Researchers are interested in investigating the different linguistic factors that play a role in children’s literacy development. One such area of linguistic awareness is morphological awareness, which is defined as a conscious awareness of the morphological composition of words and the ability to reflect on and manipulate that structure (Carlisle, 1995). For example, a child who has morphological awareness understands that the word *trees* is composed of two meaningful parts, or morphemes: the base word *tree* and the plural *-s*. Although researchers have found morphological awareness to be a contributing factor in children’s literacy development (e.g., Carlisle & Nomanbhoy, 1993; Elbro & Arnbak, 1996; Nagy, Berninger, & Abbott, 2006), this linguistic factor often receives minimal attention. Comparatively, an impressive body of research documents the crucial role of phonological awareness in reading and spelling (e.g., Adams 2002; Bird, Bishop, & Freeman, 1995; Catts, Fey, Zhang, & Tomblin, 2001; Ehri et al., 2001; Lonigan, Burgess, & Anthony, 2000; Storch & Whitehurst, 2002) and the importance of orthographic knowledge in literacy development (e.g., Apel, Wolter, & Masterson, 2006; Berninger, 2001; Cunningham, 2006). Phonological and orthographic knowledge, however, explain only a portion of the variance in reading and spelling ability. Thus, it is likely that morphological awareness may be an important contributor to early literacy development.

**ABSTRACT:**

*Purpose:* The purpose of this study was twofold. First, we investigated whether first-grade children evidenced morphological awareness and whether they used their knowledge of morphological relations to guide their spelling. Second, we sought to determine whether children’s morphological awareness abilities were predictive of their performance on word-level reading and spelling measures.

*Method:* At the beginning of the academic school year, 43 first-grade children were administered an oral morphological awareness production task, a series of single-word morphological spelling tasks, and a battery of language and literacy tasks.

*Results:* The first-grade children were able to generate words reflecting morphological relations before they received explicit instruction regarding morphological relations between words. In addition, the children used morphological information to guide their spelling of single words, as evidenced by a difference in patterns of spellings between 1- and 2-morpheme words. Regression analyses revealed that the children’s performance on the oral morphological production task explained unique variance on their reading and spelling measures above and beyond the variance that was accounted for by phonological awareness.

*Conclusion:* Children as young as first graders evidenced morphological awareness, and morphological awareness influenced the children’s literacy development. Theoretical implications of the findings are discussed.

KEY WORDS: morphological awareness, spelling, reading, literacy development
Theories of Reading and Spelling Development

In many common models of reading and spelling development, often described as “stage theories,” morphological awareness is not considered to play a significant role in early literacy acquisition (Bear & Templeton, 1998; Ehri & McCormick, 1998; Gentry, 1982; Henderson, 1985; Moats, 2000; Schlaganl, 2001). According to these models, children progress through a series of stages in which different facets of word structure are learned; beginning readers and spellers are largely focused on the phonetic level of written language, and additional information such as morphology is not thought to influence children’s spelling and reading until relatively late in the process of literacy learning. Depending on the model, children are not thought to use morphology in reading or spelling until approximately third grade (Henderson, 1985), fourth grade (Ehri & McCormick, 1998; Moats, 2000), or late elementary and middle school years (Schlagal, 2001).

In contrast to stage theory, other theories suggest an early influence of morphology on literacy development. The work of Treiman and colleagues (Treiman, 1993; Treiman & Cassar, 1996; Treiman, Cassar, & Zukowski, 1994) indicated that, from an early age, children have the ability to use multiple sources of linguistic information in spelling. Beginning spellers in these studies were apparently not limited to a phonetic strategy in spelling, as many of these children were able to also incorporate basic morphological knowledge (e.g., applying knowledge of basic inflectional morphology such as past tense -ed or orthographic knowledge (e.g., employing knowledge of orthographic constraints and not spelling a word with a ck at the beginning) as early as first grade.

Based on these and other findings, some authors proposed a “repertoire theory” of spelling development (Apel, Masterson, & Niessen, 2004; Sulzby, 1996). The repertoire theory suggests that children, even at an early age, apply a range of multiple linguistic processes in their reading and spelling and may rely more heavily on phonological, orthographic, or morphological knowledge at differing phases in their reading and spelling development. Thus, reading and spelling development is explained best by growth in the number and actual use of children’s linguistic resources (i.e., phonological awareness, orthographic knowledge, morphological awareness, semantic knowledge) over time. In this theory, children use these multiple linguistic resources early on to read and spell, with reliance on each linguistic resource dependent on the task.

Development of Morphological Awareness

According to Carlisle (2003), the first signs of explicit morphological awareness appear in the elementary years, as judged by children’s responses when they are asked to analyze or manipulate the morphological structure of words (e.g., Examiner states, “Runner: How fast can she _____?” and the expected response is run). In kindergarten and first grade, typically developing children are in the process of mastering inflections, such as tense markers and the plural -s (Berko, 1958; Carlisle, 1995). In studies by Clark and Cohen (1984) and Jones (1991), kindergartners and first graders also showed some competence with simple derivations that have a transparent relationship and did not involve phonological shifts (e.g., swim to swimmer). First graders may indeed be learning some derivational affixes, but researchers reported that first graders’ knowledge of morphological structure is generally limited to transparent and common derivations (Carlisle, 1995; Carlisle & Nomanbhoy, 1993).

Researchers found morphological awareness to be related to spelling and writing ability in the early school years. Rubin (1988) assessed the morphological awareness of kindergartners and first graders in relation to their early writing ability. In this study, children were given an oral morphological knowledge measure from the Berry-Talbott Language Test (Berry & Talbott, 1966) that required them to apply basic inflectional and derivational suffixes to nonsense base words given a sentence context and illustrative line drawing (e.g., “This is a nad who knows how to trom. He is tromming. He did the same thing yesterday. What did he do yesterday? Yesterday he ______.” trommed). The children also were asked to spell single words containing final consonant clusters. English-speaking children tend to have particular difficulty with consonant clusters as they are learning to spell, and they often fail to symbolize one or more of the phonemes of the cluster (Marcel, 1980; Read, 1975; Rubin, 1988; Snowling, 1994; Treiman & Cassar, 1996). A common error is the omission of the first phoneme of a two-phoneme final consonant cluster, especially when the first phoneme is a nasal or a liquid consonant. Examples of this kind of error include writing brand for brand, or thief for think. Children are less likely to omit the second consonants of these clusters; errors such as bran for brand, or theen for think, are far less common (Marcel, 1980; Read, 1975; Rubin, 1988; Snowling, 1994; Treiman & Cassar, 1996).

