing letters, sounds, and words are the most technically sound (Coker & Ritchey, 2013; Lembke et al. 2003; Ritchey, 2006; Ritchey & Coker, 2014, 2013; Ritchey, Coker & McCraw, 2010). At the sentence-level, research supports the use of picture word, sentence copying and sentence writing tasks for first and second graders (Coker & Ritchey, 2013; Lembke et al., 2003; McMaster et al., 2011; McMaster, Du & Petursdottir, 2009; Ritchey & Coker, 2014). To measure students' ability to write connected text, picture or photo prompts and story prompts have technical adequacy at first through third grade but are most appropriate and reflective of student ability in third grade and above (McMaster et al., 2011; McMaster et al., 2009; Ritchey & Coker, 2014, 2013).

Scoring. Quantitative production-dependent measures have technical adequacy for use in the early primary grades. Countable indices like words written (WW; a word is a sequence of any two letters), words spelled correctly (WSC; according to English spelling), correct word sequences (CWS; two adjacent words spelled correctly and used correctly in the context of a sentence), and correct letter sequences (CLS; two letters adjacent to each other in a word that are correctly placed within that word) are reliable and valid ways to measure CBM-W tasks in the elementary grades (Deno, Marston & Mirkin, 1982; Deno, Marston, Mirkin & Lowry, 1982; Deno, Mirkin & Marston, 1980; Coker & Ritchey, 2010; Gansle et al., 2006; Gansle, Noell, VanDerHeyden, Naquin &

Slider, 2002; Lembke et al., 2003; Marston & Deno, 1981; McMaster et al., 2011; McMaster et al., 2009; McMaster & Campbell, 2008; Parker, Tindal & Hasbrouck, 1991; Ritchey & Coker, 2013; Ritchey et al., 2010; Tindal & Parker, 1991; Videen, Deno & Marston, 1982). CWS and CLS had the strongest reliability ($r > .70$) and validity coefficients ($r > .60$) across various tasks and grade levels, indicating their utility as a scoring procedure for screening.

CBM-W was first tested as a screening measure, meaning it was used at one to three time points during an academic year (typically fall/winter/spring) to identify students who fell below a certain level of performance, indicating the need for further assessment and intervention (Deno, 2003; 1985). Further research has investigated its use not only as a screening instrument but as a method of collecting data on student performance more frequently for progress monitoring.

Progress monitoring. Once students have been identified as struggling and in need of intervention, educators need valid and reliable measures that they can use at regular intervals over the course of an intervention or period of instruction to measure students' change in performance during that instruction (Deno, 2003). CBM-W has been studied for use as a progress monitoring measure as well as a screening measure.

McMaster et al., (2011) and Parker, McMaster, Medhanie and Silberglitt (2011) modeled early writing growth using WW, WSC and CWS across sentence and picture tasks. They found that these tasks and scoring indices showed student growth across groups of students (McMaster et al., 2011) and within individual students (Parker et al., 2011) over approximately 12 weeks. McMaster et al. (2011) found that at least eight data points were needed to establish stable slopes or growth rates for students, and Parker et al. (2011)

found that transcription-based tasks showed linear growth while sentence writing tasks produced non-linear growth (development was fast initially but plateaued). This means that a) not all students progress at the same rate, b) not all skills progress in the same way, and c) sentence copying and picture word tasks lend themselves well to progress monitoring over relatively short periods of time. CBM-W tasks and scoring indices are valid and reliable methods for assessing early writing at single points in time as well as monitoring growth over time.

Summary

CBM-W research has shown that sentence writing tasks are valid and reliable measures of writing ability in the early primary grades. The countable scoring index CWS had the strongest reliability and validity in first through third grade and provides instructionally useful information about the accuracy of student spelling and writing. CBM-W tasks and scoring procedures have been validated to be used for screening as well as progress monitoring purposes.

Conclusion

There is a critical need to provide writing interventions to struggling students, especially early in a child's academic career to prevent later failure. Writing is now treated as a cross-disciplinary skill with the Common Core State Standards and students who struggle or have diagnosed disabilities in writing will need support to meet those standards. In the early grades, transcription skills are important for building the foundation of writing proficiency, however little research exists on transcription interventions in first through third grade. Furthermore, morphological awareness is an important linguistic factor beyond phonological knowledge that goes into spelling ability.

However, research on the effects of morphological awareness training on written language outcomes is still emerging. This study aims to address this research gap by measuring the effect of a morphological awareness intervention on the spelling and sentence writing outcomes of struggling writers in the early elementary grades.

CHAPTER 2

METHODS

Participants and Setting

Participants were a convenience sample of $N = 28$ second ($n = 18$) and third ($n = 10$) grade students from one elementary school serving grades two through five in a small community in a Midwestern school district. The author first spoke with the principal about her interest in participating in the study. The principal allowed the author to then speak with the second and third grade teachers and describe what the study would involve for them and their students. The author made sure to state that teachers were not required to participate and that anyone who was interested could enroll. Once the principal and teachers decided they were interested in participating, the principal provided a letter of interest and support to the author for the Institutional Review Board (IRB) review process. Once the study was approved, the author had teachers who were interested in having their classes participate sign a written teacher consent form (see Appendix) allowing the author to screen their classes for the study and agreeing to complete a written survey about their classroom instructional practices in writing. All second ($n = 5$) and third grade ($n = 6$) teachers decided to participate.

Parent consent forms (see Appendix) were then distributed in each class describing the study and explaining that the screening process was considered a classroom activity, so all students would participate, but only students whose parents provide written consent would have their data kept and analyzed. Any student whose parents either said no or did not return a consent form were excluded from further testing and their written data was returned to their teachers. Of the interested classrooms, the

author obtained parental consent to keep and analyze the screening data for 163 students ($n = 86$ second grade and $n = 77$ third grade) across 11 classrooms using a sentence-level picture word CBM-W task (for a more detailed description and explanation of this measure, see Measures section and sample in Appendix). The author identified students who fell below the 25th percentile using local norms on the correct word sequences (CWS) scoring index for CBM-W (for definitions and discussion of how norms were developed, see Measures section). The 25th percentile is a common cut point used for screening in the special education literature, particularly in early grades (Fuchs & Fuchs, 2006).

The list of students who fell at or below the 25th percentile was provided to each student's teacher to confirm that teachers felt the students were low achieving in writing. The author presented each teacher with a list of students in their class who fell below the 25th percentile and the teachers indicated whether they felt that was an accurate reflection of those students' writing abilities. One teacher also expressed concern that a particular student who she thought struggled in writing did not fall below the screening cut point. That teacher provided the author with recent work samples and outlined the difficulties this student was having. The author used professional judgment to include this particular student in the pre-testing phase. Two teachers did not have any students who qualified for pre-testing. The final sample of teachers was $n = 9$. Students who met the screening criteria were then given the Spelling and Writing Samples subtests of the Woodcock Johnson Test of Achievement-3 (WJ-3; Woodcock, McGrew, Mather & Schrank, 2007) as a pre-test measure. Both subtests were group administered (see Procedures). Students who also fell below the 25th percentile on either subtest of the WJ-3 using the age norms

provided in the WJ-3 manual were eligible to participate in the study. The participants were also given the Digit Span and Letter-Number Sequencing subtests of the Weschler Intelligence Scale for Children-4 (WISC-IV; Weschler, 2003) as a working memory covariate measure. Transcription and writing skills are constrained by working memory ability, particularly in struggling writers (Bourke & Adams, 2003; Graham & Harris, 2000; Swanson & Zheng, 2013), so it was important to measure participants' skills in this area as a covariate measure. Participants were also given the Following Directions subtest of the Clinical Evaluation of Language Fundamentals-5 (CELF-5; Semel, Wiig & Secord, 2013) as a language counterfactual measure, which will be described later.

Ninety-three students fell below the 25th percentile on the CBM-W benchmark and qualified for pre-testing with the WJ-3. Out of these 93 students, 76 had written parental consent to participate in pre-testing. Two students with severe behavior concerns were excluded from further participation because their teachers felt they would be unable to attend to and complete the intervention tasks, leaving a sample of 74 students for pre-testing. Student verbal assent was obtained before proceeding with pre-testing procedures. All students assented. After pre-testing these 74 students using the WJ-3 Spelling and Writing Samples subtests, 28 students ($n = 18$ second grade, $n = 10$ third grade) fell below the 25th percentile on either subtest and qualified to be in the study. These 28 students were individually randomized within each grade level across classrooms into intervention and comparison groups ($n = 14$ total in each experimental group; $n = 9$ second grade, $n = 5$ third grade). An online team randomization program (<https://www.randomlists.com/team-generator>; see Figure 3) was used to randomly assign each participant within each grade level to either the intervention or the comparison

condition. All participants in each grade level were assigned a unique number (not their student number). The individual numbers were entered into the program (e.g., numbers 1-10 for third grade) and two groups were requested (e.g., two groups of five for third grade). The program randomly assigned each identification number to one of two separate groups. The first group was labeled as the intervention condition, the second group as the comparison condition. This was conducted for each grade level.



Figure 3. Screenshot of random group generator used for random assignment.

One second grade student in the intervention condition moved away before post-testing was complete, for a final count of $N = 27$ students, which is an attrition rate of 3.5%. The final student participant sample was made up of 14 males (52%) and 13 females (48%); 89% White, 7% Latino, and 4% multi-racial; 22% received special education services; 52% were eligible for free/reduced lunch. For comparison, the school's rate of special education diagnosis for the district was 8.37% and free/reduced lunch eligibility was 38.2% for the 2014-2015 school year. Out of the students receiving special education, 50% had a diagnosis of Language Impairment, 33% had a diagnosis of

Intellectual Disability, and 17% had a diagnosis of Other Health Impairment. No students were receiving services for English language learners.

Study Design

This study employed a control group design with pre-/post-testing and random assignment. Students were individually randomly assigned within each grade level to the intervention ($n = 13$) or comparison ($n = 14$) group. In addition to the pre- and post-tests, participants received bi-weekly progress monitoring with CBM-W picture word sentence writing probes. Progress monitoring involved administering a different sentence writing CBM-W form twice weekly to track student progress over the course of the intervention. For details about the progress monitoring procedures, see Procedures section.

Measures

CBM-W. Students were initially given one form of a sentence-level picture word CBM-W task as a screening measure. This task was chosen because it represented an appropriate level of language for second and third grade students and was similar to the sentence writing tasks students completed during the intervention, which yields face and content validity. Aligning the test and intervention tasks means gains in sentence writing from the intervention should be reflected in student performance on the sentence writing CBM-W. The CBM-W forms were developed for a larger screening study in first through third grades. For progress monitoring, students were given a different form two days each week (Mondays and Thursdays) for five weeks. Each CBM-W probe was group administered for three minutes (see Procedures section). Participants were then given one final CBM-W form at post-test for a total of 12 data points. Specific administration directions for the CBM-W sentence writing task are provided in the Procedures section.

The picture word task was scored using the CWS procedure (two adjacent correctly spelled words that are correctly used in the context of the sentence). The task and quantitative scoring procedures were chosen because they demonstrated adequate reliability ($r > .70$) and validity ($r > .60$) for early elementary grades (Lembke, et al., 2003; McMaster et al., 2009; McMaster et al., 2011).

Local norms were developed from a larger screening study conducted in a different school district. The sentence writing picture word CBM-W, along with word dictation (word-level writing) and story prompt (paragraph-level writing) tasks, were administered to $N = 338$ students in first ($n = 96$), second ($n = 118$), and third ($n = 124$) grade in the fall, winter, and spring of an academic year in a neighboring city. The norming sample consisted of 166 males (49.1%) and 172 females (50.9%). The racial and ethnic makeup of the norming population was 64% White, 26% Black, 4% Hispanic, 2% Asian, and 5% multi-racial. Fifty four percent were eligible for free and reduced lunch, 9% were identified as receiving special education services, 8% were receiving gifted education services, and 2% were receiving services for English language learning. Each participant was given two forms of each task and administration was counterbalanced to control for order effects and were stratified evenly across grade levels. Word dictation was administered individually while picture word and story prompts were group administered, all for three minutes. To develop local norms, the 10th, 25th, 50th, and 90th percentiles were calculated for each grade level, task, and scoring procedure (words written, words spelled correctly, correct letter/word sequences, correct minus incorrect letter/word sequences), as well as rate of improvement from fall to winter, winter to spring, and fall to spring (Carlisle, Poch, & Lembke, 2015). For this study, the picture

word CWS norms (25th percentile) for second and third grade were used for screening purposes (see Appendix).

Norm-referenced test of spelling and writing. All students were given the Spelling and Writing Samples subtests of the WJ-3 (Woodcock, et al., 2007). The Spelling subtest evaluated students' ability to spell words from dictation. Test items start with drawing lines and single letters and progress to spelling single words. The administrator reads the word aloud, reads a sentence containing the word, then repeats the word. The Writing Samples subtest assessed students' ability to write in response a picture and/or verbal prompt. Test items start with one-word responses and progress to sentence and multi-sentence responses if students are able. This test was selected for several reasons. The norming population included ages 2:0-90:11 (years:months), demonstrated sufficient reliability ($r = .87$ for Spelling, $r = .90$ for Writing Samples; Schrank, McGrew & Woodcock, 2001) and has been used to measure student outcomes in other writing intervention studies at the early elementary level (Berninger et al., 2002; Graham et al., 2002). The chosen subtests have shown adequate concurrent validity with the selected CBM-W tasks and scoring procedures in a previous study of CBM-W in early elementary grades ($r > .60$; Ritchey & Coker, 2014) and with other standardized tests of writing ($r = .57-.77$; Schrank et al., 2001). There are also two alternate forms of the subtests to limit testing effects from pre- to post-test. These subtests specifically target the word- and sentence-level of language which is what is being targeted in the interventions, which yields face and content validity. The Writing Samples subtest also allows students to generalize skills taught in the intervention by going beyond the sentence-level of writing if they are able.

Norm-referenced test of working memory. The Digit Span and Letter and Number Sequencing subtests of the WISC-IV (Weschler, 2003) make up the Working Memory Index and were used to measure students' working memory. The Digit Span subtest required students to listen to and repeat back sequences of three to nine numbers forwards and two to nine numbers backwards. The Letter and Number Sequencing subtest required students to listen to and repeat back a mixed series of letters and numbers so that the numbers come first from lowest to highest then the letters in alphabetical order (e.g., 1-A-B). Students repeated the first set of sequences in the order that they heard them, then the second set of sequences had to be repeated backwards. The WISC-IV was chosen because it was normed on students ages 6:0-16:11 and demonstrates adequate reliability (internal consistency: $r = .92$; test-retest: $r = .89$) and validity ($r = .72$; Schrank et al., 2001).

Norm-referenced test of receptive language. The Concepts and Directions subtest of the CELF-5 (Semel et al., 2013), which measures receptive semantic and syntactic abilities, was given as a counterfactual measure. A counterfactual measure is used to account for maturational growth in skills that are not explicitly taught during an intervention (Apel et al., 2013). Students in second and third grade should demonstrate some natural language growth over time in semantics and syntax, but not significantly so and not as a result of the morphological awareness intervention. Administering a counterfactual measure allows the effects of the intervention to be more precisely measured. The Concepts and Directions subtest requires students to listen to oral directions and point to pictures in a specific order. The CELF-5 was chosen because it was normed on ages 5:0 to 21:11, demonstrates adequate reliability ($r = .83-.90$) and

concurrent validity with other standardized tests of language ($r = .78-.91$), and is relatively quick to administer and score. It is worth noting that although the proposed study is investigating a morphological awareness intervention, the author chose not to directly assess oral morphological skills using the CELF-5. The focus of the study is to determine the effects of the intervention on written language outcomes, therefore orally assessing this domain is not warranted.

Student focus groups. At the end of the intervention, the participants in each grade level met as a group with the primary investigator and answered four questions about what they thought of the intervention. A structured interview protocol was used with the following questions: 1) Do you think being in this [intervention] group helped you become a better speller and writer?, 2) What was your favorite activity? 3) What was your least favorite activity?, and 4) How could the groups be more interesting? Students also had the chance to offer any additional information at the end of the focus group if they had thoughts that were not addressed by the structured questions. Student responses were audio recorded and names were not used to protect privacy.

Procedures

Screening. Students were screened in their classrooms with the CBM-W task using the correct word sequences (CWS) scoring procedure (e.g., two adjacent words in a sentence that are spelled and used correctly in context). One form was used for screening instead of the average of two forms because in the larger screening study from which the CBM-W forms were taken, one form of the CBM-W had nearly identical validity coefficients with the criterion measure for the study, the Weschler Individual Test of Achievement-3 Spelling and Sentence Composition subtests (WIAT-3; Weschler, 2009),

as the average of two forms (one form: $r = .21-.22$; two forms: $r = .22-.24$). The CBM-W task was group administered by the author for three minutes (see administration directions below). Students who fell below the 25th percentile on this measure were confirmed with their teacher and were then given the pre-test and covariate measures. The CBM-W screener was given four weeks pre-intervention.

