DOCUMENT RESUME

ED 465 986 CS 511 183

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TITLE	The Contribution of Morphology to Reading and Spelling Achievement.
SPONS AGENCY	National Inst. of Child Health and Human Development (NIH), Bethesda, MD.
PUB DATE	2002-00-00
NOTE	29p.; Virginia Berninger, Principal Investigator.
CONTRACT	P5OHD33812
PUB TYPE	Reports - Research (143)
EDRS PRICE	MF01/PC02 Plus Postage.
DESCRIPTORS	Classroom Research; Grade 4; Intermediate Grades; *Literacy; *Morphology (Languages); *Reading Achievement; Reading Research; *Spelling
IDENTIFIERS	Orthography; *Phonological Awareness; Research Suggestions; Washington (Seattle)

ABSTRACT

A study examined the contribution of morphological knowledge to the reading and spelling achievement of fourth grade children. Results in the study were expected to indicate that morphology contributes to reading and spelling achievement beyond phonological and orthographic awareness. Participants were 58 native English-speaking fourth graders (88% were European American) from various public and private elementary schools in the Greater Seattle area. Participants, none of whom had reading disabilities, were selected from a larger group participating in a year-long study concerning the effects of phonological awareness instruction on literacy achievement. Participants were individually administered five tasks by one of four trained testers. Three subtests measuring the children's morphological awareness were administered, along with one task determining individual word identification ability and one task tapping phonological awareness. Except for word identification, all the tasks were presented orally--no reading was required. Findings suggest that morphology seems to contribute to the reading and spelling achievement of fourth-grade students. In particular, it seems to enhance performance on measures of word identification, spelling, vocabulary, and comprehension. Results indicated that morphological knowledge predicted reading and spelling achievement beyond orthographic and phonological awareness. Further study is needed to determine which aspects of written language achievement are most affected by morphological knowledge and when morphology begins to play a role in reading success. Includes 2 tables. Appended is a scoring of narratives rubric. (Contains 34 references.) (NKA)

The Contribution of Morphology to Reading and Spelling Achievement

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This research was sponsored by Center Grant P5OHD 33812 from the National Institute of Child Health and Human Development
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The Contribution of Morphology to Reading and Spelling Achievement

Learning to read and spell is one of the primary tasks of an elementary school child. Some children easily acquire the skill of reading while others struggle. Some never succeed. The children who fail to develop adequate reading skills eventually leave school, but they may have a dim future: 75 percent of the unemployed are illiterate adults as are 60 percent of prison inmates. 85 percent of juvenile delinquents cannot read (Adams, 1990). Clearly, learning to read is vitally important to a child's future success.

In order to improve literacy instruction, researchers try to determine the underlying skills that contribute to successful reading and spelling acquistion. We know about some, but not all, of the skills utilized by good readers. This study strives to find out more about which skills enhance the mastery of reading and spelling by asking the following questions: For more experienced readers, does morphological knowledge contribute to reading and spelling achievement beyond phonological and orthographic awareness? Which aspects of literacy achievement are affected by morphological knowledge?

Orthographic and Phonological Awareness

Orthographic fluency and phonological awareness have been shown to play a role in reading achievement. In fact, they are the two best predictors of beginning reading achievement (Adams, 1990; Ball & Blackman, 1991; Lundberg, Frost, & Peterson, 1988). Orthographic awareness is the ability to rapidly recognize, name, and produce letters. This skill is important because the more fluently and confidently a child recognizes letters, the easier it will be for the child to learn about letter patterns in words

and letter-sound correspondences (Adams, 1990). An important step in learning to read is increasing one's focus on orthographic cues (Ehri, 1987; Share & Gur, 1999; Berninger, Proctor, De Bruyn & Smith, 1988); within connected text, skilled readers fixate on nearly every word that they read (Adams, 1990).

Phonological awareness is the ability to recognize and manipulate the sound segments of language. For languages that utilize an alphabetic writing system (such as English), phonological awareness is vitally important because the phoneme is the unit of speech represented with letters (Ball & Blachman, 1991). The ability to manipulate phonemes helps children understand the principles behind the alphabetic code (Griffith & Olson, 1992). Children without phonological awareness tend to be poor readers (Griffith & Olson, 1992; Adams, 1990). Also, training studies have shown that instruction in phonological awareness increases word recognition ability (Ball & Blachman, 1991; Iverson & Tunmer, 1993).

