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Christina Bloom

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Christina Bloom  
Dr. Judith Parker  
LING 491: Dyslexia: Language & Speech

## The Impact of Morphological Awareness on the Reading Development of Children with Developmental Dyslexia

### **Introduction**

The effects of phonological awareness on reading development have been widely researched and are understood and recognized by both educators and linguists. The effects of morphological awareness on reading, though, have been comparatively under-researched until the past two decades, and the topic of morphological awareness is not as commonly discussed by educators as phonological awareness (Goodwin and Ahn 184). The contribution of morphological awareness to reading has not received as much attention as the contribution of phonological awareness, but the impact that morphological awareness makes on reading is significant.

Simply put, “morphology is the study of the forms of words” (Hall 27). Words are made up of small units called morphemes, which are “the most basic element[s] of meaning” (Lyster 262). Morphemes and phonemes (the latter of which phonology and phonological awareness are concerned with) are both units that make up words, but phonemes are units of sound that do not necessarily have meaning while morphemes must always carry meaning. The word “antidisestablishmentarianism” is composed of seven different morphemes. A break down of the word’s morphemic structure can be seen below.

anti/dis/establish/ment/ari/an/ism

Each of these seven morphemes carries a unique meaning that contributes to the overall definition of the word. “Anti-” means “against;” “-dis-” means “apart;” “establish” means “to found or build;” “-ment-” means “an action or resulting state;” “-ary-” means “of or related to;” “-(i)an-” means “of or belonging to something;” and “-ism” means “an action or its result.” All of these individual morphemes combine to form the word and make up the definition of “antidisestablishmentarianism.”

There are two main types of morphemes: free morphemes and bound morphemes. A free morpheme is a morpheme that can stand on its own. Colloquially, free morphemes are often referred to as “roots.” In the example of “antidisestablishmentarianism,” “establish” is the free morpheme. Bound morphemes, in contrast, are morphemes that cannot stand on their own. Bound morphemes can also be called “affixes,” and they can appear before (prefixes), in the middle of (infixes), around (circumfixes), and after (suffixes) free morphemes. Within the category of bound morphemes, there are two divisions. The two types of bound morphemes are inflectional morphemes and derivational morphemes. Inflectional morphemes are grammatical markers added to free morphemes that indicate features such as tense, number, possession, or comparison. These do not change the part of speech or fundamental meaning of the word. The word “cats” is made up of one free morpheme (“cat”) and one inflectional morpheme (the suffix “-s”). “Cat” is a noun, and “cats” is a noun. Adding “-s” to “cat” does not change the part of speech of the free morpheme.

In contrast, the second type of bound morpheme, the derivational morpheme, can change the part of speech of the free morpheme or the fundamental meaning of the word. The word “beautiful” is made up of two morphemes: “beauty” and “-ful.” “Beauty,” a noun, is the free morpheme in this word. “-ful” is a derivational morpheme added to “beauty,” changing it from a

noun to an adjective. Because “-ful,” a bound morpheme, changes “beauty’s” part of speech, “-ful” is a derivational morpheme.

Morphological awareness, as defined by Vaknin-Nusbaum et al., is the “attentiveness to the morphemic structure of words and the ability to inflect words and consciously manipulate their structure to express different meanings” (1916). Morphological awareness allows readers to recognize, comprehend, and utilize morphemes when reading. A typically-developing child with a high level of morphological awareness could recognize that “antidisestablishmentarianism” is made up of many parts (although he or she would probably not use the word “morphemes” to describe those parts) and could probably break the word up into meaningful segments. If the child happened to know the meaning of some of the individual morphemes, he or she could also use this knowledge of morphemic definitions to figure out a loose definition of the word.

Children can use morphological awareness in listening to words and hearing words sounded out. A child can hear the word “music” and the word “musical” and understand, from the sound of the two words, that the two words are related. However, because of phonological rules and restrictions on language, morphemes are sometimes pronounced differently in different words even though the meanings of the morphemes are the same. For example, in the case of the words “sign” and “signature,” “sign” is an important free morpheme in the word “signature,” and the two words are semantically related, but “sign” (on its own) is pronounced /saɪn/, and “signature” is pronounced /sɪg.nə.tʃɪ/. The morpheme “sign” is still in the word “signature,” and the meaning of the free morpheme contributes to the meaning of the word, but the pronunciation is different because of the added bound morphemes. In this latter case, the graphic representations of the word and morpheme, which are the representations with which reading is concerned, are essential to understanding the morphological connection between the two words.

