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When Does Warmness Become Warmth?

An Investigation of Children's Vocabulary Acquisition Through Their Writing

by

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Abstract

This study examined differences between third and fifth graders in the use of morphologically complex words in written and oral storytelling, as well as how morphological awareness predicted the use of morphologically complex words in written storytelling after factors of phonology, spelling, and vocabulary were taken into account. Forty-one third graders and 28 fifth graders were administered a series of tests that assessed literacy abilities. Additionally, participants composed oral and written narratives based on a picture prompt. The stories were analyzed for the use of morphologically complex words. Results revealed that fifth graders used more morphologically complex words than third graders, and participants used more morphologically complex words in their oral stories than in their written stories. As a set, phonological awareness, spelling, morphological awareness, and vocabulary predicted the use of morphologically complex words, but no predictors were unique. Educational implications are discussed.

When Does Warmness Become Warmth?

An Investigation of Children's Vocabulary Acquisition Through Their Writing

Acquiring proficient literacy skills is a crucial part of a child's education. Because literacy is such a necessity in today's world, it is important to understand how a child employs different language skills to develop overall reading and writing abilities. This knowledge can help educators to assist students through the learning process. Until fairly recently, phonological factors, or the sounds that make up a language, have received the most attention in children's literacy acquisition (Carlisle, 2003). When a child "sounds out" an unfamiliar word, he or she is using phonological knowledge to read (Carlisle, 2000).

Phonological awareness, or an understanding of the different sounds that form words, is seen by many as the most important aspect of literacy acquisition. As a result, educators are generally more knowledgeable about phonemes and phonological knowledge than other types of literacy factors (Carlisle, 2003). With the educational programs that have stressed phonological awareness, one might think that phonological factors are the only important predictors of reading ability. The English system of writing is not purely alphabetic, however; rather, it is morphophonemic, meaning that words are represented in writing according to their meanings as well as the way they sound (Green, McCutchen, Schwiebert, Quinlan, Eva-Wood, & Juelis, 2003; Nagy, Berninger, Abbott, Vaughan, & Vermeulen, 2003). Morphemes are the smallest units of meaning in a word. For example, to make the word *head* plural, one adds the letter *s* to the root word

head, resulting in *heads*. While the word is pluralized with the addition of *s*, one pronounces the *s* more as a *z*. If the English language were purely phonetic, the plural form of *head* would be spelled *headz*. According to morphological rules, *s* is the letter commonly added to pluralize a word. Therefore, the English lexicon utilizes both phonological and morphological properties in the written representation of words. Because English is a morphophonemic language, phonological factors alone cannot explain the process of literacy acquisition.

Over the past decade researchers have been directing attention not only to the phonological aspects of reading and writing, but also to the morphological aspects. Research has shown that as children progress through elementary school, other literacy skills such as morphological awareness are important in reading and reading comprehension (Carlisle, 2003). As a result, researchers have examined morphological awareness as a contributor to literacy acquisition. Morphological awareness is a "conscious awareness of the morphemic structure of words and their ability to reflect on and manipulate their structure" (Carlisle, 1995, p. 194). More specifically, when someone is able to manipulate and decompose words into their constituent morphemes, he or she is said to have morphological awareness (Fowler & Liberman, 1995; Katamba, 1993). For example, the word beautiful can be broken down into two morphemes, with *beauty* as the stem meaning aesthetically pleasing, and *–ful*, the suffix that transforms the word into an adjective.

Importance of Morphological Awareness

Morphological awareness has the potential to assist children's reading in a number of ways. It makes them more aware of the system of writing, allows them to read and spell relatively long words, serves as a tool for breaking words down into chunks, creates more links between words in the mental lexicon, and increases children's analytical skills by requiring them to understand each constituent of a word to arrive at the correct definition (Carlisle, 2000; Nagy et al., 2003). During the intermediate school years, children encounter many new morphologically complex words. Nagy and Anderson (1984) predicted that readers can understand the meanings of 60% of the unfamiliar words they encounter by breaking the word down into its constituent morphemes. Having an awareness of the structure of words can assist in defining these unfamiliar words, as there is a significant correlation between morphological awareness and the ability to define words at certain grade levels (Carlisle, 2000). Anglin (1993) argued that morphological awareness provides a reader with skills for what he refers to as "morphological problem solving". Anglin's morphological problem solving allows a reader to figure out the meanings of words through his or her morphological knowledge. Anglin described potentially knowable words as words that have meanings which can be figured out through morphological problem solving. Using morphological problem solving to figure out the meanings of these potentially knowable words, one can increase both the size of one's vocabulary and the rate of its development. It is therefore not surprising that recent research

has investigated morphological awareness for its role in reading and writing. The purpose of the present study was to identify the developmental trajectory of the use of morphologically complex words in oral and written storytelling, as well as to investigate what language factors predict children's use of morphologically complex words in writing.

Types of Morphemes

Morphology consists primarily of two types of morphemes: inflectional and derivational. Inflectional morphemes are suffixes that preserve the root word but change its tense or quantity (Katamba, 2003). Changing the word *cook* to *cooked* requires the use of the inflectional morpheme *-ed*. An example of a morpheme that changes the quantity of a word is the letter *s*. Adding the morpheme *–s* to the root word *cat* creates *cats*, a word that indicates a quantity of more than one. It is important to note that in using inflectional morphemes, the meaning of the word does not change. Derivational morphemes, on the other hand, can change the meaning of a word, as well as change the part of speech (Katamba, 2003). An example of a derivational morpheme that changes the part of speech of a word is adding *–ly* to *slow* to form *slowly*. *Slow* is an adjective, but adding *–ly* changes the word to an adverb. An example of adding a derivational morpheme to change the meaning of a word is adding *ir-* to *regular* to form *irregular*. The addition of this morpheme transforms the word into its opposite. While the addition of this derivational morpheme may seem intuitive, other transformations are not as obvious, such as deriving the word *sign* from *signature*

and *write* from *written*. These transformations can be difficult because they often involve a change in the sound of the root word, an alteration known as a phonological shift. Derivations that do not involve a shift in phonology are known as phonologically transparent words.

Words that involve more than one morpheme are said to be morphologically complex. Many words are easily identifiable as morphologically complex words. For example, *drinking* can clearly be broken down into two morphemes: *drink* and *–ing*. In this case *drink* is a regular verb, and its tense is changed by adding *–ing*. English also contains many irregular word forms, however, and often when these words undergo a change in tense, they are not considered morphologically complex. For example, even though the word *run* undergoes a change in tense when it becomes *ran*, this resulting form is retrieved from memory as opposed to being built from morphological knowledge. For this reason, words such as *ran* that are the result of irregular inflections are not considered morphologically complex.

Children's Development of Syntax

Before reviewing the literature on children's development of morphological awareness, I provide a more general summary of grammar and syntax development. Once grammar and syntax development are understood, the development of morphological awareness can be placed in the same developmental framework.

Beginning at around the age of one and a half, children speak only short utterances that convey only essential information (Siegler, 1991). These utterances begin at a two-word stage, where very simple relationships are represented (Jay, 2003). For example, a child might say “Cat run” as opposed to “The cat is running”. These two-word sentences represent children’s very basic view of the world. Children at this age focus on meaning and do not include grammatical morphemes such as *–ed* and *–ing*. It is very common for young children to omit the appropriate grammatical structures that belong in the sentence, such as articles and morphemes. Even though their beginning sentences consist of only two words and do not contain grammatical morphemes, because children have a command of the order of the words, they are considered to have a very basic understanding of grammar at this age (Siegler, 1991).

Initially, children’s understanding of grammar focuses on meaning as opposed to parts of speech. They are more likely to produce sentences that express objects or events that are likely to occur in the real world (Siegler, 1991). As children develop and take on more complex views of the world, they form longer sentences and begin to show an understanding of grammatical morphemes. Grammatical morphemes encompass plurals, possessives, and morphemes such as *–ing*, *-ed*, and *un-*. Brown (1973) noted the development of 14 grammatical morphemes that children use. Table 1, taken from Jay (2003), lists the 14 grammatical morphemes in the order in which children learn to use them. It is

Table 1

Order of Acquisition of Grammatical Morphemes

Type	Example
1. Present progressive	Adam is eating.
2. Preposition *in*	Eve sit in chair.
3. Preposition *on*	Sweater is on chair.
4. Plurals	books
5. Irregular past tense	went, came, ate
6. Possessives	Adam's chair
7. Uncontracted copula	Cowboy is big
8. Articles	the doggie, a cookie
9. Regular past tense	Eve walked home.
10. Third person present regular	He plays.
11. Third person present irregular	He has some toys.
12. Uncontracted auxiliary	He was going to work.
13. Contracted copula	I'm happy.
14. Contracted auxiliary	Mommy's going shopping.

important to note that this list is specific to children learning English as their first language. Cross-language differences do exist (Jay, 2003).

One way of studying children's grammatical development is to measure the mean length of utterance (MLU). The MLU is measured by counting the number of morphemes a child uses during a certain period of time (Jay, 2003). Brown (1973) found that children's MLUs increase over development. Another method of studying morphological development is through the elicitation method (Jay, 2003). In studies that use the elicitation method, the experimenter asks the child to produce grammatical morphemes by having them fill in the blank. For example, the experimenter might say "I have one cat. If another cat comes, I will have two _____". In this example, the child would produce the word *cats*, adding the grammatical morpheme *–s* onto the word *cat* to form the plural version. Berko (1958), using the elicitation method, conducted the first study of children's development of grammatical morphemes. Results of her study are discussed in the following section on morphological development.

Miller and Chapman (1981) created a five-stage developmental model of children's grammar. Children start to combine words in stage I, beginning at approximately age one and a half. During stage II, children begin adding grammatical morphemes to their utterances. They begin asking *who, what, when, where,* and *why* questions and using negations (e.g., placing *no* at the beginning of their sentences to indicate that something is *not* happening) in stage III. During stage IV children begin producing complex sentences, or sentences that contain

more than one clause. This usually occurs at the age of two. During stage V, children produce new forms of complex sentences. Complex forms include object complementation, *wh*- embedded clauses, coordinating conjunctions, and subordinating conjunctions. Typically, children are forming most of the complex sentence forms by the time they are four years old (Jay, 2003).

Children's Development of Morphological Awareness

The focus of much research has been children's development of the knowledge of morphemes, especially as assessed through oral language. Research focusing on this area of development has generally divided the developmental pattern into three areas: development of the knowledge of inflectional morphology, derivational morphology, and compounds (Anglin, 1993).

Children's Development of Knowledge of Inflectional Morphemes

Using the elicitation method, Berko (1958) conducted a study to understand the development of children's grammar by asking preschool aged children to produce different forms of nonwords. She showed a picture to the child and pointed out what was in the picture. For example, she showed the child a picture of a creature and told the child "This is a wug". Then she would show the child a picture with two of the creatures and ask the child to complete the sentence "There are two ____". Even at the preschool age (as young as two), children were able to produce the new word "wugs" by adding the inflectional morpheme *–s* to the end of the "wug". However, the preschoolers experienced difficulty using more complex inflectional morphemes, such as *–es*, where the

word becomes more than one syllable. Results of Berko's study revealed that children are able to correctly produce forms of words they have never heard before and therefore could not have memorized; they must have an understanding of some basic grammatical rules. More specifically, preschool age children can understand and produce simple inflectional morphemes implicitly (that is, without a conscious awareness of grammatical rules) (Carlisle, 2003).

Brown (1973) observed that preschool aged children had a tendency to attach inflections to words that form irregular plurals or past tenses. An example of this tendency, known as overregularization, is saying "I runned" instead of "I ran". Because it is unlikely that children have seen these words before, as words like "runned" are not real words, overregularization supports the idea that children actively apply grammatical rules they have learned to new words and do not simply retrieve forms of words from memory. They are actively applying knowledge of inflectional morphemes to create new words that, while orthographically incorrect, demonstrate correct usage of the morphemes.

Understanding of inflectional morphemes continues to develop through the elementary school years. Rubin, Patterson, and Kantor (1991) found that, while normally achieving second graders do have morphological awareness of inflections, they have not mastered inflectional morphemes in either oral or written language. Bryant, Nunes, and Bindman (1997) found that it is not until third grade that students grasp a solid understanding of the inflection *–ed* to create the past tense.

Children's Knowledge of Compounds

Research indicates that children also begin developing awareness of compounds during the preschool age (Anglin, 1993, Berko, 1958). Berko (1958) assessed preschool aged children's ability to produce compound words. While adults in this study were able to use derivational suffixes to form pseudowords such as *wuglet*, children instead created compounds that demonstrated the same meaning present in the derivation, such as *baby wug*. Clark (1982) suggested that children often create new compounds by applying their knowledge of compounds that they already know. For example, a child could produce the word *treebottom* to describe the bottom of a tree if he or she is already familiar with the word *treetop*. Results of several studies suggest that very young preschool children can both comprehend and produce compounds (Anglin, 1993).

Children's Knowledge of Derivational Morphemes

Derivational morphology is generally the area of morphology with which children have the most difficulty, and it is often the last to begin to develop (Anglin, 1993; Berko, 1958; Clark, 1982; Wysoki & Jenkins, 1987). Carlisle (1996) proposed that somewhere between the first and fourth grades, children shift their focus away from inflectional morphemes and point it toward understanding derivational morphemes. While this development may begin during the preschool years, it continues to develop throughout upper elementary school, middle school, and even high school. As previously mentioned in the discussion of children's acquisition of compounds, Berko (1958) asked children to produce

derivations of words and found that instead of producing derivatives, children often provided compounds. For example, instead of saying that a dog covered with quirks is a *quirky* dog, they tended to form compounds, such as *quirk dog*. Adults, on the other hand, were successful in producing the correct derivations. Tyler and Nagy (1989) found that fourth graders have considerable knowledge of derivational morpheme and the knowledge of derivational suffixes continues to increase over the elementary school years.

Derivational morphology can involve phonological shifts, which may be one of the reasons children, especially poor readers, have more difficulty acquiring this type of knowledge. As discussed previously, a derivation is said to have a phonological shift if the word with the derivational morpheme sounds different from the base of the original word. For example, when the base word *heal* becomes *health*, it involves a phonological shift. Phonologically transparent shifts are transformations such as *sleep* to *sleepy*, where the base word retains its phonological properties. Carlisle (2000) found that when children were asked to create derivational forms of words, they performed better on phonologically transparent words than phonologically shifted words. This finding suggests that within derivational morphology, children first develop knowledge of phonologically transparent transformations.

Singson, Mahony, and Mann (2000) also found that knowledge of derivational suffixes increases with grade level and that the later elementary grades are an important time for developing derivational morphology, in both oral

and written language. They administered a derivational suffix task to children in grades three through six, where the child's task was to fill in a blank in a sentence with the word that had the correct derivational ending. For example, if given the sentence "The famous doctor performed the _____," the child would choose *operation* from four choices that differed in the final morpheme. The children were also administered a version of this task that used nonwords instead of real words. For example, if given the sentence "I could feel that _____," the child would choose *froodness* from four choices that differed in the final morpheme. Both tasks were administered in two ways. One way involved having the child read the sentences silently; the other way involved the researcher simultaneously reading the sentences aloud to the child. Overall, children did not perform as well on the pseudoword task as the real word task. Performance also increased with grade level, especially between grade three and the other grades. The differences were not as large between grades four and five, and the differences hardly existed between grades five and six. This suggests that during grade three, children are developing a greater sense of derivational morphology. Less emphasis is placed on phonological skills, and morphological awareness becomes increasingly important.

Development of Morphological Awareness as a Whole

Because many of the new words children encounter as they progress through the intermediate grades are morphologically complex words, it is reasonable to believe that understanding the meaning and orthography of words

(i.e., their morphological properties) is crucial with increasing grade-level (Verhoeven & Carlisle, 2006). Children are beginning to acquire morphological knowledge by the time they are preschoolers (Carlisle & Fleming, 2003). Deacon and Bryant (2006) found evidence that children use morphological knowledge as a spelling strategy, at least by the age of seven. In an interview Anglin (1993) provided students in the first, third, and fifth grades with different words, some of which were morphologically complex, and asked them to explain each word and use it in a sentence. He found that students' knowledge of morphologically complex words significantly increased with grade level. Anglin also found that children's ability to figure out the meaning of new words based on morphological properties they had already learned significantly increased from grades one to three, and again in grade five. Few first grade children were able to do this, but children in grades three and five showed improvement.

Mahony, Singson, and Mann (2000) administered a morphological awareness task to children in grades three through six. The children were asked whether two words in a pair were related. Some pairs of words were not related, such as *cat* and *catalog*. Other pairs of words were related, such as *atom* and *atomic*. Children either accepted or rejected the words as being related. Results indicated that the ability to correctly accept or reject pairs increased with grade level. It was more common for younger children to accept similar words as being related when they really were not, such as accepting that *buggy* and *bug* are related. On the other hand, older children improved in their ability to accept

related words, even if they were dissimilar. Specifically, Mahony et al. (2000) found that the children performed well in recognizing the relationships among words that were related to topics they were learning in school, such as understanding the relationship between *moon* and *month*. The older children were also often able to see relationships between words that were phonologically dissimilar, such as understanding that *breakfast* is related to *break*. Carlisle and Fleming (2003) found similar results; third graders were more attentive to word similarities and dissimilarities than first graders. They also presented first and third graders with the unfamiliar word *treeless* and asked them to explain the meaning. Very few first graders tried to explain the meaning of the word, but a relatively larger number of third graders provided reasonable definitions of the unfamiliar word. However, when the unfamiliar words became less phonologically transparent, third graders did not perform as well when asked to provide definitions. Results from these studies indicate that morphological awareness is continuing to develop during elementary and middle school years.