Theory Supporting a Link between Morphological Knowledge and Literacy Achievement

Yet, despite that fact that phonological awareness is an even better predictor of reading achievement than IQ (Griffith & Olson, 1992), it does not explain all of the variance in reading and spelling achievement. One factor that may explain additional variance in reading and spelling achievement is morphological knowledge. Morphological awareness is the knowledge that morphemes, the smallest meaningful units of language, are represented in the orthography. Elbro and Arnbak (1996) proposed a clear framework for explaining the possible relevance of morphology to reading and writing. Three of their main arguments are the influence of morphology on orthography

in languages such as English, the relationship between vocabulary knowledge and morphemic knowledge, and errors in reading and spelling that appear to be morphologically based.

Morphology and orthography are related; this may have consequences for reading and spelling achievement (Elbro & Arnbak, 1996). Words that appear irregular phonologically are often not irregular when looked at from a morphological standpoint "such as the "silent" letter in *condemn* (*condemnation*) and *bomb* (*bombardment*) and the spelling of phonemically ambiguous letters (such as *–city/ -sity*) in *electricity* (the second *c* in morphological analogy with *electric*), and in *university* (like *universe*)" (Elbro & Arnbak, 1996, p.210, italics original). Learning to read and spell involves an understanding of the relationship between the morphological and orthographic systems of a language.

Knowledge of morphemes provides insight into the meaning of words (Elbro & Arnbak, 1996; Nagy & Anderson, 1984; Nagy &Scott, 1990). Between first grade and fifth grade children's vocabulary knowledge increases from about 10,400 words to about 40,000 words (Anglin, 1993). Many of the words that the children acquire are bi- or multi-morphemic words. In first grade children know about 6,900 words of more than one morpheme; by fifth grade this amount has increased to about 22,900 words (Anglin, 1993). Furthermore, children utilize morphological problem solving skills; they break words down into their various morphemes to uncover the words' meanings (Anglin, 1993). For example, a ten-year old girl said she had never heard the word "treelet" before but that she was able to define it. Since she knew the definition of "tree" and

made an analogy of "piglet" to "treelet" she decided that "treelet" must mean a small tree (Anglin, 1993). Thus, children who have an awareness of morphology use their problem solving skills to heighten their comprehension of unknown words and difficult texts.

Many errors in reading and spelling appear to be morphologically based (Elbro & Arnbak, 1996). Lower achieving readers in grades three and four make more morphologically related mistakes in their written narratives than do higher achieving readers (Green, 2001). The errors made by the children at this level often reveal that children are phonologicalally aware; for example, "walked" will be spelled "walkt." But a lack of morphological knowledge is clearly exhibited; these children don't know that the past tense marker for regular verbs is always "-ed" despite how it sounds. Further evidence of mistakes at the level of morphology can be seen in the spelling test of a fourth grade student. This struggling reader was asked to spell "careless," "easier," and "produced;" he wrote "carlles," "esere," and "produst" (McCutchen, et al., 2000). In the spellings, the child accounted for all of the phonemes heard in the words. Yet, the child misspelled the words because he misrepresented the morphological markers "-less," "-er," and "-ed." Here, the problem is not phonological awareness; it is morphological knowledge.

Theory Against a Link Between Morphological Knowledge and Literacy Achievement

Despite the theory that morphology contributes to reading and spelling achievement, some researchers disagree. In fact, one researcher states that morphemes may not be a necessary part of language processing at all; there is no functional value to the morpheme (Smith, 1995). We actually need full lexical entries for words that are

typically considered morphologically complex such as "atheoretical" and "dissatisfied" because we need to know that these forms are the correct forms and that "*asatisfied" and "*distheoretical" are not. Also, breaking words up into morphemes is not helpful because of the number of false morphemes- "regal" is not "re" plus "gal." Smith concludes that there is no reason to remove affixes from base words; in order to use language effectively one does not need to break a word into its component parts. A speaker can correctly use the word "breakfast" without realizing it is a combination of "break" and "fast." Thus, from Smith's viewpoint, morphological awareness would not aid literacy achievment.

