THE DEVELOPMENT OF MORPHOLOGICAL KNOWLEDGE IN RELATION TO EARLY SPELLING ABILITY

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Abstract. This study assessed the morphological knowledge of kindergarteners and first graders in relation to their early spelling ability. Morphological knowledge was investigated because, in order to spell, children need to understand that words are composed of morphemes and phonemes, and because poor spellers 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 morphological knowledge omitted more inflectional morphemes in spelling 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 spelling proficiency.

INTRODUCTION

Children who demonstrate learning problems characteristically make errors when reading and spelling 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 experimental research concerning morphemic errors in written language. The studies that do exist demonstrate that children with learning problems make more of these errors in spelling than other children (Anderson, 1982; Moran, 1981). However, possible reasons for the occurrence of these errors have not been addressed.

The basis for such errors in spelling might fall into one of two categories. On the one hand, they might 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

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knowledge. If that is the case, children who make such errors in spelling would be expected to perform poorly in their attempts to use morphological rules in spoken language or to analyze the internal structure of words.

Although the relationship between morphological knowledge and spelling ability has not been examined directly, there is good reason to anticipate that children who make morphemic errors in spelling are indeed deficient in their underlying morphological skills. Several studies have demonstrated that children with reading problems have difficulty applying morphological rules to new words (Brittain, 1970; Doehring, Trites, Patel, & Fiedorowicz, 1981; Vogel, 1975, 1983; Wiig, Semel, & Crouse, 1973). In all of these studies, morphological knowledge has been 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, 1966). This method is used in order to determine 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 these rules between the ages of four and seven (Brown, 1973; de Villiers & de Villiers, 1973; Selby, 1972; Temmin, 1957). In contrast, children with learning problems develop morphological knowledge more slowly, although they are found to follow the same sequence in their rule acquisition.

Although it has been demonstrated that children grouped by reading ability differ significantly in their use of inflectional morphemes, as measured by the Berko procedure, research has not yet examined whether morpheme use is directly related to other linguistic skills or why these relationships might exist. Since children with learning problems show a strong tendency to make morphemic errors in spelling as well as in reading, it is of particular interest to determine if there is a relationship between morphological knowledge and spelling ability. Since the English orthography is morphophonemic, like the spoken language it represents (Liberman, Liberman, Mattingly, & Shankweiler, 1980), spelling requires that the child understand that words are made up of morphemes, which, in turn, are made up of phonemes. Studies of spelling ability of college students indicate that poor spellers fail most dramatically on those words that require sensitivity to morphophonemic structure (Fischer, 1980; Hanson, Shankweiler, & Fischer, 1983). In addition, examination of the spontaneous writing samples of learning disabled children and adults documents incorrect usage of both inflectional and derivational morphemes (Anderson, 1982; Liberman, Rubin, Duques, & Carlisle, 1985; Moran, 1981). Based on this evidence, a strong relationship between the ability to use morphemes correctly in spoken and written language would be expected since morpheme use in either case would depend on the development of morphological rules and access to them in the lexicon. It would also be expected that morpheme use would depend, at the very least, on an implicit understanding of morphophonemic structure. However, the explicit understanding that words are made up of morphemes, which, in turn, are made up of phonemes, would clearly differentiate the proficient from the disabled writers.

Previous research studies have demonstrated that the ability to analyze the internal structure of words explicitly is a critical component in learning to read (Blachman, 1983; Fox & Routh, 1980; Liberman, Shankweiler, Fischer, & Carter, 1974; Lundberg, Olofsson, & Wall, 1980; Treiman & Baron, 1981) and in learning to spell (Liberman et al., 1985; Perin, 1983; 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).

Research into the structural analysis of spoken words and its relationship to reading and spelling abilities has yielded valuable diagnostic and instructional information thus far. It is clear that children with reading and spelling problems are less able than their normally achieving peers to analyze spoken words into their constituent phonemes. However, many questions about this relationship remain unanswered. To begin with, the ability to analyze spoken words into their constituent morphemes has been barely examined. Since the English orthography, like the spoken language it represents, is morphophonemic, we need to investigate the ability to analyze the internal structure of words as a function of both morphemic and phonemic structure.