In sum, the importance of morphological awareness tends to increase with grade level. While phonological awareness is vital in early decoding, it plays a smaller role as children progress through the elementary grades. During the early elementary school grades, skills related to morphological awareness and phonological awareness tend to overlap (Jarmulowicz, Taran, & Hay, 2007), but past this point, morphological awareness becomes increasingly important (Nagy, Berninger, & Abbott, 2006). Nagy et al. (2006) found that from the fourth/fifth

grade-level to the sixth/seventh grade-level, there was relatively little growth in the contribution of morphological awareness to different literacy measures; however, from the six/seven grade-level to the eight/nine grade-level, there was a large growth in the contribution of morphological awareness.

Phonological Awareness vs. Morphological Awareness

It is important to distinguish between phonological awareness and morphological awareness. Phonological awareness is the knowledge of the sound structure of words (Jarmulowicz, Hay, Taran, & Ethington, 2008). For example, understanding that the word *dog* consists of a single syllable and is made up of three distinct sounds demonstrates phonological awareness. Morphological awareness is different from phonological awareness in that it is the understanding of word structure, not sound structure. While phonological awareness and morphological awareness are correlated with each other (Nagy et al., 2006; Singson, Mahony, & Mann, 2000), they are still separable literacy variables (Mahony, Singson, & Mann, 2000). It is suspected that phonological awareness is more important in decoding words at early ages, as it develops before morphological awareness (Carlisle & Nomanbhoy, 1993), but as phonological awareness becomes stronger, morphological awareness becomes increasingly important in decoding. Using path analysis, Jarmulowicz et al. (2008) found that phonological awareness develops before morphological awareness.

While phonological factors alone cannot account for the development of reading and writing abilities, it has been unclear as to how morphology uniquely

contributes to literacy. Morphological abilities may simply stem from phonological awareness, thus not truly contributing to reading abilities. Specifically, morphological awareness may not function independently of phonological awareness (Deacon & Kirby, 2004). For example, does a child produce the word *unresponsive* because of a conscious understanding of the prefix *un-* and suffix *–ive,* or simply because he or she has frequently heard the word pronounced and can recognize the appropriate phonemes? Would morphological awareness exist without phonological awareness? Previous research has attempted to separate the effects of morphology and phonology to determine its unique contribution to reading measures. Deacon and Kirby (2004) found that even after controlling for phonological factors, morphological awareness still significantly contributes to reading comprehension in grades three through five. The results also suggested that the contribution of morphological awareness to reading comprehension is at least as great as the contribution of phonological factors. Nagy et al. (2003) identified morphological awareness as a significant unique contributor to reading comprehension in second-grader at-risk readers after controlling for the effects of orthography, phonology, and oral vocabulary. The unique contribution of morphological awareness to different reading abilities reveals that it is a topic that warrants further study.

Models of Word Recognition

Before understanding the importance and role of morphological awareness in literacy tasks, it is helpful to have a background in different models of word

recognition. Models of word recognition can reveal how morphological awareness may play a part in identifying and interpreting words, both familiar and unfamiliar. There are several models of word recognition, but there is much uncertainty as to the role of individual morphemes in identifying morphologically complex words. Three well-known models of word recognition that most relate to morphological awareness are discussed in the proceeding paragraphs.

Direct-Access Model

According to the direct-access model, words are represented in the mental lexicon in their entirety. Short, morphologically simple words such as *write* and *invite* are represented in the same fashion as morphologically complex forms based on the same words, such as *written* and *uninvited*. If accessing the word *uninvited*, the reader would retrieve it from the mental lexicon in its entirety, and words such as *invite*, *invites*, *uninvited*, and *invited* would have separate representations (Reichle & Perfetti, 2003). Once the full-forms are accessed from the mental lexicon, individual morphemes can play a role in further processing, but it is only after the entire morphologically complex word is located that this can occur. Because people are able to differentiate between homophones (words that sound the same but have different meanings), there is evidence for the direct-access model (Jay, 2003). For example, despite *there*, *they're*, and *their* all having identical pronunciations, people can still read them and understand that they have different meanings. This finding provides evidence that words can be stored in their entirety in the mental lexicon.

Decomposition Model

The decomposition model is based on the idea that morphologically complex words are completely assembled based on their constituent morphemes. When presented with a word, the reader parses the word (breaks it down) and identifies each component (Reichle & Perfetti, 2003). According to this model, in order to identify the word *uninvited*, one must access the prefix *un-*, the root word *invite*, and the suffix *–ed* separately from within the mental lexicon and then assemble the morphologically complex word from these individual morphemes. Research has supported this model, as there is converging evidence that the morphological structure of a word has representation in the mental lexicon (Verhoeven & Carlisle, 2006). While this model is credible in that it explains how people can understand words they have never before encountered, its shortcoming is that it only accounts for words that have obviously recognizable morphemes. This model could not account for words such as *built*, where the inflected form is irregular and not the result of simply adding a morpheme. In other words, one cannot construct the past tense of *build* by accessing the root word plus a morpheme. Another mechanism must be present for readers to recognize and comprehend irregular word forms.

Dual-Route Model

The dual-route model combines the direct-access and decomposition models of reading and proposes that two routes exist that each lead to the retrieval of words (Carr & Pollatsek, 1985). This model posits that one can access the

mental lexicon via two paths: the direct path (lexical) or the grapheme-phoneme correspondence path (sublexical). The direct path involves accessing the word in its entirety, as supported by the direct-access model. According to this model, as skilled readers learn new words, they store them in the mental lexicon (Coltheart, Curtis, Atkins, & Haller, 1993). When a reader encounters words that are already learned, he or she retrieves these words from the mental lexicon. Both meaning and pronunciation are retained. Retrieving words via the mental lexicon is called the lexical path, and it is through the orthography of the word that the reader is able to retrieve it. However, new words are not stored in the mental lexicon, because readers have not previously encountered these new words. Therefore, a second method of understanding words must exist. This second method, called the sublexical path, involves the reader using grapheme-to-phoneme correspondence rules to grasp the meaning of the new word. Grapheme-to-phoneme correspondence rules involve the reader's understanding that written letters have different sounds. The sublexical path involves breaking the word that must be identified into its smaller parts. When a reader sees a word, the meaning of the word can be accessed via either of these two paths, but it is assumed that the sublexical path takes longer than the direct path (Jay, 2003). It may be that when readers encounter familiar words, they use the direct access path because it is faster, but when they come into contact with new words, they use the sublexical path (Forster & Chambers, 1973). It is also thought that when encountering words, there is a "race" between the two paths, with the faster path serving as the

primary means of retrieval. Some words may be better identified through decomposition, whereas others may be better identified through direct access (Reichle & Perfetti, 2003). The goal of many studies has been to understand how these two paths function in word identification.

Niswander-Klement and Pollatsek (2006) argued that word frequency and root frequency influence how the two paths operate. For shorter words they proposed that both paths are activated, but because the words are short and can thus be processed in a single fixation, people are quickly able to identify these words via the direct path. As a result, while the compositional path is activated, it is not needed and has little to no role in the identification of short words. For longer words, Niswander-Klement and Pollatsek found support that the compositional path is the preferred path. They proposed that the reason for this is because longer words are more difficult to process in a single fixation, thus slowing access via the direct path and making access via the compositional path more likely. They also noted that for longer words, the initial fixation often does not occur at the beginning of the word but further into the word, providing easiest processing for the root word. Once the root word is processed, it is then possible to assemble the longer word with knowledge of morphemes. The dual-route theory of reading is thought to be more credible than either the direct access or decomposition models, and it reveals how morphological awareness could quicken word retrieval and understanding.

Processing of Morphologically Complex Words

Processing morphologically complex words involves the integration of many linguistic factors, including semantics, grammar, phonemes, and spelling (Carlisle, 2003). Carlisle's review of the role of morphology in learning to read (2003) provided an excellent example that thoroughly captures the linguistic skills that play a role in identifying morphologically complex words. I will use her example to demonstrate these linguistic skills. Suppose a sixth grader is reading her social studies book and reads the sentence, "The harsh winter storms resulted in the migration of the tribe to a new locality." She is not aware of the meanings of all the words in this sentence, but she can use her linguistic abilities to attempt to help interpret the sentence as a whole. First, she sees two words that are rather unfamiliar to her: *locality* and *migration*. After sounding out these two words, she hears the similarity of *local* and *locality*, as well as *migrate* and *migration*. As a result of the phonological similarities, coupled with the similarities in spelling (orthography), she surmises that these words are related in meaning. The student might also be familiar with the suffix *–ion*, knowing that this suffix transforms words into nouns. While the suffix or the preceding article "the" may play a role in her identification of the word as a noun, it is primarily the root word *migrate* that allows her to guess the meaning of the word *migration*. From this example it is easy to see how morphological processing is an interactive process that involves semantics, phonology, and orthography.

Morphological Awareness and Word Recognition

Carlisle and Stone (2005) found that both lower and upper elementary school children were more accurate at reading derived, phonologically transparent morphologically complex words than pseudoderived words. For example, when they presented children with words that had two syllables and two morphemes, such as *hilly*, the children read the words more accurately than when they presented them with words that had two syllables and only one morpheme, such as *silly*. While the word hilly and silly look and sound alike, *hilly* has both a base morpheme (*hill*) and a suffix morpheme (*-y*). The word *silly* has only one morpheme, and thus does not provide children with an opportunity to break the word down into its constituent morphemes. Carlisle and Stone matched the derived and pseudoderived words for spelling and word frequency. This was done so that participants would not read the derived words more accurately simply because they appeared more frequently in English or because the derived words were easier to spell than the pseudoderived words. Additionally, Singson, Mahony, and Mann (2000) found that morphological awareness is an independent factor in predicting reading ability, even after the effects of verbal short term memory are taken into account. They also found significant correlations between children's derivational morpheme knowledge and reading abilities in grades three through six. The results of these studies suggest that children use knowledge of base morphemes to assist in the recognition of words.

Morphological Awareness and Spelling

One area of investigation has been the relationship of morphological awareness to a child's spelling abilities. Singson, Mahony, and Mann (2000) assessed children in grades three through six for multiple language abilities and found that a greater knowledge of derivational morphology is associated with a greater ability to decode English words in terms of their spellings. Nunes, Bryant, and Bindman (1997) developed a five-stage spelling model. According to their model, phonological awareness is the most important predictor of spelling during the first three stages. Children rely almost solely on the way a word sounds when attempting to spell it, which often results in an orthographically incorrect but phonetically correct spelling of the word. As children enter the later stages of the model, however, they develop an explicit understanding of grammar and morphemes and thus rely on morphological rules when spelling. Nunes, Bryant, and Olsson (2003) further investigated the role of morphological awareness in spelling in a study of phonological and morphological intervention programs. The intervention programs involved teaching children morphological or phonological distinctions. Hypothesizing that morphological awareness provides children with an understanding of morpheme boundaries, which in turn assists in word pronunciation, they created four different intervention programs: phonological awareness; phonological awareness with a writing emphasis; morphological awareness; and morphological awareness with a writing emphasis. Over 12 weekly sessions, the researchers taught groups of children explicit understanding

of morphological or phonological rules through games. The games were only played orally in two of the intervention programs; in the other two programs that had a writing component the children were taught how to incorporate their morphological or phonological knowledge into writing as well as speaking. While all four intervention groups led to improved performance on a standardized reading test, the two intervention programs that stressed morphological awareness produced improvements in spelling whereas the intervention groups that stressed phonological awareness did not. Nagy, Berninger, and Abbott (2006) studied the effects of morphological awareness on spelling and found that it made a unique significant contribution to spelling for students in grades four through nine. It is clear from previous research that morphological awareness is related to spelling abilities.

Morphological Awareness and Reading Comprehension

In addition to examining the role of morphological awareness in spelling, past research has also investigated the relationship between morphological awareness and reading comprehension (Carlisle, 2000; Deacon & Kirby, 2004; Nagy et al., 2003; Nagy, Berninger, & Abbott, 2006). Carlisle proposed that morphological awareness is very important during the middle school years; to help clarify its role, she investigated the use of morphological awareness in reading comprehension and vocabulary in third and fifth graders. Fifth graders performed better than third graders on all three morphological tasks and their morphological task scores were significantly correlated with reading achievement

(the three morphological tasks accounted for 55% of the variance in reading comprehension and 53% of the variance in vocabulary). For third graders, only one of the morphological tasks was significantly correlated with reading achievement (the three morphological tasks accounted for 43% of the variance in reading comprehension and 41% of the variance in vocabulary). The results of this study suggest that morphological awareness significantly contributes to reading comprehension at both the third and fifth grade levels.

Nagy et al. (2003) used structural equation modeling to see how phonological factors, orthographic factors, and morphological factors predicted reading comprehension in at-risk readers and writers. They found that morphological awareness was the strongest predictor of reading comprehension for at-risk second grade readers and at-risk fourth grade writers. For the second graders morphological awareness accounted for the greatest unique variance in reading comprehension of all the language factors studied (phonological, orthographic, morphological, and oral vocabulary). While morphological awareness did not account for any of the unique variance in reading measures for the fourth grade at-risk writers, it was significantly correlated with reading comprehension. Nagy, Berninger, and Abbott (2006) found that morphological awareness made a significant unique contribution to reading comprehension for students in grades four through nine. Nunes, Bryant, and Olsson (2003) studied the effects of their intervention groups on reading comprehension in addition to spelling, and found that, although weaker than the spelling effects, reading

comprehension improvements were present in the groups that emphasized morphological awareness. Larsen and Nippold (2007) also found that understanding the role of morphemes in words is related to reading abilities. They asked children in the sixth grade to provide the meanings of different words, and they found that some of the children used morphological analysis to provide definitions of low-frequency words. They also administered a morphological analysis task to the students, and the results indicated that better performance on the morphological analysis task was associated with a greater understanding of word meaning and better reading comprehension. From the findings of past research it is clear that morphological awareness is related to reading comprehension in grade-school children.

In sum, morphological awareness is directly related to a variety of literacy skills, including word recognition, decoding, spelling, and reading comprehension. These relationships have been identified in grade levels ranging from early elementary school to middle school, and even preschoolers have shown an understanding of morphological awareness.

Writing Model

Hayes and Flower (1986) developed a model of writing with three processes: planning, translating, and reviewing. Planning is a reflective process that involves pre-writing tasks such as decision making and goal setting (McCutchen, 2006). For example, in Carlisle's spontaneous writing task, after being shown the picture prompt, the participant first has to think about what he or

she would write before beginning the physical act of writing. Translating, the second process, involves text generation and transcription. Text generation involves transforming thoughts and ideas into language, such as by retrieving information from long-term memory (Jay, 2003). An overlap exists in the cognitive processes involved in the text generation stage of translating and the production of oral language (McCutchen, 2006). The translating process also involves transcription, which refers to the physical act of writing to represent the text; this stage does not overlap with the cognitive demands of oral language. Text generation and transcription are two processes that do not necessarily develop at the same rate (Bernigner, Fuller, & Whitaker, 1996). The third process, reviewing, is the time in which the writer evaluates and revises what he or she has already written. This can entail making mechanical changes such as punctuation, as well as content changes. The reviewing process is often difficult for less skilled writers, as it can require the writer to change what he or she has already devoted much effort to writing (Jay, 2003). While this model of writing consists of three distinct cognitive processes, one process may interrupt or become a part of another; the processes are interactive (Berninger, Fuller, & Whitaker, 1996).

In addition to the three cognitive processes involved in writing, there are three other features of writing that are important to understand: task environment, long-term memory, and working memory (Jay, 2003). The task environment consists of the writing assignment and a way of storing the writing. The long-term memory component involves the writer knowing about not only the topic of the

writing, but also how the reader will respond to his or her writing. The working memory component involves the three previously discussed cognitive processes of planning, translating, and reviewing (Jay, 2003). As evidenced by Hayes' and Flower's model (1986), writing is a more cognitively demanding process than reading. It involves both language and cognitive resources, such as working memory (Jay, 2003). The physical component of writing places a stronger demand on working memory, which uses resources that could otherwise be used for planning oral language, such as finding the most effective and appropriate words (McCutchen, 2006). While writing is a difficult task, morphological awareness could facilitate the process by providing children with the tools needed to access a broader vocabulary while writing, making it easier for them to find the words in long-term memory that will convey their ideas (Green et al., 2003). In addition to reading comprehension, morphological awareness can also aid children in writing tasks.

Writing Development in Children

While Hayes' and Flower's writing model can explain skilled adult writing, it is less effective in explaining children's writing development. Therefore, researchers have proposed modifications (Berninger, Fuller, & Whitaker, 1996). First, the text generation process in Hayes' and Flower's model was further broken down into the text generation of words, sentences, and paragraphs. This breakdown allows for individual differences to be better

considered, because there is great variability within an individual's ability to produce words, sentences, and paragraphs (Berninger, Fuller, & Whitaker, 1996).