Other researchers such as Stemberger (1995) don't take quite as extreme of a viewpoint as Smith does, but these researchers do agree that morphology is too closely connected to phonology and other language processes to differentiate between them. Stemberger argues that since morphology is so closely related to other aspects of language processing, researchers who want to attribute a linguistic phenomenon to morphology must first rigorously separate out all of the influences of phonology. Phonological processing affects morphology; one example is the pronunciation of the plural marker "-s." The "-s" can be pronounced in three different ways as in "cats," "roses," and "dogs," even though the plural marker is always spelled the same way. Another example of the influence of phonology on morphology is with the superlative ending "-est." This suffix cannot be added to words with three syllables (*horriblest). Thus, phonology and morphology may be so closely related that they cannot be teased apart.

Similar to Stemberger, Fowler and Liberman (1995) argue that morphological awareness is closely tied to phonological awareness. Problems in morphological knowledge arise from weaknesses at the phonological level. In order to use morphology to account for variance in reading and spelling achievement, Fowler and Liberman believe that it is important to distinguish between morphemic awareness that does and does not require phonological knowledge. While the relationship between "teacher" and "teach" is clear at the morphological level, seeing the relationship between "invite" and "invitation" or "courageous" and "courage" involves phonological insight as well. Fowler and Liberman argue that if poor readers struggle only at the morphophonemic level (i.e. with words like "knowledge" and "know" but not with "player" and "play") the poor readers' problem is phonological rather than morphological in nature. Thus, Fowler and Liberman conclude that teachers should focus their instruction on the level of phonology instead of at the morphological level.

Evidence for a Link Between Morphological Knowledge and Literacy Achievement

Although many researchers believe that morphology is, at best, a weak component of language processing and literacy achievement, there is evidence that morphology contributes to written word reading above and beyond the contributions of phonology and orthography. Stolz and Feldman (1995) found that readers ultilize the information from all of the morphemes in a word. Reading the morphologically complex nonsense word "*stealer" primed the reader to more quickly identify the word "thief." Furthermore, skilled readers more easily formed the word "brighten" after seeing the morphologically complex word "harden" than after reading the morphologically simple

word "garden." Since the reading of the target word is primed by the information contained in the morphemes making up the priming word, Stolz and Feldman conclude that morphology does play a role in reading independent of phonology and orthography. Morphological awareness and instruction at the level of morphology could therefore influence reading and spelling achievement, particularly in the area of word identification.

Other studies have shown that morphology affects higher-level reading skills such as comprehension. Carlisle's (1995) longitudinal study of kindergarten through second grade students showed that morphological awareness uniquely contributed to second grade reading achievement. In particular, a morphological production task completed by the children in first grade was the strongest predictor of reading comprehension in second grade. (A phonological awareness task contributed the most to their word analysis abilities.) Results of this study indicated that morphological knowledge contributed to reading comprehension beyond phonemic and orthographic awareness for second grade students.

Elbro and Arnbak (1996) report similar findings for dyslexic teenagers. In their reading of single words and connected texts, dyslexic children used morphological knowledge to compensate for their phonological deficits. The teenagers who used morphological analysis most effectively had the highest reading comprehension scores on the measures given. In a second study, dyslexic teenagers who received morphological awareness training (without any training in phonemic awareness) improved their reading of connected texts and their spelling of morphologically complex words. The use of

morphological knowledge allowed the children to reach a higher level of text comprehension than would be predicted from their word identification skills.

Morphological knowledge also seems to aid spelling and writing. Carlisle (1996) did a study of narratives written by second and third grade learning disabled and non-learning disabled students. She found significant differences between the number of morphologically complex words used by second and third graders and by learning disabled (LD) and non-LD students. LD students, especially in second grade, were less accurate than non-LD students. During the second and third grade developmental period the children seemed to be working toward mastery of inflectional forms and just beginning to use derivational forms in their writing. The more successful writers and spellers were the students with strong morphological knowledge.