Pre-test. The WJ-3 subtests were group administered by the author four weeks before the intervention. Testing took place in groups of five to ten students in the school cafeteria outside of lunch time to ensure a quiet atmosphere, and in the school office conference room when the cafeteria was in use. The WISC-IV and CELF-5 were also individually administered by the author and two trained doctoral students two to four weeks before the intervention. Testing was completed in large storage rooms with individual desks for students. The doctoral students were trained in test administration and scoring with the author. Training and fidelity of assessment information is discussed in the Fidelity section below.

Progress monitoring. Participants were given different forms of the picture word CBM-W task twice a week during the intervention period to monitor growth. The assessment was given by the author and proctored by trained graduate students for the intervention group only. The comparison group received progress monitoring administration from the author only.

Post-test. Four weeks after the intervention was complete, all students were group administered the WJ-3 subtests and the CBM-W by the author and individually administered the CELF-5 subtest by the author and the trained doctoral students.

CBM-W picture word task. Students were given a picture word prompt to respond to for three minutes. Each prompt consisted of 12 pictures of common objects and actions paired with the written word (“paper,” “eggs,” “walk,”). During group administration, the author read each picture word aloud while students followed along. Students were instructed to, “Write one sentence for each picture in your packet. If you don’t know how to spell a word, make your best guess” (see full directions in Appendix). The intervention group was administered the progress monitoring measures in groups of eight to ten students during their scheduled intervention times. Intervention instructors served as proctors during testing and made sure students were on task. All assessment administration was conducted by the author. The comparison group was administered progress monitoring measures in groups of two to eight by the author at a time mutually agreed upon with their teachers.

Woodcock-Johnson Tests of Achievement-3 (WJ-3). The Spelling subtest was given in groups of eight to ten students. The subtest is untimed and took approximately 15 minutes to administer. The author monitored student responses during testing to ensure ceilings for all students were reached. Items 8-43 were administered as this was adequate for all students to reach their individual basal and ceiling points. The author presented each item and gave students approximately 15 seconds to respond before moving to the next item.

The Writing Samples subtest was given in small groups of four to eight students. This subtest is also untimed and took approximately 30 minutes to administer to each group. The set of items for this subtest is pre-determined, so each testing group was given all the required items for their grade level (items 1-12 for second grade and items 12-18

for third grade). The author presented each item and gave students unlimited time to respond. The author seated one student per table so that if a student finished an item faster than his/her peers, the author could provide the next item quietly while the rest of the group was writing. The Writing Samples subtest allows for students who score either very high or very low on their pre-determined item set to be administered more items to receive a more accurate score, much like a basal or ceiling rule. The Writing Samples subtests were scored the same day as administration and any student requiring additional items were administered those items the next day. No students required additional items at pre-test, and two required additional items at post-test.

Weschler Intelligence Scale for Children-IV (WISC-IV). The WISC-IV working memory subtests were administered individually by the author and two trained doctoral students who were blind to the study condition of the participants. Administration took approximately 10 minutes per participant. Students were seated at a desk in a quiet part of the school and given each test item. The subtests are untimed and testing was concluded when each student reached their ceiling point.

Clinical Evaluation of Language Fundamentals-5 (CELF-5). The CELF-5 language subtest was administered individually by the author and two trained doctoral students and took approximately 5-10 minutes per participant. At pre-test the doctoral students were blind to the study condition of the participants. At post-test, since the doctoral students also served as intervention instructors, they only tested participants they were unfamiliar with who were not in their intervention groups. Students were seated at a desk in a quiet part of the school and given each test item. The subtests are untimed and

testing was concluded when each student reached their ceiling point, which is prescribed in the manual as five consecutive items answered incorrectly.

Inter-rater reliability of scoring. Inter-rater reliability of scoring was conducted on 10% of each assessment. All WJ-3, WISC-IV, CELF-5, and CBM-W screening assessments were scored by the author. Progress monitoring probes were scored by the author and by a trained expert scorer from the larger screening study from which the CBM-W forms were drawn. The expert scorer was blind to the study condition of the participants and all assessments were labeled with unique identification numbers with all other identifying information of the participants removed. The author conducted inter-rater scoring reliability with the expert CBM-W scorer and with an expert scorer who used the WJ-3 as part of her work as a school psychologist. The author's inter-rater reliability with expert scorers was 100% on the picture word CBM-W task, 100% on the WJ-3 Spelling subtest, and 85% on the WJ-3 Writing Samples subtest.

Fidelity of assessment administration. The doctoral students who administered the individual WISC-IV and CELF-5 subtests were provided training and observed by the author. The author has five years' experience giving the WISC-IV Working Memory and CELF-5 tests as part of her work as a speech-language pathologist. Fidelity of administration was assessed using an observation checklist. Fidelity of each assessment was 100% for both doctoral students.

Intervention. The intervention was provided four to five times per week in small groups of two to five students for 25 minutes per session. Due to school scheduling constraints, second grade students received the intervention five times per week and third grade students received it four times per week. However, because of unexpected school

cancellations during the semester, the groups only differed by one total session (third grade: 19, second grade: 20). When school was cancelled, the lesson for that day was skipped and instruction resumed with the next scheduled lesson. The unexpected school cancellations resulted in second graders missing two review lessons. Overall, second grade students ended up receiving one additional morpheme lesson (suffix –er/-est) beyond what the third grade students received. The intervention was provided during each grade level’s scheduled intervention block, therefore all students continued to receive their regular classroom writing instruction each day. In general, classroom instruction involved time spent in explicit spelling instruction and various extended writing activities. For a more in-depth discussion of classroom writing practices, see the Comparison Group Instruction section. Ideally the intervention would have been conducted for 10 weeks, but was conducted for five weeks in order to complete the study before state high stakes testing began by request of the participating teachers.

The author and seven assistants provided the intervention each week. The assistants received training from the author on how to deliver each step in the intervention using a scripted lesson plan. The intervention had a total of ten scripted lessons over the five week intervention period. One lesson target (e.g., plural “-s” endings) was taught over two days, with a review session after every two lessons. All sessions started with a goal statement (e.g., “Today we are learning about [target pattern or affix] so we can [become better writers and spellers]”) and ended with a summary (e.g., “Today we learned about [target pattern or affix]. Who can tell me some words that have [target pattern or affix] in them?”). See sample schedule in the Appendix.

Intervention activities. Each session included four activities (adapted from Apel & Diehm, 2014) after the initial goal statement (one minute): 1) a listening activity (two minutes), 2) word sort (five minutes), 3) “say it another way,” (three minutes) and 4) an affix writing book (14 minutes). Activities were adapted from Apel and Diehm (2014) and Apel et al. (2013). Apel and Diehm (2014) included rotating schedules of activities and had many interventionists delivering the package in schools. For the purposes of this study and due to resource constraints, the activities here were the same each session across groups. A sample lesson plan and activity materials are located in the Appendix.

Listening and word sort activities. The listening activity involved the students raising their “thumbs up” when they heard the target affix read aloud in a short story. In the word sort activity, students sorted word cards that can be differentiated between having or not having the target affix and practiced saying the letters and words on each card. They were presented with a card and were instructed to “Say it, spell it, say it again” so that they practiced spelling the word and reading it aloud. The students then decided if the word contained the target morpheme and they sorted it into the appropriate “yes” or “no” pile. Word cards during lessons 1-3 were paired with pictures. From lesson 4 onward the pictures were removed and the word cards only contained the printed word.

Say it another way. The “say it another way” activity involved students verbally producing words containing the target affix based on a sentence or prompt given by the instructor (e.g., “How can I say ‘more than one dog’ another way?”). The instructor presented a written root word and asks the question, students orally responded, and then the affix is written next to the word to create the new word.

Affix book. The affix book activity was a cumulative booklet where students circled words with targeted affixes in written lists, orally defined the words in their own words, and wrote sentences containing the target affix. Instructors provided students with feedback and error correction and prompted them to review and edit their sentences by asking four questions: 1) “Did you spell the target word correctly?”, 2) “Did you use the word correctly in your sentence?”, 3) “Are there any words missing in your sentence?”, and 4) “What does a good sentence start and end with (a capital and a punctuation mark)?” Review sessions involved talking about the targets under review, identifying and saying words with the target, and playing matching and fill in the blank games with the targets. Each session concluded with a summary of the day’s lesson (one minute).

Order of lessons. Affixes were taught in spoken and written forms. The order of affixes taught (see Table 1) followed the developmental progression of morpheme acquisition, included derivational and inflectional morphemes, and was replicated from Apel & Diehm (2014) and Apel et al. (2013). Root words used during intervention activities were taken from the Dolch (1936) word list and Graham, Harris and Loynachan’s (1993) lists of commonly used words in reading, writing and spelling. All root words were at or below the third grade level of word frequency according to Dolch (1936) and Graham et al. (1993). None of the words used on the CBM-W task and the WJ-3 were directly taught during the intervention. Spelling rules for dropping a final /e/ for –ed and –ing endings were taught. Due to time constraints, only regular plural spelling rules were taught. Each lesson contained 10-20 words used over two days.

Table 1

Order of Affix Lessons

Lesson	Target Affix
1	Plural –s
2	Third person –s
3	Past tense –ed
4	Present progressive –ing
5	Prefix un-
6	Prefix re-
7	Suffix –er (person)
8	Suffix –ly
9	Suffix –er (more)/-est

Adapted from Apel & Diehm, 2014

Scaffolding plan. The general plan for scaffolding lessons was teacher modeling of all activities during lessons one through three, guided practice during lessons four through six, and independent practice for lessons seven through ten. However, because the morphemes taught early in the sequence were familiar to students and the students quickly picked up on the activity directions, the level of modeling was decreased sooner than planned. It was determined by the author and other instructors that the students did not need a teacher model beyond lesson one (the first two sessions). Guided practice was expanded to lessons two through five, and independent practice was implemented during lessons six through ten. Specific procedures for each level of scaffolding will be detailed below. Specific feedback, error correction, and prompts to review and edit were implemented by instructors during every session regardless of level of scaffolding.

Modeling. Modeling was provided during the first lesson to explicitly teach students how to complete the activities. For the listening activity, the instructor provided a practice sentence and demonstrated how and when to give a thumbs up in response to the target words. During the first three lessons, the instructor would pause after each target word to give students the change to process the information and respond appropriately. The word cards used during the word sort activity contained black and white photographs paired with printed words. The instructor presented each card one at a time and demonstrated the “Say it, spell it, say it again” strategy. The instructor then did a think aloud where they talked about how they either heard or did not hear themselves saying the target morpheme and how they would decide whether the word belonged in the “yes” or “no” pile. Students were then instructed to respond as a group as the instructor went through the remaining cards for the lesson. For “say it another way,” the instructor presented a written root word on a portable white board and modeled how to add the target morpheme to make a new word. The instructor replied aloud and then wrote the affix next to the printed word. Students were instructed to respond as a group for the remaining words for the lesson. During the affix book sentence writing activity, the instructors demonstrated how to proceed through the list of given words using the same “Say it, spell it, say it again” strategy from the word sort activity and conducted a think aloud about whether the word should be circled (contained the target morpheme) or left blank (did not contain the target morpheme). As the teacher demonstrated the procedure with each word the students followed along on their papers and circled the correct words when the teacher was done modeling. For the sentence writing portion of this activity, the instructor provided a written model sentence for all students to transcribe

to ensure that all students were able to see and use the target morphemes correctly in written sentences. The instructor modeled how to review and edit his/her own sentence, by asking the editing questions aloud: “Did I spell [target word] correctly? Did I use the word correctly in my sentence? Are there any words missing from my sentence? What does a good sentence start and end with?”

Guided practice. Lessons two through five shifted towards guided practice and the instructor faded the overt models at the beginning of each activity. During the listening activity, the teacher no longer explicitly modeled how and when to give a thumbs up for target words, but still paused after some of the target words to make sure all students had responded appropriately. During the word sort, the word cards only contained the printed target words and no longer contained pictures. The instructor started the activity by asking for a group choral response to the first one to three words, then called on individual students to respond. Students were also asked to explain their reasoning for categorizing a word. For “say it another way,” the instructor presented the written word and asked for a group choral response to attaching the affix correctly. The instructor continued to write the affix on the board for efficiency. During the word discrimination portion of the affix book activity, the instructor presented each word to the group for a group response and students were responsible for circling the correct words on their own papers. For the sentence writing portion, instead of the instructor providing a written model sentence, students orally generated sentences as a group. The instructor then designated one of the sentences as a good example and all students wrote that sentence without a visual model. The instructor prompted students to go through the four editing prompts from above. Because students wrote at varying speeds, the instructor was

able to provide specific feedback and prompts to individual students as they finished their sentences. The instructor checked with each student to make sure they had followed the editing prompts and pointed out specific places the student may have missed an error (“What does a good sentence end with? Did you put a period at the end of this sentence? Check your work!”).

Independent practice. Lessons six through ten included independent practice during intervention activities. For the listening activity, the instructor provided corrective feedback and paused only when a student was observed to not respond correctly. During the word sort, individual students responded to each card and continued to explain their reasoning for choosing “yes” or “no” for each word. For “say it another way,” the instructor continued to write the words and affixes on the white board, but students responded individually without a model. During the affix book activity, all students read through and circled the target words in the list independently and the group checked answers before moving onto the sentence writing portion. Students then individually generated and wrote their own sentences. The instructor asked each student what their sentence was before they began writing. The instructor monitored and provided feedback and error correction when needed and orally prompted students to ask themselves the four editing questions discussed previously.

Due to resource and time constraints, it was more appropriate to treat the intervention as a standardized package in terms of affix targets and intervention activities, as was conducted in previous research (see Chapter 1) rather than individualizing to each student’s specific level of morphemic knowledge. Because of the scheduling constraints imposed by the school, any students who were absent were not able to receive any make-

up instruction, because there were no additional sessions or days available to conduct make-ups. Average attendance across students was 93%. Additionally, students were observed to be disinterested during the bi-weekly progress monitoring probes and intermittently distracted during instruction. To address this, the instructors implemented a mystery motivator halfway through the intervention. Students could choose various prizes and rewards from a prize bin if they stayed on task.

Fidelity of intervention implementation. Fidelity of implementation was recorded with a checklist (see Appendix) by either the author or an outside observer through direct observation. Twenty two percent of intervention sessions were observed for fidelity. Interventionists achieved a mean fidelity of implementation of 97% (range 89-100%). The 89% fidelity was achieved by one interventionist who had issues with setting the timer for each lesson activity. The interventionist was re-trained and obtained 100% fidelity upon the second observation.

Student focus groups. On the last day of the intervention, all participants met in grade level groups with the primary investigator. Students gathered around a table in the same room where the intervention took place. The focus groups lasted approximately 10 minutes each. The author started by saying she wanted to know what the students thought of their writing group and how she could make it better. She emphasized that she wanted the participants to be honest and that they would not hurt her feelings or get in trouble if they said they did not like an activity or if they did not think the intervention was helpful. The author then asked the interview questions (see Measures section) and allowed the participants to answer. If any students did not answer the author asked them directly, “What do you think?” to ensure that all perspectives were heard.

Dissemination plan. A summary report was provided to all participating teachers and the school principal after data analysis was complete (see Appendix). The report contained the study purpose, overview of measures, intervention procedures, significant results, and implications for practice. Intervention lesson plans and materials were also provided to all teachers for their personal use at the conclusion of the study. The author offered to train teachers and present results in person, but the principal requested that these be provided electronically.

Comparison Group Instruction

All students in both the intervention and comparison groups continued to receive their regular classroom writing instruction during the study. All participating classroom teachers ($n = 9$) completed a brief written instructional questionnaire outlining what writing curriculum and instructional practices they used in their classrooms. The instrument was adapted from the national survey administered by Cutler and Graham (2008) and is printed in the Appendix. This allowed the author to document the type of instruction that students in the comparison group received during the study and to detect any differences in instruction that may have impacted intervention results.

Teachers were given a questionnaire that asked how they would describe their approach to teaching spelling and writing, how much time per day they spent teaching spelling and writing, and to estimate how often they used various instructional groupings (whole group, small group, partners, individual work) and specific evidence-based practices in spelling and writing. Responses for approach to spelling and writing instruction were compiled and descriptively coded (1 = process approach, 2 = skills-based approach, 3 = other). Estimates of percentage of time spent in various instructional

groupings were entered as whole numbers (30% spent in whole group coded as 30).

Estimates of frequency of use of evidence-based practices were coded numerically (1 = Daily, 2 = Weekly, 3 = Monthly, 4 = Rarely, 5 = Never, 6 = Other). All responses that were written in by teachers or coded as “other” were typed out in full and analyzed for common themes across teachers and grade levels.

