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What is This?

The Foundations of Literacy

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Abstract

Learning to read and write in English requires children to master the alphabetic principle, the idea that the letters in printed words represent the sounds in spoken words in a more or less regular manner. Children need at least two skills in order to grasp the alphabetic principle. The first is phonological awareness, or a sensitivity to the sound structure of spoken words. The second is knowledge about letters, including knowledge of letter names and knowledge of letter sounds. Recent research sheds light on these foundational skills, documenting the linguistic factors that affect children's performance and how children put their phonological skills and knowledge of letters to use in learning to read and spell.

Keywords

reading; spelling; phonology; alphabet

Learning to read and write is not a simple task for children. Indeed, Gough and Hillinger (1980) called learning to read an "unnatural act" because it is so slow and so laborious. Although a few children begin to read and write before they enter school, most require intensive teaching in order to achieve a degree of fluency. Research has helped us understand the difficulties that children face in learning to read and write and has guided efforts to structure instruction to help children overcome these difficulties.

The ultimate goal of reading instruction is for children to be able to comprehend and learn from written texts. To achieve this goal, children must be able to identify printed words accurately and auto-matically. For English, with its alphabetic writing system, this involves learning to appreciate how the letters in printed words relate to the sounds in spoken words. Children who have grasped this *alphabetic principle* will be able to decipher printed words that they have not previously encountered. They will be able to produce readable, if not always correct, spellings. Children who do not master the alphabetic principle in the first few years of school will fall further and further behind their peers as they are expected to do more and more independent reading.

What do children need to know in order to learn the alphabetic principle? Researchers have identified two important precursors—phonological awareness and knowledge about letters (e.g., Adams, 1990). *Phonological awareness* refers to a sensitivity to the sound structure of language. A child who possesses phonological awareness knows not just that the spoken words "bat" and "pat" sound different, but that the difference is located in the first of the three sound units, or *phonemes*. Similarly, a child who possesses phonological awareness knows that "bat" and "got" are alike by virtue of sharing

the third of their three phonemes. *Letter knowledge* includes knowledge of letter names, knowledge of letter sounds, and the ability to retrieve this information quickly and effortlessly. In what follows, I review recent findings on children's phonological awareness and knowledge about letters and on the links between these skills. The research discussed involves children learning to read and write in English.

PHONOLOGICAL AWARENESS

A number of studies have shown a general relationship between phonological awareness and later reading and spelling skill. Ball and Blachman (1991) found that kindergartners who received training in segmenting spoken words into phonemes, in addition to training in letter-sound relationships, showed more improvement in reading than children who received instruction in letter-sound relationships alone. Moreover, the children who received the phonemic-segmentation training were better able to represent words' phonological structure in spelling. Such findings could be taken to mean that phonological awareness is a single homogeneous skill. If we can boost the level of this skill, we will see corresponding improvements in reading and spelling. The present view, in contrast, is that phonological awareness is heterogeneous. Certain words and syllables, because of their linguistic structure, are harder for children to analyze than others. These difficulties lead to specific problems in spelling and reading.

One example of the heterogeneity of phonological awareness comes from studies that have documented confusions based on the linguistic feature of *voicing*. To un-

derstand this feature, consider that the initial phonemes of "Kate" and "gate" are produced by the release of air that has built up by a closure in the vocal tract. The interval between the release of the closure and the beginning of vocal cord vibration is longer for /k/ (unvoiced) than it is for /g/ (voiced). The phonemes /k/ and /p/ are alike in voicing (both unvoiced) but differ in *place of articulation*, or where the closure is made in the mouth. When asked to judge whether a spoken syllable begins with a specified target phoneme, preschool and kindergarten children are more likely to err if the syllable's initial phoneme differs from the target only in voicing than if it differs from the target only in place of articulation (Treiman, Broderick, Tincoff, & Rodriguez, 1998). Voicing confusions emerge in spelling as well, as when normally progressing first graders misspell /k/ as "g" (Treiman, 1993) or older dyslexic children (those with serious problems in learning to read and spell) do the same (Kibel & Miles, 1994). A spelling error like "gopt" for "kept" does not reflect any visual similarity between the letters "k" and "g." Instead, it reflects the similarity between the phonemes. This similarity affects reading as well; for example, young children more easily learn to read "gbn" as a spelling of "cabin" than "pbn" as a spelling of "cabin" (Rack, Hulme, Snowling, & Wightman, 1994).