Typically-developing children use morphological awareness to their advantage in reading. Studies have shown that morphological awareness contributes to the spelling, phonological, vocabulary, decoding, and reading comprehension skills of early readers. However, children with developmental dyslexia often struggle with morphology. This morphological deficit can impact their reading abilities and can cause them to fall behind their typically-developing peers. Many studies are revealing that because morphological awareness plays such a large role in the reading process, children who struggle with morphological awareness (such as children with developmental dyslexia) struggle in areas such as spelling, phonology, vocabulary, decoding, and reading comprehension—the very areas that morphological awareness benefits in typically-developing children.

### **Relationship Between Morphological Awareness and Spelling**

Because morphological awareness involves the recognition of and ability to manipulate morphemes, it makes sense that morphological awareness positively impacts spelling skills. Children can use morphological rules to aid their spelling. When children (or adults, for that matter) write, they can think about the meaning of the word they are trying to spell and break that word down into individual morphemes based on the word's meaning. If a child knows how to spell the word “cat,” and knows that the inflectional morpheme “-s” is added to words to make them plural, when a child is taking a spelling test, told to fill in the blanks, and given the sentence, “This is a cat. Now there are two of them. There are two \_\_\_\_\_,” the child knows to add “-s” to “cat” in order to make the free morpheme plural.

An article by Goodwin and Ahn examined 17 different morphological instructional interventions involving school-aged children (preschool through twelfth grade). Goodwin and Ahn's analysis of these interventions coded the interventions by the focus of the interventions,

which were literacy, reading, spelling, vocabulary, and “other” (197). Goodwin and Ahn’s study found that interventions focused on morphological awareness can help improve spelling skills (along with other skills that will be discussed later) in children, which shows that teaching children morphologically-based spelling rules helps students apply those morphological rules to their own written spelling and can help students recognize morphological relationships that are found within the orthographies of words (205). When children receive focused morphological instruction, they can learn the rules of morphology, learn how to apply them, and then use them in their own spelling.

A study on the relationship between morphological awareness and reading and spelling in Greek by Pittas and Nunes echoed Goodwin and Ahn’s finding that morphological awareness positively impacts spelling. Pittas and Nunes set out to understand the contribution of morphological awareness to reading and spelling in Greek and did so by following the morphological development of 404 Greek Cypriot children from state-supported schools beginning in either first or third grade (1507). The children’s development was assessed through a battery of tests that was administered in two different periods eight months apart. The tasks given focused on either measures of morphological awareness (which were labelled predictor measures) or reading and spelling tests (which were labelled outcome measures) (1512). Pittas and Nunes controlled for phonological awareness and verbal ability in order to discover whether or not morphological awareness contributed independently to reading and spelling. The study found that morphological awareness in the first administration of the battery of tests predicted reading and spelling performance in the second administration. It also found that, in Greek, morphological awareness contributes independently and uniquely to reading and spelling skills, even after controlling for verbal ability and phonological awareness (1523). This finding is

significant because it reveals that even though phonological awareness may contribute to spelling, morphological awareness also contributes to spelling independently of phonological awareness. Because phonological awareness has been a focus for educators, it is important to note that morphological awareness makes a type of contribution that phonological awareness does not and therefore should not be overlooked.

A study by Nagy, Berninger, and Abbott sought to find out whether or not morphological awareness makes a significant contribution to literacy outcomes after phonological awareness had been controlled for. Spelling was one of the several literacy outcomes in question. The study tested 96 fourth graders, 86 fifth graders, 116 sixth graders, 102 seventh graders, 105 eighth graders, and 102 ninth graders in an American public school general education program. The students were tested for morphological awareness, phonological awareness, and several different literacy outcome skills. The measures of morphological awareness included a suffix choice test, which required participants to select the correct inflectional or derivational suffix in the context of a sentence, and a morphological relatedness task, which asked participants to express whether or not one word was derived from another. The measures of phonological awareness featured an oral nonword repetition task, which had children repeat a pseudoword after a period of time, testing for phonological short-term memory, and a task that required the decoding of written words. Finally, the measures of literacy outcomes were tasks focused on reading vocabulary, reading comprehension, spelling, the decoding of inflected words, the decoding of prefixed and pseudoprefixed words, the decoding of prefixed irregular stems, the decoding of suffixed irregular stems, and the decoding of sets of morphologically related words. The results of the study revealed that morphological awareness makes significant contributions to several literacy

outcomes (more of which will be discussed later), including spelling. Spelling was impacted by morphological awareness at each grade level tested in this study.