Data Analysis

Descriptive statistics (mean, *SD*, range, skewness, kurtosis, gain scores) were calculated for all measures. To answer the first research question, what is the effect of a morphological awareness intervention on the spelling and writing outcomes of second and third grade students identified as being at risk for writing difficulty, a multi-variate analysis of covariance (MANCOVA) was conducted to determine group differences and significant growth on outcome measures. Effect sizes (Cohen’s *d*) were also calculated to determine the magnitude of the effect of the intervention. At post-hoc, the following additional scoring indices were calculated on student writing samples at pre- and post-test and entered into the MANCOVA: total and average number of correct letter sequences (CLS) on the WJ-3 Spelling subtest, average CWS per probe on CBM-W, total words written on the CBM-W, and total and average number of morphemes used spontaneously on CBM-W. The original total CWS score takes productivity into account; a student who writes many sentences will likely have a higher total CWS simply due to producing more text. The post-hoc average CWS score is meant to investigate group differences on the CBM-W when productivity is taken out of consideration (Lembke et al., 2003). The local norms were formed based on total CWS, so both types of CWS scores were used in the data analysis. The number of morphemes used on the CBM-W task included any

morphemes spontaneously produced and did not include any test items that already had a morpheme as part of the prompt (e.g., “pants” was a test item, so any use of that word in student responses was excluded from the morpheme analysis).

To answer the second research question, what student-level variables (e.g., working memory, oral language, grade level) predict student growth on spelling and writing outcome measures, a growth curve analysis using hierarchical linear modeling (HLM) was conducted. This was to determine if students’ final performance on the CBM-W task and rate of growth over the 12 data points was significantly different from zero and whether any other variables impacted growth (e.g., working memory scores, pre-test spelling ability, grade level). This is a method commonly used in the research when investigating student growth slopes (Coker & Ritchey, 2010; McMaster et al., 2011).

The student focus group responses were transcribed and analyzed in two phases. The first phase identified common responses to the interview questions and the second phase identified major themes and any sub-themes about the intervention, the activities, and writing as a whole.

All data was scored and entered into SPSS v. 22.0 (IBM Corporation, 2013) and HLM 7 (Raudenbush, Bryk, Cheong, Congdon, & du Toit, 2011) for analysis.

CHAPTER 3

RESULTS

The purpose of this study was to investigate the effects of a morphological awareness intervention on student spelling and writing outcomes as measured by curriculum-based measurement of writing (CBM-W) and standardized writing assessments. Two primary research questions were addressed by this study.

1. What is the effect of a morphological awareness intervention on the spelling and writing outcomes of second and third grade students identified as being at risk for writing difficulty?

To address this question, a multi-variate analysis of variance (MANCOVA) was conducted to determine group differences and significant growth on outcome measures. Effect sizes (Cohen's *d*) were also calculated to determine the magnitude of the effect of the intervention. At post-hoc, the following additional scoring indices were calculated on student writing samples at pre- and post-test and entered into the MANCOVA: total and average correct letter sequences (CLS) on the WJ-3 Spelling subtest, average CWS on the CBM-W, total words written on the CBM-W, and total and average morphemes used on the CBM-W. Additionally, participants were asked a series of questions in a focus group format about their opinions on the intervention activities. Student responses were transcribed and analyzed for common themes

2. What student-level variables (e.g., working memory, oral language, grade level) predict student growth on spelling and writing outcome measures?

To address this question, an HLM growth curve analysis was conducted to determine if students' final performance on the CBM-W task and rate of growth over the

intervention period was significantly different from zero and whether any other variables impacted growth (e.g., working memory scores, pre-test spelling ability, grade level).

The intervention group and the comparison group were not statistically significantly different from each other on pre-test scores, the covariate measure or the counterfactual language measure (WJ-3 Spelling: $t = 1.37, p = .18$; WJ-3 Writing: $t = -1.10, p = .28$; CBM-W total CWS: $t = -.87, p = .39$; WISC-IV: $t = -.29, p = .77$; CELF-5: $t = -.07, p = .95$). Additionally, neither group was significantly different on any of the post-hoc scores except the pre-test average CLS on the WJ-3 Spelling. The two groups were significantly different ($t = -2.70, p = .01$) with the intervention group ($M = 3.99, SD = .47$) scoring higher on average than the comparison group ($M = 3.33, SD = .76$).

Students with special education diagnoses were distributed equally across the intervention and comparison groups through random assignment.

Descriptive Data

Descriptive statistics (mean, *SD*, range, skewness, kurtosis) were calculated for all measures, and pre-/post-test gains were calculated for the outcome measures. The descriptive statistics calculated for each measure and experimental group were the mean score, standard deviation, range (minimum to maximum), skewness (whether data are symmetrical) and kurtosis (whether data cluster around the center or the tails of a distribution). Box's test ($F = 85.75, p > .05$) indicated that the assumption of the equality of covariance matrices was met, meaning the covariance of the dependent variables are equal across group (homogeneity of variance). Visual inspection of the data and the skewness and kurtosis values indicated multiple outcome and post-hoc measures were non-normal. For the entire sample, the WJ-3 Spelling and Writing Samples post-tests and

the average correct letter sequences (CLS) on the WJ-3 Spelling were negatively skewed (Spelling: -1.58; Writing: -2.35; CLS: -2.12) and leptokurtic (positive kurtosis, heavy-tailed distribution; Spelling: 4.01; Writing: 8.25; CLS: 6.72). Average morpheme use on the CBM-W was positively skewed (2.21) and leptokurtic (6.40). To address the non-normality of the data, several transformations were attempted (reverse-scored post-test scores, log of original post-test scores, log of reverse-scored post-test scores). The transformation that corrected the non-normality was using gain scores (post-test minus pre-test). Gain scores were used in the multi-variate analysis (see MANCOVA section). All descriptive data (mean, *SD*, range, skewness, kurtosis, gain scores) are displayed in Table 2 for the intervention group and Table 3 for the comparison group. Collinearity of the WISC-IV and outcome measures was calculated with a Pearson product-moment correlation. Coefficients were moderate and all were significant except for the WJ-3 Spelling post-test (pre-test: WJ-3 Spelling: $r = .42, p < .05$; WJ-3 Writing: $r = .53, p < .01$; CBM-W total CWS: $r = .46, p < .05$; post-test: WJ-3 Spelling: $r = .30, p > .05$; WJ-3 Writing: $r = .54, p < .01$; CBM-W total CWS: $r = .43, p < .05$).

At pre-test, the intervention group outscored the comparison group on the WJ-3 Writing (intervention: $M = 94.46, SD = 11.65$; comparison: $M = 86.57, SD = 23.32$) and CBM-W total CWS (intervention: $M = 17.15, SD = 7.60$; comparison: $M = 14.64, SD = 7.34$), while the comparison group outscored the intervention group on the WJ-3 Spelling measure (comparison: $M = 83.21, SD = 9.26$; intervention: $M = 78.85, SD = 7.02$).

On the post-hoc measures, the intervention group outscored the comparison group on average correct letter sequences (CLS) on the WJ-3 Spelling subtest (intervention: $M = 3.99, SD = .47$; comparison: $M = 3.33, SD = .76$), average morphemes used on the

CBM-W task (intervention: $M = .36$, $SD = .22$; comparison: $M = .28$, $SD = .23$), total morphemes on the CBM-W (intervention: $M = 1.85$, $SD = 1.46$; comparison: $M = 1.21$, $SD = .70$), and total words written on the CBM-W (intervention: $M = 21.38$, $SD = 9.83$; comparison: $M = 17.64$, $SD = 5.56$), while the comparison group outscored the intervention group on total CLS (comparison: $M = 66.86$, $SD = 28.13$; intervention: $M = 61.54$, $SD = 20.42$) and average CWS (comparison: $M = 3.92$, $SD = 1.40$; intervention: $M = 3.53$, $SD = 1.43$).

On the counterfactual measure, the intervention group outscored the comparison group on the CELF-5 Following Directions subtest (intervention: $M = 8.00$, $SD = 2.12$; comparison: $M = 7.93$, $SD = 3.15$). On the covariate measure, the intervention group outscored the comparison group on the WISC-IV working memory composite (intervention: $M = 84.31$, $SD = 13.05$; comparison: $M = 82.79$, $SD = 13.98$).

At post-test, the comparison group outscored the intervention group on the WJ-3 Spelling (comparison: $M = 85.21$, $SD = 10.48$; intervention: $M = 83.46$, $SD = 6.75$) and total CWS on the CBM-W (comparison: $M = 26.00$, $SD = 11.75$; intervention: $M = 25.15$, $SD = 12.13$), while the intervention group outscored the comparison group on the WJ-3 Writing measure (intervention: $M = 94.23$, $SD = 14.04$; comparison: $M = 82.00$, $SD = 23.70$).

On the post-hoc measures, the intervention group outscored the comparison group on average CLS (intervention: $M = 3.95$, $SD = .37$; comparison: $M = 3.53$, $SD = .70$), average morphemes on the CBM-W (intervention: $M = .19$, $SD = .27$; comparison: $M = .13$, $SD = .18$), total words written on the CBM-W (intervention: $M = 29.54$, $SD = 13.64$; comparison: $M = 27.29$, $SD = 10.54$). The comparison group outscored the intervention group on total CLS on the WJ-3 Spelling (comparison: $M = 76.43$, $SD = 24.63$;

intervention: $M = 72.62$, $SD = 21.03$), average CWS on the CBM-W (comparison: $M = 3.84$, $SD = 1.44$; intervention: $M = 3.52$, $SD = 1.24$), total morphemes on the CBM-W (comparison: $M = 1.14$, $SD = 1.17$; intervention: $M = .54$, $SD = .66$). It is worth noting that the scores of both the treatment and comparison groups on the post-hoc measures decreased from pre- to post-test.

Table 2

Descriptive Statistics for Outcome and Covariate Measures for Intervention Group (n = 13)

Measure	Pre-test				Post-test				Gain ^a			
	<i>M(SD)</i>	Range	Skew	Kurt	<i>M(SD)</i>	Range	Skew	Kurt	<i>M(SD)</i>	Range	Skew	Kurt
WJ-3 Spelling	78.9(7.0)	65-89	-0.4	-0.3	83.5(6.8)	70-92	-1.1	0.4	4.6(5.9)	-11-13	-1.6	3.9
WJ-3 Spelling Average CLS	4.0(0.5)	2.7-4.6	-1.7	3.5	4.0(0.4)	3.3-4.4	-0.8	-0.5	-0.04(0.4)	-0.6-0.7	0.7	-0.7
WJ-3 Spelling Total CLS	61.5(20.4)	27-91	-0.4	-1.0	72.6(21.0)	45-107	0.2	-1.3	-.04(.39)	-0.6-0.7	0.7	-0.7
WJ-3 Writing	94.5(11.7)	74-118	0.2	0.4	94.2(14.0)	63-114	-0.9	0.6	-0.2(8.9)	-15-17	0.1	-0.4
CBM-W Total CWS	17.2(7.6)	2-31	-0.1	0.4	25.2(12.1)	4-43	-0.03	-0.5	8.0(7.9)	-4-22	0.2	-0.8
CBM-W Average CWS	3.5(1.4)	1.0-5.5	-0.3	-0.6	3.5(1.2)	1.3-6.0	0.3	0.5	-.002(1.3)	-2-2	-0.3	-1.1
CBM-W Total Morphemes	1.9(1.5)	0-5	0.9	0.5	0.5(0.7)	0-2	0.9	-0.02	-1.3(1.7)	-4-1	-0.2	-0.7
CBM-W Average Morphemes	0.4(0.2)	0-0.7	0.1	-0.9	0.2(0.3)	0-1	2.5	7.4	-0.2(0.4)	-0.7-0.7	1.1	1.7
CBM-W Total Words Written	21.4(9.8)	4-36	0.1	-0.8	29.5(13.6)	6-49	0.1	-0.7	8.2(7.5)	0-26	1.1	1.2
CELF-5	8.0(2.1)	4-11	-0.5	-0.6	8.5 (3.9)	2-15	0.01	-0.5	.5(3.4)	-6-7	0.3	0.3
WISC-IV	84.3(13.1)	62-110	0.3	-0.1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

^aGain scores were calculated by subtracting the pre-test score from the post-test score.

Table 3

Descriptive Statistics for Outcome and Covariate Measures for Comparison Group (n = 14)

Measure	Pre-test				Post-test				Gain ^a			
	<i>M(SD)</i>	Range	Skew	Kurt	<i>M(SD)</i>	Range	Skew	Kurt	<i>M(SD)</i>	Range	Skew	Kurt
WJ-3 Spelling	83.2(9.3)	58-97	-1.4	3.7	85.2(10.5)	55-100	-1.9	5.2	2.0(5.0)	-4-11	0.7	-0.5
WJ-3 Spelling Total CLS	66.9(28.1)	9-119	-0.4	0.4	76.4(24.6)	15-105	-1.3	1.7	9.6(14.8)	-16-32	-0.1	-0.6
WJ-3 Spelling Average CLS	3.3(0.8)	1.1-4.3	-1.9	5.6	3.5(0.7)	1.5-4.3	-2.0	5.2	0.2(0.4)	-0.5-1.0	-0.01	-0.2
WJ-3 Writing	86.6(23.3)	9-102	-3.2	11.2	82.0(23.7)	9-109	-2.4	7.5	-4.6(13.1)	-34-14	-0.7	0.5
CBM-W Total CWS	14.6(7.3)	3-30	0.4	0.4	26.0(11.8)	6-47	0.1	-0.6	11.4(9.3)	-1-27	0.2	-1.3
CBM-W Average CWS	3.9(1.4)	1-6.3	-0.3	0.4	3.8(1.4)	0.5-6	-0.6	1.2	-0.1(.7)	-1.7-0.8	-0.7	0.1
CBM-W Total Morphemes	1.2(0.7)	0-2	-0.3	-0.6	1.1(1.2)	0-3	0.4	-1.5	-0.1(1.2)	-2-2	0.5	-0.6
CBM-W Average Morphemes	0.3(0.2)	0-0.7	0.1	-1.3	0.1(0.2)	0-0.5	1.1	-0.4	-0.2(0.3)	-0.7-0.5	0.6	0.5
CBM-W Total Words Written	17.6(5.6)	10-30	0.8	0.7	27.3(10.5)	8-43	-0.2	-0.7	9.6(10.1)	-8-24	-0.3	-0.7
CELF-5	7.9(3.2)	1-11	-1.0	-0.1	8.1(3.3)	1-12	-1.0	0.1	0.2(2.7)	-5-5	0.1	-0.1
WISC-IV	82.8(14.0)	52-104	-0.6	0.6	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

^aGain scores were calculated by subtracting the pre-test score from the post-test score.

Growth from Pre- to Post-Test

To detect within-group differences between pre- and post-test scores, or to detect growth for each group, a series of paired samples *t*-tests were conducted for the intervention and comparison groups separately. Both groups made significant growth from pre- to post-test, but not on the same measures. On the outcome measures, the intervention group improved significantly from pre- to post-test on the WJ-3 Spelling ($t = -2.84, p < .05$) and total CWS on the CBM-W ($t = -3.67, p < .01$), while the comparison group made significant improvement only on the CBM-W using total CWS ($t = -4.56, p < .01$). Neither group made significant gains on the WJ-3 Writing Samples measure or on the CELF-5 language counterfactual measure.

On the post-hoc scores neither group made significant progress on the scores that measured *average* performance (average CLS on the WJ-3 Spelling, average CWS on the CBM-W, average morphemes on the CBM-W), however both groups grew significantly on the post-hoc scores that measured *total* performance or production. Both groups grew significantly from pre- to post-test on total CLS on the WJ-3 Spelling (comparison: $t = -2.42, p < .05$; intervention: $t = -2.36, p < .05$) and total words written on the CBM-W (comparison: $t = -3.57, p < .01$; intervention: $t = -3.93, p < .01$). The intervention group showed a significant difference from pre- to post-test on total morphemes used on the CBM-W ($t = 2.77, p < .05$), however the mean total morphemes used by the intervention group went down over time (pre-test: $M = 1.85$; post-test: $M = .54$).

In sum, the only measure where the intervention group significantly and the comparison group did not was the WJ-3 Spelling outcome measure. Both groups significantly increased their total production over time (e.g., total words written, total

CLS, total CWS) but not their accuracy as measured by average performance over time (e.g., average CWS, average CLS, average morphemes).

Multi-Variate Analysis of Covariance (MANCOVA)

The MANCOVA was used to determine if the intervention had an effect on students in the intervention condition and whether there were significantly different results on each outcome and post-hoc measure (WJ-3 Spelling standard score, WJ-3 Spelling total and average CLS, WJ-3 Writing Samples, CBM-W total and average CWS, CBM-W total and average morphemes, CBM-W total words written) between the intervention group and the comparison group (see Table 3). A MANCOVA was used instead of a series of univariate analyses of variance (ANOVA) because the first research question is a multivariate question (what is the effect on spelling and writing) and the MANCOVA protects against inflated Type I error rates, or a “false positive” (rejecting the null hypothesis that there is no significant difference between groups). Student gain scores were used for analysis (post-test minus pre-test scores) to account for non-normality of data (see Descriptive Data section).