Rubin (1988) sought to determine whether children were less likely to omit consonants in two-morpheme words, where knowledge of the base word could provide additional information to guide children’s spelling. For example, would children be more likely to symbolize the n in rained than the n in blind, because the two-morpheme word rained would allow children to draw on their knowledge of the base word rain? If children’s early spelling reflects a purely sound-based strategy, children would most likely not be able to use such a strategy yet; thus, omissions would be equally common for both one- and two-morpheme words.

In this study, Rubin (1988) found fewer nasal omissions for the two-morpheme words than the one-morpheme words. These results seem to be consistent with the theory that even very young children can use more than just a sound-based strategy to spell words. Rubin also found that children who performed poorly on the oral morphology task were more likely than those who performed well on the task to omit consonants from the two-morpheme words, which suggests a link between morphological awareness and early writing ability. The results should be interpreted with caution, however, because the words that the children were asked to spell were not always matched for the clusters they contained. Most two-morpheme words contained a nasal followed by a voiced stop (e.g., canned), whereas one-morpheme words were more likely to end with a nasal followed by an unvoiced stop (e.g., sent). Because nasals are more likely to be omitted before voiceless stops (Marcel, 1980; Read, 1975; Treiman & Cassar, 1996), the study would have been stronger if the words had been matched for the clusters they contained.

Treiman et al. (1994) and Treiman and Cassar (1996) conducted subsequent studies based on similar reasoning. Treiman et al. studied children’s spelling of flaps. A flap is a voiced sound that is produced with a quick tap of the tongue against the alveolar ridge, and it is sometimes spelled as a d (e.g., riding) and in other instances with a t (e.g., writing). It is not possible to predict the correct spelling of the flap based on how it sounds; however, morphology can provide a clue in some cases. If beginning spellers spell phonetically, they should generally spell a flap as a d regardless of the morphological structure of the word. If children use morphological
information to guide their spelling, they should be more likely to
use a t for dirty than for duty, given their knowledge about the
base word (dirt).

In the Treiman et al. (1994) study, children in kindergarten
through second grade completed a single-word spelling task as well
as a spelling completion task in which they were asked to fill in the
blank in an item such as du__.y. These researchers found that even
the kindergartners in their study were more accurate when spell-
ing the flaps of two-morpheme words such as dirty, which have a
base word ending with a t, than one-morpheme words such as duty.
The children did not use a morphological strategy to the full extent
possible, but did appear to have a rudimentary ability to use mor-
phology in spelling. These findings are in contrast with the results of
an earlier study by Treiman (1993) in which no significant difference
was found between the spellings of flaps in one- and two-morpheme
words in first-grade children’s creative writings. This discrepancy
between the findings of Treiman et al. (1994) and Treiman (1993)
may be attributable to the different tasks used (i.e., spelling single
words or completing spellings of words vs. spelling in the context
of a creative writing task). The seemingly more demanding task of
spelling words in connected text may have required an additional
working memory load and thus reduced the amount of resources that
were available for morphological analysis.

Treiman and Cassar (1996) sought to determine whether the
morphological effects that were reported in Treiman et al. (1994)
ocurred more generally in different samples of words. They studied
elementary children’s (kindergarten through fourth grade) spellings
of final consonant clusters in one- and two-morpheme words. In
this experiment, the dictated words were carefully matched for the
clusters they contained. The results of the study suggested that as
early as first grade, children demonstrated a rudimentary mor-
phological strategy in that they were more likely to delete the first
consonant of clusters in one-morpheme words (e.g., brand for brand)
than they were in two-morpheme words, where they generally re-
tained the final consonant of the base word (e.g., tun for tuned).

Morphological Awareness’ Influence on Literacy

Morphological awareness has been found to be related to literacy
achievement. Studies of adults and older children have demonstrated
that morphological knowledge plays a role in reading complex
words (e.g., Elbro, 1990; Elbro & Ambak, 1996; Fowler & Liberman,
1995; Fowler, Napps, & Feldman, 1985; Nagy et al., 2006) as well as
in spelling and reading comprehension (e.g., Nagy et al., 2006).
A number of researchers have also reported that knowledge of
morphology is significantly related to reading and spelling abilities
even in the elementary years. Carlisle and Nomanbhoy (1993)
reported that morphological awareness, measured by a morpholog-
ical production task (e.g., “Help. Father tells me you are a good
______” helper), accounted for a significant 4% of the variance
in single-word reading, above and beyond the contribution of phono-
logical awareness, for first-grade children. Moreover, Carlisle
(1995) conducted a longitudinal study that followed children from
kindergarten through second grade and found that first-grade mor-
phological awareness made a significant contribution to later reading
achievement. Specifically, the morphological production task that
was administered in first grade was the best predictor of reading
comprehension in second grade.

An additional 4-year longitudinal study that was conducted by
Deacon and Kirby (2004) revealed that morphological awareness as
measured in second grade contributed significantly to pseudoword
reading and reading comprehension in later grades but rarely
contributed to single-word reading. With regard to spelling in the
early elementary years, Nunes, Bryant, and Bindman (2006) found
that 6-year-olds’ inflectional spellings predicted their morpho-
logical awareness performance at the ages of 7 and 8.

These findings suggest that morphological awareness has a wide-
ranging role in literacy achievement. Thus, it seems clear that a
relationship exists between morphological awareness and reading
and spelling abilities; however, further research is needed to clarify
the exact nature of the connection and the way in which it changes
throughout development.