A study by Linda S. Siegel also supported the relationship between morphological awareness and spelling. The study set out to understand the relationship of morphological awareness to the reading and spelling skills of typically-developing children, children who struggle with dyslexia, and children in an English language learning program (15). Siegel's study tested 1,238 sixth graders from an urban area in Canada and had them complete a series of tasks examining their morphological, phonological, reading, auditory, reading comprehension, and spelling skills. The children with dyslexia scored lower on the tasks testing for morphological awareness, spelling skills, and reading and reading comprehension skills than their typically-developing peers, indicating that the deficit in morphological awareness experienced by children with dyslexia may cause issues with spelling, reading, and reading comprehension. These results reveal a link between morphological awareness and spelling and reading. Additionally, the contribution of morphological awareness to reading and spelling was found to be over and above the contribution made by phonological awareness, which was found when analyzing the correlations between morphological awareness, phonological awareness, reading, and spelling (21). Like Pittas and Nunes's study, Siegel's study notes the independent contribution of morphological awareness apart from phonological awareness (20). Again, this is important because it reveals that morphological awareness and phonological awareness are distinct skills and that morphological awareness also plays a role in the reading process.

A study by Breadmore and Carroll also sought to discover whether or not morphological awareness and phonological awareness were two independent skills. The study first compared 36 children with dyslexia to 72 typically-developing children and then compared 28 children with



Otitis Media (OM) to 56 typically-developing children. (Children with Otitis Media were included in this study because these children suffer with infections of the inner ears, and because of these infections, they often incur mild to moderate hearing loss. This hearing loss affects their phonological skills, and these children frequently experience a phonological impairment.) Each child was required to take two spelling tests, which each featured a different set of nonwords. The nonwords were featured in sentences in order to give the participants context for the usage of these words. The children with dyslexia produced fewer phonologically-plausible spellings than their typically-developing peers and struggled to establish root constancy for both inflectional and derivational forms. They used morphological strategies less often than age-matched typically-developing children, but about as frequently as reading-level matched typically-developing children. The results of this part of the study indicate that children with dyslexia struggle with both phonology and morphology. In the examination of children with Otitis Media, though, the children with OM scored low on phonological awareness testing and inflectional suffix constancy but did not struggle with derivational suffix constancy the way their peers with dyslexia did. The results of this part of the study show that though the children with OM struggled with phonology due to issues with their hearing, they did not struggle with the use of morphology. These findings are significant because they reveal that morphological awareness and phonological awareness are both distinct skills, and this can be seen in the spelling differences of these two groups. The findings are also significant because they show that dyslexia impacts morphological awareness which impacts spelling.

Finally, a study by Bourassa and Treiman observed 32 children with dyslexia and 32 typically-developing third-to-sixth graders in two sessions. In the first session, the researcher read a morphologically complex word aloud, and children were asked to first repeat and then

spell the given word. In the second session, children were asked to repeat and then spell “base words” or the roots of words. The older typically-developing children readily employed morphology in their spelling, but older children with dyslexia and the younger typically-developing children did not have the same grasp on morphology as the older typically-developing children. The older children with dyslexia performed on the same morphological level as the younger typically-developing children. This finding reveals that children with dyslexia do have some understanding of morphology and graphotactic (written) patterns, but they do not perform on the same level as their age-matched peers. This is important because it reveals that though children with dyslexia experience a morphological deficit, they still develop the same morphological skills as their typically-developing peers. The morphological skills just develop at a slower rate in children with developmental dyslexia.

The results of these studies all point towards a link between morphological awareness and spelling. These studies show that morphological awareness can contribute to a child’s spelling abilities independently of phonological awareness and that children with dyslexia often struggle with spelling because of their morphological deficits. Although these spelling-related morphological skills do eventually develop in children with dyslexia, they develop more slowly than they do in typically-developing children.

### **Relationship Between Morphological Awareness and Phonological Processing**

As studies in the previous section revealed, morphological awareness and phonological awareness are two separate skills. Although they may impact one another, they are both independent and make unique contributions to various skills. As the following studies will observe, morphological awareness makes several contributions to phonological processing.

