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MORPHOLOGICAL KNOWLEDGE AND EARLY WRITING ABILITY*

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This study assessed the morphological knowledge of kindergarteners and first graders in relation to their early writing ability. Morphological knowledge was investigated because, in order to write, children need to understand that words are composed of morphemes and phonemes, and because poor writers have particular difficulty with inflected forms of words. Kindergarteners and first graders were grouped by their implicit understanding of morphology and were given tests of dictated spelling and morphological analysis. First graders with poor implicit morphological knowledge omitted more inflectional morphemes in writing and were less able to identify base morphemes in spoken words than kindergarteners and first graders with higher levels of implicit morphological knowledge. The results demonstrate the importance of morphological knowledge in the development of written language proficiency.

Key words: morphological knowledge, writing, spelling

INTRODUCTION

Children who demonstrate written language problems characteristically make errors when reading and writing inflected and derived forms of words. They tend to omit and substitute inflectional markers and to substitute base words for derived words, or one derived form of a word for another. Although these errors are frequently documented in clinical case reports, there is little research concerning morphemic errors in written language. The studies that do exist demonstrate that children with learning problems have more difficulty representing required morphemes in their writing than their normally developing peers (Anderson, 1982; Moran, 1981), and that these difficulties

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persist among adults with written language problems (Liberman, Rubin, Duques, and Carlisle, 1985). Furthermore, college students who are poor spellers fail most dramatically when asked to spell dictated words that require sensitivity to morphophonemic structure (Fischer, Shankweiler, and Liberman, 1985).

In their examination of college students, Fischer et al. (1985) found that both good and poor spellers represented all of the morphemes in their spelling attempts but poor spellers did not spell many of the words accurately. Rather than omitting or substituting required morphemes, their errors included violations of orthographic conventions (such as the doubling rule) and violations which suggested a lack of understanding of underlying morphophonemic regularities (such as spelling health for health). The poor spellers also performed significantly worse than the good spellers when asked to indicate the boundaries between base morphemes and affixes of words which they first spelled to dictation. Therefore, correctness of spelling was found to be related to accuracy in analyzing written words into their component morphemes, all of which had been represented by both the good and the poor spellers.

In contrast to research in which spelling accuracy was examined in relation to underlying morphological knowledge, studies to date have not addressed possible reasons for omissions and substitutions of required morphemes in writing. The basis for such errors in writing might fall into one of two categories. On the one hand, they might only represent part of a general tendency to misspell words. If this is the case, omissions of inflectional endings, for example, might be but one instance of a more pervasive pattern of final consonant omissions. On the other hand, they might reflect an underlying deficit in morphological knowledge. In fact, there is good reason to anticipate close ties between morphological knowledge in spoken language and morpheme use in writing. Since the English orthography is largely morphophonemic (Chomsky and Halle, 1968; Liberman, Liberman, Mattingly, and Shankweiler, 1980), even early attempts at writing require an understanding that words are made up of morphemes, which, in turn, are made up of phonemes. We might posit that the acquisition of morphological knowledge and access to it in the lexicon, underlying correct morpheme use in spoken language, is also basic to correct morpheme use in written language.

Although research has not yet examined whether morphological knowledge is directly related to writing skills, several studies have explored its relationship to reading skills. These studies have demonstrated that children with reading problems have difficulty applying morphological rules to new words (Brittain, 1970; Doehring, Trites, Patel, and Fiedorowicz, 1981; Vogel, 1975, 1983; Wiig, Semel, and Crouse, 1973). In all of this research, morphological knowledge was assessed by an elicited spoken language task that requires the application of basic inflectional and derivational rules of morphology to nonsense base words (Berko, 1958; Berry and Talbott, 1966). This method is traditionally used in order to ensure that children are actually applying the morphological rules that they have mastered and are not just producing memorized vocabulary items. It has been found that normally developing children master the inflectional rules of English between the ages of four and seven (Brown, 1973; deVilliers and deVilliers, 1973; Selby, 1972; Templin, 1957). In contrast, children with problems learning written language develop morphological knowledge more slowly, although they follow the same sequence
in acquiring these rules.

Morpheme use in spoken language is only one ability that has been examined in relation to reading ability. Other studies have demonstrated that the ability to explicitly analyze the internal structure of words is also highly related to learning to read (Blachman, 1983; Fox and Routh, 1980; Liberman, Shankweiler, Fischer, and Carter, 1974; Lundberg, Olofsson, and Wall, 1980; Treiman and Baron, 1981) as well as to learning to spell (Perin, 1983; Liberman et al., 1985; Zifcak, 1981). In the reading studies, the ability to analyze spoken words into syllabic and phonemic segments has been found to be highly related to letter naming and word recognition performance in kindergarten, first and second grade children. In the spelling studies, phonemic segmentation ability has been found to be significantly related to dictated spelling performance in kindergarteners (Liberman et al., 1985), first graders (Zifcak, 1981) and adolescents (Perin, 1983).