The main analysis in a MANCOVA contains two parts. The first part involves conducting an analysis of variance on all outcome measures together as a group. Results then indicate whether the intervention condition had an overall effect on the participants in the intervention as a whole. The second part is a series of univariate analyses of variance on each individual outcome measure. Results of this analysis indicate whether the intervention condition had an effect on each outcome measure for the intervention participants and whether that was significantly different from the comparison group. To interpret the multivariate results, a researcher must choose which test statistic she will use

to interpret the data based on sample size, number of dependent variables, and homogeneity of covariance matrices (see Descriptive Data). For small samples with unequal group sizes where the assumption of equality of covariance matrices has been met, the recommendation is the use the Pillai's trace test statistic (Bray & Maxwell, 1985; Field, 2009; Olson, 1974). This statistic has enough power to detect differences and is robust enough to account for normality violations in the data. For this study, the author has chosen to use Pillai's trace to interpret the multivariate analysis results.

Using Pillai's trace, there was a large but nonsignificant effect of the intervention on outcome measures when controlling for working memory, $F(9, 16) = 1.13, p > .05$, partial $\eta^2 = .40$ (see Table 4). The magnitude of the partial eta squared effect size is based on Cohen's (1969) definition as cited in Richardson (2011) of small .0099, medium .0588, and large .1379. The intervention improved the spelling and writing scores of students in the intervention condition, but their scores were not significantly different from the scores of the students in the comparison condition. More specifically, there was a small to medium effect of the intervention on the WJ-3 Spelling subtest $F(1, 24) = 1.70, p > .05, d = .48$ and a small effect on the WJ-3 Writing Samples measure $F(1, 24) = .91, p > .05, d = .39$ for the students in the intervention, but these effects were not significant, meaning there was no difference in scores between the intervention group and the comparison group. The magnitude of Cohen's d effect sizes is based on the standards in Cohen (1988) of small .2, medium .5, and large .8. Additionally, there was a significant effect of the intervention on total morphemes used on the CBM-W, but the magnitude was negative ($d = -.85$), meaning the average score went down over time. The effect of

the intervention on the total CWS on the CBM-W and all other post-hoc measures was either negligible or negative (see Table 4).

Table 4

MANCOVA Results^a

<u>Multivariate Effects^b</u>				
Measure		<i>F</i>	<i>p</i>	partial η^2
Pillai's Trace		1.13	.40	.40
<u>Between-Subjects Effects^c</u>				
Measure	Type III SS	<i>F</i>	<i>p</i>	Cohen's <i>d</i>
WJ-3 Spelling	50.04	1.70	.21	.48
WJ-3 Spelling Total CLS	17.84	.07	.80	.10
WJ-3 Spelling Average CLS	.40	2.26	.15	-.62
WJ-3 Writing Samples	120.81	.91	.35	.39
CBM-W Total CWS	84.88	1.14	.30	-.39
CBM-W Average CWS	.05	.05	.83	.08
CBM-W Total Morphemes	10.43	4.68	.04	-.85
CBM-W Average Morphemes	.002	.02	.89	-.06
CBM-W Total Words Written	23.26	.32	.58	-.17

^a Gain scores were used for MANCOVA analysis; ^b *df* = 16; ^c *df* = 1

HLM Growth Modeling

An HLM growth curve analysis was used to determine how students grew on the progress monitoring CBM-W measure, whether the intervention impacted student growth rates, and what other variables may have shaped growth rates for students. Test data

observations (level 1) were nested within students (level 2) and were collected bi-weekly during the duration of the intervention. Because total CWS scores on the CBM-W measure showed significant growth for both the intervention and the comparison group, those scores were used for the HLM analysis.

Unconditional model. An unconditional growth model was analyzed first to evaluate growth on CBM scores and to determine which model of growth fits the data best: a linear growth model or a non-linear quadratic growth curve. To begin, Time (testing occasion) was the only variable at level-1 with CBM pre-test score as the outcome variable. Deviance testing indicated that a random slopes model was more appropriate than a fixed slopes model ($\chi^2 = 8.01, df = 2, p < .05$), meaning the slopes vary randomly across students and are not fixed (Raudenbush & Bryk, 2002). The linear slope model resulted in a better fit over an intercept-only model (e.g., no growth over time; $\chi^2 = 7.30 (2), p < .05$). Next, a quadratic term was added to the model to see if any growth was non-linear. Deviance testing indicated that random slopes were more appropriate than fixed slopes for this model as well ($\chi^2 = 22.50, df = 5, p < .001$). The addition of a quadratic term resulted in a better fit over the linear slope model ($\chi^2 = 22.50 (5), p < .001$). Because the quadratic term was significant, it will be retained in the model, as shown below.

Level-1 Model (within-student): $CBM_{it} = \pi_{0i} + \pi_{1i}*(TIME_{it}) + \pi_{2i}*(TIME_{it}^2) + e_{it}$

Level-2 Model (between students): $\pi_{0i} = \beta_{00} + r_{0i}$
 $\pi_{1i} = \beta_{10} + r_{1i}$
 $\pi_{2i} = \beta_{20} + r_{2i}$

For the within-student model, π_{0i} is the intercept or expected score at for student i at the CBM pre-test, π_{1i} is the slope or mean linear growth rate on the CBM task for

student i between each test point, π_{2i} is the mean quadratic growth curve or non-linear growth rate on the CBM task for student i between each test point, and e_{ii} is the measurement error for student i at time t .

For the between student model, π_{0i} is the intercept for student i , β_{00} is the average intercept or outcome score for students at pre-test; π_{1i} is the linear growth rate for student i , β_{10} is the average linear slope for all students; π_{2i} is the quadratic growth rate for student i , and β_{20} is the average quadratic growth rate across all students. r_{0i} , r_{1i} , and r_{2i} are the random errors associated with the mean intercept, mean linear slope, and mean quadratic growth curve, respectively. Results of the unconditional model are displayed in Table 5.

Table 5

HLM Growth Curve Analysis Results, Unconditional Model

<u>Fixed Effects</u>	<u>Coefficient</u>
<i>Intercept (π_0)</i>	
Mean pre-test CBM-W (β_{00})	16.67***
<i>Linear Slope (π_1)</i>	
Mean linear growth rate (β_{10})	2.83***
<i>Non-linear Growth (π_2)</i>	
Mean quadratic growth rate (β_{20})	-.16**
<u>Random Effects</u>	<u>Coefficient</u>
Mean pre-test CBM-W error (r_{0i})	55.73**
Mean linear slope error (r_{1i})	5.33**
Mean non-linear growth error (r_{2i})	.03*

*** $p < .001$; ** $p < .01$; * $p < .05$

Intercept. All students scored an average of 16.7 CWS at pre-test on the CBM task ($p < .001$). Students varied significantly in their CBM-W pre-test scores (intercepts) before the intervention ($r_0 = 55.73, p < .01$), demonstrating individual differences in baseline ability or performance across the entire group of students.

Linear growth rate. Student slope or linear growth over time was 2.83 CWS per testing occasion, or 5.66 CWS per week. This growth rate was significantly different from a null growth rate ($p < .001$), indicating that all students in the study made significant growth on the CBM task over time. The average slope was moderately reliable ($r = .52$), which means the observed score variance is likely not due to error. Students varied significantly in their slopes ($r_1 = 5.33, p < .01$), demonstrating individual differences in linear growth rate.

Quadratic growth rate. The overall quadratic growth curve or non-linear acceleration rate was -.16 CWS per testing occasion, or -.32 CWS per week, which was also significantly different from zero ($p < .01$), indicating that all students demonstrated a non-linear growth trend in addition to their linear slopes and that students decreased in their CBM-W performance over time. The quadratic growth curve had moderate reliability ($r = .45$), suggesting score variance was not due to error. Students varied significantly in their rate of acceleration ($r_2 = .03, p < .05$).

Conditional model. Several variables were added to the model as level-2 predictors: intervention group (condition coded as 0 = comparison group, 1 = intervention group), working memory, pre-test scores, and grade level (coded as 0 = second grade, 1 = third grade). It is worth noting that the study sample was rather homogenous in terms of demographics, so race, gender, and free/reduced lunch status were not used as predictors.

Each predictor that was not significant was removed from the model one at a time based on which had the highest p -value. The final conditional model was:

$$\text{Level-1 Model (within-student): } CBM_{ii} = \pi_{0i} + \pi_{1i}*(TIME_{ii}) + \pi_{2i}*(TIME2_{ii}) + e_{ii}$$

$$\text{Level-2 Model (between students): } \pi_{0i} = \beta_{00} + \beta_{01}*(GRADE_i) + r_{0i}$$

$$\pi_{1i} = \beta_{10} + \beta_{11}*(PREWJS_i) + r_{1i}$$

$$\pi_{2i} = \beta_{20} + \beta_{21}*(GRADE_i) + \beta_{22}*(PREWJS_i) + r_{2i}$$

Test scores were centered around the grand mean (individual's score – total sample average score) in the final model to create a true zero point for these measures. In order to accurately calculate linear slope, a true zero point (intercept) must exist to examine what the CBM-W outcome score is for students who scored a zero on the WJ-3 Spelling, for example (Anderson, 2012). Because no participants in the sample actually scored zero points on the measures, using the grand mean allows for a true zero point to exist (intercept). For the within-student model, the parameters are the same as in the unconditional model. For the between students model, in addition to the parameters discussed in the unconditional model, β_{01} is the regression coefficient showing the relationship between intercept and grade level; β_{11} is the regression coefficient showing the relationship between mean linear growth rate and pre-test WJ-3 Spelling score; β_{21} is the regression coefficient showing the relationship between mean quadratic growth rate and grade level, and β_{22} is the regression coefficient showing the relationship between mean quadratic growth rate and pre-test WJ-3 Spelling score. r_{0i} , r_{1i} , and r_{2i} are the random errors associated with the mean intercept, mean linear slope, and mean quadratic growth curve, respectively.

The variables that significantly predicted growth on CBM-W over time were grade level and pre-test score on the WJ-3 Spelling measure. The intervention did not explain or predict growth in CBM-W scores. Conditional model results are in Table 6.

Table 6

HLM Growth Curve Analysis Results, Conditional Model

<u>Fixed Effects</u>	<u>Coefficient</u>
<i>Intercept (π_0)</i>	
Mean pre-test CBM-W (β_{00})	11.56***
Mean pre-test x grade (β_{01})	13.78***
<i>Linear Slope (π_1)</i>	
Mean linear growth rate (β_{10})	2.83***
Mean growth rate x pre-test WJ-3 Spelling (β_{11})	.20***
<i>Non-linear Growth (π_2)</i>	
Mean quadratic growth rate (β_{20})	-.14**
Mean growth rate x grade (β_{21})	-.06**
Mean growth x pre-test WJ-3 Spelling (β_{22})	-.01**
<u>Random Effects</u>	<u>Coefficient</u>
Mean pre-test CBM-W error (r_{0i})	3.32
Mean linear slope error (r_{1i})	1.88*
Mean non-linear growth error (r_{2i})	.14*
<u>Proportion of Variance</u>	
Level 1 within student (R_1^2)	.003
Level 2 between student (R_2^2)	.80

*** $p < .001$; ** $p < .01$; * $p < .05$

Intercept. The overall average CBM score at pre-test was 11.56 CWS ($p < .001$).

Third graders scored an average of 13.78 CWS higher than their second grade peers at

CBM pre-test. However, this variation across student intercept was not statistically significant ($r_0 = 3.32, p > .05$), meaning students did not vary significantly in their pre-test scores before the intervention. This reflects the results of the paired samples t-tests examining group equivalency.

Linear growth rate. On average, students demonstrated a mean linear growth rate of 2.83 CWS per testing occasion, or 5.66 CWS per week. This slope was significant ($p < .001$), indicating that mean slope for all students was significantly different from zero. This slope was moderately reliable ($r = .36$), suggesting that variation in slopes was not likely due to error. The correlation between pre-test CBM score (intercept) and linear slope was strong ($r = .72$), indicating that students with a higher baseline ability on CBM grew faster over time.

When controlling for baseline spelling ability, a one unit increase in WJ-3 Spelling pre-test score was associated with a .20 increase in CBM-W score per testing occasion, or .40 CWS per week ($p < .001$), indicating that student growth rates were significantly different from zero and that students with higher baseline spelling ability had a higher linear growth rate over time. Students also varied significantly in their linear growth rates ($r_1 = 1.88, p < .05$), indicating individual differences in growth rates over time. Spelling scores were a significant predictor of linear slope.

Quadratic growth rate. To review, the quadratic or non-linear growth curve term provided the best fit to the data when added to the intercept plus slope model. This indicates that student growth over time tended to increase sharply at first and level off later rather than growing in a steady linear relationship. On average, students demonstrated a quadratic growth rate of -.14 CWS per testing occasion, or -.28 CWS per

week, which was significant ($p < .01$), indicating the non-linear growth rate for all students was significantly different from zero. The negative quadratic term indicates the curvature of the growth is pointing downwards, or that across all students, growth in general went up and then went down over time (see Figure 3).

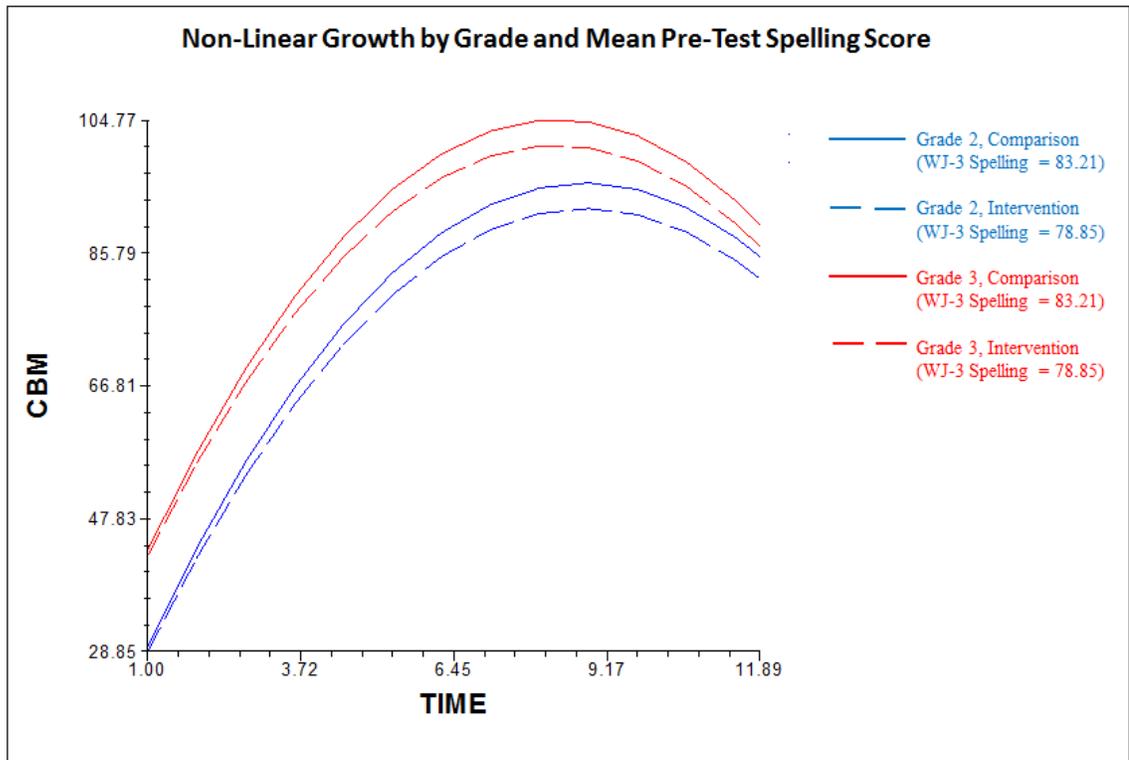


Figure 4. Quadratic growth curves by grade and mean pre-test spelling score.

This growth rate was moderately reliable ($r = .35$), suggesting that variation in non-linear growth rate was not likely due to error. In general, students with lower spelling pre-test scores and students in a lower grade accelerated faster than their higher performing and older peers. A one unit increase in grade level corresponded to a non-linear growth or acceleration rate of $-.06$ per testing occasion, or $-.12$ CWS per week ($p < .001$) indicating third graders accelerated slower than second graders. A one unit increase in WJ-3 Spelling pre-test score corresponded to a rate of acceleration of $-.01$ CWS per

testing occasion, or -.02 CWS per week ($p = .001$) meaning students with higher pre-test spelling scores accelerated significantly slower than peers with lower pre-test spelling scores. Grade level and pre-test scores were significant predictors of the quadratic growth curve. Students varied significantly in their quadratic growth rates ($r_2 = .14, p < .05$), indicating individual differences in acceleration over time.