Recent studies have begun to examine the explicit understanding of morphophonemic structure in children. Derwing and Baker (1977, 1979) have investigated the development of morpheme identification ability in children in grades 3 through college. They provided the children with word pairs that were varied for semantic and phonetic similarity, such as teach-teacher, slip-slipper, cupboard, and moon-month. The children were required to read each pair and indicate if one word “came from the other,” using a 5-point scale to specify the degree of relatedness. Performance correlated with age and degree of semantic and phonetic relationship between the paired words. The authors concluded that morpheme recognition ability may develop as much through instructional experience as through language acquisition and suggested that it would be difficult to sort out the contributions of these two sources of linguistic knowledge.

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. It would be expected that if younger children were deficient in morpheme use, which would reflect their implicit awareness of morphological structure, they would also be deficient in their ability to recognize base morphemes within two-morpheme words, or their explicit awareness of morphological structure. If these abilities were found to be related to each other and to morpheme use in early spelling, it would be possible to demonstrate the necessity of helping young children develop sensitivity to morphemic structure through direct instruction.

Therefore, the present study was designed to examine the relationship between implicit awareness 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. Furthermore, the relationship between performance on the spoken language tasks and the ability to represent base morphemes and inflectional morphemes in beginning attempts at spelling was investigated.

Although previous studies that document morphemic errors in spelling analyzed spontaneous writing samples, it was not considered reasonable 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 awareness of morphological structure of spoken words to enable us to learn more about the course of this development. Secondly, previous studies of invented spelling (Read, 1971, 1975) have demonstrated that by age five many children are able to analyze words into their constituent phonemes and use their knowledge of letter names to “invent” written representations of the spoken words. By scoring
for the number of morphemes represented in writing rather than for correctness of spelling, it seemed reasonable to use a dictated spelling task as an early indication of the ability to represent inflectional morphemes in written form. In this way, both spoken and written language measures of the morphological knowledge of young children could be obtained. Finally, this information could be used in future research to predict the course of morphemic development in the written language of children and adults.

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. During a one-week period, they were individually given the Berry-Talbott Test of Language (Berry, 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 when shown illustrative pictures.

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 Test of Language. 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 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.

Table 1

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<th>Berry-Talbott Test of Language: Grouped Mean Score (and Standard Deviation) for Kindergarteners and First Graders</th>
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To determine if the children differed in their performance on the Berry-Talbott Test, an analysis of variance was conducted. The analysis revealed a significant main effect of group (high, low), $F(1,82) = 347.16, MSe = 11.83, p < .001$, and grade (kindergarten, first), $F(1,82) = 19.92, MSe = 11.83, p < .001$. 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, $t(41) = 3.58, p < .001$; the low first graders performed better than the low kindergarteners, $t(41) = 2.86, p < .007$; and the high kindergarteners performed better than the low first graders, $t(39) = 9.49, p < .001$. 

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Materials and Specific Procedures

1) Experimental Spelling Test. This measure was designed to assess the children's representation of base and inflectional morphemes in the early stages of their experience with written language. It contained 31 words that were considered to be part of the average kindergartener's spoken vocabulary. Twenty-one words were organized according to morphemic structure (one or two morphemes) and type of final consonant cluster (nasal or non-nasal). Three experimental words were given in each of the following categories: (1) 2-morpheme words ending in \textit{md} (hummed, jammed, dimmed), (2) 1-morpheme words ending in \textit{nd} (wind, band, kind), (3) 2-morpheme words ending in \textit{nd} (pinned, canned, lined), (4) 1-morpheme words ending in \textit{nt} (tent, pant, hint), (5) 2-morpheme words ending in \textit{nt} (bent, can't, don't), (6) 1-morpheme words ending in \textit{st} (list, dust, nest), and (7) 2-morpheme words ending in \textit{st} (kissed, fussed, messed). Ten words were used as fillers to reduce the possible priming effects of the experimental words. Five of the fillers were one-morpheme words (winter, candy, dinner, money, and wise) and five were two-morpheme words (hunter, windy, winner, funny, and pies). The experimental and filler words were randomized and each word was dictated, then used in a meaningful sentence and repeated. The children were instructed to write each word on a pre-numbered response form.

2) 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 31 words that were used for spelling. The child was asked questions such as “Is there a smaller word in \textit{dust} that means something like \textit{dust}?” or “Is there a smaller word in \textit{kissed} that means something like \textit{kissed}?” for each of the words. For one-morpheme words (such as dust, pant, and wind), the child was supposed to respond “No.” For two-morpheme words (such as fussed, can't, and pinned), the child was supposed to respond “Yes” and supply the base word.

These procedures were demonstrated in six training trials 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 not related to the stimulus word (such as pillow and sink) were included in the training trials and required “no” responses. On the test trials, no demonstrations or feedback were given.