While it has been demonstrated repeatedly that children with reading and spelling problems are less able than their normally achieving peers to analyze spoken words into their constituent phonemes, the ability to analyze spoken words into their constituent morphemes has received little attention. In one series of studies, the development of morpheme identification ability has been examined in students in grades three through college (Derwing and Baker, 1977, 1979). The subjects were presented with word pairs which were varied for semantic and phonetic similarity, such as teach—teacher, slip—slipper, cup—cupboard, and moon—mouth. They were required to read each pair and indicate if one word “came from the other”, using a five-point scale to specify the degree of relatedness. Performance correlated with grade level (elementary, junior high school, high school, and university) and degree of semantic and phonetic relationship between the paired words. The authors concluded that morpheme recognition ability may develop as much through formal education (including learning to read) as through language acquisition, and suggested that it would be difficult to sort out the contributions of these two sources.

Although this research into the explicit analysis of morphemic structure is provocative, similar studies have not been conducted with children who demonstrate learning problems or with children below third grade. If, as suggested earlier, the morphemic error patterns of children with written language problems reflect an underlying deficit in morphological knowledge rather than a consistent pattern of final consonant omissions, we should be able to expose this deficit in other tasks. For instance, these children might be expected to perform poorly when applying morphological rules in spoken language, reflecting their implicit morphological knowledge, or when explicitly analyzing the internal morphemic structure of spoken words. While an implicit understanding of morphemic structure would be the minimum requirement for morpheme use in writing, the explicit understanding of the morphemic structure of English words might be expected to differentiate between proficient and poorer writers.

If morpheme use in spoken language and morpheme analysis ability were found to be related to morpheme use in early writing as well as to each other, the importance of helping young children develop sensitivity to morphemic structure could be demonstrated. With this in mind, the present study was designed to examine the relationship
between implicit knowledge of morphemic structure, as measured by the ability to apply morphological rules to new words, and explicit awareness of morphemic structure, as measured by the ability to identify base words within two-morpheme words. In addition, the ability to analyze the internal structure of words at the morphemic and phonemic levels was compared. Furthermore, the relationship between performance on the spoken language tasks and the ability to represent base and inflectional morphemes in beginning attempts at writing was investigated.

Although previous studies that document morphemic errors in written language analyzed spontaneous writing samples, it was not considered feasible to elicit writing samples in the present study since the children tested were only in kindergarten and first grade. However, it was important to select children of this age for several reasons. First of all, it was expected that they would demonstrate sufficient variability in their levels of implicit and explicit knowledge of morphemic structure of spoken words to enable us to learn more about the course of this development. Secondly, both spoken and written language measures of the morphological knowledge of young children could be obtained at a point in time when the effect of written language experience on the development of this knowledge should be minimal. Finally, the information obtained could be used in future research to predict the course of morphemic development in the written language of older children and adults.

Since spontaneous writing samples were considered an inappropriate measure for very young children, individual words were dictated as a means of investigating the relationship of children's writing to their morphological knowledge. Analysis of the early spellings of preschoolers, kindergarteners, and first graders suggests that young children devise an orthographic system for representing spoken language in written form even before they have been taught to spell (Read, 1971, 1975). They proceed from partially representing to completely representing all of the segments in a word, first using letters whose names are phonetically related to the phonemes (such as y for /w/ or e for /i/) and later using letters that represent the phonemes accurately though they may violate the particular orthographic conventions of English (such as c for s or ee for ea). By scoring for the number of morphemes represented in writing rather than for correctness of spelling, a dictated spelling task could provide an early indication of the ability to represent base and inflectional morphemes in written form.

Furthermore, when attempting to spell words in which a nasal consonant precedes the final consonant (such as the n in wind), young children tend to omit the nasal consonant, although they include it if it is not part of a consonant cluster (such as the n in pan) (Read, 1971, 1975; Zifcak, 1981). They tend also to omit nasal consonants that precede final consonants more often than non-nasal consonants in the same position (such as the s in dust or list) (Read, 1971, 1975). While these omissions have been attributed to the child's perception of the acoustic realization of nasal consonants as nasalization of the preceding vowel (Read, 1971, 1975), examining the nasal consonant omissions in another way may allow us to explore further the influence of morphological knowledge on written language. Since nasal consonants in final consonant clusters may function as morpheme boundaries in some words but not in others (as in pinned but not wind), we can ask if children who are morphologically knowledgeable would be
more likely to include preconsonantal nasal consonants when the nasal segment marks a morpheme boundary than when it does not.

**METHOD**

**Subjects**

The subjects were children selected from four kindergarten classes and four first grade classes in a suburban Connecticut public school. The children eligible for testing were all those for whom parental permission was obtained. The available 128 children (59 kindergarteners and 69 first graders) demonstrated adequate vision and hearing and were judged to have normal intelligence by their classroom teachers and the school psychologist. All were monolingual speakers of Standard American English. During a one-week period, they were individually given the Berry-Talbott Language Test (Berry and Talbott, 1966), a measure of elicited morpheme production in spoken language. This test required them to apply basic inflectional and derivational rules of morphology to nonsense base words by completing spoken sentences (yielding 38 responses) when shown illustrative line drawings, providing an index of implicit morphological knowledge. For example, one of the items designed to elicit production of the past tense marker was: “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 ________.”