A study by Cunningham and Carroll examined the impact of early phonological processing on phonological and morphological awareness and on the links between morphological awareness and phonological awareness and reading ability. By testing 164 kindergarteners and first graders from the UK and then retesting those students in third and fourth grade, Cunningham and Carroll were able to measure the growth of the students in regard to morphological and phonological awareness. The battery of tests featured a phoneme segmentation task, a pseudoword reading task, a pseudoword spelling test, and a reading comprehension test. The tests were designed to measure phonological and morphological skills and strategies as well as reading comprehension in participants. After analyzing a series of regressions comparing the scores from the various skills tests, the authors of the study concluded that students who struggled with phonological perception (the processing of language sounds) were more likely to struggle with morphological issues. This finding is important because it reveals one way in which phonology impacts morphological awareness.

In a previously-mentioned study, Goodwin and Ahn acknowledged a way in which morphological skills impact phonological processing. Goodwin and Ahn's study, which analyzed 17 morphological interventions and explored the impacts of such interventions, examined the impact of morphological interventions on various skills. The analysis revealed that morphological interventions, which feature specific instruction in morphology, can actually improve children's phonological awareness. This finding suggests that the two skills are not the same but work closely together and affect one another. This is an example of how morphological awareness impacts phonological processing.

The study by Breadmore and Carroll that was explained in the previous section sought to explore the relationship between phonology and morphological awareness. The study tested two

groups of children, one group with dyslexia and one group with Otitis Media, and found that the children with dyslexia struggled with both phonological awareness and morphological awareness, but the group of children with Otitis Media struggled with phonology but not morphology. The findings of this study are significant because they reveal that morphological awareness and phonological awareness are two separate skills and that children who struggle with morphology may not struggle with phonology. This confirms that the two skills are distinct because children may struggle with one skill and not the other.

A study by Casalis et al., like the study by Breadmore and Carroll, examines the relationship between morphological awareness and phonological awareness in children with dyslexia, noting that many educators and linguists supposed that morphological awareness was secondary to phonological awareness and that the development of morphological awareness was dependent on the development of phonological awareness. Because dyslexia is often associated with poor phonological skills, this was a plausible belief; Casalis et al., though, hypothesized that the two types of awareness were distinct and that the development of morphological awareness was separate from the development of phonological awareness.

The article presented two studies. The first study tested 33 children with dyslexia between the ages of eight and twelve, 20 typically-developing first graders, and 14 typically-developing second graders. The children underwent a battery of tests including a sentence completion task which mimicked Berko's "wug" study; a sentence comprehension task to test for reading comprehension; a test for receptive grammar, which had children select the picture that was most closely related to a sentence they either heard or read; a reading task, in which children read regular words, irregular words, and pseudowords; a phoneme suppression task, in which children were asked to pronounce a word after a particular phoneme (such as the /d/ in /draɪ/ or

the /g/ in /grup/) was deleted (/draɪ/ would become /raɪ/ after the deletion of /d/, and /grup/ would become /rup/ after /g/ was deleted); a morphological analysis task, which had children pronounce morphologically complex words; a suffix deletion task, in which children had to give the root of a word pronounced by the researcher; a production after definition task, in which children completed a sentence which explained the definition of a word; and finally a morphological fluency task, in which children had to come up with as many real words as possible that contained a given morpheme. The first study revealed that the children with dyslexia scored lower than their typically-developing counterparts on morphological and phonological skills, but that children with dyslexia outperformed the younger typically-developing children on the morphological fluency task, indicating that children with dyslexia are able to use morphology, but their performance in certain morphological tasks is lower than in others. Children with dyslexia seem to develop morphological knowledge differently than typically-developing children, but the authors of this study admit that this is simply a hypothesis that will require further testing (129). The results of this study also hinted that the development of morphological awareness may not be related to the development of phonological awareness, but the researchers admitted that more evidence was needed before this claim could be made with confidence.

The first study revealed what the authors believed to be two different categories of dyslexia in school-aged children. Some of the children with dyslexia struggled with severe phonological deficits, while some of the children with dyslexia exhibited the same reading-level patterns as their reading-level matched peers. The authors used this finding in the second study to determine whether or not morphological awareness is dependent on phonological awareness. The study tested eleven children with dyslexia who struggled with severe phonological deficits and 14 children with dyslexia who only experienced a delay in reading development. These children,

who were not included in the first study, participated in a phoneme suppression task, a suffix deletion task, a sentence completion task, and a production after definition task. The children with the phonological deficit performed as well as the children with delays in reading development on sentence completion task, indicating that both groups possess the same level of morphological awareness even though one group had a lower level of phonological awareness. The results of this second study reveal that morphological awareness is highly correlated with phonological awareness, but the two skills are distinct. The development of morphological awareness is not dependent on the development of phonological awareness in children with dyslexia. This study emphasizes the concept that morphological awareness is different than phonological awareness and makes unique contributions to reading development.