Summary and Research Questions

Morphological awareness, or the ability to reflect on and manip-
ulate the morphological structure of words, develops over a num-
ber of years. Because written English represents language at a
morphological as well as a phonological level, it seems likely that an
awareness of the morphemic structure of words would play a role
in the development of children’s literacy skills. Although several
common theories of literacy development suggest that morpholog-
ical awareness is not important until the late elementary school
grades or the middle school grades, there is some evidence to the
contrary. The results of various studies reviewed here suggest that
even very young children have at least a rudimentary awareness of
the morphological structure of words, and that they use or rely on
morphological information to guide their reading and spelling as
early as the first grade.

Several reviewed studies demonstrated a connection between
morphological awareness and children’s success on reading and
writing measures. The role of morphological awareness increases with
age as children encounter an increasing number of morphologically
complex words in the later elementary grades. Although there is
theoretical and empirical evidence to support a link between mor-
phological awareness and literacy development, further research is needed
to explore the nature and development of the relationship.

This study was designed to address two main questions regarding
first-grade children’s morphological awareness.

- Do first graders evidence morphological awareness before
  they have received explicit classroom instruction in this area?
  And, do they use their knowledge of morphological relations
to guide their spelling?
- Do children’s morphological awareness abilities predict their
  performance on reading and spelling measures?

METHOD

Participants

The 43 children who participated in this study were English-
speaking first-grade students from two first-grade classrooms at an
elementary school in the Intermountain West. The children were
asked to participate in the study because their teachers volunteered
to be part of this study, and all parents of participating children pro-
vided informed consent consistent with the university’s institu-
tional review board. In the year before the current study, all par-
ticipating children received instruction from the same kindergarten
teacher in a half-day kindergarten program with reportedly no explicit instruction in the area of morphology. Additionally, the children were tested within the first 6 weeks of their first-grade year; at the time of testing, the first-grade teachers reported that they had not yet explicitly provided morphological instruction. The children ranged in age from 6:1 (years;months) to 7:1, with a mean age of 6:4. They were from middle-class homes and an elementary school with 24% of grade-school children receiving free and reduced lunch. The sample included 53% female and 47% male participants, and the racial and ethnic mix was 84% Caucasian, 9% Asian, 2% Pacific Islander, and 5% Native American. All children included in the sample evidenced typical hearing and cognitive abilities and exhibited normal language development, as measured by the Sentence Imitation subtest of the Test of Language Development—Primary; Third Edition (TOLD–P:3; Newcomer & Hammill, 1997). Children were excluded from the sample if they scored below the 16th percentile on the TOLD–P:3 Sentence Imitation subtest.

Procedure

At the beginning of the academic year (October), each child completed a series of tasks in which word reading skills, spelling, phonological awareness, and morphological awareness were assessed. The Word Attack and Word Identification subtests of the Woodcock Reading Mastery Tests—Revised (WRMT–R; Woodcock, 1998) were used as an early measure of word reading ability. Overall spelling skills were assessed using the Test of Written Spelling—Fourth Edition (TWS–4; Larsen, Hammill, & Moats, 1999), and phonemic awareness skills were tested using the Elastic subtest from the Comprehensive Test of Phonological Processes (CTOPP; Wagner, Torgeson, & Rashotte, 1999). Two tasks of morphological awareness, an oral morphological production task (adapted from Carlisle, 1995, and Carlisle & Flemming, 2003) and a single-word morphological spelling task (adapted from Treiman & Cassar, 1996, and Treiman et al., 1994) (described in the Stimuli section in detail) also were administered. The subtests of the WRMT–R and CTOPP, as well as the oral morphological production task, were administered to children individually. Average individual testing time was approximately 15 min per child, and testing was completed in one sitting. The TWS–4 and the single-word morphological spelling task were administered to the group of children in the children’s regular classrooms on a separate day from the individual testing. The TWS–4 was administered according to the standardized procedures, and the words for the single-word morphological spelling task were presented in random order; for each word, the examiner read the word aloud, used it in a sentence, and said the word again.

Stimuli

Oral morphological production task. The oral morphological production task was based on an expressive measure that was described by Carlisle and her colleagues (Carlisle 1995; Carlisle & Flemming, 2003; Carlisle & Nomanbhoy, 1993). This task requires children to produce the correct morphologically complex form of a word to complete a sentence. For example, the examiner reads aloud a base word such as farm and then reads the sentence context, such as “My uncle is a ______.” The child is asked to provide a form of the base word that fits the sentence (the expected response in the example item is farmer). The assessment consists of 15 test items (see Appendix A), five of which are inflected forms (e.g., plurals, past tense, comparatives), five of which are derived transparent forms in which the relationship between the base word and derived word is clear or transparent (i.e., no phonological or orthographic changes to the base word; e.g., teach and teacher), and five of which are derived opaque forms in which the relationship between the base word and derived word is less clear or opaque (i.e., involve either phonological or orthographic changes to the base word; e.g., long and length). One practice item was administered to ensure that the children understood the task.

Scoring. For scoring purposes, students received full credit if they provided the targeted correct morphologically complex form or if they provided an alternate syntactically appropriate answer that contained the targeted base word and an alternative affix that retained the inflected form, derived transparent form, or derived opaque form, respectively.

Reliability. Interscorer agreement for the morphological production task was conducted by the second author and two other trained scorers. One hundred percent of the protocols were scored independently by two separate scorers. Following the independent scoring, the assigned scores were compared, and the calculated interscorer agreement was 99.5%. Discrepancies were resolved through consensus.

Single-word morphological spelling task. Based on the word lists and tasks that were described by Treiman et al. (1994) and Treiman and Cassar (1996), a single-word morphological spelling task was developed for this study (see Appendix B). Because words containing flaps and words containing final consonant clusters may provide information about children’s use of morphological knowledge in spelling, both types of words were included in this assessment.