Four groups were formed by selecting those children from each grade who scored within the highest and lowest thirds of the distribution of scores on the Berry-Talbott Language Test. The children from the highest third of the kindergarten and first-grade distributions will be referred to as the high kindergarteners and high first graders. Similarly, the subjects from the lowest third of the kindergarten and the first grade distributions will be referred to as the low kindergarteners and low first graders. The mean age and test scores for each group are summarized in Table 1.

To determine if the children differed in their performance on the Berry-Talbott Language Test, an analysis of variance was conducted. The analysis revealed a significant main effect of group (high, low), $F(1, 82) = 347.2, p < 0.001$, and grade (kindergarten, first), $F(1, 82) = 19.9, p < 0.001$. There was no interaction between group and grade. Furthermore, comparison tests revealed significant differences among the groups: The high first graders performed better than the high kindergarteners, $t(41) = 3.6, p < 0.001$; the low first graders performed better than the low kindergarteners, $t(41) = 2.9, p < 0.007$; and the high kindergarteners performed better than the low first graders, $t(39) = 9.5, p < 0.001$.

**Materials and specific procedures**

*Experimental spelling test.* This measure was designed to assess the children's representation of base and inflectional morphemes in the early stages of their writing. It contained 28 words that were considered to be part of the average kindergartener's spoken vocabulary, as determined by their occurrence in beginning reading materials.
TABLE I

*Berry-Talbott Language Test:* Grouped mean scores (with Standard Deviations and ranges) for kindergarteners and first graders

<table>
<thead>
<tr>
<th></th>
<th>Kindergarteners</th>
<th>First Graders</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>n</td>
<td>21</td>
<td>19</td>
</tr>
<tr>
<td><em>Berry-Talbott</em></td>
<td>10.8</td>
<td>24.7</td>
</tr>
<tr>
<td>SD</td>
<td>3.3</td>
<td>2.5</td>
</tr>
<tr>
<td>Range</td>
<td>4–15</td>
<td>21–29</td>
</tr>
<tr>
<td>Mean Age (years–months)</td>
<td>5–5</td>
<td>5–5</td>
</tr>
</tbody>
</table>

Eighteen words were organized according to morphemic structure (one or two morphemes) and type of final consonant cluster (nasal or non-nasal). The experimental words ending in a non-nasal cluster were *nest, messed, dust, fussed, list,* and *kissed,* and those ending in a nasal consonant cluster were *barid, canned, wind, pinned, kind, lined, hint, dimmed, pant, jammed, tent,* and *hummed.* One- and two-morpheme stimulus items were matched for final cluster and vowel whenever possible, as is the case for both *st* and *nd* cluster words. However, this was not possible for the items ending in *nt* and *md,* because there are no one-morpheme words in English that end in *nt* or two-morpheme (regular past tense) words that end in *nt.* Ten words were used as fillers to reduce the possible priming effects of the experimental words. Five of the fillers were one-morpheme words and five were two-morpheme words. The experimental and filler words were randomized and each word was dictated, then used in a meaningful sentence (see Appendix) and repeated. The children were instructed to write each word on a numbered response form.

*Experimental phoneme analysis test.* This measure was designed to assess the children's ability to analyze the structure of a spoken word into its constituent phonemes. It consisted of 18 of the same words that were used in the experimental spelling test. Since the 10 filler words were not needed to prevent a priming effect in this task, they were eliminated to save time. The test procedure, modelled after Ehri and Wilce (1980), was as follows: Six identical blocks were placed in a row on a table in front of the child. Each word was dictated to the subject, who was instructed to repeat it aloud and then to pronounce it slowly, simultaneously moving a block forward as each phoneme was articulated. The examiner recorded each segment pronounced by the subject as well as the number of blocks used.
Six training trials preceded the test trials. On the first three training trials (at, mă, sam), the examiner demonstrated the correct response and the subject was instructed to imitate the demonstration, which was repeated if needed. On the last three training trials (hat, mask, lamp), the child was required to respond spontaneously. If the response was incorrect, the examiner followed the previous procedures, providing a demonstration for the child to imitate. On the 21 test trials, neither demonstrations nor feedback were given.

*Experimental morpheme analysis test.* This measure was designed to assess the ability to analyze a spoken word into its constituent morphemes by requiring each child to identify base morphemes within words. This task consisted of the same 28 words (18 experimental words and 10 filler words) that were used for spelling. The child was asked questions such as “Is there a smaller word in *list* that means something like *list*?” or “Is there a smaller word in *kissed* that means something like *kissed*?” for each of the words. For one-morpheme words (such as *list*, *hint*, and *wind*), the child was supposed to respond “No”. For two-morpheme words (such as *kissed*, *dimmed*, and *pinned*), the child was supposed to respond “Yes” and supply the base word.

These procedures were demonstrated in six training trials (raining, rains, rained, pillow, sink, teacher) in the following manner. First, the child listened to each question and responded spontaneously. If the response was incorrect, the examiner repeated the question, provided the correct response along with a brief explanation, and asked the question again. This procedure was repeated once if needed. Words that contained smaller words that were related and smaller words that were not related to the stimulus word were included in the training trials. On the test trials, no demonstrations or feedback were given.