### **Relationship Between Morphological Awareness and Vocabulary**

Morphology deals with morphemes, small, meaningful units of words, and this fact is important to the relationship between morphological awareness and vocabulary. English has a relatively opaque orthography, which means that there is not necessarily a direct correspondence between the sounds of the words and their spellings. This is why English has words that feature many silent letters (as in the word “know” [/*nəʊ*/]) and why different letters sometimes have different pronunciations (“c” can be pronounced as /*si*/ or /*k*/ or /*s*/ depending on the phonological constraints placed on it by surrounding sounds). This is why phonological awareness, the recognition of sounds in words, does not play as significant a role in vocabulary skills as morphological awareness does—words do not always look like they sound. However, because morphological awareness focuses on the meanings of constituent units of words, it has a significant impact on vocabulary. A reader can look at a free morpheme, see a different word that contains that free morpheme, and recognize that those two words are related. From there, he or

she can use his or her understanding of morphology to determine the meaning of the word. However, a child could hear the same two words, and if the free morpheme is not pronounced the same way in both, the child might not recognize the relationship between the two words.

As an example of this, “sign” and “signature” are related words. The free morpheme “sign” is orthographically represented the same in both forms. However, the free morpheme is not pronounced the same way in both words (“**sign**” /**sam**/ vs. “**signature**” /**sɪg.nə.tʃɪ**/). Hearing the two words, a child may not recognize that the two are related; but with a fundamental understanding of morphology, a child could see these two words and recognize that they are semantically related. This is why orthographic, not just phonological, representations of words are important to morphology and why morphology impacts vocabulary, a fact which will be supported by studies listed below.

A study by Berninger et al. set out to determine whether growth in phonological, morphological, and orthographic awareness continues at equal rates. The study tested 241 children, a group of first graders and a group of third graders, and followed the participants for the next four years. The children underwent a battery of tests every year, and this battery included groups of various phonological, morphological, and orthographic tasks as well as a vocabulary test. In terms of morphological awareness, the authors wanted to test whether or not morphological awareness is simply a matter of memorizing vocabulary. The study showed, though, that performance in vocabulary knowledge (measured by the vocabulary test, which asked participants to explain the meanings of given words) only predicted certain types of morphological awareness. Vocabulary knowledge alone was not enough to predict morphological awareness. This finding, the authors suggest, reveals that vocabulary and morphological awareness are two closely related skills, but they are not the same skill.

Although morphological awareness and vocabulary skills are not the same skill, they can impact one another, as Cunningham and Carroll point out. This previously-discussed study focuses on the impact of early phonological processing on phonological awareness and morphological awareness and on the links among morphological awareness and phonological awareness and among morphological awareness and reading ability. Cunningham and Carroll aim to expand the understanding of morphological awareness and its effect on reading ability. In the study, Cunningham and Carroll control for various types of linguistic awareness and skills, and the findings reveal that vocabulary is strongly related to the producing and comprehending of morphologically complex words (524). This finding is important because it shows the link between morphological awareness and vocabulary.

An article by Spencer et al. agrees with the previous findings. This article features two studies that both examine the relationship between morphological awareness and vocabulary. The first study featured 99 fourth graders who underwent an assessment that included nine different morphological awareness tasks which tested for derivational morphology, compounding (the formation of compound words), and inflectional morphology as well as a test of vocabulary knowledge. This first study suggested that morphological awareness and vocabulary knowledge may not be two separate skills. The second study, though, recognized that Study 1 only assessed definitional knowledge, meaning that the students were not being tested on how morphologically complex vocabulary words are used in context. This second study predicted, therefore, that morphological awareness may relate to vocabulary knowledge beyond definitional knowledge and sought to prove that morphological awareness and vocabulary knowledge are two separate domains.