Proportion of variance. Proportion of variance (see Table 5) calculated at level 1 (within-student) indicated that time explained less than 1% of the variance within student CBM scores ($R_1^2 = .003$), indicating that the passage of time alone did not account for growth in a student's CBM scores. Proportion of variance at level 2 (between students) indicated that 80% of the variation between students was explained by grade level and spelling pre-test scores ($R_2^2 = .80$).

Summary of Classroom Instructional Practices

There were no significant differences between the classroom instruction received by the intervention and comparison groups (see Tables 7 and 8). This also held true when the data was analyzed by grade level experimental group. All teachers reported using a combination of a process-based and skills-based approach to their writing instruction and reported teaching word families and using *Words Their Way* (Bear, Invernizzi, Johnston, & Templeton, 2012) as their spelling curriculum.

Table 7

*Teacher Reported Classroom Writing Instructional Practices for Participants (n = 27):
Descriptive Data and Independent Samples t-test*

Instructional Grouping and Time	<i>M(SD)</i>		<i>t^a</i>	<i>p</i>
	<i>Intervention (n = 13)</i>	<i>Comparison (n = 14)</i>		
% Whole group	39.23(14.41)	35.00(16.05)	-.72	.48
% Small group	16.15(9.39)	16.79(10.85)	.16	.87
% Pairs	14.23(4.49)	13.93(4.88)	-.17	.87
% Individual instruction	31.15(15.43)	35.36(18.24)	.64	.53
Minutes teaching spelling	32.69(4.39)	31.43(5.69)	-.64	.53
Minutes teaching writing	32.69(16.79)	32.14(13.97)	-.09	.93
Instructional Practices^b	<i>M(SD)</i>		<i>t</i>	<i>p</i>
	<i>Intervention (n = 13)</i>	<i>Comparison (n = 14)</i>		
Graphic organizers	3.08(.28)	3.29(.83)	.87	.39
Teacher conferences	1.85(1.35)	1.71(1.33)	-.26	.80
Peer conferences	3.15(.69)	3.50(1.02)	1.03	.32
Writing prompts	3.85(1.14)	4.29(1.27)	.94	.35
Teacher modeling	2.00(.58)	1.93(.62)	-.31	.76
Student planning	1.92(1.12)	2.29(1.54)	.70	.49
Student revising	2.69(.75)	2.86(1.17)	.43	.67
Student goal setting	3.00(1.00)	3.07(1.00)	.19	.85
Mini lessons	1.69(.48)	1.57(.51)	-.63	.53
Students sharing writing pieces	2.00(.82)	2.21(1.37)	.49	.63
Progress monitoring	2.15(1.14)	1.71(.83)	-1.15	.26
Handwriting instruction	4.08(2.53)	4.00(2.45)	-.08	.94

^a*df* = 25; ^bRating scale used for Instructional Practice items: 1 = Daily, 2 = Weekly, 3 = Monthly, 4 = Rarely, 5 = Never

Table 8

Teacher Reported Classroom Writing Instructional Practices Across Teachers (n = 9)

Daily Instructional Grouping and Time	<i>M(SD)</i>		
	<i>Second Grade (n = 6)</i>	<i>Third Grade (n = 3)</i>	<i>Total (n = 9)</i>
% Whole group	38.33(18.35)	43.33(25.17)	40.00(19.37)
% Small group	20.83(9.17)	10.00(10.00)	17.22(10.34)
% Pairs	10.00(3.16)	18.33(2.89)	12.78(5.07)
% Individual instruction	31.67(21.60)	28.33(18.93)	30.56(19.60)
Minutes teaching spelling	31.67(6.83)	28.33(2.89)	30.56(5.83)
Minutes teaching writing	34.17(14.97)	45.00(25.98)	37.78(18.39)
Instructional Practices^a	<i>M(SD)</i>		
	<i>Second Grade (n = 6)</i>	<i>Third Grade (n = 3)</i>	<i>Total (n = 9)</i>
Graphic organizers	3.17(.41)	3.33(.58)	3.22(.44)
Teacher conferences	1.67(.52)	2.00(1.73)	1.78(.97)
Peer conferences	3.50(.55)	2.67(.58)	3.22(.67)
Writing prompts	3.50(.55)	3.33(1.15)	3.44(.73)
Teacher modeling	1.83(.41)	2.00(1.00)	1.89(.60)
Student planning	2.83(.75)	1.00(1.00)	2.22(1.20)
Student revising	3.00(.63)	2.33(1.15)	2.78(.83)
Student goal setting	3.50(.55)	2.67(1.53)	3.22(.97)
Mini lessons	1.33(.52)	1.67(.58)	1.44(.53)
Students sharing writing pieces	2.33(.82)	2.00(1.00)	2.22(.83)
Progress monitoring	2.00(1.10)	1.67(.58)	1.89(.93)
Handwriting instruction	3.83(.41)	1.00(0.00)	2.89(1.45)

^aRating scale used for Instructional Practice items: 1 = Daily, 2 = Weekly, 3 = Monthly, 4 = Rarely, 5 = Never

Student Focus Groups

All participants were part of a grade level focus group. A structured interview protocol was used with an open-ended question at the end to provide students the opportunity to share their opinions that were not addressed by the structured questions. In response to the first question, do you think being in this [intervention] group helped you become a better speller and writer, all students in both grades responded yes. One third grader then amended his response and said, “Well, kinda. 50/50. Some stuff I already knew and some stuff I learned.” In response to the second question, what was your favorite activity, second graders said the writing [affix] book and the “say it another way” activities were their favorites. Third graders said the writing, word card sort, and listening (“I liked when you put your thumbs up”) were the best. In response to the third question, what was your least favorite activity, second graders said listening and the word sort cards, and third graders said listening and the bi-weekly progress monitoring. Two out of five third graders said they liked all the activities. In response to the fourth question, how could the groups be more interesting, second graders said play more games and each person should have their own folder and set of word cards. Third graders said do a different activity every day, change the members of the groups periodically, and have individual white boards or word cards for each student to write on. It appears that overall students felt the intervention activities helped them with their spelling and writing, even though they already knew some of the target morphemes. They also felt that making the series of activities more dynamic and making the group more “fun” would help them be engaged during the lesson.

CHAPTER 4

DISCUSSION

Overview

The purpose of this study was to determine the effect of a morphological awareness intervention on the spelling and writing outcomes of struggling writers in second and third grades. The first research question was: what is the effect of a morphological awareness intervention on the spelling and writing outcomes of second and third grade students identified as being at risk for writing difficulty? In addition to descriptive statistics, paired sample *t*-tests and a MANCOVA were conducted to investigate the performance of students from pre- to post-test on outcome and post-hoc measures. The second research question was: what student-level variables (e.g., working memory, oral language, grade level) predict student growth on spelling and writing outcome measures? An HLM growth curve analysis was conducted to investigate student growth on the CBM-W progress monitoring measure. Results of the pre-/post-test statistical analyses will be discussed first, then the progress monitoring growth curve analysis, student focus group responses, implications for practice, and finally limitations and implications for future research.

Intervention Effects

Results of the paired sample *t*-tests suggested that the intervention produced significant growth in spelling which is similar to the findings of previous studies (Apel & Diehm, 2014; Apel et al., 2013; Devonshire et al., 2013; Kirk & Gillon, 2009; Vadasy et al., 2006; Wolter & Dilworth, 2013).. Students in the intervention improved significantly from pre- to post-test on the WJ-3 Spelling measure ($p < .05$) and the comparison group

did not. Even though the comparison group outscored the intervention group on this measure at post-test, the comparison students' growth was not statistically significant which implies that the intervention had some effect on student spelling ability. This reflects the findings of previous research that showed that morphological awareness interventions can positively impact student word spelling (Apel & Diehm, 2014; Apel et al., 2013; Devonshire et al., 2013; Kirk & Gillon, 2009; Vadasy et al., 2006; Wolter & Dilworth, 2013).

However, in the current study, this gain in spelling was attenuated when controlling for working memory in the MANCOVA. This implies that whatever positive significant effect the intervention had on general spelling skills was partially accounted for by participants' existing working memory skills. Transcription skills are constrained by working memory or the ability to hold ideas and sounds in one's head long enough to write them down (Bourke & Adams, 2003; Graham & Harris, 2000; Swanson & Zheng, 2013). The results of the current study suggest that working memory influenced or was somehow related to student spelling performance. Perhaps the magnitude of spelling improvement provided by the intervention and detected by the paired samples *t*-test was simply not large enough to outweigh participants' baseline working memory capacity. However, even though the statistical significance of the intervention effect was no longer present after controlling for working memory, small effects, as defined by Cohen (1988; small .2, medium .5, and large .8), were still detected on the standardized spelling and writing measures. The WJ-3 Spelling effect size ($d = .48$) was bordering on medium, even though the effects were not statistically significant. This means that the study was underpowered.

The ideal sample size with sufficient power to detect an intervention effect size of at least $d = .65$ (the average effect size for spelling across the morphological studies reviewed in Chapter 1) for the current study was $n = 30$ participants per group, or $N = 60$ total (Dong & Maynard, 2013). Previous studies with samples at least this big ranged from $N = 75$ total participants (Apel & Diehm, 2014) to $N = 468$ total participants (Nunes et al., 2003). Studies with less than 60 total participants had intervention durations ranging from nine weeks (Apel et al., 2013, $N = 51$) to 20 weeks (Vadasy et al., 2006, $N = 21$). So, it is possible that earlier studies had enough statistical power to detect intervention effects and the current study did not. However, no previous studies of morphological awareness intervention controlled for memory skills. It is also possible that had previous studies controlled for working memory in a multivariate analysis, the impact of the intervention on spelling may have been smaller or nonexistent. Perhaps replicating the current study with a much larger sample and longer intervention duration would lead to significant and larger group differences on the spelling outcome measure and provide more information about the relationship between spelling and working memory.

Another mixed result was that even though the intervention group improved in their overall standard score on the WJ-3 Spelling subtest, they did not improve significantly on the post-hoc average CLS scoring procedure used to re-score the subtest. This score measured beyond a simple binary right/wrong spelling assessment and more deeply probed the accuracy of word-level spelling by counting the number of correctly placed letters within a word. The significant growth on the WJ-3 Spelling score by the intervention group but the lack of improvement on the CLS scoring procedure of the

same assessment is difficult to reconcile. If students were able to get enough words spelled correctly to show significant improvement on the WJ-3 we would expect them to significantly improve in their average number of CLS as well, indicating that they can order the letters in the test items correctly to get the entire item correct. Perhaps this discrepancy is because the CLS metric was an average for each student based on the total number of items they completed (total CLS divided by total words completed) including their basal (lowest six correct starting with the first whole word test item) and their ceiling (highest six they answered incorrectly). The test items got longer and more complicated as students progressed through the test, so because students were able to get more items correct overall at post-test as shown in the paired samples *t*-test on the total WJ-3 Spelling score, they were also by default completing more difficult items near their ceiling points which contained more letters and, therefore, more opportunities for mistakes in CLS. Perhaps their average CLS scores did not improve because of the longer, more phonemically complicated words that were included in their average score at post-test. Past studies that used standardized tests of spelling only used the total standardized score for analysis (Devonshire et al., 2013; Kirk & Gillon, 2009; Nunes et al., 2003; Vadasy et al., 2006; Wolter & Dilworth, 2013). Studies that measured whether students spelled individual morphemes correctly in words used researcher-created unstandardized tests (Apel & Diehm, 2014; Apel et al., 2013; Devonshire et al., 2013; Nunes et al., 2003), therefore it is difficult to say whether this pattern of lack of growth in CLS is supported by findings from other studies.

The current intervention taught morphological rules for spelling and forming words. It could be that students improved their morphological spelling knowledge but

were not able to transfer that knowledge in a way that was detected by the CLS scoring metric. This supports findings from previous research that stated that even though participants may have increased their spelling ability and identification of morphological spelling rules and strategies, participants did not always spontaneously utilize or transfer those strategies to other types of words (Devonshire et al., 2013; Wolter & Dilworth, 2013). It is also possible that even if students improved their ability to use morphological strategies for spelling, perhaps the CLS score, or the WJ-3 Spelling test itself, did not adequately measure morphological spelling knowledge. On the two forms of the WJ-3 that were administered at pre- and post-test, only four items that the students completed contained morphological affixes (e.g., “cooked” and “rewards” on Form A, “laughing” and “clothes” on Form B). The lack of improvement in CLS on the spelling measure could be because morphological spelling rules were not explicitly tested by this assessment. In future iterations of this study perhaps using an additional spelling measure that targets specific affixes will lend more precise information about how student spelling improves after the intervention.

The small effect ($d = .39$) but lack of significant growth on the WJ-3 Writing Samples subtest could be explained by the way that particular subtest was administered and scored. The Writing Samples subtest was originally chosen because it measured the word and sentence level of language, has been used in previous written language interventions at the early elementary level (Berninger et al., 2002; Graham et al., 2002), and has shown adequate reliability ($r = .90$; Schrank et al., 2001) and validity with other standardized tests of writing ($r > .60$; Schrank et al., 2001) and the picture word CBM-W task ($r > .60$; Ritchey & Coker, 2014). The Writing Samples subtest did not reward or

penalize spelling, capitalization, or punctuation on most of the test items, so even if students improved in these skills as a result of the intervention, this would not be reflected in their Writing Samples scores. Additionally, the Writing Samples subtest required students to write to a specific prompt or idea, sometimes with multiple sentences, whereas the intervention activities required students use a target word while writing single sentences about a topic of their choice, so it could be that the Writing Samples tasks were more difficult than or not aligned closely enough with the intervention activities and therefore student growth was not observed during the brief intervention period. Adding an outcome measure in future research where the test items closely match the intervention tasks would help determine whether the intervention produced writing gains specific to spelling, sentence writing, and morphological knowledge.

Some of the Writing Samples test items were measuring background knowledge and not exclusively writing ability. One item said, “You have been asked to write a report about elephants. Write a good first sentence for this report.” This type of item requires students to have some working background knowledge of elephants and to be familiar enough with the expository genre of writing in order to get this item correct, and many students expressed confusion over this type of item. It is possible that in order to see improvement on this subtest, the intervention needed to target writing sentences in response to a specific prompt or topic and include more explicit instruction in syntax and editing.

It is also possible that the sentence writing opportunities and instruction in the intervention were not explicit or powerful enough to obtain growth on the standardized

measures. Emerging research in morphological awareness and writing in upper grade levels has shown that teaching morphological rules with specific science vocabulary words while also giving students the opportunity to practice using those words in sentences and connected writing resulted in improved essays in fifth grade science classes (McCutcheon et al., 2013). Additionally, Nunes et al. (2003) found growth in spelling for the intervention group that practiced writing the target words they were taught. In a related spelling intervention study with young students, Berninger and colleagues (2002) found that when they compared intervention conditions that included spelling instruction with and without composition instruction, the only group of third graders who improved their writing composition were those who received explicit instruction in planning, organizing, and revising their writing. It appears that providing instruction at the sentence level of language and beyond and giving students opportunities to practice applying what they have learned in their spelling intervention is important when attempting to measure improvements in writing. While the current study attempted to address the element of writing instruction in previous studies by including sentence writing in the intervention activities, perhaps that instruction needed to be more explicit, or the duration of the intervention needed to be longer to provide more practice opportunities and thus, detectable performance gains on the WJ-3. This is similar to results from Parel (2006) who concluded that the lack of significant results was because the intervention duration was too short. It is worth noting that Berninger et al. (2002) and McCutchen et al. (2013) both used holistic ratings to score their student writing outcomes. Maybe the writing growth in those studies would look different or be smaller if measured by a standardized test of writing. Likewise, adding a measure of open-ended student writing scored by a

trait-based rubric to the current study may yield a different perspective about the quality of writing gains for students.

Lastly, working memory was a covariate in the multivariate analysis. Working memory impacts writing performance in terms of transcription and also text generation (Bourke & Adams, 2003; Graham & Harris, 2000; Swanson & Zheng, 2013), so it is possible that baseline working memory capacity somehow impacted participants' ability to hold information in their minds about the prompt for each test item while answering in sentences. Students were allowed to have each item read to them as often as they needed for this exact reason, so that their responses were reflective of their writing ability and not their memory. However, more data is needed to more clearly delineate the relationship between working memory and sentence writing ability.