*General procedures*

The 86 children in the four groups were tested in January of the school year to determine the relationship of their morpheme use in spoken language to their morpheme use in writing and to their explicit morpheme and phoneme analysis abilities. During the one-week period following administration of the *Berry-Talbott Language Test*, each of the groups was given the dictated experimental spelling test in a half-hour group session. During the following three-week period, each child was given the experimental measures of phoneme analysis and morpheme analysis and a letter naming task in an individual testing session of approximately 40 minutes. The morpheme analysis task was administered last to avoid sensitization to morphemic structure on the writing and phoneme analysis measures. To insure consistent presentation of the stimuli, all of the test items were recorded by a speaker of Standard American English and were presented on tape.
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TABLE 2

Percentage (and number) of 18 words represented completely and partially in responses to dictated spelling test

<table>
<thead>
<tr>
<th>Kindergarteners</th>
<th>First Graders</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low</td>
</tr>
<tr>
<td>Complete represenations</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>(0.8)</td>
</tr>
<tr>
<td>Partial representations</td>
<td></td>
</tr>
<tr>
<td>PCO(^a)</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>(1.6)</td>
</tr>
<tr>
<td>FCO(^b)</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>(1.0)</td>
</tr>
<tr>
<td>Other</td>
<td>80</td>
</tr>
<tr>
<td></td>
<td>(14.5)</td>
</tr>
</tbody>
</table>

\(^a\) PCO = Preconsonantal Consonant Omission  \(^b\) FCO = Final Consonant Omission

RESULTS

Implicit morphological knowledge and writing ability

Letter naming scores were tabulated and showed that all but the low kindergarten children could name over 90% of the letters of the alphabet.

Responses on the dictated spelling test were categorized either as complete or as partial representations of the morphemes in the target word. A child received credit for a complete representation if all of the consonants in the word were represented (as in carid, katid, or crid for carried).

Complete representations. For each child, the percentage of words that were completely represented on the dictated spelling test was tabulated. The mean percentages (and number, out of 18 responses) for each group are given in Table 2.

To determine if the children differed in their ability to represent completely in writing the words used in this study, an analysis of variance was conducted with two between-groups factors (implicit morphological knowledge, grade). The analysis revealed significant main effects of implicit morphological knowledge, \(F(1, 82) = 29.1, p < 0.001\), and grade, \(F(1, 82) = 113.9, p < 0.001\). There were no significant interactions among these factors.

These results demonstrate that the ability to represent both base and inflectional morphemes when writing is related to implicit morphological knowledge as well as to grade level. The responses were analyzed further to determine whether the phonemic and
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The morphemic structure of the words influenced the ability to represent morphemes completely in written form. When all the children were considered together, 56% of words ending in non-nasal consonant clusters (st) were completely represented in writing, but only 41% of words ending in nasal consonant clusters (nd, nd, nt) were completely represented. This difference in frequency of complete representation of words of varying phonemic structure was highly significant, \( t(85) = 6.4, p < 0.001 \), and supports previous findings that young children are more likely to represent non-nasal consonants than nasal consonants in final consonant clusters (Read, 1971, 1975; Liberman, et al., 1985). However, 46% of both one-morpheme and two-morpheme words were completely represented in writing, \( t(85) = 0.16, \text{n.s.} \).

Partial representations. Table 2 also shows percentages of words that were not represented completely in writing. Each type of partial representation is presented; each was calculated as a percentage of the 18 possible responses. The three types are: (1) Omissions of the first consonant in the final consonant cluster (PCOs — preconsonantal consonant omissions, such as the \( n \) in \( canned \) or in \( band \)), yielding the response \( cad, kad, ed, \) or \( kd \) for \( canned \); (2) Omissions of the second consonant in the final consonant cluster (FCOs — final consonant omissions, such as the \( d \) in \( canned \) or in \( band \)), yielding the response \( can, kan, cn, \) or \( kn \) for \( canned \); and (3) “Other” errors, which included incorrect initial consonants (such as \( fand \) for \( cand \)) and representations of only the initial consonant, or the initial consonant and the vowel, of the base morpheme (such as \( c \) or \( ca \) for \( cand \)). The responses were examined for preconsonantal consonant omissions since it had been demonstrated by Liberman, et al. (1985), Read (1971, 1975), and Zifcak (1981) that young children tend to omit nasal consonants in final consonant clusters, and we wanted to see whether these omissions would be influenced by the morphemic structure of the words. The responses were examined for final consonant omissions since it had been demonstrated that children with learning problems omit more verb tense markers in their writing than other children (Anderson, 1982; Moran, 1981), and we wanted to determine whether final consonants were omitted more frequently when they functioned as inflectional morphemes than when they did not.

Preconsonantal consonant omissions (PCOs). To determine if the children differed in their tendency to omit the first consonant in a final consonant cluster, an analysis of variance was conducted with two between-groups factors (implicit morphological knowledge, grade). Neither implicit morphological knowledge nor grade level yielded significant main effects, \( F < 1 \). There was, however, a significant interaction between implicit morphological knowledge and grade level, \( F(2, 82) = 9.1, p < 0.003 \). This result was obtained because low first graders and high kindergarteners had higher proportions of PCOs than low kindergarteners and high first graders.