Additionally, gender differences must be considered in the model of children's writing development. Olinghouse (2008) found that gender is a significant predictor of narrative writing fluency, with females using more words in their stories. Berninger and Fuller (1992) found that in elementary school grades boys have more oral verbal fluency, but girls have better writing skills such as the number of words they can write under a certain time limit. While gender was not considered in Hayes' and Flower's adult writing model (1986), it should be taken into account in explaining the process of children's writing development.

Morphological Awareness and Writing

Many studies have investigated morphology in reading and spelling (Carlisle, 2000; Deacon & Kirby, 2004; Nagy et al., 2003; Nunes, Bryant, & Bindman, 1997; Nunes, Bryant, & Olsson, 2003), but fewer studies have examined morphological awareness in writing (Carlisle, 1996; Green et al., 2003; Nagy et al., 2003; Rubin, 1991; Rubin, Patterson, & Kantor, 1991). In early grades educators emphasize reading, but as children progress in school, writing plays an increasingly important role in their education. To speak fluently, one must have an implicit understanding of morphological rules (Rubin et al., 1991). Derivational and inflectional morphemes are often required to produce the correct word, and it is necessary to be able to manipulate these morphemes and

understand their appropriate use. Writing requires the same implicit awareness as well as an explicit understanding of morphemes and orthographic properties of words. Rubin (1991) hypothesized that this explicit understanding of morphemes is what sets proficient writers apart from poor writers.

Rubin et al. (1991) assessed implicit and explicit morphological awareness in normally achieving second graders, language-learning-disabled second graders, and adults with literacy problems. The morphological awareness scores of the adults with literacy problems did not significantly differ from either second grade group, well below the expected score for adults on both the implicit and explicit morphological awareness tasks. Rubin et al. (1991) also administered two writing tasks: a dictated sentence task and a spontaneous writing task. They found that morphological errors in writing corresponded to measures of both implicit and explicit morphological awareness in oral language. The normally achieving second graders scored the highest on both measures of morphological awareness, and they also made the fewest number of errors in adding inflections to the end of words in the dictated writing task. The language-learning-disabled second graders, the group that had the lowest scores on the morphological awareness assessments, made the greatest number of morphological errors in the dictated writing task. For the spontaneous writing task, the normally achieving second graders rarely made morphological errors. In contrast, the language-learning-disabled second graders and the adults with literacy problems both made significantly more errors in the spontaneous writing task than the normally

achieving second graders. It appears that the adult group, despite having had much more exposure to both oral and written language than the normally achieving second graders, lacked not only greater knowledge of morphemes than the second graders; they also had more difficulty applying their morphological knowledge to writing.

The results of this study suggest that maturation and exposure do not necessarily increase morphological awareness and while the deficits may not be as apparent in oral language, they are very apparent in written language. One implication of this study is that even if a person seems to possess oral morphological skills, it is still important to examine morphemes in writing to have a clearer picture of understanding of morphological knowledge. A second important implication is that, because maturation and exposure are not ameliorating morphological deficits, explicit instruction in morphological awareness may be beneficial. The study of Rubin et al. (1991) was the basis for several later studies on the use of morphologically complex words in writing.

Carlisle (1996) administered a spontaneous writing task to non-learning-disabled and learning-disabled second and third graders, looking at the frequency and accuracy of the use of morphologically complex words. One finding of interest was that third grade students more often wrote a narrative of the picture that used the past tense, whereas second grade students more often wrote a present tense description of the picture. This distinction is important, because use of the past tense of regular verbs requires a greater knowledge of morphologically

complex words, mainly the addition of the inflectional morpheme *–ed*. The number of students using past tense, as well as the number of students using compound words, increased from second to third grade. Additionally, third graders used significantly more morphologically complex words than second graders. It is also worth noting that the second graders made more errors in using morphologically complex words than third graders. Carlisle found a significant correlation between a morphological awareness task and the use of morphologically complex words in the spontaneous writing task.

Green et al. (2003) examined differences in writing among third and fifth graders in a study that used a cross-sequential design, measuring students' abilities in both the fall and spring. They instructed the students to write a 15-minute narrative about a provided picture. Results indicated that the types of morphologically complex words used most frequently varied across age (e.g., inflectional vs. derivational). Both third and fourth graders used more inflectional forms correctly than derivational forms. When students did use derivational forms, fourth graders used them more accurately than third graders. Examples of derivational forms include adding *–ly* to change an adjective into an adverb (e.g., *quick* to quickly) and adding *–ful* to turn a verb into an adjective (e.g., *wonder* to *wonderful*). One important finding was that by the spring of the fourth grade, there was not such a large difference in accurate use of derivational and inflected forms in the children's writing. The results of Green et al. (2003) provide insight into morphological development in children's writing, but more research is

necessary to understand how exactly morphology is employed in the writing process.

Summary of Literature

From the literature, it is clear that morphological awareness has the potential to enhance literacy skills in a number of ways. Specifically, researchers have found relationships between morphological awareness and spelling, reading comprehension, and decoding. While fewer studies have investigated the relationship between morphological awareness and writing, it has been found that children continue to develop the ability to use morphologically complex words in writing throughout elementary school. It is predicted that the role of morphological awareness in literacy development is more important at later grade levels than earlier grade levels, and this increased emphasis on morphological awareness could lessen the role of phonological awareness in literacy development. Additionally, as children progress through elementary school, higher expectations are placed on children's writing abilities. Due to the increasing role of morphological awareness, coupled with the increasing demands on children's writing skills, morphological awareness as it pertains to writing is a topic that should be further studied.

Present Study

Two main questions were addressed in the present study: How do third graders compare to fifth graders in the use of morphologically complex words in oral and written storytelling; and how do factors of morphological awareness,

phonological awareness, spelling ability, and vocabulary predict the use of morphologically complex words in written narratives? The first question was addressed by administering oral and written storytelling tasks to third graders and fifth graders; stories were analyzed for the use of morphologically complex words. I hypothesized that both third and fifth graders would use more inflectional morphemes than derivational morphemes but this difference in morpheme use would be smaller for fifth graders. I also hypothesized that fifth graders would use more derivational morphemes than third graders. Lastly, I hypothesized that both third and fifth graders would use more morphologically complex words in the oral storytelling task than in the written storytelling task, because oral storytelling does not involve the extra step of transcription, a stage where children might have difficulty expressing these more complicated words. Morphologically complex words included words that contained inflectional morphemes, derivational morphemes, contractions, and possessives as indicated by an apostrophe.

The second question was addressed by administering a set of tests that assessed morphological awareness, phonological awareness, spelling ability, and vocabulary. I hypothesized that for both grade levels, even after other language factors were taken into account, morphological awareness would still significantly predict the use of morphologically complex words in written narratives. I further hypothesized that morphological awareness would play a more important role for fifth graders than for third graders, because much of the past research suggests

that as children enter higher grade levels, words become more morphologically complex and students rely more exclusively on morphological factors in reading and writing (Carlisle, 2000; Green et al., 2003; Nagy, Berninger, & Abbott, 2006).

The present study expands upon the research of Carlisle (1996) and Green et al. (2003) by identifying where in the writing process morphological awareness may be hindered. Just because a child does not use morphologically complex words in writing does not mean that he or she lacks morphological awareness or the ability to produce morphologically complex words. Because writing is a more cognitively demanding process than speaking, it could be that a child is capable of producing morphologically complex words but does not yet have the ability to transcribe the words into writing. Comparing an oral narrative with a written narrative could indicate whether a child can spontaneously produce morphologically complex words because, unlike the written narrative, the oral narrative does not require the extra stage of transcription. First, one could see whether or not the child can spontaneously produce morphologically complex words in an oral narrative. Then, one could see whether or not the child was capable of transcribing them into writing. Examining the possible disparity between the use of morphologically complex words in oral and written narratives could provide insight into where in the writing process morphological awareness is blocked. Depending on whether the transcription of writing is inhibiting proper

morphological use, teachers could find ways to incorporate more directed transcription practice into everyday writing lessons.

The present study also differs from Carlisle (1996) and Green et al. (2003) in that participants were provided with time to review their written narratives before submission. Because writing is a cognitively demanding function, it was possible that children could make careless errors, such as forgetting to add the proper inflectional morphemes. A child may in fact know how to use morphemes to correctly produce a word, but the extra demand of writing could detract from the child's attention, making it appear as if the child misused a morphologically complex word. Carlisle (1996) suggested that a future study provide a revision period after administering the writing task to participants, as this would help to reduce the chances of a child masking his or her true morphological ability with careless mistakes. The results of the present study help to provide an understanding of the relationship among different language factors as they pertain to writing, with implications for teaching methods at different grade levels, such as whether explicit instruction in morphological awareness could be beneficial for students' writing.

Method

Participants

Participants were 41 third graders and 28 fifth graders from private schools and summer camps in the Pioneer Valley. Because the data collection began in the spring and ended in the winter, the grade level differed depending on the time of year. For the purposes of this study, a third grader was defined as someone in the spring of third grade or the fall of fourth grade, and a fifth grader was defined as someone in the spring of fifth grade or the fall of sixth grade. Three main reasons exist for having chosen this particular sample. First, these two grade levels have represented important changes in reading and writing development according to previous literature. Second, I wished to remain consistent with past research that has investigated the use of morphologically complex words in writing. Most of these studies have involved comparisons between third and fifth graders or fourth and fifth graders.

Parent permission slips were sent home with students at the appropriate grade levels (see Appendix A). There were 30 male and 39 female students included in the data set. For third graders alone, there were 20 males and 21 females, and for fifth graders alone, there were 10 males and 18 females. Participants had an average age of 10.35 (*SD* =1.16). The average age of a third grader was 9.52 (*SD* = .64), and the average age of a fifth grader was 11.58 (*SD* = .40). Approximately 70% of the sample was Caucasian, 12% Biracial, 7% African American, 7% Hispanic, and 3% Asian American. One percent of the sample did

not identify a racial background. When asked what language was spoken most frequently at home, approximately 90% reported English, and 4% reported Spanish and English together. Italian, Jamaican, Vietnamese, and Spanish alone each comprised 1% of the sample. As a measure of socioeconomic status, each school or program was asked to provide the number of students on reduced or free lunch programs. For three of the schools, the percentage of students in either of these programs ranged from 9% to 12%. Data were not available for the remaining schools and programs.

Materials

Participants were administered two storytelling tasks and a battery consisting of several tests that assess language abilities. These tests included three tests of morphological awareness, a test of phonological awareness, a test of spelling, and a test of vocabulary. I administered the assessments to approximately 60% of the participants; research assistants whom I supervised administered the assessments to the remaining participants. The storytelling tasks are described first, followed by the language tasks.

Storytelling Tasks

Two storytelling tasks were administered, where participants were instructed to tell orally or write a story about one of two pictures: a girl with a monkey or a beach with dinosaurs (see Appendix B). These pictures were taken from children's books by Smee (1989) and Donnelly (1989), respectively. The stories were counterbalanced for both the picture and type of storytelling task.

During the written storytelling task, the person administering the test instructed the participant to write a story about the picture. The participant had five minutes to write the story and was given a black pen for the task. At the end of the 5-minute writing period, the participant was given a 1-minute revision period. The person administering the test provided the participant with a blue pen for revisions. The purpose of the pen change was to allow the coder to differentiate between words written during the 5-minute writing period and the 1-minute revision period. The use of morphologically complex words was coded, as well as any corrections to morphologically complex words the participant made during the revision period. Specifically, each participant received a score for both inflectional and derivational morphemes in each task. Each score was the sum of inflectional or derivational morphemes used in the narratives. The number of revisions that involved morphological corrections was also recorded.

For the oral storytelling task, participants were shown a picture prompt of either a girl and a monkey or dinosaurs on a beach (see Appendix B). The person administering the test instructed the participant to tell a story about the picture. Instructions for this task can be found in Appendix B. Because writing a story takes considerably longer than telling an oral story, participants were given approximately 1 ½ minutes to tell their stories. Stories were tape recorded and later transcribed for coding. Each participant was shown a sample picture prompt and read a sample story immediately before the first storytelling task he or she completed, whether it was the written or oral task (see Appendix B). The

participant was not given a sample before the second storytelling task he or she completed.

Morphological Awareness

To assess morphological awareness, three tests were used. The first test, called the Test of Morphological Structure: Derivation, assessed knowledge of morphological structure and was used in Carlisle (2000). Specifically, it involved assessing the participant's knowledge of derivational morphemes. All questions followed the same format. The person administering the test read a target word aloud. She then read a sentence but excluded one word from the sentence, which was replaced with the word "blank". The participant's task was to produce the missing word by using his or her knowledge of derivational morphemes to change the target word to make it fit in the blank. An example is "Farm. My uncle is a _____." In this scenario, the participant said "farmer" and received 1 point, or he or she incorrectly answered the question and received no point. The test was administered orally and the participant responded orally. Participants had a practice round with two sentences before beginning the task, which contained 33 sentences (see Appendix C). At no time did the participant see a written form of this task. Administration was discontinued when a participant answered six items incorrectly. Five new items were added to the assessment used in Carlisle (2000) in order to prevent a ceiling effect for the fifth graders.

The second test, called the Test of Morphological Structure: Production, assessed the participant's ability to use derivational morphemes to decompose

words. This test was similar to the first morphological test in structure, in that the participant was provided with a target word followed by an incomplete sentence. An example was “Driver. Children are too young to _____.” The participant said “drive” and received 1 point, or he or she incorrectly answered the question and received no point. Once again, the participant had a 2-sentence practice round before beginning the task, which also contained 33 sentences (see Appendix C). This task was administered and responded to orally, and at no time did the participant see any written form of the task. Administration was discontinued when a participant answered six items incorrectly. Five new items were added to the assessment used in Carlisle (2000) in order to prevent a ceiling effect for the fifth graders.

The final test of morphological awareness, called the Suffix Choice Test, assessed a participant’s ability to manipulate morphemes using pseudowords (Berninger, Abbott, Billingsley, & Nagy, 2001; Berninger & Nagy, 1999). This test was based on the prior research of Mahony (1994), Singson, Mahony, and Mann (2000), Nagy, Diakidoy, and Anderson (1993), and Tyler and Nagy (1989, 1990). The participant was given a written form of the test, where he or she saw a sentence and four choices with which to fill in a blank. The person administering the test also read the sentence and four choices aloud to the child, so this task did not depend on the child’s ability to decode words. An example of an item on this task is “Our teacher taught us how to _____ long words”. For this item the participant was provided with the following choices: *jittling, jittles, jittled*, and

jittle. A response of "jittle" received 1 point; a response of one of the other answers received no point. This task consisted of 14 items (see Appendix C). Administration was discontinued when a participant incorrectly answered six items.

Phonological Awareness

Phonological awareness was measured using the Word Attack Subtest of the Woodcock Reading Mastery Tests – Revised (Woodcock, 1987). This test assessed a student's ability to decode 45 nonwords. Participants were presented with nonwords and instructed to read them aloud one at a time. Doing so tested the student's ability to analyze words phonetically. Participants were told at the beginning of the task that the pseudowords were not real words. A student received a point for each word that he or she pronounced correctly and completely (i.e., the student must have been able to read the word aloud fluently, not as disjointed syllables). The participant was not penalized for variations in pronunciation that were due to accents. The score a student received was based on the total number of correct responses. This test has a reliability of .87 (Woodcock, 1987). It contained a total of 32 items (see Appendix D). Administration was discontinued after a participant incorrectly answered six items.

Spelling

Participants' spelling abilities were assessed using the Wechsler Individual Achievement Test – Second Edition. This test assessed the participant's ability to spell dictated words. The person administering the test read aloud one word at a

time and provided a sentence for context. The participant wrote each word dictated on a sheet of paper provided by the test administrator. The words increased in difficulty as each word was read. Items 1-40 of the test were used (see Appendix E). The participant received 1 point for each correct response. The reliability of this test ranges from .93 to .94, depending on the age group being tested (Weschler, 1991). The test was discontinued after a participant answered a total of six items incorrectly.

Vocabulary

Participants' vocabulary was assessed using the Peabody Picture Vocabulary Test – Third Edition (Dunn & Dunn, 1997). During each round of this task, participants were presented with a card which had four pictures on it. The person administering the test dictated a stimulus word and instructed the participant to point to the picture that described that word. The word was not provided in the context of a sentence, and the participant was not told whether or not his or her response was correct. Each round of pictures increased in difficultly, and the test continued until the participant made eight or more errors on a particular set of items. Participants were provided with a practice round consisting of two questions before the actual test began (see Appendix F). The median reliability of this test is .94 (Dunn & Dunn, 1997).

Procedure

Participants were administered these tasks over a 2-day span with one session on each day. Each session lasted for approximately 20 minutes. Session

one included one storytelling task and half of the language tasks. Session two included another storytelling task and the remainder of the language tasks. All participants received the language assessments in the same order. The first session began with either an oral or written story, followed by the Spelling Task, the Morphological Awareness Tasks, and, if the participant had completed the oral storytelling task first, the Word Attack. If the participant had completed the written storytelling task first, the first day session ended with the Morphological Awareness Tasks. The second day consisted of the Word Attack if the participant had not already taken it on the previous day, followed by the Peabody Picture Vocabulary Test and the remaining storytelling task. The two storytelling tasks were counterbalanced for picture and storytelling type. Immediately following the second session, participants were asked to report some demographic information, which included date of birth, racial background, and the language most frequently spoken at home. Participants were tested in a quiet location. After each task participants received a small reward as compensation for their time and concentration.