Based on this evidence, morphological awareness plays a role in reading and spelling achievement. Instruction at the level of morphology would be helpful in increasing reading and spelling success. Students lacking morphological knowledge may have a more difficult time completing literacy activities than students proficient in morphology, so teachers would want to help students increase their morphological awareness.

Even if it is the case that phonological awareness and morphological awareness are too closely related to separately account for the variance in reading and spelling achievement, instruction at the level of morphology might still benefit students. Some students may have such severe phonological problems that instruction at the phonological level may be nearly impossible. For these students, instruction at the level of

morphology may be an effective strategy for increasing reading and spelling achievement (Elbro & Arnbak, 1996). Furthermore, many upper elementary school students no longer want to play the games or sing the nursery rhymes that are so useful in heightening the phonological awareness of children in the primary grades (McCutchen & Berninger, 1999). Teachers are concerned about the developmental appropriateness of instruction; instruction in morphology might be one way to tap into phonological awareness that does not seem too "childish" to older students. Morphological awareness instruction might be a useful addition or alternative to phonological awareness instruction for boosting children's reading and spelling success.

Expectations for the Current Study

This study examined the contribution of morphological knowledge to the reading and spelling achievement of fourth grade children. Results in this study were expected to indicate that morphology contributes to reading and spelling achievement beyond phonological and orthographic awareness.

Method

Participants

Participants were 58 native English-speaking children (31 girls, 27 boys) from various public and private elementary schools in the Greater Seattle area. All of the children were fourth grade students ranging in age from 9 years, 6 months to 10 years, 10 months at the time of testing; 88% of the students were European-American. Students from all reading achievement levels seen in the regular classroom were included; none of the students had been diagnosed with a reading disability. The participants for this study

were selected from a larger group of students participating in a year-long study concerning the effects of phonological awareness instruction on literacy achievement.

Tasks and Procedures

Individually Administered Tasks

Students participating in the study were individually administered five tasks by one of four trained testers. For the most part, the students were familiar with the testers because they had been working in the classroom throughout the school year as part of a year-long study of phonological awareness instruction. Two packets of the tasks were used; the order of the tasks differed in the two packets. Three subtests measuring the children's morphological awareness were administered, along with one task determining individual word identification ability and one task tapping phonological awareness. Except for word identification, all of the tasks were presented orally; no reading was required. For the morphological tasks, the children were allowed to see the stimulus words and sentences.

The Oral Morphological Awareness score was made up of three morphological awareness subtests from a preliminary version of the University of Washington Morphological Awareness Battery (Berninger, et al., 1999). One subtest, consisting of five items, focused on derivational suffixes. For two of the items, the students were asked to choose from among four alternatives the word with the appropriate derivational suffix that best completed the given sentence. For example, the stimulus sentence, "He listened carefully to the _____" was provided. The children had to select an answer from a) directs, b) directions, c) directing, and d) directed. For the other three items in

the task, the children chose the appropriate derivational suffix to complete the sentence as in, "It was the dark____ sky of winter," a) ful, b) less, c) est, d) ly. Correct responses on this subtask indicated an awareness of both the semantic and syntactic role of morphology because different derivational suffixes change the meaning and syntactic category of the base word. A subset of the children, 51 students, was given a multiple choice vocabulary test to check that the base words in the Derivational Suffixes subtask were in the vocabularies of the students. The mean score was 4.94 (sd=.31) out of 5, so vocabulary was not assumed to be a confound in this activity.

A second, five-item morphological subtask entitled "Plausible Words with Derivational Suffixes" (Berninger, et al., 1999) presented the children with a plausible, though not typically used, word such as "dogless." The children then chose from among four alternatives the sentence that correctly used the proposed word. This subtask required students to understand how derivational suffixes change the meanings of words and to identify the correct usage of an unfamiliar, morphologically complex word. Again, a subset of the students, 49 children, was given a multiple choice vocabulary test concerning the base words used. The mean score was 4.71 (sd=.58) out of 5. Vocabulary was not assumed to be a confound.