Flap words were of interest because it was assumed that if children spelled words phonetically, they would tend to represent the flap (which is voiced) with a d rather than a t. If, however, the children did not use only phonological information but drew on their knowledge of morphology as well, they might be more accurate when spelling morphologically complex words because they could use their knowledge of a base word (e.g., dirt) to determine the spelling of a flap (e.g., a t in dirty).

The 10 flap words in this measure consisted of six words in which the flap was spelled as a t (three were one-morpheme words and three were morphologically complex) and four words in which the flap was spelled as a d (two were one-morpheme words and two were morphologically complex). Examples of matched pairs of one- and two-morpheme flap words include duty and dirty (t flap) and spider and reader (d flap).

Words containing final consonant clusters were of interest because children typically have trouble with clusters as they are learning to spell; a common error is the omission of the first consonant in a two-consonant final consonant cluster, especially when that consonant is a liquid or a nasal. The hypothesis here, based on the research of Rubin (1988) and Treiman and Cassar (1996), was that if beginning spellers are purely phonetic spellers, there should be no difference between their patterns of misspellings in one- versus two-morpheme words. If, however, beginning spellers are aware of morphological relations between words, they may be more likely to keep the first consonant in a final cluster when the cluster contains a morpheme boundary (e.g., the n in rained) than when the word is a single morpheme (e.g., blind).

Each of the 12 cluster words in this measure contained a two-phoneme cluster at the end of the word. Six of the words were morphologically complex, and six consisted of a single morpheme. As
recommended by Treiman and Cassar (1996), one- and two-morpheme words were carefully matched for the clusters they contained. For example, the one-morpheme word *blind*, which ends with /nd/, was matched with the two-morpheme word *rained*, which ends with the same phonemes.

**Scoring.** The scoring protocol drawn from Treiman et al. (1994) and Treiman and Cassar (1996) considered only the “critical segment” of the word, or the flap or cluster of interest. For *t*-flap items, responses were divided into three categories: responses in which the flap was spelled with a *t* (e.g., *drice* for *dirty*), those in which the flap was spelled with a *d* (e.g., *durdy* for *dirty*), and an “other” category in which no *t* or *d* was written, except at the beginning or end of a word (e.g., *doori* for *dirty*). The scoring process was the same for *d*-flap items.

The spellings of final clusters were scored for whether the two phonemes of the cluster were symbolized in a phonologically plausible manner. It was not important whether these phonemes were represented in the conventional way. For example, in the word *bars*, the /s/ phoneme could reasonably be symbolized as either an *s* or an *z*. In the word *kicked*, either a *c* or a *k*, or both, was acceptable for the first phoneme of the cluster, and either a *d* or a *k* was acceptable for the second. A response was categorized as an “A spelling” if it contained a representation of the first consonant of the cluster, but not the second. Examples of A spellings seen in this study are *tun* for *tuned* and *kik* for *kicked*. If the second consonant of the cluster was represented and the first was not, the response was categorized as a “B spelling.” Examples include *kalet* for *collect* and *beed* for *beard*. Responses were categorized as “AB spellings” if both consonants were represented in the correct order. Examples of these responses are *bors* for *bars* and *fect* for *faced*. Responses were categorized as “other” if they did not fit into any of the three categories.

**Reliability.** After each spelling protocol was independently coded by the second author, 10% of the protocols were randomly pulled to check interscorer reliability by the first author and a scorer who was unaware of the experimental purpose (blind scorer). Interscorer agreement was 96%; discrepancies were resolved through consensus.

### RESULTS

**Question 1: Early Morphological Awareness**

The first question asked whether or not children as young as first graders evidence morphological awareness. Distributions of oral morphological production task scores are summarized in Table 1. Student scores followed a normal curve distribution (where the distribution of scores is symmetrical, with mean, mode, and median approximately equal), indicating that, on average, the young students in this sample demonstrated explicit awareness of morphological relations. For example, the average total score was 7 correct responses out of a possible 15, and the standard deviation was 2.3. Approximately 34% of the students scored within 1 SD above the average score; an equal percentage of the students scored within 1 SD below the average score. Had these students, as a group, not demonstrated morphological awareness, we would have seen a disproportionate number of scores below the median score of 7.

Table 2 shows the mean percentage of total student spelling responses by type of spelling response for each word category. Within each word category, the product of the total number of words in a category and the number of student responses (e.g., 42 student responses multiplied by 6 single-morpheme, two-consonant final cluster words) is in parentheses. For both the one- and two-morpheme, two-consonant, final cluster categories, retention of both final consonants was the most common response. Chi-square likelihood ratio tests were used to analyze the difference in response percentages (D’Agostino, 2004). The A spelling, where the student retained the first consonant in the final cluster, was significantly more common in the two-morpheme condition; likelihood ratio $\chi^2(1, n = 252) = 22.619, p < 0.01$. The B spelling, as well as the AB spelling, was not significantly different between single-morpheme words and two-morpheme words. The percentage of $t$ spellings of two-morpheme critical segments with a *t* flap was significantly greater than the percentage of $t$ spellings of one-morpheme words with a *t* flap; likelihood ratio $\chi^2(1, n = 126) = 65.604, p < 0.01$. The percentage of $d$ spellings of a *d*-flap word in the one-morpheme category was significantly greater than the percentage of $d$ spellings in the two-morpheme category. These results indicate morphological awareness among the students. As expected, the difference in percentages of $d$ spellings of a one-morpheme *d*-flap word versus a two-morpheme *d*-flap word (the control condition) was not significant; $\chi^2(1, n = 126) = 2.67, p = 0.10$.

Spelling responses at the student level are summarized in Table 3. Mean number of correct $t$ spellings of two-morpheme, *t*-flap words was twice the number of correct $t$ spellings of one-morpheme, *t*-flap words.