The second study tested 90 eighth graders and had them undergo a three-part vocabulary test and a two-part morphological awareness test. The first part of the vocabulary test assessed definitional knowledge; the second part asked subjects to use a target word in a sentence, assessing the subject's word usage and indicating that he or she could use the word in context; the third part asked students to provide synonyms and antonyms for words, assessing the level of word relatedness among the students. The authors then assessed the correlations between vocabulary and morphology and found that morphological awareness, though strongly related to vocabulary knowledge, is a separate skill from vocabulary knowledge. The research showed that morphological awareness is an important part of vocabulary comprehension and use, but that the two skills are unique (980). This finding is significant because, like studies by Berninger et al. and Cunningham and Carroll, this study reveals that morphological awareness and vocabulary skills are closely related skills but are not the same skill.

In the study by Nagy et al., participants in grades four to nine underwent testing to determine whether or not morphological awareness makes a significant contribution to various reading outcomes after controlling for phonological awareness. The study found that morphological awareness makes independent contributions to several categories of literacy outcomes, and vocabulary is one of those outcomes. At each tested grade level, morphological awareness was highly correlated with vocabulary. Morphological awareness, the study found, is related to vocabulary. Morphological awareness plays a significant role in vocabulary processing skills in students.

Goodwin and Ahn examined 17 different morphological intervention studies, and their review revealed that morphological interventions impact vocabulary. Morphological awareness, they claim, can successfully improve vocabulary outcomes for struggling readers and spellers

(204). They strongly suggest that morphological intervention be included in remediation programs in order to help struggling readers. Their finding that morphological interventions improve vocabulary skills again supports the idea that morphological awareness has a positive impact on vocabulary and that morphological interventions can help students who struggle with vocabulary.

### **Relationship Between Morphological Awareness and Word Reading and Decoding**

Decoding is what most people think of as the actual act of reading. Decoding is translating the orthographic symbols into meaningful words either out loud or in one's head. Decoding is the "sounding out" part of reading, which is why this skill is often associated with phonological awareness. Because phonological awareness is concerned with sounds rather than meaning, it is easy to understand why there is such a strong connection between phonological awareness and decoding. Indeed, phonological awareness plays a much greater role in the decoding process than morphological awareness does. Several studies indicate, though, that morphology also plays a role in the decoding process—a "small, but significant" role, according to Kirby and Deacon (234).

Kirby and Deacon sought to explore the relationship between morphological awareness and reading development outside of the contribution of phonological awareness (223). Kirby and Deacon's study is a longitudinal study following 143 children from Kingston, Ontario from second through fifth grade. Each year, the students underwent a battery of tests assessing their reading development, including assessments for phonological awareness, morphological awareness, verbal and nonverbal intelligence, and reading ability. The researchers examined the correlations between the tests and found that morphological awareness does make a limited impact on word reading, but it is not nearly as significant as the contribution of phonological

awareness to decoding. This finding is important for educators because it shows that morphological awareness, though important, is not enough for children to learn to decode words. Morphological awareness does make an impact on decoding, but it is not as significant as the impact that phonological awareness makes, and therefore both skills are necessary and benefit children's reading development.

In Goodwin and Ahn's study on morphological interventions, Goodwin and Ahn state that their findings suggest that morphological interventions can improve reading outcomes for struggling readers and spellers (204). Pittas and Nunes echo this finding. In their previously-mentioned study on the relation between morphological awareness and reading and spelling in Greek, the researchers tested for reading fluency (the ability to read words with speed and accuracy) through a standardized reading test. Fluency is an important part of the decoding process because the better a student decodes, the more fluent he or she becomes. The study revealed that morphological awareness contributes to reading, and that "early morphological awareness predicted later performance in reading" (1523). Again, the morphological contributions to reading were limited, but they were present. This finding reveals that morphological awareness makes a very small contribution to decoding and fluency, but its contribution is not nearly as significant as that of phonological awareness.

A study by Kirby et al. examined the relationship between morphological awareness and reading development. The longitudinal study followed 103 students from kindergarten through third grade and tested the students each year to track their growth. The battery of tests administered each year included phonological awareness tasks, morphological awareness tasks, reading ability, and reading comprehension. After studying the correlations between the results of each test, the authors concluded that morphological awareness impacts the accuracy and

efficiency of word decoding, which echoes Pittas and Nunes's finding about the relationship between morphological awareness and fluency. The results of this study are important because they indicate that students with dyslexia and/or a morphological deficit will decode words much more slowly, much less accurately, and much less easily than their typically-developing peers. The findings of Kirby et al. and Pittas and Nunes's studies seem to imply that the primary impact of morphological awareness's influence on decoding may simply be the fluency of decoding.