In order to interpret the PCO results meaningfully, the obtained interaction needs to be considered first. The low percentage of PCOs made by high first graders is a consequence of the high percentage of words that are represented completely. However, the low kindergarteners’ low percentage of PCOs occurs for a very different reason. Although 17 of their 18 responses are partial representations, the majority of these errors involve multiple omissions and/or substitutions of letters, and therefore fall into the
TABLE 3
Percentage of words ending in nasal clusters with PCO errors

<table>
<thead>
<tr>
<th></th>
<th>Kindergarteners</th>
<th>First Graders</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>1-morpheme words</td>
<td>15</td>
<td>33</td>
</tr>
<tr>
<td>2-morpheme words</td>
<td>10</td>
<td>26</td>
</tr>
</tbody>
</table>

category of "other" errors. The low kindergarten children had not progressed to the point of leaving out just one of the required consonants in the dictated words.

Keeping this in mind, it was still of interest to examine the effect of word structure on the children's tendency to omit preconsonantal consonants. As expected (based on the results of previous spelling studies discussed earlier), a significant effect of phonemic structure was obtained. The children in general made PCO errors on 20% of words ending in nasal consonant clusters but only on 8% of words ending in non-nasal clusters, t (85) = 5.6, p < 0.001. Next, the effect of morphemic structure was examined, to determine if children in the high groups, relative to the low groups, would make more PCOs on one-morpheme words than on two-morpheme words, because preconsonantal consonants might signal morpheme boundaries on two-morpheme words more readily to them than to the low groups. Because most of the PCO errors were made on words with nasal clusters, only the 12 nasal cluster words were considered in this analysis. The children in general omitted 26% of the nasal consonants in one-morpheme words but only 14% in two-morpheme words, t (85) = 5.0, p < 0.001. The children in each of the groups omitted fewer nasal consonants from final consonant clusters in two-morpheme words than in one-morpheme words, as can be seen in Table 3. Therefore, when representing nasal consonants in final clusters, sensitivity to morphemic structure did not give children in the high groups an advantage over children in the low groups.

Final consonant omissions (FCOs). The percentages of final consonant omissions that occurred on one- and two-morpheme words for each group are given in Table 4. To determine if the groups differed in their tendency to omit final consonants from one- and two-morpheme words, an analysis of variance was conducted with two between-groups factors (implicit morphological knowledge, grade) and one within-groups factor (morphemic structure). The analysis revealed significant main effects of implicit morphological knowledge, F (1, 82) = 4.8, p < 0.03, since children in the low groups omitted more final consonants than children in the high groups, and morphemic structure, F (1, 82) = 43.9, p < 0.001, since everyone omitted more final consonants from two-morpheme words than from one-morpheme words. Furthermore, significant interactions were obtained for morphological knowledge and grade level, F (2, 82) = 12.9, p < 0.001,
and for morphological knowledge, grade level, and morphemic structure, $F(3, 82) = 7.1, p < 0.01$. These interactions suggest that although everyone omitted more final consonants in writing when these consonants were inflectional morphemes than when they were not, low first graders omitted relatively more inflectional morphemes than the other groups. As with the PCO results, low kindergarteners and high first graders made fewer FCOs than did high kindergarteners and low first graders, and this is again attributable to the high percentage of complete representations made by the high first graders and the high percentage of “other” errors made by the low kindergarteners. In contrast to the PCO results, however, where high kindergarteners and low first graders made a similar number of errors, FCOs were about twice as frequent for low first graders as for high kindergarteners. Further analyses demonstrated that although low first graders and high kindergarteners did not differ in their tendency to omit final consonants from one-morpheme words, $t(40) = 1.2, p > 0.25$, low first graders did omit significantly more final consonants than high kindergarteners from two-morpheme words, $t(40) = 2.2, p < 0.035$.

These results suggest that the ability to represent final consonants in beginning attempts at written language is significantly related to morphological knowledge in spoken language, and is not significantly related to grade level independent of linguistic ability. Although low first graders completely represented more words in writing than the kindergarteners, they omitted more final consonants than the high kindergarteners. Furthermore, it is clear from these results that final consonants were omitted more often from two-morpheme than from one-morpheme words, and that it was the morphologically less knowledgeable first graders who were omitting those inflectional morphemes.

### Implicit morphological knowledge and phoneme analysis ability

On the phoneme analysis task, responses were scored as correct if all the phonemes in the word were represented. (Affricates and vocalic diphthongs were treated as single
segments in this scoring system.) Using this criterion, the percentage of correct responses was tabulated for each child. High first graders analyzed 78\% of the words correctly, low first graders 53\%, high kindergarteners 26\%, and low kindergarteners 3\%.

To determine if the children differed in their ability to analyze the phonemic structure of the words used in this study, an analysis of variance was conducted with two between-groups factors (implicit morphological knowledge, grade) and one within-groups factor (cluster type). The analysis revealed significant main effects of morphological knowledge, $F(1, 82) = 14.4, p < 0.001$, and grade, $F(1, 82) = 61.8, p < 0.001$, demonstrating that the ability to analyze the phonemic structure of a word completely is related to morphological knowledge as well as to factors associated with grade level. Moreover, cluster type was also significant, $F(1, 82) = 28.0, p < 0.001$, indicating that all of the children were able to segment more words with non-nasal clusters (50\%) than words with nasal clusters (38\%) into their constituent phonemes. This result supports previously obtained findings that the phonemic structure of the words influences phoneme analysis performance (Read, 1975; Liberman et al., 1985). No significant interactions among the factors were obtained.