### Table 1. Oral morphological production task scores.

<table>
<thead>
<tr>
<th>Oral production (number of items)</th>
<th>Mean</th>
<th>Median</th>
<th>SD</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inflected words (5)</td>
<td>3.53</td>
<td>4</td>
<td>0.827</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Derived transparent words (5)</td>
<td>2.28</td>
<td>2</td>
<td>1.182</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>Derived opaque words (5)</td>
<td>1.26</td>
<td>1</td>
<td>1.157</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>Total score (15)</td>
<td>7.07</td>
<td>7</td>
<td>2.344</td>
<td>2</td>
<td>13</td>
</tr>
</tbody>
</table>

### Table 2. Mean percentage of spelling responses by word category.

<table>
<thead>
<tr>
<th>Word category (product)</th>
<th>Type of completion</th>
<th>Student spelling response</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>A*</td>
</tr>
<tr>
<td>Final cluster, one morpheme (252)</td>
<td>0.01</td>
<td>0.15</td>
</tr>
<tr>
<td>Final cluster, two morpheme (252)</td>
<td>0.10</td>
<td>0.10</td>
</tr>
<tr>
<td>t flap, one morpheme (126)</td>
<td>0.34</td>
<td>0.62</td>
</tr>
<tr>
<td>t flap, two morpheme (126)</td>
<td>0.83</td>
<td>0.17</td>
</tr>
<tr>
<td>d flap, one morpheme (126)</td>
<td>0.15</td>
<td>0.83</td>
</tr>
<tr>
<td>d flap, two morpheme (126)</td>
<td>0.10</td>
<td>0.90</td>
</tr>
</tbody>
</table>

**Note.** Product = total number of category words and number of student responses.

*A*student retained the first of the two consonants in the final cluster, *B*student retained the second of the two consonants in the final cluster, *A*student retained both of the two consonants in the final cluster.
-flap words, which provides further support of morpheme aware-
ness in these first graders. Students also retained the first consonant
in two-consonant, final cluster words more frequently for two-
morpheme words than for one-morpheme words. An analysis
of variance (ANOVA) for dependent samples was conducted to eval-
uate the significance of these differences. ANOV A results are sum-
marized in Table 4. The effect of two morphemes for
spellings
of
-t-flap words was significant, as was the effect of two morphemes
on retention of the first consonant (A spelling) in a two-consonant,
final cluster word. One morpheme was also a significant source
of variance, in the expected direction, for d spellings of t-flap words
and for retention of the second consonant in two-consonant, final
cluster words. These results are consistent with the word-level re-
sults above and provide further evidence of morphological aware-
ness in this sample of first graders. Morphemes were not a significant
source of variance for retention of both consonants in two-consonant,
final cluster words.

Table 5 summarizes the pairwise differences in marginal means
of d spellings between the four word categories where student
t spellings were scored responses. The mean number of student
t-spelling responses was significantly greater in the t-flap, two-
morpheme category than in the one-morpheme category, as well as
in the control d-flap one- and two-morpheme category. These results
further indicate morphological awareness in this first-grade sam-
ple. As expected, there were no significant differences between the
control categories of d-flap words.

Table 6 summarizes the pairwise differences in
d spellings among
the possible conditions for which d spelling was a scored response.
Students incorrectly applied d spellings to one-morpheme, t-flap
words significantly more than to two-morpheme, t-flap words. As
expected, no differences were found in student spellings of d-flap
(control) words, regardless of whether the words contained one or
two morphemes.

Question 2: Predictive Morphological Awareness
Influence on Literacy

The second question asked whether first-grade children’s morpho-
logical awareness abilities predict their performance on reading and
spelling measures. To test the predictive value of early morphological

<table>
<thead>
<tr>
<th>Spelling response</th>
<th>Word characteristics (sample spelling)</th>
<th>M</th>
<th>SE</th>
<th>95% Confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student spelled with a t</td>
<td>t flap; one morpheme (e.g., duty for duty)</td>
<td>1.02</td>
<td>.165</td>
<td>0.69 1.36</td>
</tr>
<tr>
<td></td>
<td>t flap; two morpheme (e.g., dirty for dirty)</td>
<td>2.47</td>
<td>.112</td>
<td>2.24 2.69</td>
</tr>
<tr>
<td></td>
<td>d flap; one morpheme (e.g., spider for spider)</td>
<td>0.30</td>
<td>.091</td>
<td>0.12 0.49</td>
</tr>
<tr>
<td></td>
<td>d flap; two morpheme (e.g., reader for reader)</td>
<td>0.19</td>
<td>.083</td>
<td>0.02 0.35</td>
</tr>
<tr>
<td>Retained 1st consonant – A</td>
<td>Final cluster; one morpheme (e.g., bran for brand)</td>
<td>0.05</td>
<td>.032</td>
<td>-0.02 0.11</td>
</tr>
<tr>
<td></td>
<td>Final cluster; two morpheme (e.g., raid for raised)</td>
<td>0.63</td>
<td>.115</td>
<td>0.40 0.86</td>
</tr>
<tr>
<td>Retained 2nd consonant – B</td>
<td>Final cluster; one morpheme (e.g., brand for brand)</td>
<td>0.91</td>
<td>.162</td>
<td>0.58 1.24</td>
</tr>
<tr>
<td></td>
<td>Final cluster; two morpheme (e.g., raid for raised)</td>
<td>0.56</td>
<td>.126</td>
<td>0.30 0.81</td>
</tr>
<tr>
<td>Retained both – AB</td>
<td>Final cluster; one morpheme (e.g., brand for brand)</td>
<td>4.91</td>
<td>.199</td>
<td>4.51 5.31</td>
</tr>
<tr>
<td></td>
<td>Final cluster; two morpheme (e.g., raised for raised)</td>
<td>4.58</td>
<td>.198</td>
<td>4.18 4.98</td>
</tr>
</tbody>
</table>

Note. SE = standard error.
awareness on the students’ spelling achievement, TWS–4 standard scores were regressed on the total scores from the oral morphological production task. CTOPP Elision subtest standard scores were entered into the model as a covariate, as this measure of phonological awareness has been shown to correlate highly with literacy scores in young children (e.g., Adams, 2002; Bird et al., 1995; Ehri et al., 2006), which was also regressed on oral morphological production task total scores. CTOPP Elision subtest standard scores were once again included in the regression model as a controlled covariate. Reading composite results were strikingly similar to TWS–4 results. As hypothesized, morphological awareness was a significant predictor of reading outcomes in this sample of first graders, as indicated by its statistically significant $\beta$ coefficient (see Table 8). Moreover, the significant change in the model $F$ statistic ($\Delta F = 8.32, p = .006$) when morphological awareness was added to a model where the CTOPP was the lone predictor confirmed that morphological awareness accounted for a statistically significant, unique portion (9.6%) of the total variance in reading, beyond the variance accounted for by phonological awareness.