In the third subtask, the "Comes From" subtask (Berninger, et al., 1999), the children had to determine if two words were morphologically related by deciding if one word "came from" the other. The students were presented with two stimulus words such as "moth" and "mother" and then asked if the second word came from the first (See Derwing, 1976). The children answered either yes or no to each of the twelve items.

In addition to the morphological awareness measures, a word identification assessment and a phonological awareness assessment were administered. The children completed the Word Identification subtest of the Woodcock Test of Reading Mastery (Woodcock, 1991) as a measure of their ability to recognize words out of context. The children read aloud a list of words until they missed six in a row. The children's phonological awareness was assessed by a preliminary version of the Segmenting Nonwords subtest of the Comprehensive Test of Phonological Processing (CTOPP, Torgeson, 1999). Students were presented with nonsense words and asked to orally segment the words into phonemes. There were eight items at the two phoneme level followed by nineteen items containing three to eight phonemes. When students missed five items in a row testing was discontinued. The nonword segmenting task was chosen because, based on a larger sample of students administered several subtests from the preliminary version of the CTOPP, the nonword segmenting task yielded the broadest variation.

Group Administered Tasks

The students also completed the Gates-MacGinitie Reading Test (MacGinitie & MacGinitie, Level 4 Form L, 1989), the WIAT (1992) spelling subtest, an orthographic fluency measure referred to here as the Alphabet Task (Berninger, et al., 1992), and the writing of a narrative. A trained tester administered these tests in the students' regular classrooms.

The Gates-MacGinitie Reading Test consists of two subsections: Vocabulary and Comprehension. The Vocabulary subtest has 45 multiple-choice questions that the

students were given 20 minutes to complete. Each question presented a sentence or phrase with an underlined word. The students were told to pick from among five alternatives the word or phrase that meant the same or nearly the same as the underlined word. The Comprehension section consists of 48 questions; the students had 35 minutes to complete this section. To measure the students' comprehension, the students read short passages and then answered two to four questions about the passage. Each question was multiple-choice with five alternatives. The Gates-MacGinitie was administered according to standard protocol.

The spelling subtest of the WIAT was adapted for group administration. Students heard a word, then heard the word used in a sentence, and then heard the word repeated again. The children were asked to spell the word on their papers. This procedure was followed for 35 items, beginning with actual words.

The Alphabet Task required students to print as many lowercase letters of the alphabet as possible in 20 seconds. Incorrectly formed, hard-to-decipher, and cursive letters were counted as incorrect.

Finally, a written narrative was elicited from the children following the protocol from The Expression Connection: A Structured Approach to Teaching Storytelling for School-Aged Children (Klecan-Aker & Brueggman, 1991). After hearing a sample story based on a presented picture, the children were asked to write a story based on a new picture stimulus. The narratives were transcribed verbatim and then scored for morphological accuracy based on the system used by Carlisle (1996) and Green (2001). Inflectional suffixes on words in the following categories were marked as correct, as

having an error of omission, or as having an error of commission: present tense verbs, past tense verbs, present participles, copula, plurals, auxiliaries, derived forms, and possessives. After the number of words fitting into each category was tallied, the scores were collapsed to get a total morphological accuracy score, called "Written Morphological Accuracy," for each child. This written accuracy score was the number of accurate uses of the morphological forms divided by the number of attempts. See Appendix A for scoring guidelines.

Results

Mean Scores

Below are the mean scores for each of the measures.

Table 1. Mean scores.

	Minimum	Maximum	M	SD
Oral Morphological Awareness - percent correct	55%	100%	86%	11%
Written Morphological Accuracy- percent correct	29%	100%	87%	16%
Segmenting Nonwords- raw score (maximum possible is 27)	9	27	14.91	5.01
Alphabet Task- raw score (maximum possible is 26)	8	26	18.81	5.12
Word Identification- standard score	76	132	106.05	12.31
Spelling- standard score	72	126	103.10	11.66
Vocabulary- percentile rank	1	99	68.59	27.48
Comprehension- percentile rank	1	99	67.81	32.55

Table 1 shows the zero-order correlations for the measures considered in this study. The Alphabet task, Oral Morphological Awareness, and Written Morphological Accuracy correlated significantly with the reading and spelling achievement measures.