Results

Reliability of Morphological Awareness Assessments

To my knowledge, no reliability analyses have been performed on the morphological awareness assessments used in this study. Before beginning any data analysis, I wished to compute the reliability for each test so as to not include unreliable measures in subsequent analyses. The reliabilities of the Derivation, Production, and Suffix Choice tests were all well above average, α = .94, .96, and .86, respectively. These reliabilities included the 10 additional items unique to this study. Because of the high reliabilities of these assessments, I included them in all subsequent analyses.

Descriptive Statistics of Predictor and Outcome Variables

The means and standard deviations of all predictors can be found in Table 2. The means and standard deviations of all outcome variables for written and oral stories can be found in Tables 3 and 4, respectively.

Correlations Among Literacy Assessments

One of my primary questions was how spelling, phonological awareness, morphological awareness, and vocabulary predict the number of morphologically complex words children use in their written narratives. A major component of this study is the investigation of developmental trends, so I also included age as a predictor. Because all of the assessments measured literacy skills, I expected them to be positively correlated. As expected, all of the predictor variables were positively correlated with the exception of phonological awareness and age, as

Table 2

Means and Standard Deviations of All Predictors

	M	SD
Spelling	33.19	6.08
Derivation MA	10.19	7.28
Production MA	22.30	8.82
Suffix Choice MA	8.07	3.95
MA Total	40.57	16.84
Phonological Awareness	23.83	5.38
Vocabulary	138.39	18.67

Table 3

Means and Standard Deviations of All Outcome Variables (Written Stories)

	M	SD
Total Morphologically Complex Words	11.41	6.14
Total Inflectional Morphemes	7.55	4.12
Total Derivational Morphemes	2.26	1.88
Proportion Morphologically Complex Words	.13	.04
Proportion Inflectional Morphemes	.09	.03
Proportion Derivational Morphemes	.03	.02
Unique Morphologically Complex Words	9.90	5.62
Unique Inflectional Morphemes	6.49	3.74
Unique Derivational Morphemes	2.00	1.72
Proportion Unique Morphologically Complex Words	.13	.04
Proportion Unique Inflectional Morphemes	.07	.03
Proportion Unique Derivational Morphemes	.03	.02
Total Number of Words	87.46	33.43

Table 4

Means and Standard Deviations of All Outcome Variables (Oral Stories)

	M	SD
Total Morphologically Complex Words	17.41	8.71
Total Inflectional Morphemes	11.84	6.01
Total Derivational Morphemes	2.29	2.11
Proportion Morphologically Complex Words	.14	.05
Proportion Inflectional Morphemes	.09	.03
Proportion Derivational Morphemes	.02	.02
Unique Morphologically Complex Words	14.04	6.60
Unique Inflectional Morphemes	9.61	4.44
Unique Derivational Morphemes	1.84	1.54
Proportion Unique Morphologically Complex Words	.11	.03
Proportion Unique Inflectional Morphemes	.08	.02
Proportion Unique Derivational Morphemes	.01	.01
Total Number of Words	130.68	61.61

shown in Table 5. Generally, these findings are consistent with past research, which has shown that literacy skills are positively correlated with one another, as well as age.

Additionally, I expected that the morphological awareness tasks (Derivation, Production, Suffix Choice) would be more highly related to one another than they were to other assessments. This was true for phonological awareness, as their correlations with phonological awareness were not as strong as they were with each other, but this was not true for vocabulary. While all correlations were highly significant, the correlations between the morphological awareness tasks and vocabulary were higher than the correlations among the morphological tasks. Despite this finding, because the three morphological awareness tasks were correlated, I thought it would be reasonable to combine the three scores from each task into a single score for each participant. In all subsequent analyses, this sum will be referred to as morphological awareness.

Correlations Between Literacy Assessments and Outcome Measures

Before performing regression analyses, I also examined the correlations between the predictor and outcome variables. Based on past research that has examined the relationships between literacy skills and writing ability, I expected positive correlations in all cases. There were several ways to quantify my outcome measure, each with a primary strength and weakness. First, I summed the frequencies of inflectional morphemes, derivational morphemes, compounds, and contractions in each participant's written narrative. This method of measuring

Table 5

Correlation Coefficients between Literacy Assessments

Tasks	1	2	3	4	5	6	7	8
1. Spelling	--	.41**	.54**	.52**	.58**	.75**	.66**	.31**
2. Derivation MA	--	--	.53**	.51**	.83**	.24*	.62**	.34**
3. Production MA	--	--	--	.57**	.89**	.43**	.71**	.37**
4. Suffix Choice MA	--	--	--	--	.76**	.46**	.63**	.29*
5. MA Total	--	--	--	--	--	.44**	.79**	.41**
6. Phon. Awareness	--	--	--	--	--	--	.46**	.08
7. Vocabulary	--	--	--	--	--	--	--	.44**
8. Age								--

Note: There were 69 participants included. *p<.05. **p<.01.

the outcome variable does not take into account the length of the narrative but is able to capture the exact number of times a child is using morphemes in his or her writing. From a developmental standpoint, inflectional and derivational morphemes are the two more interesting types of morphemes. Therefore, I also used the frequencies for each of these two morphemes as outcome measures. The correlations between the predictors and these frequency outcome measures are displayed in Table 6.

As previously stated, using the frequency as an outcome measure does not take into account the length of the narratives. Therefore, I also computed outcome measures as a proportion, where I summed the number of morphologically complex words for each participant and then divided by the word count of the story. Proportions control for story length but do not differentiate between participants who use more morphemes than others. For example, using the proportion method, a participant who used one morphologically complex word in a 10-word story would receive the same score as a participant who used 10 morphologically complex words in a 100-word story. While it would seem that these two children are at different writing levels, their scores would mask this difference in ability. Just as with the frequencies, I also decomposed the proportion variable into two separate measures: inflectional morphemes and derivational morphemes. Correlations between these predictors and the proportion outcome measures can be found in Table 7. As can be seen from Tables 6 and 7,

Table 6

Correlation Coefficients between Predictors and Frequencies of Morphologically Complex Words (Written)

Tasks	Total Frequency	Inflection Frequency	Derivation Frequency
Spelling	.47**	.47**	.22
Morphological Awareness	.34**	.36**	.17
Phonological Awareness	.44**	.43**	.19
Vocabulary	.46**	.63**	.29*
Age	.14	.13	.06

Note: There were 69 participants included. *p<.05. **p<.01.

Table 7

Correlation Coefficients between Predictors and Proportions of Morphologically Complex Words (Written)

Tasks	Total Proportion	Inflection Proportion	Derivation Proportion
Spelling	.30*	.22	.09
Morphological Awareness	.20	.22	.04
Phonological Awareness	.31*	.23	.03
Vocabulary	.20	.15	.10
Age	< .01	< .01	-.01

Note: There were 69 participants included. *p<.05. **p<.01.

the literacy assessments were more often significantly correlated with frequency measures of morphologically complex words than proportions.

In addition to using the frequency and proportion of all morphologically complex words, I also gave each participant a score for the unique morphologically complex words he or she used in the written narrative. This score was the sum of inflectional or derivational morphemes, but if the same morphologically complex word was used multiple times, it was only counted once. For example, if a child had just learned a new word, such as *wonderful*, he or she may have been more inclined to use the word several times. The repeated use of a morphologically complex word would not necessarily reflect the child's morphological awareness. To control for this tendency, I also performed analyses where repeated words were only counted as one morphologically complex word. All the correlations between the predictors and the frequencies of unique morphologically complex words are shown in Table 8. Correlations between the predictors and the proportions of unique morphologically complex words can be found in Table 9.

Interestingly, age was not correlated with any of the measures of written use of morphologically complex words. This is surprising, as age was significantly positively correlated with many of the literacy assessments. Proposed reasons for this finding are addressed in the Discussion. Because age was not significantly correlated with any of the written outcome measures, I did not include it in any of

Table 8

Correlation Coefficients between Predictors and Frequencies of Unique Morphologically Complex Words (Written)

Tasks	Unique Total Frequency	Unique Inflection Frequency	Unique Derivation Frequency
Spelling	.50**	.53**	.19
Morphological Awareness	.39**	.44**	.18
Phonological Awareness	.44**	.46**	.16
Vocabulary	.41**	.41**	.25*
Age	.20	.18	.12

Note: There were 69 participants included. *p<.05. **p<.01.

Table 9

Correlation Coefficients between Predictors and Proportions of Unique Morphologically Complex Words (Written)

Tasks	Unique Total Proportion	Unique Inflection Proportion	Unique Derivation Proportion
Spelling	.51**	.30**	.06
Morphological Awareness	.42**	.36**	.09
Phonological Awareness	.44**	.24*	.04
Vocabulary	.42**	.29*	.18
Age	.20	.07	.06

Note: There were 69 participants included. *p<.05. **p<.01.

the subsequent regression analyses where the outcome variable was a measure of written morphologically complex words.

Even though I did not plan to perform regression analyses with any oral morpheme use measure as the outcome variable, I still wished to examine how the predictors correlated with measures of oral morpheme use. I expected that all of the predictors would also be positively correlated with the measures of oral morpheme use. Just as with the measures of written morpheme use, there were four different ways to quantify oral morpheme use. The correlations of the predictors with the outcome measures of total frequency, total proportion, unique frequency, and unique proportion are shown in Tables 10, 11, 12, and 13, respectively. Morphological awareness and vocabulary were consistently correlated with the use of inflectional morphemes, both frequencies and proportions. Age was only correlated with the frequency measures of morphologically complex words, not the proportions. This is likely due to a lack of variability in the proportion measures.

Regressions of Literacy Assessments on Frequency of Morphologically Complex Words

For each of the written outcome measures, I performed a multiple regression with spelling, phonological awareness, morphological awareness, and vocabulary as the predictors. First, I ran a regression with the frequency of morphologically complex words in the written stories as the outcome measure. This score is the sum of inflectional morphemes, derivational morphemes,

Table 10

Correlation Coefficients between Predictors and Frequencies of Morphologically Complex Words (Oral)

Tasks	Total Frequency	Inflection Frequency	Derivation Frequency
Spelling	.09	.11	.16
Morphological Awareness	.22	.26*	.20
Phonological Awareness	< .01	.06	< .01
Vocabulary	.18	.24*	.12
Age	.33*	.22	.36**

Note: There were 69 participants included. *p<.05. **p<.01.

Table 11

Correlation Coefficients between Predictors and Proportions of Morphologically Complex Words (Oral)

Tasks	Total Proportion	Inflection Proportion	Derivation Proportion
Spelling	.12	.23	.09
Morphological Awareness	.17	.26*	.13
Phonological Awareness	-.06	.11	-.07
Vocabulary	.20	.34**	.09
Age	.28*	.15	.21

Note: There were 69 participants included. *p<.05. **p<.01.

Table 12

Correlation Coefficients between Predictors and Frequencies of Unique Morphologically Complex Words (Oral)

Tasks	Unique Total Frequency	Unique Inflection Frequency	Unique Derivation Frequency
Spelling	.15	.18	.23
Morphological Awareness	.24*	.28*	.22
Phonological Awareness	.08	.08	.12
Vocabulary	.21	.28*	.15
Age	.21*	.23	.34**

Note: There were 69 participants included. *p<.05. **p<.01.

Table 13

Correlation Coefficients between Predictors and Proportions of Unique Morphologically Complex Words (Oral)

Tasks	Unique Total Proportion	Unique Inflection Proportion	Unique Derivation Proportion
Spelling	.24*	.32**	.17
Morphological Awareness	.20	.28*	.16
Phonological Awareness	.05	.17	< .01
Vocabulary	.28*	.39**	.13
Age	.22	.12	.18

Note: There were 69 participants included. *p<.05. **p<.01.

compounds, and contractions in each participant's narrative. The regression was significant, $F(4, 64) = 5.20$, $p < .001$, and accounted for 24.5% of the variability in the use of morphologically complex words. However, none of the predictors was unique (see Table 14).

I also wished to see how the literacy assessments predicted the use of only inflectional morphemes and only derivational morphemes. First, I performed a regression analysis with the frequency of inflectional morphemes in the written narratives as the outcome variable. The regression was significant, $F(4, 64) = 5.39$, $p < .001$, and accounted for 25.2% of the variance. None of the predictors was unique (see Table 15). Next, I performed a regression analysis with the frequency of derivational morphemes as the outcome variable; this regression was not significant $F(4, 64) = .98$, $p > 05$.

Regressions of Literacy Assessments on Proportion of Morphologically Complex Words

After performing the regressions with frequencies as the outcome variables, I ran regressions with proportions as the outcome variables. I computed the proportion of morphologically complex words by summing the frequencies of inflectional morphemes, derivational morphemes, compounds, and contractions, and then dividing by the total number of words in the participant's narrative. The regression was not significant, $F(4, 64) = 1.92$, $p > .05$.

Just as with the frequencies, I performed regression analyses with the proportions of only inflectional morphemes and only derivational morphemes as

Table 14

Regression Analysis of Literacy Assessments on Frequency of Morphologically Complex Words

Tasks	*B*	*t*
Spelling	.27	1.41
Morph. Awareness	.04	.58
Phon. Awareness	.23	1.24
Vocabulary	-.01	-.10

Note: There were 69 participants included. **p*<.05. ***p*<.01.

Table 15

Regression Analysis of Literacy Assessments on Frequency of Inflectional Morphemes

Tasks	*B*	*t*
Spelling	.21	1.58
Morph. Awareness	.05	1.16
Phon. Awareness	.131	1.05
Vocabulary	-.03	-.64

Note: There were 69 participants included. **p*<.05. ***p*<.01.

the outcome variables. When the outcome variable was the proportion of inflectional morphemes, the regression was not significant, $F(4, 64) = 1.33$, $p > .05$. I also performed a regression with the proportion of derivational morphemes as the outcome variable, which was not significant, $F(4, 64) = .27$ $p > .05$.

Regressions of Literacy Assessments on Frequency of Unique Morphologically Complex Words

Because I was also interested in the unique morphologically complex words the children were using in their writing, I ran regressions with the number of unique morphologically complex words as the outcome measure. Again, the predictor variables were spelling, phonological awareness, morphological awareness, and vocabulary. First, I used the total number of unique morphologically complex words in writing as the outcome variable; the overall regression was significant, $F(4, 64) = 6.02$, $p < .001$, accounting for 27.3% of the variance. However, none of the predictors was unique (see Table 16).

Next, I examined individual types of morphologically complex words by using the unique number of inflectional morphemes as the outcome variable. This regression did have significant predictive power, $F(4, 64) = 7.49$, $p < .001$, accounting for 31.9% of the variance. None of the predictors was unique (see Table 17). Next, I was interested in the unique number of derivational morphemes as the outcome variable; this regression was not significant, $F(4, 64) = 1.19$, $p > 05$.

Table 16

Regression Analysis of Literacy Assessments on Frequency of Unique Morphologically Complex Words

Tasks	*B*	*t*
Spelling	.24	1.39
Morph. Awareness	.04	.64
Phon. Awareness	.16	.98
Vocabulary	.02	.39

Note: There were 69 participants included. *p<.05. **p<.01.

Table 17

Regression Analysis of Literacy Assessments on Frequency of Unique Inflectional Morphemes

Tasks	*B*	*t*
Spelling	.20	1.79
Morph. Awareness	.05	1.40
Phon. Awareness	.09	.87
Vocabulary	-.01	-.30

Note: There were 69 participants included. *p<.05. **p<.01.

Regressions of Literacy Assessments on Proportion of Unique Morphologically Complex Words

In addition to using frequencies of unique morphologically complex words, I again wished to include unique proportions as an outcome variable. First, I performed a regression analysis with the proportion of unique morphologically complex words as the outcome variable. I computed this score by summing each participant's unique inflectional morphemes, derivational morphemes, compounds, and contractions for the written narrative, and then dividing by the number of words in the narrative. The overall regression was significant, $F(4, 64) = 6.62$, $p < .001$, accounting for 29.3% of the variance. None of the predictors was unique (see Table 18).

The next regression analysis I performed used the proportion of unique inflectional morphemes as the outcome variable. The overall regression was significant, $F(4, 64) = 2.62$, $p < .05$, $R^2 = .141$, but none of the predictors was unique (see Table 19). Additionally, I ran a regression analysis with the proportion of unique derivational morphemes as the outcome variable; this regression was not significant, $F(4, 64) = .74$, $p > .05$.

Hierarchical Regression

In addition to examining how the different literacy assessments predict the use of morphologically complex words, I also wished to see whether morphological awareness contributed to the regression model after controlling for phonological awareness. One way to answer this question is to perform a multiple

Table 18

Regression Analysis of Literacy Assessments on Proportion of Unique Morphologically Complex Words

Tasks	*B*	*t*
Spelling	.25	1.63
Morph. Awareness	.05	.95
Phon. Awareness	.11	.78
Vocabulary	.01	.18

Note: There were 69 participants included. *p<.05. **p<.01.