### Table 4. Source table for completely within-subjects analysis of variance (ANOVA).

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>$F$</th>
<th>$p$</th>
<th>$\eta^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student spelled with a $t$</td>
<td>Two morphemes vs. one morpheme in a $t$ flap</td>
<td>141.74</td>
<td>3</td>
<td>47.24</td>
<td>135.26</td>
<td>$&lt;.001$</td>
</tr>
<tr>
<td></td>
<td>Error</td>
<td>44.01</td>
<td>126</td>
<td>.35</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student spelled with a $d$</td>
<td>Two morphemes vs. one morpheme in a $d$ flap</td>
<td>52.93</td>
<td>3</td>
<td>17.64</td>
<td>51.62</td>
<td>$&lt;.001$</td>
</tr>
<tr>
<td></td>
<td>Error</td>
<td>43.07</td>
<td>126</td>
<td>.34</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Retained 1$^{st}$ – A</td>
<td>Two morphemes vs. one morpheme in a two-consonant, final cluster word</td>
<td>7.27</td>
<td>1</td>
<td>7.27</td>
<td>23.07</td>
<td>$&lt;.001$</td>
</tr>
<tr>
<td></td>
<td>Error</td>
<td>13.23</td>
<td>42</td>
<td>.32</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Retained 2$^{nd}$ – B</td>
<td>Two morphemes vs. one morpheme in a two-consonant, final cluster word</td>
<td>2.62</td>
<td>1</td>
<td>2.62</td>
<td>5.82</td>
<td>.02</td>
</tr>
<tr>
<td></td>
<td>Error</td>
<td>18.88</td>
<td>42</td>
<td>.45</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Retained both – AB</td>
<td>Two morphemes vs. one morpheme in a two-consonant, final cluster word</td>
<td>2.28</td>
<td>1</td>
<td>2.28</td>
<td>3.87</td>
<td>.06</td>
</tr>
<tr>
<td></td>
<td>Error</td>
<td>24.72</td>
<td>42</td>
<td>.59</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note.** SS = sum of squares, df = degrees of freedom, MS = mean square, $F$ = Fisher’s $F$ ratio.

### Table 5. Pairwise comparisons from an ANOVA of student $t$-spelling responses.

<table>
<thead>
<tr>
<th>Word type (condition)</th>
<th>Mean difference</th>
<th>SE</th>
<th>$p$</th>
<th>Upper bound</th>
<th>Lower bound</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two-morpheme $t$-flap word</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>One-morpheme, $t$-flap word</td>
<td>1.44**</td>
<td>.134</td>
<td>$&lt;.001$</td>
<td>1.01</td>
<td>1.81</td>
</tr>
<tr>
<td>One-morpheme, $d$-flap word</td>
<td>2.16**</td>
<td>.124</td>
<td>$&lt;.001$</td>
<td>1.82</td>
<td>2.51</td>
</tr>
<tr>
<td>Two-morpheme, $d$-flap word</td>
<td>2.28**</td>
<td>.121</td>
<td>$&lt;.001$</td>
<td>1.94</td>
<td>2.62</td>
</tr>
<tr>
<td>One-morpheme $d$-flap word</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>One-morpheme, $t$-flap word</td>
<td>$-0.72$**</td>
<td>.150</td>
<td>$&lt;.001$</td>
<td>$-1.14$</td>
<td>$-0.30$</td>
</tr>
<tr>
<td>Two-morpheme, $t$-flap word</td>
<td>$-2.16$**</td>
<td>.124</td>
<td>$&lt;.001$</td>
<td>$-2.51$</td>
<td>$-1.82$</td>
</tr>
<tr>
<td>Two-morpheme, $d$-flap word</td>
<td>0.12</td>
<td>.060</td>
<td>.35</td>
<td>$-0.05$</td>
<td>0.28</td>
</tr>
</tbody>
</table>

**Note.** Based on estimated marginal means. Adjustment for multiple comparisons: Bonferroni.

**The mean difference is significant at the .001 level.
DISCUSSION

Early Morphological Awareness

The first question addressed whether first-grade children demonstrated morphological awareness, both in their ability to orally produce words reflecting various morphological relationships and in their spellings of words with multiple morphemes. Children were administered an oral morphological production task that required them to generate responses of three different types: inflected words, derived words with transparent relationships, and derived words with opaque relationships. While even preschoolers have been reported to demonstrate some level of implicit morphological awareness (i.e., applying compounding and adding suffixes to create new words), the oral production task presumably tapped children’s explicit awareness of morphological relations because it required the manipulation of words in context and required children to analyze language in more deliberate and intentional ways (Carlisle, 1995).

The results of this study indicate that first-semester, first-grade children are indeed capable of generating morphologically related words to fit a context, and thus demonstrate some level of explicit awareness of morphology. This seems to be the case despite the fact that the children in our study had not received explicit classroom instruction in morphological relationships before testing for this study.