Correlations

Table 1. Correlations of Measures

	1	2	3	4	5	6	7
1. Oral Morphological Awareness							
2. Written Morphological Accuracy	.186						
3. Segmenting Nonwords	-.017	.237					
4. Alphabet Task	-.086	.205	.023				
5. Word Identification	.385**	.624**	.126	.206			
6. Spelling	.250	.581**	.094	.407**	.818**		
7. Vocabulary	.407**	.651**	.033	.334*	.688**	.642**	
8. Comprehension	.265*	.718**	.072	.137	.660**	.570**	.773**

*Correlation is significant at p<.05 level. **Correlation is significant at p<.01 level.

It should be noted that, surprisingly, the two morphological measures did not correlate significantly with each other, although they showed similar patterns of correlations with the reading achievement measures. The measure of Written Morphological Accuracy (derived from children's spellings) generally yielded more robust correlations with reading than did Oral Morphological Awareness; and, not surprisingly, Written Morphological Accuracy correlated significantly with the spelling achievement score. We attribute the relative lack of robustness of our Oral Morphological Awareness measure to its brevity. The preliminary version of the University of Washington Morphological Awareness Battery (Berninger, et al., 1999) contained relatively few items, and the battery has been significantly extended in more recent versions (Berninger & Nagy, 2000).

Also unexpectedly, the phonological awareness measure did not correlate significantly with any of the other measures. Such a finding raises some concern about the validity of the phonological measure, but we suspect the lack of correlation is due primarily to the composition of the present sample. Because more students in this study

were above average readers than below average readers, their phonological abilities were sufficient and thus no longer strongly predictive of reading achievement.

Regressions

Four different models were compared in regression analyses. Model 1 used Segmenting Nonwords to predict each of the achievement measures (Word Identification, Spelling, Vocabulary, and Comprehension). Model 2 included both Segmenting Nonwords and the Alphabet task in the regression equations. Model 3 incorporated the Segmenting Nonwords task, the Alphabet task, and Written Morphological Accuracy. Finally, Model 4 incorporated the Segmenting Nonwords task, the Alphabet task, and Oral Morphological Awareness. This series of models was used to evaluate the unique contribution of morphological awareness to reading and spelling achievement, taking into account any shared variance with phonological awareness and orthographic awareness.

Table 2. Regression Outcomes.

	Word ID			Spelling			Vocabulary			Comprehension		
	R^2	F	ß	R^2	F	ß	R^2	F	ß	R^2	F	ß
Model 1:	.016	.909		.007	.370		.001	.061		.005	.293	
Segmenting Nonwords			.126			.081			.033			.072
Model 2:	.057	1.671		.186	6.268[b]		.112	3.485[a]		.024	.664	
Segmenting Nonwords			.122			.071			.025			.069
Alphabet Task			.203			.423[b]			.334[a]			.136
Model 3:	.397	11.835[c]		.489	17.221[c]		.481	16.651[c]		.526	19.968[c]	
Segmenting Nonwords			-.020			-.063			-.123			-.104
Alphabet Task			.081			.308[b]			.207[a]			-.013
Written Morphological Accuracy			.613[c]			.579[c]			.638[c]			.745[c]
Model 4:	0.222	5.132[b]		.257	6.222[b]		.304	7.868[c]		.101	2.030	
Segmenting Nonwords			.128			.075			.032			.073
Alphabet Task			.238			.446[c]			.371[b]			.160
Oral Morphological Awareness			.407[b]			.268[a]			.439[c]			.280[a]

[a]Significant at the p<.05 level, [b]Significant at the p<.01 level, [c]Significant at the p<.001 level

Word reading. In the prediction of single word reading, Models 1 and 2 indicated that neither phonological awareness nor orthographic fluency accounted for significant variance in this sample. However, Model 3, with Written Morphological Accuracy as a third predictor, did account for significant variance in word reading. Written Morphological Accuracy accounted for a unique portion of the variance explained by this model (ß=.613, t=5.132, p<.001). Similarly, when Oral Morphological Awareness was entered as the third predictor in Model 4, the model accounted for significant variance, with the Oral Morphological Awareness explaining a unique portion of the variance (ß=.407, t=3.379, p<.005).