Both the intervention and comparison groups made significant growth on the CBM-W task when using total CWS score, which indicates that growth on this measure was captured equally for both groups. However, when using average CWS score (total CWS divided by number of sentences per probe), there was no growth detected for either group. This implies that the increase in total CWS from pre- to post-test was a result of increased production (more sentences written and therefore more total CWS) than an increase in accuracy (more CWS per sentence). This is supported by observations made during progress monitoring. Students reported feeling bored with the twice-weekly CBM-W measure and were observed to rush through the assessment as time went on, trying to write as much as possible so they could "stop." Students who finished before the three minute time limit were instructed to go back to what they had written and add or edit their sentences, and that there was no reward for finishing early. Students were also told

that they were supposed to write good sentences, not get to the end of the testing packet. Despite these instructions, some students still tried to hurry and write words for as many pictures as possible in three minutes, hence the increased total CWS. Students increased the number, but not necessarily the accuracy or complexity, of sentences they produced on the bi-weekly CBM-W progress monitoring measure, which resulted in a significant difference in total CWS from pre- to post-test for each group.

Progress Monitoring Growth Curve Analysis

When looking closer at the CBM-W outcomes and progress, the HLM analysis indicated that the intervention condition did not impact or predict growth on the CBM-W measure. This is similar to the results of the MANCOVA in that no significant intervention effect was found on the outcome measures as a whole or on the specific CBM-W task. This is also similar to the *t*-test results that found significant growth from pre- to post-test on the CBM-W task for both groups. The HLM results support the notion that improvement on CBM-W was not related to intervention instruction, but rather student maturity and baseline spelling ability as seen in the final conditional model where grade level and pre-test spelling predicted growth.

Previous studies on the use of CBM-W tasks in early writing progress monitoring have established that the picture word sentence writing measure is sensitive to student growth (McMaster et al., 2009) and that slopes produced from this measure are reliable and stable (McMaster et al., 2011; Parker et al., 2011). In answering the second research question about student factors that predict growth, the current study supports previous findings that student growth on a picture word CBM-W task followed a quadratic or non-linear pattern and that baseline performance predicted growth rates (Parker et al., 2011).

However, the current study expanded the literature by measuring two different grade levels and providing information about grade level differences in growth. Previous studies investigated only first grade (McMaster et al., 2011; Parker et al., 2011).

In the current study, students in third grade on average had a higher pre-test starting point on the CBM-W than their second grade peers, which is what we would expect for students who have been in school for one year longer and have had more writing instruction. However, linear growth (.40 CWS per week) was predicted by pre-test spelling scores on the WJ-3, meaning the poorer spellers grew more regardless of grade level. This indicates that baseline spelling ability, not only maturation or increased productivity, was related to improved CBM-W scores.

A combination of grade level and baseline spelling ability predicted quadratic growth. Second graders accelerated faster compared to third graders and poorer spellers accelerated faster compared to better spellers. This makes practical sense; we would expect the lowest and youngest students to accelerate faster since they are farther behind in their writing performance compared to older and higher performing peers. While this information does not provide evidence of the effectiveness of the intervention, it contributes to our knowledge of how grade level, spelling, and writing abilities intersect and grow. This supports previous research that has shown that younger and lower performing students made the largest growth during literacy instruction compared to higher performing peers (Bowers et al., 2010; Goodwin & Ahn, 2010; 2013). In addition, the coefficient for the quadratic portion of the growth model was negative indicating growth was steep in the beginning of the intervention and tapered off. It was observed that students got bored with the bi-weekly progress monitoring measure and rushed

through the items to finish. Students also reported feeling bored with this activity in the focus group responses. Even though past research has demonstrated that student growth followed a non-linear quadratic pattern on the picture word CBM task, perhaps in this study acceleration and growth also tapered off because student performance was negatively impacted in later weeks due to lack of engagement and boredom. It would be worthwhile to replicate this part of the study with more exciting reinforcements or by spreading out the progress monitoring probes so students stay engaged to get a truer picture of their abilities. It is worth noting that no studies of morphological awareness interventions included any weekly progress monitoring measure to track student performance during the intervention; only pre-/post-test designs were used. Two studies (Devonshire et al., 2013; Kirk & Gillon, 2009) used a repeated measures design where students were given assessments before the intervention, at the intervention mid-point, and at the end of the intervention, but neither study used any sort of growth modeling analysis. The results from both studies indicated the intervention produced growth across three time points, but did not lend any information about slope or rate of improvement. The current study contributes new information to the literature about student growth rates on a bi-weekly progress monitoring measure at two different grade levels.

Student Focus Groups

The impetus for including focus groups was due to the behaviors students were exhibiting during the intervention. As stated previously, students were observed rushing through the CBM-W progress monitoring task and during the intervention groups some students were distracted and talkative. The focus group responses provided a piece of

social validity and gave insight from the participants' perspective into how to keep students engaged in the act of writing.

In general, students felt that the intervention activities helped them with their spelling and writing and they were able to find activities they liked doing. One third grader did mention that he felt the intervention helped him “50/50”, that he already had knowledge of some of the morphemes (e.g., plural –s, -ed, -ing). This provides insight into the order of target affixes for these grade levels and a potential solution to a short intervention duration. Perhaps, when faced with a limited time frame, it is possible to start targeting more advanced affixes like un- or re- instead of starting with plural –s and –ed, and then progress further to more complicated affixes (e.g., -ful, dis-) in the time allotted. In this instance it would be important to test student morpheme knowledge before the intervention. The current study treated the intervention as a standardized package, but maybe in future iterations treating the target affixes in a more individualized way and targeting affixes that are more closely aligned with current student morpheme knowledge would allow for a more precise and effective intervention in a short time period.

Another encouraging result was that students in both grade levels said they liked participating in the affix book (writing) activity. It is often difficult to engage struggling writers in the act of writing, so the fact that this sample reported enjoying this activity is promising. Future research should probe further into what specifically students liked about the writing affix book activity. Some students also wished for more variety in the daily activities. While spending time practicing writing is an important part of writing instruction (Berninger et al., 2002; McCutcheon et al., 2013; National Commission on

Writing, 2003), maybe pairing the affix book activity with one or two other activities and rotating those other activities every day will provide enough interest for students.

Implications for Practice

Educators typically feel unprepared to teach writing (Cutler & Graham, 2008), so the need for actionable recommendations on spelling and writing instruction is high. We must use caution when drawing definitive conclusions from small studies, however results that lack statistical significance can still yield practical significance (Apel & Diehm, 2014). The data from this study, when taken with the findings from previous studies in this area (Apel & Diehm, 2014; Apel et al., 2013; Devonshire et al., 2013; Kirk & Gillon, 2009; Vadasy et al., 2006; Wolter & Dilworth, 2013), suggest that it is possible to have an effect, albeit a small one, on the spelling and writing of struggling early elementary writers in a relatively short period of time (five weeks) through explicit instruction in morphological awareness. Teaching base words and affixes at the word level of language can help bring awareness to the morphological structure and rules of language and to morphologically-bound spelling rules, which ultimately improves student spelling. Teachers should provide explicit instruction and numerous practice opportunities for how to form words using base words and affixes (Nunes et al., 2003).

However, it is important to extend word-level morphological instruction to the sentence level of language to help students apply their morphological knowledge to their writing. For example, understanding that the suffix “-ed” when attached to a verb means something happened in the past is important knowledge, but knowing how to use a word with that suffix (e.g., “jumped”) in a complete sentence about the past (e.g., “Yesterday I jumped rope at recess.”) is an important application of that knowledge. Teachers should

give students ample time during the school day to practice creating and editing sentences and paragraphs using the words and targets from their morphological word study. Students often need support with applying their morphological knowledge (Devonshire et al., 2013) and providing them the chance to use morphologically complex words in sentences and paragraphs is an important next step to improving student writing (McCutcheon et al., 2013).

Additional data is needed to more definitively conclude the strength of this particular intervention package and to more precisely tap into the construct of improved writing at the sentence level and beyond. Educators can incorporate instruction in identifying and using morphological aspects of words during their spelling and writing time in the classroom with a reasonable expectation that this type of instruction will provide a benefit to their struggling writers (Apel & Werfel, 2014).

Limitations

While this study represents an initial attempt to study the effects of morphological awareness instruction on written language, one of the most notable limitations with this study was the small sample size ($n = 27$). The ideal sample size with sufficient power to detect an intervention effect was $n = 30$ participants per group, or $N = 60$ total (Dong & Maynard, 2013). A larger sample may yield a significant and stronger intervention effect. We may find that with a larger sample the gains in spelling are maintained even with a working memory covariate, and gains in the standardized test of writing may be detected.

A second notable limitation was the short intervention duration. The participating school requested that the intervention be shortened from 10 weeks to five weeks in order for the intervention and post-testing to be completed before the state high stakes testing

window opened for third grade. Due to teacher concerns, the post-testing was pushed back to after third grade had completed the state tests, which was four weeks post-intervention, but this occurred after the intervention was completed and it was not possible at that time to extend intervention instruction. The third grade teachers also asked for one week between the end of pre-testing and the start of the intervention to plan for their grade level intervention block to adjust for the students who were being pulled for the study. This shortened the intervention down to five weeks. Because of this shortened duration, progress monitoring had to be conducted bi-weekly instead of weekly in order to have enough data points to analyze. Additionally, the school intervention blocks were different between the two grade levels. Second grade had an intervention block five days per week but third grade had only four days per week. This was predetermined by the school and could not be changed for the sake of the study, therefore the third grade participants received one less day of intervention per week, and one fewer morphology lesson overall. It is possible that a longer duration and a more consistent schedule would produce more significant results and a larger effect on spelling and writing outcomes (Parel, 2006). Future research should attempt to construct a uniform schedule so that all participants in the intervention get the same amount of instruction.

A final limitation was the alignment of the measures to the intervention tasks. While using standardized assessments like the WJ-3 is important for reliability and validity of measurements, having researcher-created assessments that more precisely measured morphological knowledge in spelling and writing tasks is important to pinpoint where gains did or did not occur and to further refine the intervention.

Future Research

First and foremost, future research should replicate this study with a larger sample and a longer duration. It is possible that the lack of significant results on the standardized spelling and writing measure was due to the lack of power of a small sample and the abbreviated duration of the intervention period. A larger, longer study may yield results of statistical significance on the outcome measures similar to studies cited previously.

Future research should also use a comprehensive cognitive measure and an oral language measure to investigate the effects of memory, cognition, and language on transcription and sentence construction abilities. Cognitive skills like verbal and non-verbal reasoning, fluid reasoning, and problem solving would also account for participants' ability to apply knowledge to novel situations, which is similar to asking them to transfer morphological knowledge to connected writing tasks. Additional studies using regression analysis or structural equation modeling to predict performance or pathways between constructs of working memory, cognition, language, and spelling would provide a helpful foundation for further intervention work.

An additional spelling outcome measure that assesses the accuracy of multi-morphemic words would determine whether morphological skills taught in the intervention were being transferred to words with specific morphological targets in them. Future CBM-W forms should alternate between a general outcome set of words for one probe (e.g., dog, desk, tree) and a probe with target words that contain the specific affixes taught that week (e.g., birds, walked, teacher) to again measure whether the morphological skills being taught are being applied and maintained.

Because the current intervention did not show significant growth on the standardized writing measure for the intervention group, additional research is needed into more explicit sentence writing interventions, whether combined with the word-level morphological and spelling instruction, or used separately. Two studies that taught essay writing along with phonological spelling in third grade (Berninger et al., 2002) and morphological interventions in fifth grade (McCutcheon et al., 2013), found improved student performance on writing composition. Because the current study was so short in duration, it is difficult to precisely conclude whether the participants did not improve on the standardized writing measure because the intervention needed to be longer or because students needed more explicit instruction on how to apply the morphological spelling rules when writing sentences.

Conclusion

Existing literature on early writing suggests that transcription skills are crucial for writing development and proficiency (Abbott et al., 2010; Graham et al., 1997; Kim et al., 2014) and that intervening in morphological awareness can improve student literacy (Apel & Diehm, 2014; Apel et al., 2013; Devonshire et al., 2013; Kirk & Gillon, 2009; Nunes et al., 2003; Vadasy et al., 2006; Wolter & Dilworth, 2013). The results of the current study add to the growing body of evidence that morphological awareness plays a role in students' ability to understand, spell, and use words correctly in their writing and that explicitly teaching morphological awareness can produce gains in student spelling and written language. The current study expands on the literature by measuring sentence-level writing outcomes and controlling for working memory, neither of which was attempted in previous studies of morphological awareness interventions. Results

indicated that teaching the morphological structure of words alone is not enough to transfer to improved sentence writing; instruction and practice with sentence construction is a necessary component of improving student writing. This study also contributed to the literature by using sophisticated growth modeling with a progress monitoring CBM-W task. Student growth on a picture word CBM-W was non-linear and younger and poorer spellers accelerated faster over time. Students who struggle with written language early on have the greatest potential for growth and need to start receiving interventions as soon as possible. The key to supporting struggling writers is to do so early in their academic careers.

Proficiency in writing is an essential academic skill that prepares students for postsecondary education and employment. The ability to accurately record words and sentences on paper must be in place before more advanced writing skills like organization, word choice, and revising can be addressed. Common Core standards in writing are rigorous and embedded across the curriculum (National Governors' Association, 2010), meaning that all educators will be involved in teaching and monitoring how well students write in various contexts. However, writing instruction in American schools tends to be brief and often overlooked. Students need more writing instruction and opportunities to practice writing during the school day (National Commission on Writing, 2003). Early intervention is an important way to address the needs of struggling writers, the need for improved and targeted writing instruction, and to prepare students for success in and out of the classroom.

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APPENDIX

Teacher Consent Form

Project Title: The Impact of a Morphological Awareness Intervention on Spelling and Writing Outcomes in Second and Third Grade (IRB Project #1214352)

Dear Teacher,

My name is Abby Carlisle and I am a doctoral student at the University of Missouri. You are being asked for your class to participate in a research study. You were selected because you teach second or third grade in the Hallsville School District. Please read this form and ask any questions before agreeing to have your class participate or not participate.

Why is this study being done?

The purpose of this study is to see if a writing intervention that teaches students about word parts, spelling, and writing sentences will improve student spelling and writing in second and third grade.

What is involved?

There are three pieces in this study: testing, intervention, and a teacher questionnaire. Each piece is described in detail below. I would also ask that you distribute written consent forms for your students to take home to their parents. I will collect returned consent forms from students.

Testing

This study involves a series of writing assessments: screening, pre-test, progress monitoring, and post-test. Each section describes what your students will do if their parents agree to have them be part of the study.

Screening

To identify which students in your class are struggling writers, *all students in your classroom will take a sentence writing test during class (3 minutes long)*. This is explained to parents in the consent form as well. Students who score below the 25th percentile on this assessment and have parent permission to be in the study will be eligible to continue. I will check with you to make sure the students who scored below the 25th percentile are, in your professional opinion, struggling in writing. Students who do not have parent permission to continue with the study will not have their test data kept or analyzed. I will give the brief assessment to your class at a time that is convenient for you.

Pre-testing

Only students whose parents give permission for them to be in the study will participate in pre-testing. Students who scored below the 25th percentile on the sentence writing test will be given an individual writing test for about 10 minutes. Students who also score below the 25th percentile on this writing test will be eligible to be part of the writing

intervention. Eligible students will be given a short individual language test (5-10 minutes) and a short memory test (5-10 minutes). Total individual testing time will be between 20-30 minutes.

Progress Monitoring

I will also be giving the students in your class a weekly group-administered sentence writing progress monitoring test (3 minutes). You will receive ongoing progress monitoring data on your students' writing as a benefit of the study. I will *only* keep and analyze the test data for the students whose parents give permission for them to be in the study, but all students in the class will participate in the weekly writing assessment activity during classroom instruction.

Post-testing

Students whose parents give permission for them to be in the study will take the same series of pre-tests at the end of the intervention as a post-test. Students will take an individual writing test (10 minutes), a language test (5-10 minutes), and a memory test (5-10 minutes), for a total of 20-30 minutes of individual testing time.

Intervention

Students who are eligible for the intervention will be randomly assigned to either the intervention group or the control group. Students in the intervention group will receive the writing intervention four times per week (3rd grade) or five times per week (2nd grade) for 25 minutes for 7 weeks in small groups. Students in the control group will not receive the intervention, but I will provide you with professional development on how to deliver the intervention after the study is over.

Students in the intervention group will learn how to identify word parts including root words, prefixes, and suffixes, and how to use them when spelling words and writing sentences. Each group will be taught by trained instructors from the University of Missouri. All intervention sessions will be audio recorded so I can monitor how the instructors are teaching the intervention. No identifying information about your students will be on the recordings and the recordings will be kept in a locked file cabinet in a locked office suite and only accessible by me. Recordings will be uploaded to a password-protected server accessible only by me.

Teacher Questionnaire

All teachers who consent to have their classes participate will answer a brief written questionnaire outlining the instructional practices, strategies, and curriculum you use during writing instruction in your classroom. This is so I can describe the type of instruction students in both the intervention and the control groups are receiving during the study so I can account for any pre-intervention differences in the student groups. Your name will be removed from the questionnaire before it is removed from the school.

What are the risks and benefits of being in the study?