Although metalinguistic tasks such as the oral morphological production task are generally too difficult for kindergartners, these first graders demonstrated a substantial ability to explicitly think about and manipulate linguistic components, which is consistent with previous findings (e.g., Carlisle, 1995). The oral task in our study presumably required some degree of explicit awareness, and components of the task were clearly within the grasp of most of the typically developing children in the sample. The children performed better on inflected forms than derived forms, but their ability to generate a few transparent and opaque derivatives suggests that their explicit awareness of more complex morphological relations is beginning to develop as early as the beginning of first grade. Also, the children apparently did not wait to learn derivational principles until mastering inflections, but demonstrated some knowledge of both derivations and inflections from an early age. These findings are notable because explicit morphological awareness, particularly awareness of derivational relationships, is often considered beyond the grasp of children in the early elementary grades (Carlisle, 2003).

The spelling task that was developed for this study was based on the work of Treiman and her colleagues (Treiman & Cassar, 1996; Treiman et al., 1994). The task included two categories of words that were thought to shed light on the levels of linguistic information that children represent in their writing. The first category included

Table 7. Distributional characteristics of model covariates and outcomes.

<table>
<thead>
<tr>
<th>Measure</th>
<th>M</th>
<th>Mdn</th>
<th>SD</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morphological awareness single-word generation task total score</td>
<td>7.07</td>
<td>7</td>
<td>2.344</td>
<td>2</td>
<td>13</td>
</tr>
<tr>
<td>CTOPP Elision subtest</td>
<td>12.28</td>
<td>12</td>
<td>3.31</td>
<td>5</td>
<td>19</td>
</tr>
<tr>
<td>TWS–4</td>
<td>97.37</td>
<td>95</td>
<td>12.04</td>
<td>80</td>
<td>128</td>
</tr>
<tr>
<td>Reading composite</td>
<td>239.49</td>
<td>245</td>
<td>22.53</td>
<td>188</td>
<td>280</td>
</tr>
</tbody>
</table>

words with flaps (e.g., *city* and *dirty*), in which the middle consonant of the word, whether represented with a *t* or a *d*, is pronounced as a voiced sound that involves a quick tap of the tongue against the alveolar ridge. Logically, if beginning spellers use only phonetic information to invent spellings, they will tend to spell flaps, which are voiced, with a *d*. If they use morphological information to some extent, however, as hypothesized, beginning spellers will accurately spell *t* flaps of two-morpheme words systematically more often than they will one-morpheme words because the root word (e.g., *dirt* in *dirty*) indicates the correct spelling of the flap. In support of our hypothesis, the results of this study revealed that there was a difference between children’s spellings of flaps in one- versus two-morpheme words. Children accurately spelled significantly more *t*-flap words with a *t* when the words were morphologically complex than when they consisted of a single morpheme. Thus, consistent with the findings of Treiman et al. (1994), the participants in this study evidenced morphological awareness in their spellings of words containing flaps.

The second category in the spelling task included words with final consonant clusters (e.g., *brand* and *bars*). Consonant clusters are particularly troublesome for children who are learning to spell; a common error is the omission of the first phoneme of a two-phoneme, final consonant cluster (Marcel, 1980; Read, 1975; Rubin, 1988; Snowling, 1994; Treiman & Cassar, 1996). This study examined children’s spellings of one- and two-morpheme words with final clusters to determine if there was a difference between the way children spelled clusters that contained a morpheme boundary (e.g., *tuned*) and those that did not (e.g., *brand*). We hypothesized that first-grade students are able to use morphological information when spelling, which would be demonstrated in the fewer common error occurrences of omitting the first consonant (e.g., *tad* for *tuned*) when the cluster contained a morpheme boundary. The results of the study support this hypothesis. The participating children did retain the first phoneme of a cluster (a type A spelling) significantly more often in two-morpheme words. This finding is consistent with Treiman and Cassar (1996) and suggests that the children’s spellings were influenced by the morphological status of the cluster.

The results presented here are in line with those of other researchers (Rubin, 1988; Treiman & Cassar, 1996; Treiman et al., 1994) and provide additional evidence that beginning spellers are not focused purely on the phonetic level of language, but are able to use morphology, as well, to guide their spelling. The children in this study did not use morphological information to the full extent possible, given that errors were sometimes made on the “critical segment” of a two-morpheme word; nonetheless, the children in this study appeared to use morphology to some extent when spelling single words.

There is a debate in the literature regarding children’s early application of morphological knowledge in literacy tasks. Some researchers (Gentry, 1982; Henderson, 1985; Schlagal, 2001) have suggested that children do not start applying morphological principles until relatively late in the process of learning to read and write. The results of this study are not consistent with this suggestion, as children as young as 6 years apparently applied a morphological strategy without being explicitly taught to do so. These findings are therefore more consistent with a repertoire theory of literacy development (Apel et al., 2004; Sulzby, 1996), which suggests that children may rely on morphological knowledge at all phases of development. According to this theory, reliance on morphological knowledge varies along a continuum and is coordinated with other linguistic processes such as phonological and orthographic processing, which may be more heavily tapped into at an early age.

### Predictive Morphological Awareness Influence on Literacy

The second question addressed morphological awareness as a predictor of first-grade children’s performance on reading and spelling measures. The results of the regression analyses indicated that together, phonological awareness and morphological awareness accounted for 54% of the total variance on word-level reading and 42% of the variance on spelling. Although phonological awareness, as measured by the CTOPP Elision subtest, appeared to be an important contributor to reading and spelling performance, it did not explain all of the variance accounted for in the regression analyses. Indeed, the oral morphological production task, as a measure of morphological awareness ability, accounted for 9.6% significant and unique variance on reading and 7.4% significant and unique variance on spelling tasks above and beyond that accounted for by phonological awareness. Thus, for this group of children, performance on the oral morphological awareness production task represented a unique and independent skill that was predictive of their literacy skills.

The findings of the current study add to our understanding of morphological awareness as an early predictive measure for literacy performance. These findings are consistent with past research reporting the significant contributions of morphological awareness to reading (e.g., Carlisle & Nomanbhoy, 1993; Carlisle, 1995; Nunes et al., 2006) in the early elementary years. Taken together, these findings indicate that morphological awareness may prove to be an important factor in early literacy development, one that may be potentially valuable for inclusion in early literacy screening instruments.