Spelling. Model 1 did not account for a significant portion of the variance in spelling scores. Model 2 indicated that orthographic fluency accounted for significant variance in spelling, however. When Written Morphological Accuracy was entered as the third predictor of spelling, it also accounted for a unique portion of the variance (ß=.579, t=5.661, p<.001). The same held true when Oral Morphological Awareness was entered as the third predictor (ß=.268, t=2.275, p<.05).

Vocabulary. Model 1 did not account for significant variance in vocabulary scores, whereas Models 2 and 3 did. In addition to the significant contribution of orthographic fluency, Written Morphological Accuracy contributed uniquely to Model 3 when entered as the third predictor (ß=.638, t=6.186, p<.001), as did Oral Morphological Awareness when entered as the third predictor in Model 4 (ß=.439, t=3.857, p<.001).

Comprehension. Models 1 and 2 did not account for a significant portion of the variance in comprehension scores. Model 3 accounted for significant variance when

Written Morphological Accuracy was entered as the third predictor in Model 3, and Written Morphological Accuracy accounted for a unique portion of the variance (ß=.745, t=7.564, p<.001). When Oral Morphological Awareness was entered as the third predictor in Model 4, Oral Morphological Awareness accounted for a significant, unique part of the variance of comprehension (ß=.280, t=2.162, p<.05).

Discussion

Morphology seems to contribute to the reading and spelling achievement of fourth grade students. In particular, it seems to enhance performance on measures of word identification, spelling, vocabulary, and comprehension.

Smith (1995), Stemberger (1995), and Fowler and Liberman (1995) suggest that morphology is unimportant or of limited importance for reading and spelling achievement. They theorize that morphology is not a salient part of language; it is indistinguishable from phonological skill. However, results of this research were consistent with the findings of others (Carlisle, 1995, 1996; Elbro and Arnbak, 1996; Bentin and Frost, 1995) who have presented evidence that morphology does contribute to reading and spelling success.

In fact, the results of the current study indicate that morphological knowledge predicted reading and spelling achievement beyond orthographic and phonological awareness. The Written Morphological Accuracy score was a particularly powerful predictor of reading and spelling success. Similar conclusions were reached by Singson, Mahony, and Mann (2000), who reported that after third grade, morphological skills became increasingly valuable predictors of reading while the predictive value of

phonological awareness diminished. Although phonologocial awareness and orthographic ability undoubtedly contribute to early reading success, morphological awareness seems especially important for the continued development of more-experienced readers.

Since, for upper-elementary students, improved reading and spelling achievement may result from heightening children's morphological awareness (Henry, 1988), teachers may want to include instruction at the level of morphology in their language arts lessons rather than focusing exclusively on phonology. Morphological awareness testing may also be useful in determining whether or not deficiencies in morphology are contributing to the difficulties of a particular lower achieving reader. The ability to pinpoint the nature of a struggling reader's problems will help teachers provide better instruction; if a teacher uncovers a lack of morphological awareness in a reader, he/she will know to address that problem. Conversely, if a struggling reader is found to have strong morphological knowledge, the teacher can take a different approach in instructing that student.

Limitations

One limitation is the small number of items on two of the morphological measures. Having only five items limited the variability and may have led to a ceiling effect. Perhaps with more items, as in the revised version of the Morphological Awareness Battery (Berninger & Nagy, 2000), a clearer picture of morphological knowledge and its relationship to reading achievement would have emerged.

A second limitiation is the use of only one phonological awareness measure. In previous studies that have utilized the Segmenting Nonwords subtask of the preliminary version of the CTOPP, the Segmenting Nonwords subtask correlated with other measures of phonological awaress as well as measures of word identification and nonword reading for at-risk students (McCutchen, et al, 1999; McCutchen, et al, 2000). Thus, the Segmenting Nonwords task is a valid measure of phonological awareness, but it still would have been useful to confirm the current findings with additional phonological awareness assessments.