### **Relationship Between Morphological Awareness and Reading Comprehension**

Reading comprehension is, perhaps, the area of reading most significantly impacted by morphological awareness. As in the case of vocabulary skills, this may have to do with morphological elements being retained in orthographic representations; readers can see the morphemes when reading words and can visually recognize morphemes they already know the meanings of or morphemes that look similar to words they know. Phonological awareness, which is concerned with sounds rather than meaning, does not have this advantage and therefore does not contribute as strongly to reading comprehension as morphological awareness does.

The previously-mentioned study by Nagy et al. focused on the impact of morphological awareness on several types of literacy outcomes after controlling for phonological awareness, and the researchers concluded that morphological awareness makes a significant contribution to reading comprehension. Part of this contribution is linked to the influence of morphological awareness on vocabulary, but the study also found that morphological awareness makes a contribution to reading comprehension that is over and above vocabulary's role in reading comprehension (143). The results of this study reveal that morphological awareness is fundamentally important to reading comprehension skills in students.

Vaknin-Nusbaum et al. focuses on the relationship between morphological awareness and reading in Hebrew. The study tested 298 Hebrew-speaking and -writing second graders at the beginning and end of the school year. Subjects took a two-part morphological awareness assessment. The first part focused on plural inflectional morphemes, and the second part focused on inflectional possessive morphemes, which are represented as bound suffixes in Hebrew. Subjects also took an orthographic word recognition test, a phonological decoding test, and a reading comprehension test. The study tracked the children's development through these tests and found strong correlations between morphological awareness and reading comprehension. The study also found that morphological awareness at the beginning of second grade is a significant predictor of reading comprehension skills at the end of second grade. These findings are significant because they reveal that morphological awareness and reading comprehension are closely related skills and that morphological awareness makes a considerable contribution to reading comprehension skills. Previously-described studies, such as those by Cunningham and Carroll, Kirby and Deacon, Kirby et al., and Siegel, through their tests, all support the idea that morphological awareness and reading comprehension are different but very closely related skills and that morphological awareness makes a major contribution to reading comprehension.

A study by Mokhtari et al. sought to examine the relationship between morphological awareness and reading comprehension in seventh graders. The researchers acknowledged that morphological competency becomes more obvious as students get older because students become more metalinguistic in their thinking and language usage and because older children encounter morphologically complex words at a much greater frequency than younger students do. The study tried to determine how much variance in reading ability is due to morphological awareness and whether or not seventh grade readers exhibited a higher level of morphological

awareness than their less-skilled peers. The study tested 53 seventh graders of varying levels of reading ability. The seventh graders took two tests: the McCutchen Measure of Explicit Morphological Knowledge (in which students had to read a stem word and then complete a sentence with a derivation of the stem word) in order to test for sensitivity to morphological structure and the Texas Assessment of Knowledge and Skills (TAKS) test administered by the school. Researchers only used the reading scores from this latter test to determine the reading skill level of participants. The researchers compared the reading scores of the TAKS test and the scores on the morphological assessment and determined that the reading comprehension skills of the seventh-grade participants were positively associated with their awareness of morphological structure. This finding indicates that morphology contributes to students' abilities to recognize the meanings of words and comprehend the larger text the words are used in. The study also found that children with lower levels of reading ability also struggled more with morphological awareness than their higher-performing peers did. This again indicates the role that morphology plays to reading comprehension and reading development in general.

In a longitudinal study, Lyster et al. set out to determine the long-term effects of morphological awareness training received in preschool on reading comprehension six years after training. The researchers divided a group of 269 Norwegian preschoolers into three different groups. 106 of the preschoolers received training in phonological awareness, which involved training in syllable and sound blending and the matching of rhymes and alliterations. 127 of the preschoolers received training in morphological awareness, which included prefix and suffix identification and the recognition of components of compound words. The final group of 36 children was the control group. This group received no additional training. The morphological

and phonological training sessions were each thirty minutes long and were administered once a week for seventeen weeks.