It was notable that children’s morphological awareness was predictive of their single-word reading at the early first-grade level.
given that the words and pseudowords that the majority of children accurately read did not contain morphological derivatives. This may be explained by other linguistic factors such as semantics, which are related to morphological awareness (Carlisle & Nomanbhoy, 1993) and are influential in reading. That is, given that morphological awareness cued the children into the sound, spelling, and meaning of a word, perhaps this general awareness is positively influencing reading in all words, whether or not they are morphologically complex.

An additional explanation for the aforementioned results may be that the children moved beyond a phonetic reading strategy and used their orthographic knowledge of larger sized letter units often referred to as analogies in the literature. Ehri and colleagues (Ehri, 2000; Ehri & Wilce, 1985) believe that children initially make phoneme–grapheme correspondences and gradually develop correspondences at a larger orthographic analogy level. For example, a first-grade child who encounters an unknown word for the first time in a reading context (e.g., beak) may read the unknown word by relying on previously encountered known words with analogous rime units (e.g., peak, sneak) or analogous vowel units (e.g., bean, beak). Perhaps the morphological awareness tasks in the current study reflected children’s knowledge of the understanding of larger sized letter units, which in the morphological awareness task were morphemes (e.g., -ed, -ing), and the children were using their orthographic knowledge of rime or vowel analogies to read words that were not morphologically complex. If this hypothesis were true, this would be consistent with a repertoire theory of reading development, which suggests that children, even at an early age, are applying a range of multiple linguistic processes that may include orthographic and morphological knowledge in addition to that of phonological awareness.

**Study Implications**

The results of this study, considered with the results of earlier research (e.g., Carlisle, 1995; Carlisle & Nomanbhoy, 1993; Deacon & Kirby, 1994; Nunes et al., 2006; Treiman & Cassar, 1996; Treiman et al., 1994), may have important implications for literacy instruction. Current practices in literacy instruction seem to rely heavily on stage theory, which maintains that young students are at first only able to draw on a very limited set of skills to guide their reading and spelling. According to stage theory, morphology would not be an important component of instruction in the early grades. Stage theory, however, has been called into question as results of several studies, this study included, suggest that children are aware of meaning relations among words from an early age, and thus they may derive benefit from morphological information even as they are beginning to learn to read and write.

Given the evidence presented here, literacy screening instruments and instruction methods that incorporate morphology may be appropriate for children in the early school years. In addition, the recent research focus on developing literacy screeners that identify those children who may be at risk for literacy failure may now warrant the inclusion of a morphological awareness task. In the area of morphology instruction, teaching with a focus on the meaning and morphological structure of words may positively influence literacy development. As children progress through the elementary years and into middle school, morphologically complex words will make up an increasing proportion of the words they encounter. Guiding children’s awareness of morphemic structure from an early age is likely to provide them with an additional strategy that they can use to spell, identify, decode, and comprehend these morphologically complex words.

**Directions for Future Research**

More information is needed regarding the early development of morphological awareness and its relation to literacy abilities. Future plans for this research include comparing children’s use of morphological knowledge in single-word spellings and their use of morphology in creative writings. Studies should continue to investigate the role of morphological awareness in generating text. Continued investigation also is needed to determine the effectiveness of different tasks in assessing morphological awareness. For instance, future studies could compare different tasks and systematically vary components of the task or response requirements. In addition, the links between phonological awareness and morphological awareness, as well as between morphological awareness and literacy development, need to be more fully explored. Most importantly, the practical significance of the existing studies should be tested. There is a great need for intervention studies that demonstrate the efficacy and effectiveness of morphological instruction and intervention in the early elementary school years.

**CONCLUSION**

Considered with the results of previous research (e.g., Carlisle, 1995; Carlisle & Nomanbhoy, 1993; Deacon & Kirby, 1994; Nunes et al., 2006; Treiman & Cassar, 1996; Treiman et al., 1994), the results of the current study suggest that some aspects of morphological relations are within the grasp of first-semester, first-grade children. The tested children appeared to use morphological information to guide their spelling, which was demonstrated in significantly different patterns of spellings between one- and two-morpheme words containing flaps and final consonant clusters. Moreover, the children demonstrated the ability to generate morphological derivatives on an oral morphological awareness production task that was significantly and uniquely predictive of first-grade word-level reading and spelling abilities.

These findings are notable because explicit awareness of morphology is commonly considered beyond the grasp of beginning readers and writers, and some popular theories of literacy development suggest that children do not derive benefit from morphological knowledge until relatively late in the process of learning to read and write. Thus, explicit instruction in morphological awareness, specifically the use of morphological awareness as a reading and spelling strategy, is not commonly included in the curriculum of the early grades. The findings of this study, however, together with the findings of previous researchers, suggest that there may be value in including morphological awareness in early literacy assessments and in teaching children about word structure and meaning relations from an early age.

**REFERENCES**


Received January 14, 2008
Accepted July 23, 2008
DOI: 10.1044/0161-1461(2009/08-0001)

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APPENDIX A. ORAL MORPHOLOGICAL PRODUCTION TASK

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

1. jump: As he crossed the street, Paul __________. (jumped)
2. car: My family has two __________. (cars)
3. big: The hippo was big, but the elephant was __________. (bigger)
4. swim: Kim wanted to improve her __________. (swimming)
5. good: Sue thought her picture was the __________. (best)
6. long: He used a ruler to measure the table’s __________. (length)
7. steal: Last week, the painting was __________. (stolen)
8. beauty: That flower is __________. (beautiful)
9. science: Laura talked to the __________. (scientist)
10. decide: The students made their __________. (decision)
11. walk: Instead of driving to work, Max always __________. (walks)
12. quick: Sheila had to work __________. (quickly)
13. sad: Jim could not control his __________. (sadness)
14. teach: Josh needed help from his __________. (teacher)
15. four: Mac’s team finished __________. (fourth)


APPENDIX B. WORDS AND SENTENCES FOR THE SINGLE-WORD MORPHOLOGICAL SPELLING TASK

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