Table 19

Regression Analysis of Literacy Assessments on Proportion of Unique Inflections

Tasks	*B*	*t*
Spelling	< .01	.53
Morph. Awareness	< .01	1.55
Phon. Awareness	< .01	.20
Vocabulary	< .01	-.20

Note: There were 69 participants included. **p*<.05. ***p*<.01.

regression to see if morphological awareness is a significant unique predictor, as described in the previous analyses. However, another way to conceptualize this question is to examine whether morphological awareness has a significant contribution to explaining the variance beyond phonological awareness in a hierarchical regression. Therefore, I also performed a hierarchical regression with the frequency of written morphologically complex words as the outcome measure. The first block consisted of phonological awareness. When only phonological awareness was entered into the model, the regression was significant, $F(1, 67) = 16.22$, $p < .001$. Phonological awareness accounted for 19.5% of the variability in the use of morphologically complex words. The next block entered into the model consisted of morphological awareness, since I was interested in seeing whether the addition of morphological awareness would significantly change R^2. Again, the overall regression was significant, $F(1, 67) = 9.29$, $p < .001$. However, morphological awareness did not significantly contribute to explaining the variance in the use of morphologically complex words, $F(1, 66) = 2.10$, $p > .05$. When using proportions of morphologically complex words instead of frequencies, these results were replicated. The results of both the hierarchical and multiple regression analyses reveal that morphological awareness does not significantly contribute to explaining the variability in the use of morphologically complex words after phonological awareness is taken into account.

Regression Summary

After performing these multiple and hierarchical regressions on the frequencies and proportions of morphologically complex words, I found only partial support for my hypothesis. Most regressions had overall significance, providing evidence that, as a set, spelling, phonological awareness, morphological awareness, and vocabulary, do predict the use of morphologically complex words in writing. However, none of the regressions revealed any unique predictors, which did not support my hypothesis that morphological awareness would be a significant predictor even after the other literacy assessments were taken into account. Possible explanations for these findings are covered in the Discussion.

Analysis of Variance

My other primary question was how third graders compare to fifth graders in the use of morphologically complex words in written and oral storytelling. Specifically, I investigated differences in inflectional and derivational morphemes across oral and written stories. To examine these differences, I performed mixed design 2 x 2 x 2 (Morpheme Type x Story Type x Grade Level) ANOVAs. The within subjects factors were narrative type (oral or written) and morpheme type (inflectional or derivational). The between subjects factor was grade level (third or fifth). The dependent variable was the number of morphologically complex words used in the narratives, either written or oral. Just as with the regression analyses, there were different ways to measure the number of morphologically

complex words a child used. To test whether the conclusions drawn would be the same for each type of measure, I included both frequencies and proportions as outcome variables. The analysis for each type of measure follows.

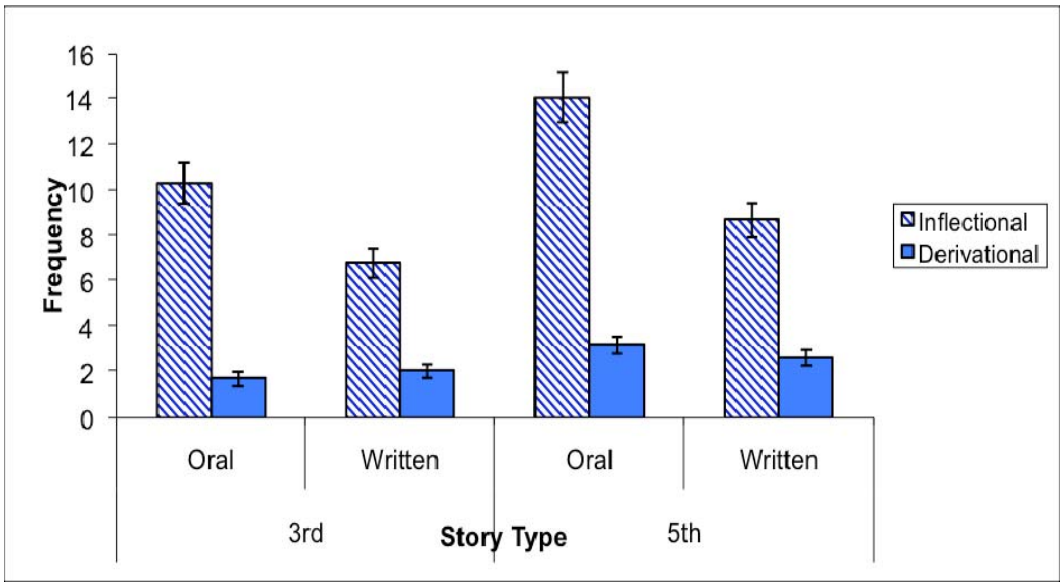
ANOVA Using Frequency of Morphologically Complex Words

First, I performed an ANOVA with the total frequency of morphologically complex words as the dependent variable (see Figure 1). There was a significant main effect of story, $F(1, 67) = 20.74$, $MSE = 348.95$, $p < .01$. As predicted, participants used more morphologically complex words in their oral narratives ($M = 7.31$) than their written narratives ($M = 5.02$). There was also a significant main effect of morpheme type, $F(1, 67) = 364.39$, $MSE = 3832.48$, $p < .01$. Participants used more inflectional morphemes ($M = 9.96$) than derivational morphemes ($M = 2.37$), which again supported my hypothesis. A significant main effect of grade level was also present, $F(1, 67) = 14.84$, $MSE = 248.59$, $p < .01$. Supporting the developmental trajectory identified in past research, these results revealed that fifth graders used more morphologically complex words ($M = 7.13$) than third graders ($M = 5.20$).

In addition to the main effects, there was also a significant interaction between morpheme type and grade level, $F(1, 67) = 5.05$, $MSE = 53.13$, $p < .05$. Fifth graders used more inflectional morphemes ($M = 11.38$) than third graders ($M = 8.55$), $t(67) = -3.32$, $p < .01$, and fifth graders also used significantly more derivational morphemes ($M = 2.89$) than third graders ($M = 1.85$), $t(67) = -3.14$, $p < .01$; however, the difference between the use of inflectional and derivational

Figure 1

Mean Frequencies of Written Morphologically Complex Words



morphemes was greater for fifth graders (M = 8.48) than third graders (M = 6.70), $t(67) = -2.25$, $p < .05$. There was also a significant interaction between story type and morpheme type, $F(1, 67) = 24.46$, $MSE = 314.79$, $p < .01$. Participants used significantly more inflectional morphemes in their oral stories (M = 11.84) than in their written stories (M = 7.55), $t(67) = -4.99$, $p < .01$; however, participants did not use significantly more derivational morphemes in their oral stories (M = 2.29) than in their written stories (M = 2.26), $t(67) = -.082$, $p > .05$. The three-way interaction between morpheme type, story type, and grade level was not significant, $F(1. 67) = .29$, $p > .05$. When the dependent measure was the frequency of unique morphologically complex words, the same results held.

ANOVA Using Proportion of Morphologically Complex Words

I also performed an ANOVA using the proportion of morphologically complex words as the dependent variable. The advantage to this method is that it controls for the length of the narratives. Using this analysis, there was no longer a main effect of story type, $F(1, 67) = .13$, $MSE < .01$, $p > .05$. Participants did not use a higher proportion of morphologically complex words in their oral stories (M = .06) than in their written stories (M = .06). There was still a main effect of morpheme type, $F(1, 67) = 531.61$, $MSE = .31$, $p < .01$. Participants used a significantly higher proportion of inflectional morphemes (M = .09) than derivational morphemes (M = .02). The main effect of grade level also remained when using proportions instead of frequencies, $F(1, 67) = 4.22$, $MSE = <.01$, $p < .01$. Fifth graders used a significantly higher proportion of morphologically

complex words (*M* = .06) than third graders (*M* = .05). Possible reasons for the disappearance of the main effect of story type are included in the Discussion.

When using proportions instead of frequencies, there was no longer an interaction between morpheme type and grade level, $F(1, 67) = .340$, $MSE < .01$, $p > .05$. However, the interaction between story type and morpheme type remained, $F(1, 67) = 5.41$, $MSE < .01$, $p < .05$. Participants did not use a higher proportion of inflectional morphemes in their oral stories (*M* = .09) than in their written stories (*M* = .09), $t(67) = -1.42$, $p > .05$; however, participants did use a marginally significantly higher proportion of derivational morphemes in their written stories (*M* = .03) than in their oral stories (*M* = .02), $t(67) = 1.92$, $p = .05$. It is interesting that these results differed from those obtained when using frequencies, where participants used more inflectional morphemes in their oral stories than in their written stories but did not show a difference in derivational morpheme usage. Again, the three-way interaction between morpheme type, story type, and grade level was not significant, $F(1, 67) = .21$, $p > .05$. When using the proportion of unique morphologically complex words, the ANOVA produced the same results as when using the total proportion of morphologically complex words.

Grade Level Differences in Morpheme Use

Based on past research on grammar and vocabulary acquisition, I hypothesized that both third and fifth graders would use more inflectional morphemes than derivational morphemes. The results of this study support this

hypothesis, as shown in the previous section. However, because of the developmental processes occurring during the late elementary school years, I also hypothesized that while fifth graders would still use more inflectional morphemes than derivational morphemes, the gap between the two morphemes types would be smaller for this grade level than for third graders. I investigated the gap for only written narratives, only oral narratives, and the total morpheme use in both types of narratives. While the third and fifth grade gaps between inflectional and derivational morphemes were not significantly different for either narrative type alone, the gap was significantly different when the morphemes from both narratives were combined, $t(67) = -2.25$, $SE = 1.59$, $p < .05$. The gap for fifth graders was significantly larger ($M = 8.48$) than the gap for third graders ($M = 6.70$). These results do not support the hypothesis that with increasing grade level, children's ability to use derivational morphemes is approaching their ability to use inflectional morphemes. These findings are inconsistent with past research, which has concluded that during the elementary school years, children's acquisition of inflectional morpheme knowledge slows as they acquire more knowledge of derivational morphemes (Hauerwas & Walker, 2003).

An additional way to understand the difference between derivational and inflectional morphemes is to determine whether there were differences in the number of participants in each grade who used each type of morpheme. Each participant received a score of 0 or 1 for whether or not he or she used each of the following types of morphologically complex words: past tense inflections (*-ed*),

complex inflections (*-ing*), plural inflections (*-s* or *–es*), or any type of derivation. I then calculated the number of third graders who used each type of morpheme, as well as the same for fifth graders. Percentages of participants who used each type of morpheme are displayed in Table 20. I performed a chi-square analysis to determine whether the percentage of students using each type of morpheme differed depending on grade level; there were no grade level differences, $\chi^2(1, N = 69) = 2, p > .05$.

Accuracy in the Use of Morphologically Complex Words

I also wished to examine participants' accuracy in using inflectional and derivational morphemes, as it is important not only that students use morphologically complex words, but that they also use them correctly. To compute each participant's accuracy score, I summed the correct uses of morphologically complex words and divided by the sum of correct and incorrect attempts to use these words. For example, one participant said "*actionly*" instead of "*actually*," which would be considered an incorrect attempt to use a derivational morpheme. This incorrect attempt would then be reflected by the participant's accuracy score. Mean accuracies for both grade levels on each of the four types of morphemes can be found in Table 21. Fifth graders, in addition to using more morphologically complex words than third graders, also used them more accurately. There was a significant main effect of grade level, $F(1, 29) = 4.51$, $MSE = .06$, $p < .05$ (see Figure 2). When considering the average accuracy across past inflections, complex inflections, plural inflections, and derivations

Table 20

Percentage of Participants Who Used Morphologically Complex Words Involving Inflectional and Derivational Morphemes

	Past Tense Inflections (*-ed*)	Complex Inflections (*-ing*)	Plural Inflections (*-s, -es*)	Derivations (all types)
3rd Graders	83%	83%	71%	66%
5th Graders	96%	78%	89%	78%

Note: There were 41 third graders and 28 fifth graders included.

Table 21

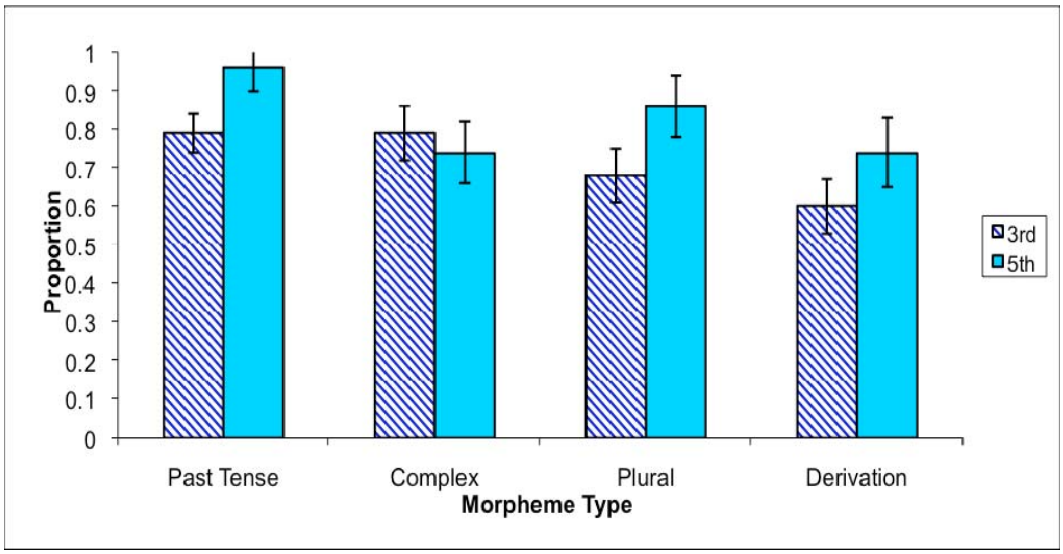
Mean Accuracies in Use of Morphologically Complex Words Involving Inflectional and Derivational Morphemes (*SD*s in parentheses)

	Past Tense Inflections (*-ed*)	Complex Inflections (*-ing*)	Plural Infecltions (*-s, -es*)	Derivations (all types)
3rd Graders	.94 (.02)	.99 (.01)	.94 (.03)	.94 (.03)
5th Graders	1.0 (.02)	.98 (.02)	1.0 (.03)	1.0 (.03)

Note: There were 16 third graders and 15 fifth graders included.

Figure 2

Mean Accuracy Proportions for Morpheme Use



fifth graders used morphologically complex words more accurately (M = .996) than third graders (M = .952). The main effect of morpheme type was not significant, $F(1, 29) = .23$, $MSE = .006$, $p > .05$, and the interaction between morpheme type and grade level was also not significant, $F(1, 29) = .94$, $MSE = .02$, $p > .05$. Note that only participants who attempted to use each morpheme type at least once were included in this analysis, which explains the rather high mean accuracies shown in Table 21.

Corrections

One of the ways in which this study differed from previous studies of the written use of morphologically complex words is that it provided participants with a short period to make corrections to their written narratives; I analyzed these corrections. Because participants were given a pen of a different color during the 1-minute editing period, it was possible to see what changes they had made. Each participant received two scores for corrections: the total number of corrections made, and the number of corrections made that involved changing an incorrectly written word into a correctly written morphologically complex word. For example, if a child had originally written "He was *walk* to school" but then changed the sentence to "He was *walking* to school" during the editing period, he or she would receive one point for morphological corrections. All morphological corrections participants made involved inflectional morphemes. Fifth graders did not make significantly more total corrections (M = 1.79) than third graders (M = 1.34), $t(67) = -1.15$, $SE = .39$, $p > .05$. Fifth graders also did not make

significantly more morphological corrections (M = .36) than third graders (M = .32), $t(67) = -.25$, $p > .05$, SE = .16. However, the number of morphological corrections participants made was correlated with scores on the Derivation task, $r(69) = .24$, $p < .05$, as well as the total number of morphologically complex words used in the written narratives, $r(69) = .34$, $p < .01$.

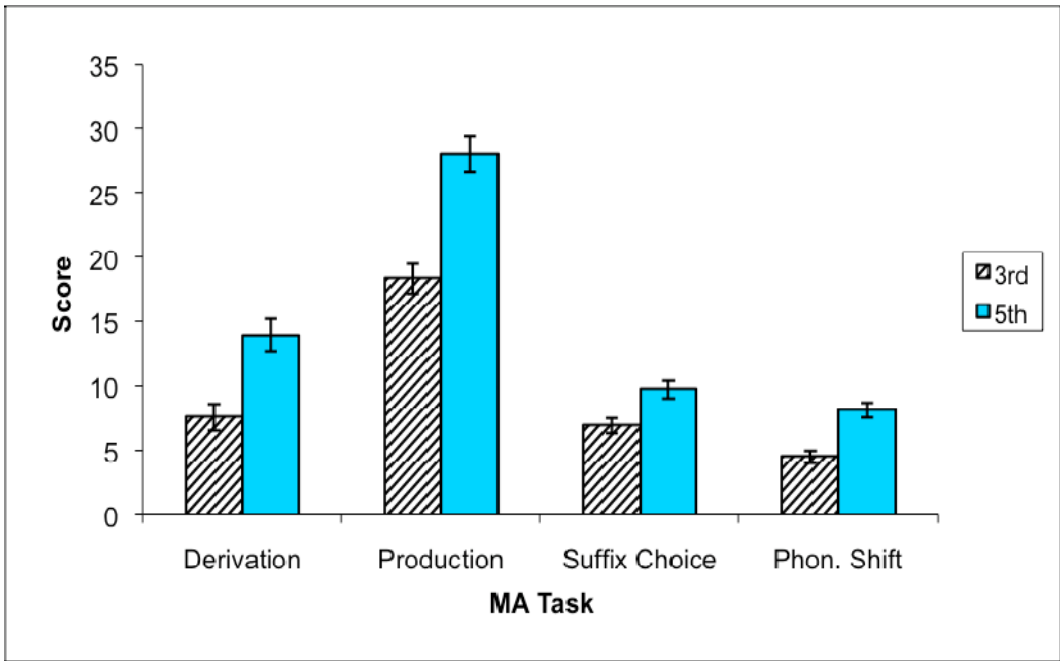
Because I proposed that allowing a revision period after the writing task might increase the number of morphologically complex words a child produces, I wished to see whether omitting any morphologically complex words fixed or added during the revision period would change the previous results. Because all the morphological corrections made were changes to inflectional morphemes, I subtracted the number of morphological corrections from the number of inflectional morphemes used in the written narratives. I then performed a mixed design ANOVA just as before, only this time the number of written inflectional morphemes did not include words added during the revision period. These results revealed significant main effects for story type, morpheme type, and grade level, as well as significant interactions between morpheme type and grade level and story type and grade level. The same conclusions would be drawn from these results as from the previous results. From these results, it is clear that the revision period was not adding to the number of morphologically complex words participants used. It is therefore reasonable to say that morphological ability was not being masked in previous studies where a revision period was not allowed (Carlisle, 1996, Green et al., 2003).