General Procedures

The 86 children in the four groups were tested further to determine the relationship of their morpheme use in spoken language to their morpheme use in spelling and to their explicit morpheme analysis ability. During the one-week period following administration of the Berry-Talbott Test of Language (1966), each of the four groups of children 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 morpheme analysis task and a letter naming task in an individual testing session of approximately 20 minutes. To insure consistent presentation of the stimuli, all of the test items were presented on tape.
Implicit Morphological Knowledge and Spelling 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, a skill needed for invented spellings.

For each child, the percentage of written words with final consonant omissions was also tabulated. The high first graders omitted final consonants from 3% of the words, the high kindergarteners from 10% of the words, and the low first graders from 17% of the words. (Since low kindergarteners were not able to name the letters of the alphabet, their spelling results will not be discussed.) To determine if the groups differed in their tendency to omit final consonants, an analysis of variance was conducted with two between-groups factors (implicit morphological knowledge in spoken language, grade level). The analysis revealed a significant main effect of implicit morphological knowledge, \(F(1,82) = 4.25, MSe = 5.97, p < .043\), and a significant interaction between morphological knowledge and grade level, \(F(2,82) = 12.63, MSe = 5.97, p < .001\).

These results suggest that the ability to represent final consonants in written language is significantly related to morphological knowledge in spoken language and is not significantly related to grade level independent of linguistic ability. In other words, the low first graders omitted more final consonants than did either the high first graders or the high kindergarteners.

When the data are examined as a function of both morphemic and phonemic structure, they indicate that in omitting final consonants in their spelling, children tend not to be influenced by the phonemic structure of the words. It was found that the percentage of error on words ending in nasal and non-nasal consonant clusters was roughly the same—8% and 7%, respectively. In contrast, there was a striking effect of morphemic structure. Whereas children omitted final consonants from only 4% of one-morpheme words, they omitted final consonants from 11% of two-morpheme words, a difference that was highly significant, \(t(85) = 5.84, p < .001\). 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 and Explicit Levels of Morphological Knowledge

In 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 *md* words [*hummed, jammed, dimmed*] were excluded from this scoring system because there are no one-morpheme words in English that end in *md.*) 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 word and “no” responses had no such control. By pairing words with similar phonemic structure and contrasting morphemic structure, one could be certain that “correct” responses validly represented sensitivity to morphemic structure and not inflation due to response bias.

Using this scoring system, the percentage of correctly analyzed word pairs was tabulated for each child. Both high first graders and high kindergarteners analyzed 48% of the pairs correctly,
low first graders 24%, and low kindergarteners 3%. The correlation between the number of pairs a child analyzed correctly and morpheme use in spoken language proved to be significant, \( r(84) = .63, p < .001 \), indicating a strong relationship between implicit and explicit levels of morphological awareness.

To determine if the groups of children differed in their ability to identify base morphemes in pairs of words that differed in morphemic complexity, an analysis of variance was conducted with two between-groups factors (implicit morphological knowledge in spoken language, grade level). The analysis revealed a significant main effect of implicit morphological knowledge, \( F(1,82) = 49.11, MSe = .05, p < .001 \), and grade, \( F(1,82) = 5.80, MSe = .05, p < .019 \). Moreover, the interaction between morphological knowledge and grade level was significant, \( F(2,82) = 4.31, MSe = .05, p < .042 \). In other words, the high kindergarteners and high first graders performed equally well.

These results show that implicit morphological knowledge in spoken language (as assessed by the Berry-Talbott Test) is a more important discriminator of explicit morphological knowledge than is grade level. Implicit morphological awareness in spoken language accounted for 34% of the total variance in explicit morphological awareness, whereas grade level accounted for only 4%, and the interaction between group and grade for 3%.

What is particularly notable about these results 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. Therefore, 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 grade level factors such as age and amount of instructional experience.

**Discussion**

The purpose of this study was to investigate the development of morphological knowledge and its relationship to early spelling ability in kindergarten and first-grade children. Two levels of morphological knowledge were examined, since previous research has suggested that children need to understand morphophonemic structure implicitly and explicitly in order to spell. Although previous studies had shown that written language proficiency requires an explicit understanding of morphophonemic structure, 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.

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 (as measured by the Berry-Talbott), 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 spelling and explicit analysis abilities, most of the kindergarteners and first graders in this study successfully applied the morphological rules for regular past tense (in the nonsense words: trommed, flitched, linged, and bazinged).