Implicit and explicit levels of morphological knowledge

On the morpheme analysis task, a two-morpheme word (such as pinned) was scored as correct if the child (1) responded “Yes” and supplied the correct base form of the word (pin), and (2) responded “No” to a phonemically similar one-morpheme word (wind). The two-pronged scoring system was necessary to counter possible effects of response bias. Without such a system, indiscriminate “no” responses would result in higher scores than indiscriminate “yes” responses, since “yes” responses had to be accompanied by the correct base and “no” responses had no such control. By pairing words with similar phonemic structure (whenever possible) and contrasting morphemic structure, one could be certain that “correct” responses validly represented sensitivity to morphemic structure and not inflation due to response bias. Nine pairs of words were formed: Three pairs consisted of one- and two-morpheme words ending in nd, three pairs consisted of one- and two-morpheme words ending in st, and three pairs consisted of one-morpheme words ending in nt and two-morpheme words ending in md.

Using this scoring system, the percentage of correctly analyzed word pairs was tabulated for each child. High first graders analyzed 62\% of the pairs correctly, low first graders 34\%, high kindergarteners 60\%, and low kindergarteners 7\%. To determine if the groups of children differed in their ability to identify base morphemes in the nine pairs of words used in this study, an analysis of variance was conducted with two between-groups factors (implicit morphological knowledge, grade). The analysis revealed a significant main effect of implicit morphological knowledge $F(1, 82) = 43.9, p < 0.001$, and grade, $F(1, 82) = 5.8, p < 0.02$. Moreover, the interaction between morphological knowledge and grade level was significant, $F(2, 82) = 4.3, p < 0.04$, since the high kindergarteners and high first graders performed almost identically, although children in the low groups did not.

What is particularly notable about the results of this analysis is that children with high levels of implicit morphological knowledge in the elicited spoken language task performed
equally well on the explicit analysis task regardless of grade level differences. This finding suggests that the ability to analyze morphemic structure explicitly, at least as measured by this task and at this point in development, seems to be more highly related to implicit morphological knowledge in spoken language than to factors associated with grade level such as age and amount of instructional experience.

To examine the relationship between implicit and explicit levels of morphological knowledge further, performance on the Berry-Tulbott Language Test and the experimental morpheme analysis task was compared. The correlation between morpheme use on the Berry-Tulbott Language Test and the number of pairs of words a child analyzed correctly proved to be significant, \( r(84) = 0.63, p < 0.001 \). Next, since the experimental morpheme analysis task included only past tense items, the number of correctly analyzed word pairs was correlated specifically with past tense morpheme use on the Berry-Tulbott Language Test, and a significant relationship was also obtained, \( r(84) = 0.51, p < 0.001 \). In addition, a highly significant relationship was found between performance on the entire Berry-Tulbott Language Test and performance on the past tense items alone, \( r(84) = 0.84, p < 0.001 \), indicating that the overall Berry-Tulbott Language Test score used in this study was an accurate reflection of implicit morphological knowledge of the particular morphemic structure (past tense) used for the experimental stimulus words. Finally, analyses of variance comparing performance on the implicit (Berry-Tulbott) and explicit (morpheme analysis) tests of morphological knowledge indicate that children in general performed better on the Berry-Tulbott Language Test than on the morpheme analysis task, whether one examines all of the Berry-Tulbott Language Test items, \( F(1, 82) = 13.1, p < 0.001 \), or just the past tense items, \( F(1, 82) = 12.2, p < 0.001 \). In either case, it was also found that the majority of the subjects were still acquiring morphological knowledge even at the implicit level as defined in this study, because they did not reach ceiling levels on the Berry-Tulbott Language Test.

**DISCUSSION**

The purpose of this study was to investigate the development of morphological knowledge and its relationship to early writing ability in kindergarten and first grade children. Considering the tendency of children with learning problems to omit and substitute inflectional and derivational morphemes in writing, it was important to determine if the ability to represent morphemes in writing might be related to an underlying deficiency in morphological knowledge. Because of the frequent occurrence of these errors, as well as the demands of morphophonemic understanding made by the orthography, an examination of writing ability in relation to morphological knowledge seemed a necessary step.

Two levels of morphological knowledge were examined, since previous research has suggested that children need to understand word structure explicitly as well as implicitly in order to read and write accurately. Although previous studies had shown that written language proficiency is highly related to an explicit understanding of phonemic structure, and that older children are acquiring the ability to analyze the morphemic structure of
words, the ability of young children to analyze the internal structure of words had been examined at the phonemic but not at the morphemic level of language. Therefore, in this study, children’s explicit understanding of the internal structure of words was examined at both the morphemic and phonemic levels. By doing this, it was hoped that more could be learned about the development of the explicit awareness of word structure and the relationship of different levels of this awareness to each other and to early writing ability.