Grade Level Differences in Morphological Awareness

In addition to examining grade level differences in the use of morphologically complex words, I also wished to investigate whether there were grade level differences in morphological awareness. The developmental trajectory identified in previous literature indicated that morphological awareness increases with grade level (Carlisle, 1996), so I hypothesized that fifth graders would outperform third graders on the morphological awareness assessments. This was true for all tests of morphological awareness, as there was a significant main effect of grade, $F(1, 67) = 29.52$, $MSE = 2119.59$, $p < .001$ (see Figure 3). Fifth graders had a higher average score on these assessments ($M = 14.99$) than third graders ($M = 9.35$). Morphological awareness improves with grade level. Because each of the morphological awareness assessments was scored on a difference scale, it did not make sense to examine the main effect of type of assessment, which is why it is not addressed here. Fifth graders did not outperform third graders equally on all four assessments, however, as there was a significant interaction between grade level and assessment, $F(1, 67) = 10.68$, $MSE = 233.05$, $p < .001$. Fifth graders performed about two times better ($M = 14.0$) than third graders ($M = 7.59$) on the Derivation task, $t(39.52) = -3.61$, $p < .001$. On the Production task, fifth graders performed about 1.5 times better ($M = 28.07$) than third graders ($M = 18.37$), $t(58.15) = -6.06$, $p < .001$. On the Suffix Choice test, fifth graders performed about 1.4 times better ($M = 9.75$) than third graders ($M = 6.93$), $t(67) = -3.09$, $p < .001$. Finally, of the items on the Suffix Choice task that

Figure 3

Mean Scores on Morphological Awarenss Tasks



involved phonological shifts, fifth graders performed roughly 1.8 times better (M = 8.14) than third graders (M = 4.51), $t(67) = -4.79$, $p < .001$. While the amount by which fifth graders outperformed third graders varied with each task, it is important to note that fifth graders consistently answered more items correctly than third graders across all four tasks.

Morphological Awareness – Phonological Shifts

One of the aspects of morphology that children have the most difficulty with is the idea of a phonological shift. For example, the transformation of the word *write* to *written* involves a sound change. As children age, they become better at recognizing that words like *write* and *written* are related even when the words are composed of different phonemes. Of the three morphological tasks used in this study, two of them involved some items that required a child's understanding of phonological shifts. Because the knowledge of phonological shifts represents a special type of morphological awareness, I computed a new score for each participant that represented a part of his or her composite morphological awareness score. Each participant received a score for the number of items correctly answered that involved a phonological shift, and this frequency was divided by the total morphological awareness score. This new variable captured a proportion which represents how much of a child's morphological awareness involves the knowledge of phonological shifts.

I performed a regression analysis using spelling, phonological awareness, vocabulary, and the proportion of phonological shifts as predictors. The outcome

measure was the frequency of morphologically complex words. This regression was significant, $F(4, 64) = 6.89$, $p < .001$, and accounted for 25.7% of the variance. The proportion of phonological shifts uniquely contributed to explaining the variance; none of the other predictors was unique (see Table 22). It is important to note that even after phonological awareness was accounted for, the morphological knowledge of phonological shifts contributed uniquely to the model.

Vocabulary and Morphological Awareness

Because little research has been done on the relationship between morphological awareness and vocabulary, I also examined how morphological awareness, as well as other literacy skills, predicted vocabulary size. In these analyses, I included each morphological awareness assessment as opposed to the total morphological awareness score because I was interested in the specific types of morphological awareness that could predict vocabulary size. All types of morphological awareness might not function the same way in predicting different literacy outcomes. Additionally, instead of including age as a continuous predictor, I performed the regression with grade level as an indicator variable. My reason for doing this is because I was interested more in grade level differences than age differences, since grade level differences are more indicative of skill changes that are the result of classroom instruction as opposed to maturation. I performed a regression with grade level, spelling, phonological awareness, the Derivation test, the Production test, and the Suffix Choice test as the predictors.

Table 22

Regression Analysis of Literacy Assessments (Including Phonological Shifts) on Frequency of Morphologically Complex Words

Tasks	*B*	*t*
Spelling	.28	1.50
Phon. Awareness	.25	1.41
Vocabulary	-.02	-.50
Phon. Shifts Proportion	34.79	2.34*

Note: There were 69 participants included. *p<.05. **p<.01.

The overall regression was significant, $F(6, 62) = 23.01$, $p < .001$, and accounted for 69% of the variance. The unique predictors were spelling, $t(63) = 2.44$, $p < .05$, the Derivation test, $t(63) = 2.36$, $p < .05$, and the Production test, $t(63) = 2.93$, $p < .01$. The Suffix Choice test was marginally significant, $t(63) = 1.94$, $p = .06$. Phonological awareness was not a significant predictor, nor was grade level (see Table 23). These results are consistent with those of Mc-Bride-Chang et al. (2005), who found that morphological awareness tasks were significant predictors of vocabulary in kindergartners and second graders. They found that morphological awareness was a unique predictor after controlling for phonological awareness, reading skill, and age, as shown by the regression analysis in this study.

What Predicts Morphological Awareness?

While most of the questions in this study centered on the use of morphologically complex words in writing, it is also important to examine the construct of morphological awareness. Specifically, what contributes to morphological awareness? Much past research has found that there is an overlap between phonological awareness and morphological awareness, so I wished to see if phonological awareness was the strongest predictor of morphological awareness. To answer this question, I performed a regression analysis with morphological awareness as the outcome variable, and age, spelling, phonological awareness, and vocabulary as the predictors. The regression was significant, $F(4, 64) = 28.16$, $p < .001$, and accounted for 63.8% of the variance. Vocabulary was

Table 23

Regression Analysis of Literacy Assessments and Grade Level on Vocabulary

Tasks	*B*	*t*
Spelling	.95	2.44*
Derivation MA	.54	2.36*
Production MA	.64	2.93**
Suffix Choice MA	.87	1.94 (p = .057)
Phon. Awareness	-.19	-.47
Grade Level	3.49	.99

Note: There were 69 participants included. *p<.05. **p<.01.

the only unique predictor; the other predictors did not uniquely contribute to the model (see Table 24). These results suggest that vocabulary, not phonological awareness, plays the largest role in morphological awareness. Implications of this finding are mentioned in the Discussion.

Table 24

Regression Analysis of Literacy Assessments and Age on Morphological Awareness

Tasks	*B*	*t*
Age	1.30	1.04
Spelling	.11	.78
Phono. Awareness	.29	.80
Vocabulary	.62	6.48**

Note: There were 69 participants included. *p<.05. **p<.01.

Discussion

The purpose of this study was to examine the developmental trajectory of children's acquisition of morphological awareness and usage. Specifically, I was interested in comparing third and fifth graders in their use of morphologically complex words, as well as examining the literacy skills that predict children's use of morphologically complex words in written narratives. To address these questions, I administered a set of literacy assessments to third and fifth graders, including tests of spelling, phonological awareness, morphological awareness, and vocabulary. Additionally, participants provided oral and written narratives that they created based on picture prompts. In general, the results supported the hypotheses regarding grade level and morpheme type differences.

Results revealed that participants used more inflectional morphemes than derivational morphemes. This result was expected, as children's understanding of inflectional morphemes is more developed at this age than their knowledge of derivational morphemes. Overall, children used more morphologically complex words in their oral stories than in their written stories, but when I examined the morpheme types separately, this difference was significant only for inflectional morphemes. Additionally, fifth graders used more morphologically complex words than third graders. While both grade levels used significantly more inflectional morphemes than derivational morphemes, the gap between the use of inflectional and derivational morphemes was larger for fifth graders. This finding was unexpected.

There was only partial support for my hypotheses about the role of morphological awareness in predicting children's use of morphologically complex words in writing. While spelling, phonological awareness, morphological awareness, and vocabulary significantly predicted participants' written use of morphologically complex words, none of the literacy assessments contributed uniquely to explaining the proportion of variance accounted for by the regressions. Therefore, the results of this study do not provide evidence that morphological awareness contributes above and beyond phonological awareness in predicting morpheme use in writing. However, even though morphological awareness as a whole did not uniquely contribute to the regression model, morphological awareness involving phonological shifts did, providing partial support for the unique role of morphological awareness in predicting the use of morphologically complex words.

Before commenting on the results of this study, it is important to note that no measure of morphologically complex words is perfect. As discussed in the Results section, there are strengths and weaknesses of both the frequency and proportion measures. These strengths and weaknesses must be considered when interpreting the results. In the previous section, I wished to present the results for both total and unique frequencies, as well as total and unique proportions, to provide an idea of how the conclusions drawn may change depending on the measure used; however, my subsequent interpretations of the results will focus exclusively on the analyses that included total frequencies. Because proportions

mask the number of times participants used morphologically complex words, using frequencies is a better approach to fully understanding the extent to which children are comfortable with using these kinds of words. It is not reasonable to say that a child who uses one morphologically complex word in a story of 10 words should be seen as equivalent in writing ability to a child who uses ten morphologically complex words in a story of 100 words. Story length, too, can play an important role in analyzing writing development and sophistication. Therefore, only analyses that included word frequencies will be interpreted in this Discussion.

How do third and fifth graders compare in the use of morphologically complex words in oral and written storytelling?

The first question posed in this study was whether children at both grade levels use more inflectional morphemes than derivational morphemes. I hypothesized that both third and fifth graders would use more inflectional morphemes than derivational morphemes because past research has shown that derivational morphological knowledge is the last type of morphology to develop. The results of this study reveal that both third and fifth graders used more inflectional morphemes than derivational morphemes, consistent with the findings of past literature (Anglin, 1993; Berko, 1958; Clark, 1982; Wysoki & Jenkins, 1987). Children's knowledge of inflectional morphemes is stronger than their knowledge of derivational morphemes at both grade levels.

Carlisle (1996) suggested that as children progress through elementary school, their understanding of derivational morphemes becomes stronger as they place less emphasis on learning inflectional morphemes. Therefore, I also hypothesized that while both grade levels would use more inflectional morphemes than derivational morphemes, the difference in frequencies between inflectional and derivational morphemes would be larger for third graders. If the older students are becoming more comfortable with using derivational morphemes and are drawing their focus away from learning inflectional morpheme at this time, it would be expected that the gap between the two types of morphemes would begin to close as fifth graders gain confidence in expressing their recently acquired knowledge of derivations. Surprisingly, the results did not support this hypothesis, as the gap between the use of inflectional and derivational morphemes was smaller for third graders than it was for fifth graders. While fifth graders used more of both types of morphemes, the gap between the two types actually increased with grade level. This finding is inconsistent with the results of Green et al. (2003). The greater gap for fifth graders seems to indicate that although children continue to gain an understanding of derivational morphemes as they progress through elementary school, the rate at which they are learning new inflections surpasses the rate at which they are learning derivations. However, fifth graders still tended to have better overall accuracy in using morphologically complex words, which could provide a partial explanation for the larger gap. During elementary school, children are learning to use more and more

morphemes, both inflectional and derivational. Their increased understanding of morphemes is shown not only through the increased frequency of usage, but also through increased accuracy.

As previously noted, the understanding of derivational morphology is often the last morphological knowledge to develop, and the trajectory of its development is longer than for inflections or compounds (Kuo & Anderson, 2006). Another primary hypothesis of this study was that fifth graders would use more derivational morphemes than third graders, due to this developmental pattern. Results supported this hypothesis, which is consistent with past research (Carlisle, 1996; Singson, Mahony, & Mann, 2000; Tyler & Nagy, 1989). Not only are children experiencing an increase in their understanding of derivational morphemes, they are also becoming more comfortable in using them in both oral and written language.

Additionally, fifth graders had a higher average score than third graders on all the morphological awareness assessments, which further supports the findings of past research (Anglin, 1993; Carlisle & Fleming, 2003; Mahony, Singson, & Mann, 2000). Fifth graders use more derivational morphemes than third graders in their writing. Additionally, fifth graders are developing a stronger, conscious awareness of the structure of morphologically complex words. This conclusion is especially evidenced by fifth graders' higher scores on the nonword morphological awareness assessment. Because this test contained only pseudowords, scores would not improve due to a larger vocabulary size. Thus,

fifth graders' outperformance of third graders on this task is indicative of a true knowledge of morphological structure and is not merely an artifact of larger vocabulary.

Fifth graders also outperformed third graders on morphological awareness items that involved phonological shifts. Because the understanding of phonological shifts is indicative of derivational morpheme knowledge, this finding also supports the conclusion that fifth graders have an improved understanding of derivational morphology. These results are consistent with Carlisle's (2000) research, which revealed that children in early elementary grade levels experience more difficulty with derivational forms that involve a phonological shift than words that do not.

An additional focus of this study was the comparison of children's use of morphologically complex words in oral and written language. Writing is more cognitively demanding than speaking, so I hypothesized that children would use more morphologically complex words orally than in writing because they could devote more of their cognitive resources to producing these words (Hayes & Flower, 1986; Jay, 2003; McCutchen, 2006). As predicted, both grade levels used more morphologically complex words in their oral narratives than in their written narratives; however, this was only true for morphologically complex words that involved inflections. For morphologically complex words involving derivations, children showed no difference in frequency of usage between the oral and written stories. At least for inflectional morphemes, these results support the idea that the

transcription component of the writing process interferes with the production of morphemes.

The data indicate that both third and fifth graders have a solid understanding of inflectional morphemes, as their use of morphologically complex words involving inflections is frequent. Both grade levels used significantly fewer derivational morphemes, and both grade levels displayed lower levels of accuracy in using derivations than inflections. It does not appear that both grade levels have a well-developed knowledge of derivational morphemes, which is probably why no differences between oral and written usage were detected here. It is unlikely that transcription, at least at the grade levels involved in this study, interfered with the production of derivational morphemes. The deficit is more likely due to developmental processes. At the third and fifth grade levels, children are beginning to master inflectional morphology, especially in oral language; however, third and fifth graders do not have a firm grasp on derivational morphemes in written or oral language, probably because derivational morphology has a longer and later developmental trajectory than inflectional morphology. Children's skills in both writing and derivational morphology need to improve in order to detect any differences between oral and written use of derivational morphemes.

How do spelling, vocabulary, phonological awareness, and morphological awareness predict the use of morphologically complex words in written narratives?

This study also sought to answer the question of how spelling, vocabulary, phonological awareness, and morphological awareness contribute to predicting the number of morphologically complex words children use in writing. I expected that age and the literacy assessments as a set would predict the number of times children used morphologically complex words. Results did support this hypothesis, as the inclusion of these predictors did lead to an overall significant regression model when the outcome measure was the frequency of morphologically complex words. These results held when the outcome measure was frequency of morphologically complex words that involved inflections. The results did not hold, however, in predicting the frequency of morphologically complex words that involved derivations. The most likely reason for this nonsignificant model for derivations is that there was not enough variability in this measure.

In addition to examining whether these literacy skills predict the number of morphologically complex words used in written narratives, I specifically wished to investigate how phonological and morphological awareness behaved as predictors when entered into the same regression model. Past research has found that morphological awareness and phonological awareness are correlated (Nagy et al., 2006; Singson, Mahony, & Mann, 2000). Although they are correlated, they

are not entirely overlapping and each measures separate literacy skills (Mahony, Singson, & Mann, 2000). Because phonological and morphological awareness are separable skills, I expected that even after phonological awareness was accounted for, morphological awareness would still uniquely and significantly contribute to explaining the variance in children's written use of morphologically complex words. After performing a series of multiple and hierarchical regressions, I found only partial support for this hypothesis. The multiple regressions revealed no unique literacy predictors, indicating that phonological awareness and morphological awareness do not contribute to predicting the use of written morphologically complex words above and beyond the other literacy skills. I also used hierarchical regression to determine whether morphological awareness contributed to the regression after controlling for phonological awareness, and again found that it did not. The proportion of variance accounted for did not significantly increase with the addition of morphological awareness as a predictor. These results held for all multiple and hierarchical regression analyses performed on the various outcome measures; however, morphological awareness related to knowledge of phonological shifts was a unique predictor in the multiple regression model.