Possible risks of being in the study are your student's writing performance being seen by peers or by you while the tests and interventions are being given. Students might be embarrassed about getting extra help in writing.

The benefits to participation are that your students have the chance to receive small group instruction in spelling and writing skills, which should improve their writing performance in the classroom. You will be able to learn how to target important writing skills related to word parts, spelling, and sentence writing and receive detailed information on your students' writing skills, which will assist you in planning instruction. You will also be part of research in the field and assist other students and teachers in improving their writing instruction. You will also be given a \$25 gift card as compensation for allowing me to work with your students.

Confidentiality

Your students' identities will be protected at all times. Your students' names will be removed from the tests before the data leaves the school building and will be replaced with a unique number (*not* their ID number from school). Your name will be removed from the written questionnaire and replaced with a unique number not related to your students' numbers. In any sort of published report that may result from this study, you and your students will *not* be identified and no information that could possibly be traced back to individual students or teachers will be shared. All data will be kept in a locked file cabinet in a locked office and only the researcher will have access to those records.

What are my rights as a participant?

Your decision whether or not to have your class participate will not affect your current or future relations with Hallsville Public Schools or the University of Missouri. If you decide to have your class participate, you are free to withdraw at any time without affecting those relationships.

Whom do I contact if I have questions, concerns, or complaints?

If you have any questions or concerns about the research study or consent process, contact:

Abby Carlisle, M.A. CCC-SLP
Doctoral Student, Department of Special Education
University of Missouri
aaa961@mail.missouri.edu
(314) 218-5349

You can also contact Abby Carlisle's academic advisor at MU, Dr. Erica Lembke, or the chair of the Department of Special Education, Dr. Tim Lewis if you have any problems or concerns and do not feel comfortable talking directly to the researcher.

Erica Lembke, PhD
Associate Professor, Department of Special Education
University of Missouri

lembkee@missouri.edu
(573) 882-0434

Tim Lewis, PhD
Professor, Department of Special Education
University of Missouri
lewistj@missouri.edu
(573) 882-0561

If you have any questions regarding your rights as a participant in this research and/or concerns about the study, or if you feel under any pressure to enroll or to continue to participate in this study, you may contact the University of Missouri Campus Institutional Review Board (which is a group of people who review the research studies to protect participants' rights) at (573) 882-9585 or umcresearchcirb@missouri.edu.

Please consider having your class participate in this study. When you have made your decision, **please sign and return the pink copy** of the attached consent form indicating your choice. The other copy is for you to keep. Thank you for your time.

Abby Carlisle, M.A. CCC-SLP
Department of Special Education
University of Missouri
303 Townsend Hall
Columbia, MO 65211
(573) 882-3742 (main office)
aaa961@mail.missouri.edu

Please sign and return the pink copy of the attached consent form indicating your choice. The other copy is for you to keep.

STATEMENT OF CONSENT

Please indicate your choice by checking the appropriate box and signing and dating below.

Print Teacher Name

Teacher Signature

Date

YES, I DO give permission for my class to participate in the writing intervention study by the University of Missouri. I give permission for the researcher to administer group writing assessments in my class and I understand that the data for students whose parents do not consent will not be kept or analyzed by the researcher.

NO, I do not wish for my class to participate in this study.

Parent Consent Form

Project Title: The Impact of a Morphological Awareness Intervention on Spelling and Writing Outcomes in Second and Third Grade (IRB Project #1214352)

Dear Parents and Guardians,

My name is Abby Carlisle and I am a doctoral student at the University of Missouri. Your child has been invited to participate in a research study on a writing intervention. Your child was selected as a possible participant because he/she is in second or third grade in Hallsville Public Schools.

You have the right to decide whether or not he/she should be involved in the study. All students in your child's classroom will be participating in a writing assessment as part of this project, however the researcher will only keep the writing tests for students whose parents have given consent. Please read this form to familiarize yourself with the purpose of the study before giving consent for your child to participate.

Why is this study being done?

The purpose of this study is to see if a writing intervention that teaches students about word parts, spelling, and writing sentences will improve student spelling and writing in second and third grade.

Who will be in the study?

2nd and 3rd grade students from Hallsville will be participating.

What will my child do?

Testing

This study involves a series of writing assessments: screening, pre-test, progress monitoring, and post-test. *All students in your child's classroom will take a sentence writing test during class* to screen for students who score below the 25th percentile. Any student who scores below the 25th percentile and has parent consent to be in the study will be eligible to take an individual writing test. Students who also score below the 25th percentile on this writing test will be eligible to be part of the writing intervention. Eligible students will be given a series of short individual tests measuring language and memory.

I will also be giving your child's class a brief (3 minute) weekly writing assessment to help their teacher monitor the progress of all the students in your child's classroom. The researcher will *only* keep and analyze the test data for the students whose parents give permission for them to be in the study, but *all students in the class will participate in the weekly writing assessment activity during classroom instruction.* Students in the study will take the same series of pre-tests at the end of the intervention as a post-test.

Intervention

Students who are eligible for the intervention will be randomly assigned to either the intervention group or the control group. Students in the intervention group will receive the writing intervention four times per week (3rd grade) or five times per week (2nd grade) for 25 minutes for 7 weeks in small groups. Students in the control group will not receive the intervention, but their teachers will learn how to deliver the intervention after the study is over. The intervention will be finished by the time MAP testing starts for 3rd grade.

Students in the intervention group will learn how to identify word parts including root words, prefixes, and suffixes, and how to use them when spelling words and writing sentences. Each group will be taught by trained instructors from the University of Missouri. All intervention sessions will be audio recorded so the researcher can monitor how the instructors are teaching the intervention. No identifying information about your child will be on the recordings and the recordings will be kept in a locked file cabinet in a locked office suite and only accessible by the researcher.

The researcher will also be collecting demographic data about your child including age, sex, disability, and race/ethnicity; district test scores; and whether he or she receives free/reduced lunch, special education, or English language learning services. This is only for informational purposes. The demographic data collected will not be connected to your child's identity in any published reports or presentations related to this study.

What are the risks and benefits of being in the study?

Possible risks of being in the study are your child's writing performance being seen by peers or by their teachers while the tests and interventions are being given. Your child might be embarrassed about getting extra help in writing.

The benefits to participation are that your child has the chance to receive small group instruction in spelling and writing skills, which should improve their writing performance in the classroom. Your child's teacher will be able to learn how to target important writing skills related to word parts, spelling, and sentence writing. The researcher will be able to provide detailed information on student writing skills to your child's teacher, which will help teachers be better able to plan instruction to help with students' writing.

Confidentiality

Your child's identity will be protected at all times. Your child's name will be removed from the tests before the data leaves the school building and will be replaced with a unique number (*not* your child's ID number from school). In any sort of published report that may result from this study, the children will *not* be identified and no information that could possibly be traced back to individual students will be shared. All data will be kept in a locked file cabinet in a locked office and only the researcher will have access to those records.

What are my child’s rights as a participant?

Your decision whether or not to have your child participate will not affect your current or future relations with Hallsville Public Schools or the University of Missouri. If you decide to have your child participate, you are free to withdraw at any time without affecting those relationships.

Whom do I contact if I have questions, concerns, or complaints?

If you have any questions or concerns about the research study or consent process, contact:

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(314) 218-5349

You can also contact Abby Carlisle’s academic advisor at MU, Dr. Erica Lembke, or the chair of the Department of Special Education, Dr. Tim Lewis if you have any problems or concerns and do not feel comfortable talking directly to the researcher.

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If you have any questions regarding your rights as a participant in this research and/or concerns about the study, or if you feel under any pressure to enroll or to continue to participate in this study, you may contact the University of Missouri Campus Institutional Review Board (which is a group of people who review the research studies to protect participants’ rights) at (573) 882-9585 or umcresearchcirb@missouri.edu.

Please consider having your child participate in this study. When you have made your decision, **please sign and return the blue page** of the attached consent form indicating your choice to your child’s teacher. The other copy is for you to keep. Thank you for your time.

Abby Carlisle, M.A. CCC-SLP
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Columbia, MO 65211
(573) 882-3742 (main office)
aaa961@mail.missouri.edu

Please sign and return this page of the consent form indicating your choice.

STATEMENT OF CONSENT

Please indicate your choice by checking the appropriate box and signing and dating below.

Print Parent Name

Parent Signature

Print Student Name

Date

YES, I DO give permission for my child to participate in the writing intervention study by the University of Missouri. I give permission for the researchers to work with my child and access my child's demographic data.

NO, I do not wish for my child to participate in this study. I understand that my child will still be participating in the classroom instructional activities and assessments, but his/her data will not be kept or analyzed as part of the study.

CBM-W Picture Word Task

Form 1

WW= 1
WSC=
CWS=
IWS=

 wash	<hr/> <hr/> <hr/> <hr/>
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 school	<hr/> <hr/> <hr/> <hr/>
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 mouse	<hr/> <hr/> <hr/> <hr/>
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Local Norms, Picture Word CBM-W Correct Word Sequences

Picture Word Prompt: Correct Word Sequences						
First Grade						
	Benchmarks			ROI		
Percentile	Fall	Winter	Spring	F-W	W-S	F-S
90 th	24	35	50	1.10	1.07	1.08
75 th	19	25	38	0.60	0.93	0.79
50 th	12	15	25	0.30	0.71	0.54
25 th	8	8	14	0.00	0.43	0.25
10 th	4	4	8	0.00	0.29	0.17
Mean	13.19	17.30	27.19			
SD	8.23	11.79	15.15			
N	59	61	68			
Second Grade						
	Benchmarks			ROI		
Percentile	Fall	Winter	Spring	F-W	W-S	F-S
90 th	44	53	53	0.90	0.00	0.38
75 th	35	39	46	0.40	0.50	0.46
50 th	26	32	37	0.60	0.36	0.46
25 th	14	22	27	0.80	0.36	0.54
10 th	7	14	19	0.70	0.36	0.50
Mean	25.70	31.63	36.47			
SD	14.22	14.66	12.89			
N	83	48	89			
Third Grade						
	Benchmarks			ROI		
Percentile	Fall	Winter	Spring	F-W	W-S	F-S
90 th	56	60	66	0.40	0.43	0.42
75 th	43	52	55	0.90	0.21	0.50
50 th	35	40	49	0.50	0.64	0.58
25 th	25	28	41	0.30	0.93	0.67
10 th	18	18	29	0.00	0.79	0.46
Mean	35.63	39.81	47.88			
SD	15.18	15.77	13.39			
N	97	83	65			

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Picture Word Administration Directions

Materials Needed:

1. Timer
2. Pencils
3. Directions for administration
4. Teacher copy of the task
5. Picture-word task for students

Directions:

Provide each student with a pencil and a picture-word prompt. Place the worksheet face up on the table in front of each student. Students should leave their pencils on their desks.

Say to the students:

Today we will do a writing activity. I will ask you to write some sentences. You will write one sentence for each picture in your packet. Keep your pencils down. First, let's name the picture on the front of your packet.

This is a car. (Point to the picture on the packet.)

What is this word? "car." (Make sure all students say the word.)

Let's make a sentence with this word. (Ask one or more students to make a sentence with this word.)

What does a good sentence start with? (Prompt for capitalization.)

What does a good sentence end with? (Prompt for ending punctuation mark.) Choose one sentence to write on the board. Read this sentence aloud to the whole class.

You will write one sentence for each picture. (Point to the first item in the sample packet.)

Start at the top, then go down the page. Try to write a sentence for each picture. When you reach the end of a page, continue on to the next page. (Show the students with the sample copy).

If you reach the end before the time is up, go back and re-read your sentences and add details or more sentences.

Keep writing until the time is up and I ask you to stop. When I say "Stop", raise your hand with your pencil in it, like this. (Demonstrate.)

Remember to do your best work. If you don't know how to spell a word, just make your best guess. If you make a mistake, just cross it out.

Before we begin, let's read each word. Pencils should not be in your hand yet. Point to each word as I read it. (Read each word aloud to the students.)

Now, everyone turn back to the first page of your packet. You will have 3 minutes to write. Remember, this is not about finishing fast, this is about writing your best sentences. Do you have any questions?

Turn the page, pick up your pencils, and point your pencils to the first line. When I say “begin,” write one sentence for each picture. Remember to do your best writing. Begin. (Start the timer).

Monitor participation. If individual students pause for about 10 seconds or say they are done before the 3 minutes have passed, say to the whole class: ***Keep writing until the timer rings.*** This prompt can be repeated if students should pause again. If students reach the last page before the end of the 3 minutes, say ***Go back and check your work or add more details.***

When the timer rings, say: ***Stop. Raise your hand with your pencil in it.***

Caution: When this is given to an entire classroom, sometimes students try to make it a competition to see who can finish first. If this happens, remind students at the completion of the task that it is NOT important to finish all of the sentences and that students who write really good sentences might take longer than students who write short sentences. We expect students to write really good sentences. Also, some students might be upset if they can't finish a sentence when the timer rings. Again try to reassure them that it's OK if they didn't finish.

Shortened Directions for Progress Monitoring:

Say: ***Do you remember how we did this before?*** (Point to an item in the sample packet) ***You are going to write a good sentence for each picture. When you reach the end of a page, continue on to the next page.*** (Show the students what you mean with the sample copy).

Keep writing until I ask you to stop. Remember to do your best work. If you don't know how to spell a word, just make your best guess. If you make a mistake, just cross it out. Before we begin, let's read each word. Point to each word as I read it (Read each word aloud to the students. Make sure they follow along).

Now, turn back to the first page and point your pencil to the first line. When I say “begin”, write one sentence for each picture. Make sure all the students are ready to start and say: ***Please begin writing*** (Start the timer set for 3 minutes).

Monitor students' participation. If individual students pause for about 10 seconds or say they are done before the 3 minutes have passed, say to the students: ***Keep writing until the timer rings.*** This prompt can be repeated if students should pause again. If students reach the stop page before the end of the 3 minutes, quickly mark the time on the stop page.

When the timer rings, say: ***Stop. Raise your hand with your pencil in it.***”

Lesson Schedule by Group

Week		Day 1	Day 2	Day 3	Day 4	Day 5
1	<i>3rd gr</i>	Lesson 1.1 plural -s	Lesson 1.2 plural -s	Lesson 2.1 3 rd person -s	Lesson 2.2 3 rd person -s	
	<i>2nd gr</i>	Lesson 1.1 plural -s	Lesson 1.2 plural -s	Lesson 2.1 3 rd person -s	Lesson 2.2 3 rd person -s	Review
2	<i>3rd gr</i>	Review	Lesson 3.1 -ed	Lesson 3.2 -ed	Lesson 4.1 -ing	
	<i>2nd gr</i>	Lesson 3.1 -ed	Lesson 3.2 -ed	Lesson 4.1 -ing	Lesson 4.2 -ing	2nd gr: Review School cancelled
3	<i>3rd gr</i>	Lesson 4.2 -ing	Review	Lesson 5.1 un-	Lesson 5.2 un-	
	<i>2nd gr</i>	Lesson 5.1 un-	Lesson 5.2 un-	Lesson 6.1 re-	Lesson 6.2 re-	Review
4	<i>3rd gr</i>	Lesson 6.1 re-	Lesson 6.2 re-	Review	NO SCHOOL	NO SCHOOL
	<i>2nd gr</i>	Lesson 7.1 -er (person)	Lesson 7.2 -er (person)	2nd gr: Lesson 8.1 School cancelled	NO SCHOOL	NO SCHOOL
5	<i>3rd gr</i>	Lesson 7.1 -er (person)	Lesson 7.2 -er (person)	Lesson 8.1 -ly	Lesson 8.2 - ly	NO SCHOOL
	<i>2nd gr</i>	Lesson 8.2 Lesson 8.1 -ly	Review Lesson 8.2 -ly	Lesson 9.1 -er/-est	Lesson 9.2 -er/-est	NO SCHOOL

Lesson Plan Sample

Total Session Length: 25 minutes

Materials: recorder, timer, picture cards, binder dry erase sheet, dry erase marker, word books, pencils

*Turn on audio recorder and say: **This is [your name] on [date] at [school] working with group number [#] on lesson [#].***

Take attendance for your group.