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 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 affects their early spelling ability.

In fact, implicit morphological knowledge had a more significant effect than grade level on the tendency of young children to omit inflectional morphemes in spelling. This was seen by the fact that low first graders made relatively more of these errors than either high first graders or high kindergarteners. Furthermore, the poorly developed implicit morphological knowledge of the low first graders correlated highly with their poor performance on the morphemic analysis task.

Considering previous research on phonemic analysis, it was enlightening to examine the types of errors made by the low kindergarteners and low first graders when they attempted to analyze the morphemic structure of spoken words explicitly. 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, *kin*” or “Yes, *tind*” or “Yes, *dus*” or “Yes, *tust*.” This finding highlights the importance of examining the ability to explicitly analyze the morphemic structure as well as the phonemic structure of words.

Looking more closely at the results of the explicit morphemic analysis task, the fact that the high kindergarteners and high first graders performed with identical proficiency, 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 identical levels of explicit morphological knowledge. Apparently, the high first graders would have had to show a 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. What seems clear is that the ability to analyze the morphophonemic structure of a word is to some degree independent of instructional experience at this age level, since high kindergarteners performed significantly better than low first graders. 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 contributions for young children. By doing so, we can begin to develop more sensitive diagnostic measures to predict later language learning deficits and to design instructional procedures that will address the morphophonemic aspects of learning to read and spell.

The present study demonstrates that children in both kindergarten and first grade vary considerably in their implicit and explicit knowledge of the morphology and that this variability affects their early attempts to represent base and inflectional morphemes in writing. It is clear from the obtained results that children who demonstrate weak implicit knowledge of morphological rules are also deficient in their ability to explicitly analyze the internal morphemic structure of words and to use inflectional morphemes in writing. Therefore, the greater tendency of the low first graders to omit inflectional morphemes in writing seems to reflect a deficiency in morphological knowledge, rather than just a general spelling problem.
Morphological Knowledge and Spelling Ability

It is notable that, even though most of the children demonstrate their implicit knowledge of the past tense rule on the Berry-Talbott Test, only the children in the high groups show some degree of proficiency when explicitly analyzing the internal morphemic structure of past tense words. In contrast, the children in the low groups are relatively unable to analyze the internal morphemic structure of the past tense words, and omit relatively more past tense inflectional morphemes in writing. Yet they too were able to use the morphological rule for past tense on the Berry-Talbott Test. 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 demonstrate some ability to manipulate phonemic structure, based on the errors they made on the morpheme analysis task, they do not seem to understand that inflected words are composed of groups of phonemes that form morphemes. Therefore, it seems probable that their lack of explicit understanding of morphophonemic structure, in conjunction with their generally weak implicit knowledge of the morphology, account in large measure for the morphemic errors they make in their early spelling attempts.

It seems clear, then, that even at the primary level, if children are to be good spellers, 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 and adults with learning problems demonstrates that errors on inflected and derived forms of words are a major characteristic of their written products. The results of this study suggest that the basis for such errors may be an underlying deficiency at the implicit level, and especially at the explicit level, of morphological knowledge. Therefore, it is of critical importance that we assess the morphological knowledge of young children so that we may identify those who are at risk for learning problems and help them to develop the sensitivity to morphophonemic structure that they need to become proficient written language users.

In order to best help these children, it seems necessary to teach them to use grammatical morphemes correctly in their spoken language if they are to become competent in spelling inflected and derived forms of words. In addition, the present results suggest that it is critical to teach these children to become explicitly aware of the structure of their spoken language productions. It is this explicit awareness of their language that should help children to apprehend the internal structure of the new words that they are required to read and spell. Written language instruction should focus on the development of structural analysis skills at both the morphemic and phonemic levels. It is clear that children should be taught that words (whether they are spoken, read, or spelled) are composed of morphemes, which, in turn, are composed of phonemes.

In conclusion, this study represents a first step in the examination of morphological knowledge in the spoken language of young children as it relates to their ability to represent morphemes in writing and their ability to analyze the internal morphemic structure of words. Since this is a new area of investigation, it is anticipated that these results will stimulate the development of other research studies. In the future, we need to conduct similar studies with learning disabled children, adolescents, and adults in an effort to account for the morphemic errors they make in reading and written expression. In this way, we can begin to document deficiencies in sensitivity to morphophonemic structure in these groups. It is hoped that studies of this type will result in improved diagnostic and instructional procedures for children and adults with language-learning disabilities.
References