It was found, in accordance with previous studies of normal language acquisition, that children in kindergarten and first grade are still developing implicit morphological knowledge and that they use certain morphological rules before others. Notably, in view of the large number of past tense items in the stimuli that were used to assess writing and explicit analysis abilities, the kindergarteners and first graders in this study successfully applied the morphological rules for regular past tense more than half of the time.

In addition, it was found that implicit morphological knowledge does not develop solely as a function of factors associated with grade level. This was seen by the fact that some kindergarteners (the high group) performed significantly better on the Berry-Tulbott Language Test than some first graders (the low group). However, the role of factors associated with grade level cannot be disregarded either, since high first graders performed significantly better than high kindergarteners, and low first graders performed significantly better than low kindergarteners. What is clear from these results is that kindergarteners and first graders vary greatly in their implicit knowledge of the morphology and that this variability may affect their early writing ability.

Turning to the writing results, implicit morphological knowledge was found to have a significant effect on the ability to represent morphemes completely (as, for example, in *cand*, *kand*, or *end* for *canned*), over and above the effects associated with grade level. The finding that first graders in general had a greater number of completely represented written responses than did high kindergarteners is not surprising in view of their instructional experience.

Partial representations in writing were examined to observe in detail what children of varying levels of implicit morphological knowledge were doing when they did not represent a word completely in written form. It had been anticipated that, at least for children in the high groups, the tendency to omit nasal consonants in consonant clusters might occur less frequently on words where the nasal consonant marked a morpheme boundary, such as the *n* in *pinned*, than on words where the nasal consonant did not mark a morpheme boundary, such as the *n* in *wind*. However, the data did not support this hypothesis. It was found that, regardless of the level of morphological knowledge of the child, all of the children omitted more preconsonantal consonants (PCOs) on words that ended with nasal consonant clusters than non-nasal consonant clusters. This result therefore lends support to the claim that, for young children, nasal consonants in final consonant clusters are perceived as nasalized vowels (Read, 1971, 1975). Thus, inclusion of preconsonantal nasal segments may be more attributable to direct instruction in orthographic patterns than to linguistic ability.

In contrast to the PCO data, implicit morphological knowledge was found to be more highly related than was grade level to the tendency to make final consonant omissions
(FCOs, such as the d in pinned or wind, yielding the response pin or win). In fact, low first graders made relatively more of these errors than either high first graders or high kindergarteners. Since the morphological knowledge of the low first graders was poorly developed, and correlated highly with their lack of explicit understanding of morphemic structure, their greater tendency to omit final consonants in writing does seem to reflect an underlying deficit in morphological knowledge rather than just a general spelling problem. Furthermore, the results show that not only were the low first graders more likely to omit final consonants than either the high first graders or the high kindergarteners, but also that the final consonants they omitted usually represented inflectional morphemes. This was demonstrated by the fact that more final consonants were omitted from two-morpheme words than from one-morpheme words by all children, but relatively more so by low first graders. The tendency to make an error of this type at a morpheme boundary (thus preserving the base morpheme and dropping the inflectional morpheme), in conjunction with some correct use of the morphological rule for past tense on the Berry-Talbott Larigirage Test, does suggest at least a moderate degree of understanding of the morphemic structure of this construction. Even the low first graders, then, may demonstrate some level of implicit morphological knowledge by producing final consonant omissions on two-morpheme words. As will be seen in the following paragraphs, omission of inflectional morphemes in writing appears to be related, in large part, to a deficiency in explicit morphological awareness.

The results also demonstrate that implicit morphological knowledge, independent of grade level, was significantly related to the children’s ability to analyze the internal structure of words explicitly at the phonemic level. In fact, the phoneme analysis results paralleled the writing results exactly, when writing was assessed by completeness of representation. This was to be expected since the ability to segment a word into its phonemic elements is a large part of the beginning spelling process. In order to produce a “phonetically accurate spelling”, the beginning speller needs only to analyze words into their constituent phonemes and assign appropriate orthographic units to represent these segments. However, spelling phonetically without regard to morphophonemic structure will not take the beginning writer very far, since our orthography transcribes both the phonemic and morphemic segments of words to be represented in written form. The proficient writer may, therefore, be one who is able to appreciate the morphemic structure of words and to analyze his language at that level of representation.

Indeed analyzing word structure at the morphemic level is exactly what the low kindergarteners and low first graders could not do. In fact, it was found that many of these children could manipulate phonemic segments without understanding morphemic structure. For example, in response to the questions “Is there a smaller word in kind that means something like kind?” and “Is there a smaller word in dust that means something like dust?”, they often responded “Yes, kîn” (or “tînd”), or “dûs” (or “tust”). A striking pattern of results demonstrated that it was implicit morphological knowledge, not instructional experience, that differentiated those children who could explicitly analyze the internal structure of the word at the morphemic level from those who could not. In fact, the high kindergarteners and high first graders performed almost identically on the morpheme analysis task, despite their different amounts of instructional experience.
The low first graders performed significantly more poorly on this task than either the high first graders or the high kindergarteners, despite their "advantage" over the high kindergarteners in amount of instructional experience. The only children who performed more poorly than the low first graders were the low kindergarteners, who were clearly at a disadvantage in terms of both instructional experience and implicit morphological knowledge.