<u>Introduction and Goal Statement (set timer: 1 minute)</u>	
<u>Materials:</u> “rabbits” picture card	
<u>Instructor:</u>	<p>Hello! My name is [NAME] and we’re going to be working together on writing over the next several weeks. We will practice how to spell and write words and sentences so that it gets easier for you to put your ideas down on paper. We’re going to talk about the beginnings and endings of words and how to spell words correctly.</p> <p>Today we will learn about the word ending, “plural –s”. When we are talking about more than one thing, we put an “s” at the end of the word to show that we mean more than one thing.</p> <p>Here’s an example. If I wanted to tell you about more than one rabbit, I would say the word, “rabbits” with an “s” at the end [show “rabbits” example word card] so you know I’m talking about many rabbits. I might say, “I saw three <u>rabbits</u> on the playground today.”</p>
<u>Listening Activity (set timer: 2 minutes)</u>	
<u>Materials:</u> None	
<u>Instructor:</u>	<p>We’re going to start today’s lesson with a listening activity. I’m going to read a short story to you. When you hear a word that ends with a “plural –s”, I want you to give me a thumbs up. Let’s do a practice sentence. [Instructor reads the following practice sentence aloud.]</p> <p><u>Practice sentence:</u> “I have two ears.”</p>
<i>Notes:</i>	<i>Students should put thumbs up when they hear ‘ears.’ If not, prompt them to do so: ‘I heard an –s at the end of ‘ears’ so put your thumb up!’</i>
<u>Instructor:</u>	<p>Great! I said the word “ears”. “Ears” ends with “-s” and I was talking about two of them, so I know “ears” ends with a “plural –s”. Let’s listen to our story. Remember to give me a thumbs up when you hear a word with “plural –s” at the end.</p>

	<p>Read aloud: <i>The ducks knew it was time to lay their eggs. They went up into the hills where they would be safe from trucks driving on the roads. The ducks chose a spot where the plants were tall and hid their nest. Then the ducks waited for their eggs to hatch.</i></p>
Notes:	<p>Instructor reads short story, students put thumbs up for target plural –s words. Prompt if a student doesn't put thumb up at the right times. Provide direct, specific feedback on student responses: "Good listening," "Yes, there was a plural –s there," etc.</p>
<p>Word Sort Activity (set timer: 5 minutes)</p>	
<p>Materials: word sort picture cards</p>	
<p>Instructor:</p>	<p>Next, we are going to do a word sort activity. I'm going to show you a word and I want you to tell me if it has our "plural –s" in it. When I look at the word on the card, I'm going to look and see if the word has an "s" at the end and if it's talking about more than one thing.</p> <p><i>[Instructor models first.]</i> Let's look at our first word. I'm going to read the word on our card: "bats." I'm going to spell the word out loud by saying each letter: B-A-T-S, then I'm going to read the word again: "bats." I see that "bats" ends with an "s" and I heard myself say the letter "s" when I spelled the word. I know the word is talking about more than one bee so yes, this card has our plural –s! I'm going to put "bees" in the YES pile. Let's do another one.</p> <p>Our next word is "doll." I'm going to read it: "doll." I'm going to spell it: D-O-L-L. Then I'm going to read the word again: "doll." I see that "doll" does not end with an "s" and I did not hear myself say the letter "s" at the end, so no, this word does not have our plural –s. I'm going to put "doll" in the NO pile.</p> <p>Remember to read the word and spell the word, then read the word again. Be sure to look at the letters to see if there's a "plural –s" at the end.</p> <p>Ok, let's do some more together. <i>[Have students respond chorally.]</i></p> <p>Sentence Frame: "Let's read it: [WORD]. Let's spell it: [spell]. Let's read it again: [WORD]. Does this word have a "plural –s"?"</p> <p><i>Targets and foils:</i> Bags Computer Boys Cups Plate Games</p>

	Pages Cheese Days Nails
Notes	<i>Instructor shows remaining cards one at a time and has students chorally “read, spell, read again” each word—accept student responses as call outs or raised hands, or group responses. Make one pile of “yes” cards, one pile of “no.” Provide direct, specific feedback on student responses: “Good reading/spelling,” “I like the way you looked at the last letter in that word,” etc.</i>
Say It Another Way Activity (set timer: 3 minutes)	
Materials: dry erase marker, say it another way binder sheet	
Instructor:	<p>Now we are going to do an activity called “Say It Another Way.” I’m going to say a phrase and I want you to tell me how I can say that phrase another way using our plural –s.</p> <p>Here’s an example. How can I say, “more than one can” another way? [Write the word “can” on your binder protector sheet.] I know that when I want to show that I’m talking about more than one thing, I can add a plural “s” at the end of the word, so I can say, “more than one can” like this: <u>cans</u>.</p> <p>Let’s do some together.</p> <p><i>[Write the singular form of the target word on the clear binder protector sheet with the “Say It Another Way” heading on top with your dry erase marker. Ask students the sentence frame with each target word, and add the “plural –s” ending to the end of the target word on your binder sheet.]</i></p> <p><u>Sentence Frame:</u> “How can I say ‘more than one [TARGET WORD]’ another way?”</p> <p><i>Targets in singular form:</i></p> <ul style="list-style-type: none"> Truck Road Nail Sister Box Table Step Duck Egg
Notes	<i>Provide direct, specific feedback on student responses: “Good listening,” “I like how you put a plural –s at the end of that word,” etc.</i>
Affix Book Activity (14 minutes total)	

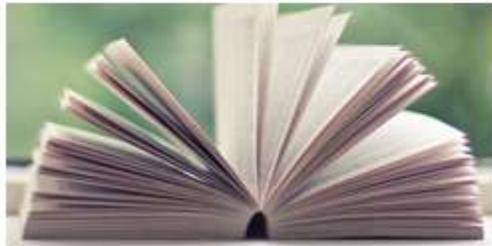
Materials: student word books, teacher word book, pencils	
Part 1: Finding words and giving definitions (set timer: 4 minutes)	
Instructor:	<p><i>[Hand out word list book and pencil to each student.]</i></p> <p>Next we are going to write in our word part books. First, we will look at our word list for today. I want you to find all the words in the list that end with our “plural –s” and circle them with your pencil. I will show you what I mean. <i>[Hold up your teacher book.]</i></p> <p>On our list we have eight words. I’m going to read each word and decide if has a “plural –s” at the end. When I find a word that ends in “plural –s,” I will circle it. Just like in our word sort activity, I’m going to read the word, spell it, then read it again.</p> <p>I’ll show you what I mean. Point your pencil to the first word. I’m going to read the word: “toys.” Then I’m going to spell the word: T-O-Y-S, then I’ll read the word again: “toys.” I heard an –s at the end of that word and I know “toys” means more than one toy, so I think yes, this word ends with a “plural –s.” What am I going to do to the word? <i>[Have students respond with “circle it.”]</i> Yes, I will circle the word “toys.” Everyone circle the first word “toys” on your paper.</p> <p>Let’s do the next word. The next word says “park”. Everybody read it: “park.” Now let’s spell the word together: <i>[all students spell chorally aloud]</i> “P-A-R-K.” Now read it again: “park.” Does this end in a “plural –s?” No, that’s right! Am I going to circle it? No, I’m not because it does not have a “plural –s” at the end. <i>[Repeat process with remaining words.]</i></p> <p>Sentence Frame: “Read it: [WORD]. Spell it: [spell word]. Read it again: [WORD]. Does this word have a “plural –s ?”</p> <p><i>Targets and foils:</i></p> <p>toys park holes bread bear candy lights birds</p>
Notes	<i>Have students chorally read and spell each word.</i>
Instructor:	Next we are going to tell what each circled word means. On our list, I know that “toys” means more than one toy. Let’s look at the next circled word. What does “holes” mean? What does “lights” mean? What does “birds” mean?

Notes	Accept volunteer answers. Complete the rest of the list. Provide direct, specific feedback on student responses: “I like how you explained that the plural –s means there’s more than one [WORD],” etc.
Part 2: Writing sentences (set timer: 10 minutes)	
Instructor:	<p>Now that we’ve circled all the words that have our “plural –s” in them, we are going to write a sentence with each one. I’ll show you what I mean. I will come up with a sentence with the word “toys”: “I play with my toys.” Everyone write that sentence on your papers. [Check to make sure each student has written the model sentence in their book.]</p> <p>Let’s look at our next word, “holes.” Who can tell me a sentence we can write with the word, “holes?” Good, let’s write that in our books. [Repeat process with remaining words—group generated sentences.]</p>
Notes	<p>Instructor models the first sentence, then has the group generate a good, simple sentence for each remaining word. Everyone writes the same sentence in their books. (In later lessons they will create their own sentences.) Repeat for each word.</p> <p>For error correction, focus on: 1) is the target word and target morpheme spelled correctly? 2) is the target word used correctly in terms of grammar and context? 3) are any words left out from the model sentence?, and 4) correct capitalization and punctuation. After those things are checked/corrected, then if there’s time you can correct the spellings of other words, fix other grammatical issues, word choice, etc.</p>
Wrap-Up (set timer: 1 minute)	
Materials: none	
Instructor:	<p>You guys did an excellent job today learning about “plural –s!” Who can tell me some words that have a “plural –s” in them? [Accept student verbal responses. Gently correct incorrect responses.] Remember, we are learning about how to spell and write different parts of words to become better writers. I will see you again on [DAY]. Great work!</p>

Stop the recorder.

Word Card Samples

pages



teacher

Fidelity of Intervention Implementation Checklist

Instructor:	Date:
Group:	Time:

Materials	1, 0, n/a	Notes
1. Timer		
2. Pencils		
3. Lesson plan script		
4. Word cards		
5. Student word part books		
6. Group attendance sheet		

Introduction	1, 0, n/a	Notes
7. Set the timer		
8. Review of last session's target		
9. Goal statement: today's target		
10. Definition of target morpheme		
11. Example of target morpheme		

Listening Activity	1, 0, n/a	Notes
12. Re-set the timer		
13. Give directions for activity		
14. Model the activity		
15. Present the example sentence		
16. Read story w/ clear voice, steady pace		
17. Provide specific feedback or error correction to students		

Word Sort	1, 0, n/a	Notes
18. Re-set the timer		
19. Give directions for activity		

20. Model: read it, spell it, say it again		
21. Present each word card		
22. Provide specific feedback to student responses		
Say It Another Way	1, 0, n/a	Notes
23. Re-set the timer		
24. Give directions for activity		
25. Model activity		
26. Present each target on the binder sheet		
27. Provide specific feedback to student responses		
Word Part Book	1, 0, n/a	Notes
28. Re-set the timer		
29. Give directions for activity		
30. Model read it, spell it, read it again		
31. Model circling the correct words		
32. Model orally defining each circled word		
33. Provide model sentence		
34. Provide specific feedback to student responses		
Wrap Up	1, 0, n/a	Notes
35. Re-state target morpheme for the session		
36. Ask students to name words with today's target morpheme in them		
37. Specific feedback to student responses		
38. Remind students of overall goal: to become better spellers and writers		
Total Completed implementation	_____ / 38 * 100 = _____ % fidelity of	

Summary Report for Teachers

Why was this study done?

The purpose of this study was to see if teaching “morphological awareness”, or the understanding and use of word affixes (re-, un-) and suffixes (-s, -ing, -er), could improve struggling writers’ spelling and sentence writing abilities.

The Intervention

Twenty seven students participated in the study.

Grade Level	Intervention	Comparison	Total
Second Grade	8	9	17
Third Grade	5	5	10
Total	13	14	27

The intervention was provided 4-5 days per week for 25 minute sessions over 5 weeks. Students learned morphological awareness through four activities: listening, word sort, say it another way, and sentence writing.

Intervention materials and lesson plans are available on Google drive:

https://drive.google.com/drive/folders/0B_Advk9wUSvjflNiVXZpdl8ybVpXOUJzMzM1OFZoZjEyeUtjOGZTczN5OVI0VVJST1JNNWM

How were students’ spelling and writing measured?

Students were pre-tested 2-4 weeks before the intervention with a sentence writing task (Curriculum-Based Measure of Writing: CBM-W) and the Spelling and Writing Samples subtests of the Woodcock-Johnson Test of Achievement-3 (WJ-3).

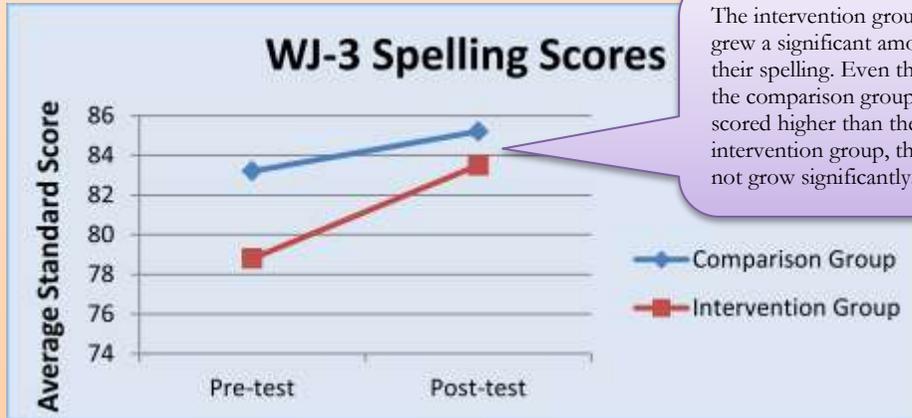
All students in the study were progress monitored twice a week using the sentence writing CBM-W task.

All students were post-tested using the same measures 4 weeks after the intervention ended.

Study Results

Students in the intervention group significantly improved their spelling from pre- to post-test. The comparison group did not.

Even though the two groups' pre-test scores were different from each other at the beginning, the groups were not statistically significantly different from each other. This means we can assume that any significant changes in test scores were because of the intervention, not because the groups were wildly different from each other at the start.



The intervention had a small effect on the spelling and writing scores for the intervention students. This means that the intervention made a small difference on the intervention group's test scores when compared to the comparison group. This is good news because it means the intervention was able to improve students' spelling and writing over a short period of time. When I run this intervention again in the future at other schools, I will deliver the intervention for a longer period of time to see if I can get a bigger effect on students' spelling and writing outcomes.

The younger and lowest performing students at the start of the study grew the most in spelling and writing.

Implications for teachers

It is possible to impact student spelling and writing over a relatively small amount of time with daily instruction in word parts, spelling, and sentence writing. This type of instruction shows promise for targeting struggling writers in early grades.

It is important to explicitly teach word parts at the word *and sentence level* of written language.

Thank you so much for allowing me to work with your students. If you have any questions or want any further information or collaboration on writing instruction, please contact me. Further writing assessment and intervention resources can be found at: <http://dbitlc.missouri.edu/>.

Abby Carlisle, aaa961@mail.missouri.edu

Teacher Questionnaire: Classroom Writing Instruction

Your Name: _____ **Grade taught:** _____

Thank you for taking the time to complete this questionnaire. Your responses will help me determine what type of instruction students are receiving during my intervention study. I will not share any information you provide with your administrators unless you give me permission to do so.

Please let me know if you have any questions or concerns.

Abby Carlisle, M.A. CCC-SLP
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314-218-5349

How would you describe the type of writing instruction you provide to students in your classrooms? (Examples: process approach, skills-based approach [teaching capitalization, grammar, etc.], Writer's Workshop model, 6 + 1 traits method, etc.)

Do you use a commercial program or published writing curriculum? If so, which one?

List the approximate percent of time you spend in each type of class grouping during writing instruction (e.g., 50%)

Whole group _____

Small group _____

Partners _____

Individual time with teacher _____

How much time in minutes do you spend per day teaching spelling skills?

How do you approach teaching spelling? (Examples: letter-sound correspondence, word parts, word families, etc.)

What types of writing activities do you students engage in during writing instruction? (Examples: story writing, drawing a picture and writing something to go with it, journal writing, writing letters to someone, etc.)

How much time in minutes do your students spend writing in an average day?

How often do you use the following instructional practices during writing? Circle the choice that most closely reflects your classroom practice.

Graphic organizers	Daily	Weekly	Monthly	Rarely	Never	Other _____
Teacher conferences	Daily	Weekly	Monthly	Rarely	Never	Other _____
Peer conferences	Daily	Weekly	Monthly	Rarely	Never	Other _____
Writing prompts	Daily	Weekly	Monthly	Rarely	Never	Other _____
Model writing for students	Daily	Weekly	Monthly	Rarely	Never	Other _____
Students planning	Daily	Weekly	Monthly	Rarely	Never	Other _____

Students revising	Daily	Weekly	Monthly	Rarely	Never
	Other_____				
Student goal setting	Daily	Weekly	Monthly	Rarely	Never
	Other_____				
Mini lessons	Daily	Weekly	Monthly	Rarely	Never
	Other_____				
Students sharing writing	Daily	Weekly	Monthly	Rarely	Never
	Other_____				
Monitoring student progress in writing	Daily	Weekly	Monthly	Rarely	Never
	Other_____				
Spelling instruction	Daily	Weekly	Monthly	Rarely	Never
	Other_____				
Handwriting instruction	Daily	Weekly	Monthly	Rarely	Never
	Other_____				

What else should I know about writing instruction in your classroom?

VITA

Abigail Carlisle was born and raised in St. Louis, Missouri. She received her B.S. in Speech and Hearing Science from the University of Illinois-Urbana in 2004, her M.A. in Speech-Language Pathology from Saint Louis University in 2006, and her M.Ed. in Education Policy & Management from Harvard Graduate School of Education in 2012. She completed her Ph.D. in Special Education with an emphasis in Learning Disabilities from the University of Missouri-Columbia in 2016.