The participants of the study were evaluated in preschool, first grade, and sixth grade. In preschool and first grade, students were tested on the ability to match initial phonemes, to blend phonemes, to count phonemes, and to delete initial phonemes. Children were also given a vocabulary test and a nonverbal IQ test. In first grade, children underwent a series of reading tests, which tested for word reading and text reading skills. Finally, in sixth grade, children were tested for word reading ability; continuous, narrative text reading ability; and discontinuous reading ability, which consisted of a passage in which children had to read the passage while referring to tables or maps at other locations on the page. The students who received morphological awareness training in preschool performed significantly better on the text reading measures than both other groups. The phonological awareness training, by contrast, did not appear to produce lasting results in the area of reading comprehension. The results of this study reveal that morphological awareness significantly affects reading comprehension and that early morphological awareness training can impact a student's reading comprehension many years later. When it comes to the domain of reading comprehension, the effects of morphological awareness training are long-lasting.

In an aforementioned study, Goodwin and Ahn analyzed the impact of morphological interventions on reading comprehension and found that morphological interventions increase morphological awareness and therefore can positively impact reading comprehension. This finding is important to educators because it reveals the significance of morphological education on reading comprehension.

## Conclusion

Morphological awareness and its relationship to reading development and dyslexia has not been studied as extensively as phonological awareness, but it is obvious that there is an important relationship between morphological awareness and reading. As revealed by Goodwin and Ahn, Pittas and Nunes, Siegel, Breadmore and Carroll, and Bourassa and Treiman, morphological awareness makes a contribution to spelling that is independent of the contribution that phonological awareness makes because when children learn the rules of morphology, they can apply the rules to their own spellings. These morphological skills, though, develop at a much slower rate in children with developmental dyslexia than they do in their typically-developing peers, according to Bourassa and Treiman. Morphological awareness also impacts and is impacted by phonological processing, as seen in studies by Cunningham and Carroll, Goodwin and Ahn, and Breadmore and Carroll. Morphological awareness and vocabulary knowledge are very closely related skills—so closely related, in fact, that they are sometimes viewed as the same skill. Studies like those by Berninger et al., Cunningham and Carroll, and Spencer et al., though, prove that morphological awareness and vocabulary knowledge are not the same skill, although the studies support the idea that the two skills are very closely related. Goodwin and Ahn acknowledge the impact of morphological interventions on vocabulary skills. Phonological awareness plays a much greater role in decoding than morphological awareness does, but morphological awareness does play a limited role in the decoding process, as seen in studies by Kirby and Deacon, Goodwin and Ahn, Pittas and Nunes, and Kirby et al. Studies like those by Kirby et al. and Pittas and Nunes suggest that the contribution of morphological awareness to decoding is mainly fluency. Finally, morphological awareness plays a major role in reading comprehension, a fact found in studies by Vaknin-Nusbaum et al., Cunningham and Carroll,



Kirby and Deacon, Kirby, Siegel, and Goodwin and Ahn. A growing body of substantial research attests to the idea that morphological awareness, though not the sole contributor to reading development, plays a significant role in the reading development of typically-developing children, and the deficit of this skill in children with developmental dyslexia strongly and negatively impacts their literacy skills.

The methods of research for this topic are generally the same in each study. Most of these studies include some kind of test for morphological awareness, a test for phonological awareness, a spelling test, a vocabulary test, a reading comprehension test, and an intelligence test. Many of the studies utilize pseudowords or nonwords in order to test for morphological and phonological awareness—if children can apply the rules of morphology and phonology to pseudo- and nonwords properly, then it is clear to researchers that these children can use these same rules on actual English words.

The most exciting findings of these studies are in the relationship between morphological awareness and phonological awareness. Morphological awareness is often overlooked as a contributor to reading development because it is often mistaken as simply another component of phonological awareness. However, studies like Breadmore and Carroll's suggest that the two types of awareness are distinct. A student can struggle with phonological awareness but not with morphological awareness. A major gap in the research that is becoming more and more obvious is whether or not a student can struggle with morphological awareness but not phonological awareness. The subject of morphological awareness and its relationship with reading development is still in the early stages of research, so it may be several years before this gap is explored. Furthermore, it might be difficult to find a population that struggles with morphological awareness and not phonological awareness, but it is currently a gap that that could

be explored since its mirror (phonological awareness struggles without morphological issues) has already been explored.

The supported link between morphological awareness and reading development has major implications for educators. As many of these articles indicate, morphological instruction should be included in reading curricula because morphological awareness impacts so many aspects of the reading process. Morphological interventions could also greatly benefit struggling readers and spellers. While phonological interventions are currently well-integrated and effective in educational programs, morphological instruction and interventions can be coupled with existing programs in order to achieve better results.

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