Past research has found that morphological awareness contributes to different literacy skills after controlling for phonological factors (Deacon & Kirby, 2004; Nagy et al., 2003); however, those studies investigated how literacy skills predict reading comprehension. No study has examined how phonological

factors and morphological awareness predict the use of morphologically complex words in writing, so the results of this study do not directly contradict previous research. It is possible that as a set, literacy skills predict the use of morphologically complex words in writing, but individually, no literacy skill is unique over others in explaining the variance.

Wu, Anderson, Wu, Li, Zhang, Shu, Jiang, Chen, Wang, Yin, He, Packard, and Gaffney (2009) examined morphological awareness in Chinese students by assigning some students to a morphological intervention program where children were explicitly instructed in morphological awareness. Using structural equation modeling, Wu et al. found that instruction in morphological awareness significantly improved students' reading abilities. Specifically, the morphological awareness instruction improved vocabulary and sentence reading in the second grade, and reading measures such as fluency and paragraph comprehension in the third grade. Interestingly, morphological awareness did not have as much influence on the writing tasks as the other literacy tasks. The group who received morphological instruction did not outperform the control group on a task that required students to write Chinese characters and on a task that involved copying written characters. On a task that involved writing dictated words, it was only the third grade morphological awareness intervention group, not the second graders, who outperformed the control group. While Wu et al.'s study did not include a spontaneous writing task, their assessments measure writing ability. Wu et al. did not yet have an explanation for these findings; however, their results do

not vastly differ from the results of this study, where morphological awareness was not a unique predictor of the morphological aspects of children's writing. Although the focus of Wu et al.'s study was on Chinese-speaking children, both Chinese and English are morphophonemic languages. Therefore, generalization to English-speaking children is possible. The results of both studies suggest that while morphological awareness is related to (and presumably causal of) improved reading skills, it is not necessarily related to a growth in writing ability at the second, third, fourth, or fifth grade levels.

When children are first learning to read, phonological factors play a crucial role in decoding words. As children age, however, the emphasis is thought to shift from phonological factors to morphological factors, and a good understanding of the morphological properties of words is important in the further development of literacy skills (Nagy, Berninger, & Abbott, 2006; Verhoeven & Carlisle, 2006). Therefore, I expected that morphological awareness would be a better predictor of children's use of morphologically complex words for fifth graders than for third graders, as they shift their reliance on phonological factors to morphological factors. The results did not support this hypothesis; when entered into a multiple regression, neither phonological awareness nor morphological awareness uniquely contributed to explaining the variance in the use of morphologically complex words. Entering phonological awareness and morphological awareness as separate blocks into a hierarchical model again yielded the same results, as the change in R^2 was not significant with the addition

of morphological awareness. Additionally, age was not significantly correlated with any of the written storytelling measures, so I did not include it in any of the regression analyses.

While these results were not as expected, a few explanations are possible for the lack of unique contribution of morphological awareness. First, Nagy et al. (2006) found that morphological awareness offered little contribution to predicting different literacy measures between the fourth/fifth and sixth/seventh grade levels. It was not until comparing sixth and seventh graders to eighth and ninth graders that they observed a larger growth in the contribution of morphological awareness. While the importance of morphological awareness is known to increase with age, it is likely that there are not enough grade level differences between third and fifth graders to observe the increase in its role. These results also indicate that phonological and morphological factors still share much overlap, even at the fifth grade level. Jarmulowicz, Taran, and Hay (2007) found that literacy skills were related to phonological and morphological awareness during the early elementary school years. Perhaps this overlap continues in the later elementary school years as well, which would also help to explain the results of Nagy et al. (2006).

Revision Period

One of the ways in which this study differed from past studies of morphological awareness and writing development is that it provided participants with a revision period after writing their stories. The purpose of this revision

period was to allow participants the opportunity to reread what they had written and correct any errors, some of which may have included errors in the use of morphologically complex words. To examine the effects of the addition of the revision period, I computed two frequencies of morphologically complex words for each participant; one included words added during the revision period and one did not. After using each of these frequencies as a dependent measure in ANOVAs, I found no differences in the conclusions that would be drawn from the results. While some children did make corrections to morphologically complex words during the revision period, the difference was not enough to be significant. It is important to note that participants were provided with sufficient time to make revisions; in all cases, participants handed me their stories, complete with revisions, before the revision time limit was reached. Because the addition of the revision period did not alter any conclusions, not providing a revision period is not hiding a child's ability to produce morphologically complex words. From the results of this analysis, I surmise that morphological awareness fits into the translating component, not the reviewing component, of the writing model.

Developmental Trajectory of Morphological Awareness

A main purpose of this study was to improve the understanding of the developmental trajectory of children's acquisition of morphological awareness. As identified in past research, children's understanding of inflectional morphemes precedes their understanding of derivational morphemes, as indicated by their writing samples. In addition to using a greater number of inflectional morphemes

in their writing samples, participants used past tense inflections more accurately than derivations. Without question, children's knowledge of derivational morphemes continues to grow through the elementary school years. This finding is consistent with past research (Carlisle & Fleming, 2003; Mahony, Singson, & Mann, 2000; Verhoeven & Carlisle, 2006). While fifth graders use more derivational morphemes than third graders and the understanding of derivational morphemes increases with grade level, it appears that students continue to learn how to use inflectional morphemes at a pace that surpasses the pace at which they are learning derivational morphemes.

An unexpected finding of this study was that, although age correlated with most literacy measures, it did not correlate with any of the written measures of morphologically complex words. Because age was correlated with many other variables, it is unlikely that the nonsignificant correlations were due to a lack of variability in the ages represented by the sample. Additionally, age was correlated with some of the measures of oral morphologically complex words. It appears that while an increase in age is related to growth in many literacy skills, children at both the third and fifth grade level are still developing their ability to use morphologically complex words in writing. They do not seem to be at the developmental point where age is predictive of their written use of morphologically complex words. As previously mentioned, writing carries more cognitive demands than speaking. The additional cognitive demands probably add length to the developmental trajectory of writing, which could explain why age

did not significantly correlate with written morphological measures for third or fifth graders. I would expect that at later grade levels, significant correlations would be present.

An important distinction is that this developmental trajectory really speaks more to children's *use* of morphologically complex words than their *understanding* of them. While it seems reasonable to assume that if a child is using several morphologically complex words then he or she has a solid understanding of them, I would like to clarify that these results pertain to writing samples and not a conscious understanding of the morphological structure of words. For example, if a child uses the word *running*, it does not necessarily indicate that the child has a conscious understanding of the morphemic structure of the word. Rather, it could just be that the child has heard the word *running* so often that it just "feels" correct to attach the suffix *–ing* to the root word. Participants' measures of morphological awareness provide more insight into the development of their morphological understanding. After comparing third and fifth graders' scores on the morphological awareness assessments, it is clear that fifth graders have a more thorough understanding of morphemes than third graders. This difference is especially evident in examining the number of correct items involving phonological shifts. During the elementary school years, specifically between third and fifth grade, children are developing an improved understanding of morphemes that alter the pronunciation of words.

Morphological Awareness and Vocabulary

An important role of morphological awareness is to help people to define unfamiliar words. Nagy and Anderson's (1984) prediction that 60% of unfamiliar words can be understood by using the knowledge of morphemes attests to the importance of morphological awareness in vocabulary acquisition. Spelling, along with derivation morphological awareness and decomposition morphological awareness, were unique predictors of vocabulary. Additionally, the Suffix Choice test was a marginally significant predictor. This finding supports past research which has proposed that morphological awareness could assist people in learning and retaining vocabulary (Kuo & Anderson, 2006). Phonological awareness and grade level, however, did not uniquely contribute to predicting vocabulary. The uniqueness of morphological awareness as a predictor of vocabulary has educational implications which are discussed later in this section. Each type of morphological awareness is a valuable skill to develop during the elementary school years and each could facilitate children's learning of vocabulary.

What Predicts Morphological Awareness?

As identified in past research, morphological awareness is an important component of children's literacy acquisition (Carlisle, 2000; Nagy et al., 2003). Even though the results of this study did not provide evidence that morphological awareness uniquely contributes to children's written use of morphologically complex words, the study of morphological awareness should not be abandoned. As the results of the regression on vocabulary revealed, all three types of

morphological awareness assessed in this study were significant predictors of vocabulary size. This is only one of the literacy skills that could be improved with morphological awareness. In addition to understanding what predicts morpheme use in writing, it is equally important to understand what predicts morphological awareness in general, as morphological awareness has the ability to assist children with many literacy tasks. Interestingly, phonological awareness was not a significant predictor of morphological awareness despite the correlation between these two variables found in previous research. Age and spelling both uniquely contributed to explaining the variance in morphological awareness, even after controlling for phonological awareness. It is not surprising that age was a unique predictor, as morphological awareness is known to increase with age. Spelling as a unique predictor could have educational implications, which are discussed toward the end of this section.

Limitations

While the results of this study did provide support for several hypotheses, it is not without its limitations. First and foremost, sample size should be considered, especially for the regression component of the data analysis. Not only did this study include only 69 participants, but of this total, only 28 participants were fifth graders. Sixty-nine participants did meet the minimum number of cases required to perform regression analyses including four or five predictors; however, this number did not exceed the minimum by much, and more

participants could have yielded more results in terms of the unique predictors in the regression model.

Additionally, although the dependent measure in the regression analyses did have variability, the variability could have been increased by having participants write longer stories. Because participants had only roughly five minutes to write a complete story, there was often not ample time for them to develop their thoughts fully. For this reason, the written narratives were not necessarily reflective of what the participants were capable of in terms of their use of morphologically complex words. Because I sometimes had to interrupt children before they completed their stories, allowing participants more time to write would most likely provide more variability in the measure of morphologically complex words; however, granting students more time also has its drawbacks, as it means that students would have to be excused from class for a longer period of time to write the stories. Rubin (1991) remarked that one of the difficulties in working with young children is that they do not produce a long enough writing sample to allow for a complete analysis of their morpheme use. The lack of significant findings in the regressions of this study, coupled with the lack of variability in the dependent measure, seem to corroborate Rubin's point.

Future Directions

In future studies, researchers wishing to investigate morphologically complex words in writing should consider an alternative method for obtaining writing samples. A better, less disruptive method would be to analyze writing

samples, based on the same spontaneous writing assignment, that have already been completed for class. For several reasons, this approach would be an improvement over the method used in the present study. First, the stories would likely be longer and thus have more variability in the derived outcome measure. Second, students would not need to miss class to write the stories, so this would better serve both students and teachers. The only additional time they would need would be for the revision period, which here was only one minute long. Third, participants would not face the pressures of a time constraint, possibly resulting in more fully developed stories that are truly reflective of their abilities. Finally, this method would be more ecologically valid because the measures of morphologically complex words would be taken from a writing sample produced under natural conditions.

Rubin (1991) also recommended that written morphological assessments include dictated spelling, elicited writing, and spontaneous writing tasks to better capture a thorough picture of children's ability to write morphologically complex words. Because all these tests involve production of written material but assess different writing abilities, a child's true writing ability could be more completely assessed using the three dependent measures than by using a single measure.

Educational Implications

One may wonder why the use of morphologically complex words in writing is worth studying, as well as how it could be a measure of writing ability. Is it necessary to use morphologically complex words to produce a writing sample

of high quality? Morphologically complex words allow writers to express their thoughts more vividly (Green et al., 2003). For example, without morphologically complex words, many adjectives and adverbs would not exist. Morphologically complex words involving derivational morphemes, such as *finally*, certainly provide the reader with a more thorough picture of what the writer wishes to convey. Writing in the past tense almost always requires the use of the past tense inflection *–ed*. Unless a writer plans to write only about topics in the singular, the inflectional morphemes *–s* and *–es* are necessary. From these few examples, it is easy to see how morphologically complex words contribute to a much more well-developed and sophisticated piece of writing. Therefore, the frequency with which a child uses morphologically complex words can be an indicator of writing ability. If a child's use of morphologically complex words is related to his or her writing ability, it is not surprising that other literacy skills can predict this ability.

Although this study failed to separate the predictive power of morphological awareness and phonological awareness in explaining the use of morphologically complex words in writing, it is still useful to know that morphological awareness itself can be predicted. Educating students about the orthographic properties of words could help children to develop an understanding of the structure of words. Teaching methods that emphasize both the structure and spelling of entire words could be extremely beneficial. Intervention programs could provide training in the orthographic properties of words as a means of strengthening children's morphological knowledge. Perhaps more important than

instruction in orthographic properties as a whole is instruction in the morphological aspects of orthography, such as prefixes and suffixes. Even if morphological awareness does not uniquely contribute to producing morphologically complex words in writing, its advantages can still be seen in many other literacy skills.

While the results of this study provided only minimal evidence that morphological awareness significantly predicts the written use of morphologically complex words, there are many reasons why morphological awareness remains an important skill. A sampling of these reasons include increased understanding of the English writing system, improved ability to read and spell long words, and development of better analytical skills (Carlisle, 2000; Nagy et al., 2003). Despite these known advantages of morphological awareness, many intervention programs focus almost exclusively on phonics to facilitate learning to read. The effects of morphological awareness on writing remain unclear; however, educators should still consider providing explicit instruction in morphological properties of words. As revealed in this study, morphological awareness significantly predicts vocabulary. Although this does not imply causation, when the results of this study are coupled with those of previous research, a more confident conclusion can be drawn as to the effect of morphological awareness on literacy development. Wu et al. (2009) found that morphological awareness, or more specifically, morphological intervention programs, improve literacy skills such as vocabulary and reading comprehension. Using structural equation

modeling, they identified morphological awareness as a causal link between the morphological intervention programs and an increase in literacy skills. The findings of both studies can provide implications for educational programs that offer explicit instruction in morphological awareness. These programs could be very helpful, especially when considered in light of the causal relationship between morphological awareness and literacy development identified by Wu et al.

Because the morphological measures in this study assessed a conscious understanding of morphemes, educational programs that stress explicit morphological awareness could be an effective teaching strategy. When children are learning new words that are morphologically complex, teachers could take additional time to explain how the structures of the words contribute to their meanings. This method is preferable to word memorization, as it could also help to create firmer links between words, prefixes, and suffixes in the mental lexicon. For example, instead of identifying the definition of *irresponsible* as someone lacking responsibility, teachers could use the opportunity to explain how the morphemes *ir-* and *–ible* change the meaning of the word *responsibility*, a word with which children may already be familiar. Brief instructional periods such as these could provide children with a much more comprehensive understanding of both the structure and meaning of words.

A theme in the literature on morphological awareness, including the present study, is that a conscious knowledge of the structure of words can have

significant effects on the speed and breadth of children's reading and writing acquisition. Given that brief exercises designed to increase children's morphological awareness can be integrated into vocabulary and spelling lesson plans without much additional effort, the benefits of morphological instruction clearly outweigh the costs. While more research is necessary to determine causal relationships between morphological awareness and writing outcomes, the prospects for the benefits of morphological awareness programs are promising.

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Appendix A

Dear Parent(s),

My name is Brooke Magnus, and I am a Psychology student at Mount Holyoke College. Currently, I am working on a thesis under the direction of Kathy Binder, a professor in the Department of Psychology and Education at Mount Holyoke College. I am conducting the study with students who have just completed the third or fifth grade, and I would like your permission to include your child in my project. This study seeks to understand how and when children acquire certain literacy skills, and how their writing conveys their knowledge of how words are formed. I am interested in looking at differences between third and fifth graders in terms of the types of words they use when telling a story aloud and writing a story on paper. I wish to compare the stories children are creating with different literacy measures, looking to see if there are relationships among the literacy measures and the types of words children are using in their stories. For example, one aspect of children's writing I am interested in observing is how often they use words with suffixes such as *–ing* and *ful*, as well as how often they might utilize suffixes such as *–ed* to convey the past tense.

I am **not** testing any ability a child is supposed to acquire at a certain age. Rather, I will be looking at overall patterns in how children use language in storytelling. The assessments I will be using are not evaluative.

If you agree to have your child participate in this study, I will administer two sets of tests lasting approximately 20 minutes each over the span of 2 days. The storytelling tasks will involve having your child tell me aloud or write down on paper a story about a picture. The other tasks involve assessments of different literacy skills. The literacy measures I am going to use are short and non-stressful. These measures are used widely in schools as reading assessments, and include measures of literacy skills such as spelling and vocabulary. If your child participates, he or she will be tested in a quiet location and will be told exactly what the tasks will involve. During the procedure, I will remain with your child and will be happy to answer any questions he or she may have, and after each task I will provide your child with a small gift as a token of thank you. Of course, even if you grant permission for your child to participate in this study, if your child does not wish to participate, he or she is under no obligation to do so. If at any point during the study your child wishes to discontinue, I will be happy to escort him or her back to the normal activities. I will also certainly stop the procedure and escort your child back to the normal activities if I notice any signs of unhappiness or stress. No matter what, your child will be thanked and rewarded with a small gift.

Your child's name will be used in neither publication nor presentation, and your child's name will be kept separately from his or her data. All data from the study will be kept strictly confidential. Data are stored in locked filing cabinets. The principal of your child's school has approved this study. Whether or not your child participates in this study will have no effect on his or her status at school.

Please indicate on the attached form whether or not you give permission for your child to participate, and sign and return the form to camp with your child. I ask that you please return the form even if your child will not be participating. If you have any questions, please contact the research supervisor, Professor Kathy Binder, at (413) 538-2105.