Despite its limitations, this study adds to our knowledge of the reading acquisition process because it goes beyond the research of previous studies. In particular, this study is interesting because it incluces students within the range of typical reading achievement seen in a classroom.

A second noteworthy detail of this work is that the children were in fourth grade; this is the point when instruction shifts away from learning to read to reading to learn. Most other studies concerning morphology and literacy achievement have looked at either beginning readers or adolescent-aged readers.

Future Research

More research should be conducted into which aspects of reading achievement are most tied to morphological knowledge. The current study found that morphological awareness played a role in word reading, spelling, vocabulary, and comprehension; however many researchers think that morphological awareness is most salient only for the higher level skills of vocabulary and comprehension. Mahony, Singson, and Mann

(2000) found that morphology only contributed a small (though significant) amount to decoding ability beyond vocabulary knowledge and phonological awareness for children in grades three through six, but that it contributed more to reading comprehension. Work by Carlisle (2000) suggested that morphological awareness and the ability to define words was related for third and fifth graders; furthermore, morphological awareness contributed to reading comprehension. Wysocki and Jenkins (1987) discovered that sixth and eighth grade students used morphological problem solving to understand unfamiliar words. Thus, more studies are needed to determine the effects of morphological knowledge on various types of written language skills.

Also, additional research needs to be conducted to pinpoint when morphological awarenss plays an important role in reading and spelling achievement. Most studies, including this one, indicate that morphology is most salient for more-experienced readers (Elbro & Arbak, 1996; Wysocki & Jenkins, 1987; Mahony, Singson, & Mann, 2000; Singson, Mahony, & Mann, 2000; Green, et al, 2001) but others suggest that morphological awareness is important very early on in reading acquisition (Carlisle, 1995; Carlisle, 1996). Clarification of when morphological awareness contributes to reading and spelling achievement (especially beyond phonological and orthographic awareness) is needed.

Conclusion

In sum, the current research indicates that morphological awareness plays an important role in the reading and spelling achievement of fourth grade students. Morphological awareness seems to predict reading and spelling success. These results

suggest that classroom teachers may want to utilize morphological instruction to help students improve their reading skills. Further study is needed to determine which aspects of written language achievement are most affected by morphological knowledge and when morphology begins to play a role in reading success.

Appendix A: Scoring of Narratives (taken from Green, 2001).

There can be misspellings of the root word, but not the morphological ending. If a spelling rule is violated (i.e. "runing") then it's an error of commission.

1. Present indicative verbs: regular (swims) or irregular (does, have, goes); all present tense verbs used with I, we, they, he/she/it, etc.
    a. Error of Omission- "She *sit* in the chair today."
    b. Error of Commission- "We *needs* to go now."

2. Past tense verbs: regular (jumped) or irregular (swam). The irregular form must be spelled correctly.
    a. Error of Omission- "She has a friend *name* Sarah."
    b. Error of Commission- "I *talkt* to my sister."

3. Participles, whether used with auxiliary verbs, participles, or gerunds: (e.g. He is playing. The boy playing with the toy is Bill.)
    a. Error of Omission- "The boys are *eat* lunch."
    b. Error of Commission- "She was *stoping* at the store yesterday."

4. Copula, contractible and uncontractible: (e.g. He's busy. He was happy.)
    a. Error of Omission- "He a fireman."
    b. Error of Commission- "He *were* a fireman."

5. Auxiliaries, contractible and uncontractible: (e.g. They're eating dinner. She was going home.)
    a. Error of Omission- "We playing baseball."
    b. Error of Commission- "She *was* eats a hot dog."

6. Plurals (regular and irregular):
    a. Error of Omission- "The boy played with all the *dog*."
    b. Error of Commission- "The *cats* is in the box."

7. Possessives:
    a. Error of Omission- "The *monkey* banana is on the floor."
    b. Error of Commission- "The *cups* handle broke."

8. Compounds: words containing two or more root words- only correct or incorrect.

9. Derived forms: any derivationally affixed word with a free root word.

10. Apostrophes: counted in tandem with possessives and contractible auxiliaries or copulas
    a. Error of Omission- "The *girls* shoe was on the floor."
    b. Error of Commission- "The three *girls'* were playing on the slide."

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