Looking more closely at the results of the explicit morphemic analysis task, the fact that the high kindergarteners and high first graders performed similarly, despite their different amounts of instructional experience, raises an interesting question. Since the high first graders demonstrated a significantly higher level of implicit morphological knowledge than the high kindergarteners, it seems curious at first that these two groups demonstrated nearly identical levels of explicit morphological knowledge. Apparently, the high first graders would have had to have shown an even greater superiority in implicit morphological awareness over the high kindergarteners in order to demonstrate a more sophisticated level of explicit awareness. In addition, the explicit analysis task may not have been sensitive enough to detect differences between the two high groups. Ongoing research is addressing these issues. What seems clear is that the ability to analyze the morphemic structure of a word is to some degree independent of instructional experience at this age level.

This position is based on the evidence that high kindergarteners performed significantly better than low first graders and almost identically to high first graders when analyzing the morphemic structure of spoken words, even though both groups of first graders had greater numbers of completely represented writing responses than did high kindergarteners. If explicit morphological knowledge developed solely as a consequence of written language experience, which seems to have made such a contribution to complete representations in writing, then the low first graders should have performed better, not worse, than the high kindergarteners on the analysis task. However, they did perform worse. Moreover, the partial representation results indicate that, while complete representations may be attributed to instructional experience, final consonant omissions appear to reflect the deficit in implicit morphological knowledge that defined the low groups and that may underlie their lack of explicit morphemic analysis skills.

It is notable that, even though the children in general demonstrated better implicit knowledge of the past tense rule on the Berry-Talbott Language Test than explicit recognition of base morphemes within inflected words, the children in the low groups showed much less proficiency (than those in the high groups) when explicitly analyzing the internal morphemic structure of past tense words, and omitted relatively more past tense inflectional morphemes in writing. At least for the low first graders, this pattern of performance suggests that it is their lack of explicit awareness of morphemic structure that should cause us the most concern. Although these children demonstrated some ability to manipulate phonemic structure, based on their performance on the phoneme analysis task and on the errors they made on the morpheme analysis task, and although they were able to use the past tense morphological rule inconsistently on the Berry-Talbott Language Test, they understood less well that inflected words are composed of groups of phonemes that form morphemes. Therefore, it seems probable that their lack
of explicit understanding of morphemic structure, in conjunction with their generally weak implicit knowledge of the morphology, may have accounted in large measure for the morphemic errors they made in their early writing attempts.

As noted earlier, inflectional morpheme omissions in writing may actually reflect at least a rudimentary level of morphological knowledge, since these errors occur at a morpheme boundary and therefore preserve the base morpheme of the word. However, even though children who omit inflectional morphemes may demonstrate a basic level of implicit morphological knowledge, their morphemic errors can still be related to the relatively weak status of this knowledge in conjunction with a serious lack of explicit understanding of morphemic structure. Therefore, it may be that it is more difficult for them to attend to more than one morpheme at a time and, consequently, they omit the inflectional morpheme in their labored attempts at writing.

In conclusion, it seems clear that, even at the primary level, if children are to develop written language skills, it is not enough for them to understand that words are made up of phonemic segments. Research into the spelling and written expression performance of older children (Anderson, 1982; Moran, 1981) and adults (Liberman et al., 1985) with learning problems demonstrates that errors on inflected and derived forms of words persist as a major characteristic of their written products. Since it is difficult to sort out the roles of linguistic ability and instructional experience at higher age levels, it is particularly helpful to begin to sort out these contributing factors in young children.

The present study demonstrates that children in both kindergarten and first grade vary considerably in their implicit and explicit knowledge of morphology and that this variability may affect their early attempts to represent base and inflectional morphemes in writing. It is clear from the obtained results that an important consideration in explaining errors on inflected and derived forms of words may be an underlying deficit at the implicit level, and especially at the explicit level, of morphological knowledge. Therefore, it is critical that we assess the morphological knowledge of young children so that we may identify those who are likely to have difficulty with written expression and help them to develop the sensitivity to morphemic structure that they need to become proficient written language users.

REFERENCES


APPENDIX

Stimuli for Dictated Spelling Task

1. pinned I pinned my dress up. pinned
2. funny That clown is funny. funny
3. hummed She hummed a song. hummed
4. wise That man is very wise. wise
5. hint I'll give you a hint. hint
6. winner The winner is happy. winner
7. lined The paper is lined. lined
8. nest The nest is broken. nest
9. canned Mom canned the green beans. canned
10. pies Let's get some apple pies. pies
11. band The band is marching. band
12. kissed She kissed her mother. kissed
13. wind The wind is blowing. wind
14. dimmed I dimmed the lights. dimmed
15. tent The tent is ready. tent
16. money I have no money. money
17. messed He messed up the house. messed
18. winter This winter is so cold. winter
19. dust The dust is too thick. dust
20. candy I'd like some candy. candy
21. dinner Your dinner is cooking. dinner
22. kind I like that kind. kind
23. pant Those dogs sure can pant. pant
24. hunter The hunter found a deer. hunter
25. fussied The baby fussied and cried. fussied
26. jammed He jammed the door jammed
27. list The list is too long. list
28. windy It is really windy. windy