Sincerely,

Brooke Magnus

Kathy Binder

MOUNT HOLYOKE COLLEGE
INFORMED CONSENT FORM

The study "Vocabulary Understanding in Children" is being conducted by Brooke Magnus, a student in the Psychology and Education Department at Mount Holyoke College. This project is being carried out under the supervision of Professor Kathy Binder, of the Psychology and Education Department at Mount Holyoke College.

This project has been approved by the Institutional Review Board of Mount Holyoke College.

I understand that:

A. Your child's participation is voluntary, and choosing not to participate in this study will not have any consequences on his or her status in the program.

B. Your child will be told that he or she does not have to participate in any or some of the tasks if he or she so chooses. Your child is free to stop the involvement in this study at any time, or refuse to answer any questions.

C. The procedures to be followed in the project will be explained to your child, and any questions he or she may have about the aims or methods of the project will be answered.

D. Your child's name and information from this study will be treated as strictly confidential. No names will be associated with the data in any way. Providing your address to receive a report of the results will not make your child's data identifiable. The data will be stored in a locked room in Reese Hall at Mount Holyoke College and the data will be accessible only to the investigators.

E. Your child will be tape recorded during the oral storytelling task. The audio recording will be deleted as soon as it is transcribed.

F. I read the Parental Permission Letter, which briefly describes the purpose of the study, before signing this consent form. I understand the aim of the study and will address any concern or doubt about it to the researcher, Brooke Magnus, or the research supervisor, Professor Kathy Binder.

After reading the above, please indicate whether you give your child permission to participate in the study.

Check one: YES _____ NO _____

_____ (Parent sign and date here)

_____ (Parent print name here)

_____ (Child's name here)

If you have any questions about this research, contact Brooke Magnus (the investigator) at (774) 526-6014 / magnu20b@mtholyoke.edu, Professor Kathy Binder (research supervisor) at kbinder@mtholyoke.edu, or Mount Holyoke College's Institutional Review Board, at institutional-review-board@mtholyoke.edu.

Would you like a report on the group results of this research project upon its completion?

YES NO

Address to which the report should be sent: _____

Appendix B

Picture Prompts for Storytelling Tasks

Picture 1

Picture 2

Picture Prompt for Sample Story

Storytelling Task Directions

Give child black pen if written task

I'm going to show you a picture. Your job is to write/tell me a story about this picture. I want you to tell me what just happened, what is happening, and what will happen next. I'd like you to talk about what the people or animals in the picture are doing instead of just describing the picture, though. I'm going to show you a sample picture first and read you the story that I wrote about it.

For written task:

I'll stop you after about 8 minutes, okay?

GIVE CHILD BLUE PEN

Now I'm going to give you a few minutes to go back and look over what you've written. If you see any spelling errors or any other mistakes, go ahead and correct them with this pen.

Sample Story

Joe and Doug had finished their homework for the day and were looking for something to do for entertainment. They finally decided to head outside to play on their scooters when Susie came running over. The expression on her face showed only excitement.

“Look! I got a new dog! I named him Fearless Bob” she exclaimed. “He can run unbelievably fast. I bet he can run faster than you!”

“He’s not fearless! Look at how soft and fluffy he is! And there’s no way that he can run faster than me, especially when I’m on my scooter. See how quickly I can move when I’m riding? Believe me, it’s hopeless for him to even try to be as fast as me,” replied Doug confidently as he pressed his foot against the ground to make the scooter move.

“Well, you certainly move quickly, but I bet that compared to my dog, you’re as slow as a snail! You two should race. Do you have a timer?” Susie asked.

“No, but we can just start running at the same time to see who gets to that bush over there the fastest. Here, throw this stick so Bob will run after it,” Doug replied.

Susie threw the stick and Bob started chasing after it. Doug immediately started riding his scooter toward the bush. Doug reached the bush first, displaying a very excited grin on his face. It was close, but Doug was just too quick for Bob.

Appendix C

Tests of Morphological Awareness

Test of Morphological Structure: Derivation

Practice a. Farm. My uncle is a _____. [farmer]

b. Help. My sister is always_____ . [helpful]

1. warm. He chose the jacket for its _____. [warmth]

2. teach. He was a very good _____. [teacher]

3. permit. Father refused to give _____. [permission]

4. profit. Selling lemonade in summer is _____. [profitable]

5. appear. He cared about his _____. [appearance]

6. express. ‘OK’ is a common _____. [expression]

7. four. The cyclist came in _____. [fourth]

8. remark. The speed of the car was _____. [remarkable]

9. protect. She wore glasses for _____. [protection]

10. perform. Tonight is the last _____ . [performance]

11. expand. The company planned an _____. [expansion]

12. revise. This paper is his second _____. [revision]

13. reason. Her argument was quite _____. [reasonable]

14. major. He won the vote by a _____. [majority]

15. deep. The lake was well known for its _____. [depth]

16. equal. Boys and girls are treated with _____. [equality]

17. long. They measured the ladder’s _____. [length]

18. adventure. The trip sounded _____. [adventurous]

19. absorb. She chose the sponge for its _____. [absorption]

20. active. He tired after so much _____. [activity]

21. swim. She was a strong _____. [swimmer]

22. human. The kind man was known for his _____. [humanity]

23. wash. Put the laundry in the _____. [washer]

24. humor. The story was quite _____. [humorous]

25. assist. The teacher will give you _____. [assistance]

26. mystery. The dark glasses made the man look _____. [mysterious]

27. produce. The play was a grand _____. [production]

28. glory. The view from the hill top was _____. [glorious]

29. vision. During the winter, the woman tried to _____ herself on a sunny beach. [visualize]

30. excess. The boy's parents did not want him to eat _____ amounts of sugary foods. [excessive]

31. brave. The girl showed _____ when she rescued the cat from the tree. [bravery]

32. collide. The cars slowed down because they did not want to have a _____. [collision]

33. injure. The athlete suffered from an _____ after her fall. [injury]

Test of Morphological Structure: Production

Practice: a. Driver. Children are too young to _____. [drive]

b. Improvement. My teacher wants my spelling to _____. [improve]

1. growth. She wanted her plant to _____. [grow]

2. dryer. Put the wash out to _____. [dry]

3. variable. The time of his arrival did not _____. [vary]

4. width. The mouth of the river is very _____. [wide]

5. density. The smoke in the room was very _____. [dense]

6. discussion. The friends have a lot to _____. [discuss]

7. famous. The actor would achieve much _____. [fame]

8. description. The picture is hard to _____. [describe]

9. fifth. The boy counted from one to _____. [five]

10. election. Which person did they _____? [elect]

11. strength. The girl was very _____. [strong]

12. decision. The boy found it hard to _____. [decide]

13. popularity. The girl wants to be _____. [popular]

14. runner. How fast can she _____? [run]

15. publicity. His views were made _____. [public]

16. difference. Do their opinions _____? [differ]

17. originality. That painting is very _____. [original]

18. agreeable. With that statement I could not _____. [agree]

19. courageous. The man showed great _____. [courage]

20. admission. How many people will they _____? [admit]

21. dangerous. Are the children in any _____? [danger]

22. reduction. The overweight man was trying to _____. [reduce]

23. baker. She put the bread in to _____. [bake]

24. division. The cake is hard to _____. [divide]

25. guidance. The map was her _____. [guide]

26. continuous. How long will the storm _____? [continue]

27. reliable. On his friend he could always _____. [rely]

28. acceptance. Is that an offer you can _____? [accept]

29. advertisement. The man decided to _____ his service in the local newspaper. [advertise]

30. perception. The sound was so quiet that he could not _____ it. [perceive]

31. defense. It is the military's job to _____ the country. [defend]

32. privacy. The crowded store was not a _____ place. [private]

33. assumption. We should not _____ that everyone likes the same things. [assume]

Suffix Choice Test: Pseudowords (University of Washington, 1999)

1. Our teacher taught us how to _____ long words.

a) jittling b) jittles c) jittled d) jittle

2. _____ makes me happy.

a) Blopness b) Bloply c) Blopish d) Blopable

3. The _____ boy plays soccer.

a) tweagness b) tweagish c) tweagment d) tweagtion

4. The girl dances _____.

a) spridderish b) spriddered c) spridderly d) spridding

5. I could feel the _____.

a) froodly b) froodful c) frooden d) froodness

6. What a completely _____ idea.

a) tribacious b) tribicism c) tribacize d) tribation

7. I admire her _____.

a) sufilive b) sufilify c) sufilation d) sufilize

8. Where do they _____ the money?

a) curfamic b) curfamity c) curfamate d) curfamation

9. Please _____.

a) scriptial b) scriptize c) scriptist d) scriptious

10. The meeting was very_____.

a) lorialize b) lorial c) lorialism d) lorify

11. I just heard a _____ story.

a) dantment b) dantive c) danticism d) dandify

12. Dr. Smith is a famous _____.

a) cicarist b) cicarize c) cicarify d) cicarial

13. Can you _____ both sides?

a) romify b) romity c) romious d) romative

14. He has too much _____.

a) brinable b) brinicity c) brinify d) brinicious

Appendix D

Word Attack Subtest of the Woodcock Reading Mastery Tests – Revised

Item 1:

Researcher: "**Look at these letters."** (Researcher runs fingers along page with four letters.) **"Point to the letter that makes the /p/ sound in the word 'pig'."**

Correct: Researcher points to p

Error or No Response: Researcher points to p and says **'This letter makes the /p/ sound as in the world 'pig'. Now you point to the letter that makes the /p/ sound.**

Item 2:

Researcher: **"What is the sound of this letter?"** (Researcher points to "k" on subject's page)

Correct: says /k/ sound

Query: says name of letter – **"That is the name of the letter. Tell me its sound."**

Item 3:

Researcher: **"What is the sound of this letter?"** (Researcher points to "n" on subject's page)

If correct: says /n/ sound

If child says name of letter – **"That is the name of the letter. Tell me its sound."**

Move on to Practice Items A and B:

Researcher: **“I want you to read some words that are no real words. Tell me how they sound.”** Researcher points to “nat”. “**How does this word sound?”**

Researcher: **“Read this word to me.”** (Researcher points to “ib”.)

Once the practice items are complete:

Researcher: **“Read each of these words to me. Don’t go too fast.”**

Remainder of Items on Word Attack:

nan	yosh	lindify
rox	tayed	saist
zoop	grawl	knoink
lish	sluke	mafreatsun
dright	thrept	phigh
feap	wheeg	deprotenation
gusp	mibgus	paraphonity
snirk	splaunch	apertuate
	quantric	

Appendix E

Wechsler Individual Achievement Test Items

Researcher: **"I am going to ask you to write some words. First I will say the number of the word so you will know where to write it on the page. Then I will say the word, use it in a sentence, and say it again. Listen carefully to the sentences so you will know which word to write."**

(3^{rd} graders start at item #16, 5^{th} graders start at item #19)

16. Say **"Number 16. *Look*. *Look* both ways before crossing the street. *Look*."**

17. Say **"Number 17. *Hand*. Raise your *hand. Hand."***

18. Say **"Number 18. *Candy.* The *candy* store was closed. *Candy."***

19. Say **"Number 19. *Two*. Martin's mother gave him *two* dollars. *Two*."**

20. Say **"Number 20. *Under*. The gloves were *under* his coat. *Under*."**

21. Say **"Number 21. *Right.* Turn to your *right* at the next corner. *Right."***

22. Say **"Number 22. *Jumped*. The dog *jumped* over the puddle. *Jumped."***

23. Say **"Number 23. *Charge.* How much did she *charge* for the book? *Charge."***

24. Say **"Number 24. *Knew.* The teacher *knew* how many were going. *Knew*."**

25. Say **"Number 25. *Careless. Careless* mistakes can cause accidents. *Careless."***

26. Say **"Number 26. *Guess.* Can you *guess* how old he is? *Guess."***

27. Say **"Number 27. *Couldn't.* He *couldn't* decide what he wanted to order. *Couldn't."***

28. Say **"Number 28. *Rough.* The table had a *rough* surface. *Rough.*"**

29. Say **"Number 29. *Riding.* They were *riding* their new bikes. *Riding.*"**

30. Say **"Number 30. *Owe.* I *owe* you more than you charged me. *Owe*."**

31. Say **"Number 31. *Design.* Luis won an award for his cover *design.* *Design*."**

32. Say **"Number 32. *Climbed.* The cat *climbed* up the tree. *Climbed*."**

33. Say **"Number 33. *Easier.* It was *easier* to push than to pull the cart. *Easier*."**

34. Say **"Number 34. *Whistle.* We heard Calvin *whistle* for his dog. *Whistle.*"**

35. Say **"Number 35. *Strength.* It took considerable *strength* to move the boxes. *Strength.*"**

36. Say **"Number 36. *Doubt.* There was no *doubt* that she was right. *Doubt.*"**

37. Say **"Number 37. *Ceiling.* Both boys helped paint the *ceiling*. *Ceiling.*"**

38. Say **"Number 38. *Principal.* The school *principal* visited the classroom. *Principal.*"**

39. Say **"Number 39. *Absence.* His *absence* was noticed immediately. *Absence.*"**

40. Say **"Number 40. *Excitement.* The crowd roared with *excitement.* *Excitement.*"**

41. Say **"Number 41. *Patients.* Our doctor is not taking new *patients*. *Patients.*"**

42. Say **"Number 42. *Beginning. Beginning* Monday, she will walk to work. *Beginning."***

43. Say **"Number 43. *They're. They're* trying to win the contest. *They're*."**

44. Say **"Number 44. *Accept.* She is unable to *accept* your invitation. *Accept."***

45. Say **"Number 45. *Subsidize.* Jill's new employer was willing to *subsidize* her daycare expenses. *Subsidize."***

46. Say **"Number 46. *Received.* He *received* your letter today. *Received."***

47. Say **"Number 47. *Edition.* The final *edition* will contain the interview. *Edition."***

48. Say **"Number 48. *Assistants.* Teaching *assistants* were in great demand. *Assistants."***

49. Say **"Number 49. *Prestigious.* The board asked several *prestigious* authors to speak. *Prestigious."***

50. Say **"Number 50. *Sovereign.* Elizabeth I was the *sovereign* queen of England. *Sovereign."***

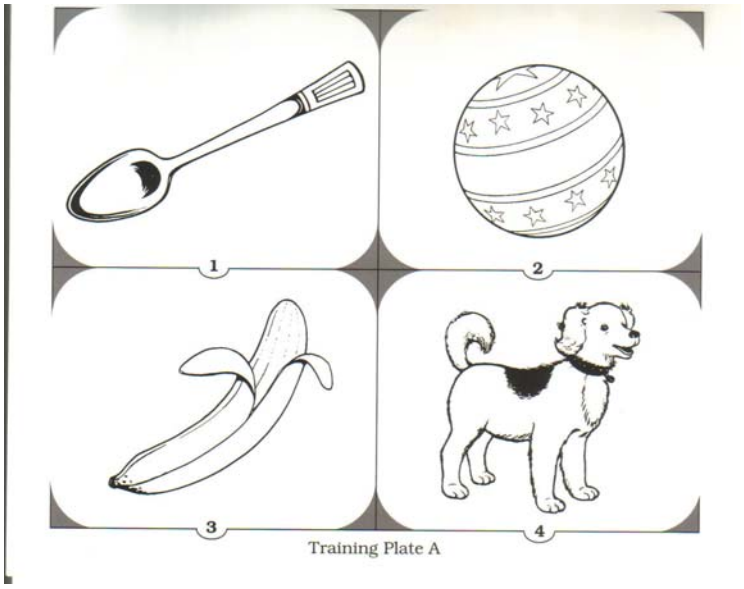
51. Say **"Number 51. *Pharmaceutical.* Aspirin is a *pharmaceutical* product. *Pharmaceutical."***

52. Say **"Number 52. *Conscientious.* Jennifer is a *conscientious* student. *Conscientious."***

53. Say **"Number 53. *Accommodate.* The large room should *accommodate* the group. *Accommodate."***

Appendix F

Picture Peabody Vocabulary Test Script and Sample Pictures



Researcher: "**I want to find out if you know the names of some pictures."**

(The researcher will show the first practice paper.)

Researcher: **"See all the pictures on this page?"** (Researcher points to each of the four pictures on the page.) "**I will say something; then I want you to put your finger on the picture of what I have said. Let's try one. Put your finger on the ball."**

If the child responds correctly without help by pointing to the ball in quadrant 2:

Researcher: "**Good! Let's try another one. Put your finger on dog."**

If the child responds correctly without help by pointing to the dog in quadrant 4:

Researcher: **"Good."**

If the child responds incorrectly, the researcher will demonstrate the correct response by pointing to the ball and will say:

Researcher: **“You tried, but this is ball. Now try again. Put your finger on ball.”**

The researcher will help as necessary until the child makes a correct response.

Researcher: **“Good! Let’s try another one. Put your finger on dog.”**

Once the child has made it through the practice round, the test will begin.

Researcher: **“Fine. Now I am going to show you some more pictures. Each time I will say something and you will point to the best picture of it. When we get further along, you may not be sure which one to point to, but I want you to look carefully at all of the pictures anyway and choose the one you think is right. Point to [first item word].”**

When Does Warmness Become Warmth?

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by

Brooke E. Magnus

A Thesis

Presented to the Faculty of Mount Holyoke College

in partial fulfillment of the requirements

for the degree of Bachelor of Arts

with Honor

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