Consonant clusters, which are widespread in English, also cause difficulty in phonological awareness tasks. For young children, a syllable-initial (i.e., *onset*) consonant cluster like the /bl/ of "blow" is a cohesive unit. Children have trouble dividing onset clusters into their component phonemes, and they have difficulty with final consonant clusters as well (Treiman, 1992; Treiman, Zukowski, & Richmond-Welty, 1995). Correspond-

ingly, normal first graders sometimes fail to spell both elements of a consonant cluster. They may misspell "blow" as "bo" or "help" as "hep" (Treiman, 1993). Similar errors have been reported among older dyslexic children (Bruck & Treiman, 1990; Kibel & Miles, 1994).

Thus, phonological awareness is not a single homogeneous skill. Some linguistic structures are more difficult than others, and these difficulties can cause specific errors in spelling and reading. As noted earlier, research has shown that instruction in phonological awareness can boost reading and spelling performance. These benefits are likely to be enhanced if such training is sequenced according to linguistic principles. For example, children should be taught to divide syllables into onset and *rime* (the unit that consists of the vowel and following consonants, if any) before they are expected to subdivide onset clusters into phonemes.

LETTER KNOWLEDGE

Children's knowledge about letters is an excellent predictor—in some studies, the best predictor—of reading success (see Adams, 1990). Studies show that children in the United States usually learn the names of letters well before they learn their sounds (e.g., Worden & Boettcher, 1990). However, there has been little research on how children acquire their knowledge about letters. The implicit assumption has been that letter names and letter sounds are learned by rote.

In a recent study, my colleagues and I obtained results that challenge the idea that children learn the sounds of letters through rote memorization (Treiman, Tincoff, Rodriguez, Mouzaki, & Francis, 1998). Analyzing data from 660 children between 3½ and 7½

years old, we found that an important determinant of letter-sound knowledge is whether the letter's sound occurs in the name of the letter and, if so, its position. Children do best when the sound of the letter is in the salient initial position, or onset, of the letter's name. Thus, children's knowledge of the sounds of letters such as *v* and *k* is relatively good. Performance is intermediate when the sound of the letter is at the end of the letter's name, or part of the rime. Thus, knowledge of letter sounds tends to be poorer for letters such as *l* and *f* than for letters such as *v* and *k*. Children have the most difficulty with those (relatively few) English letters for which the sound is not in the name, as with *h* and *w*. In such cases, knowledge of letter names can lead children astray. They may think that *w* makes the sound /d/ or that *y* makes the sound /w/ (Treiman, Weatherston, & Berch, 1994). These results show that children typically use their early-acquired knowledge of letter names and their phonological skills (awareness of onsets, in particular) in learning letter sounds. Children search for principled links between letters and their sounds.

Our results show that knowledge of letter names and knowledge of letter sounds are not two manifestations of the same underlying ability. It turns out that different factors affect children's performance on tasks that require knowledge of letter names and tasks that require knowledge of letter sounds. Although knowledge of a letter's sound is influenced by whether the sound is in the letter's name and, if so, what its position is, knowledge of letter names is not affected by these variables (Treiman, Tincoff, et al., 1998). In contrast, a child's experiences with his or her own first name have an impact on the child's knowledge of letter names, but little or no impact on the child's knowledge of letter

sounds. Young Joe is more likely to know the name of the letter *j* than Bob or Pam, but Joe is no more likely to know the sound of the letter *j* (Treiman & Broderick, 1998).

When middle-class American children arrive in kindergarten, they usually know the names of a good many letters. A major task is for them to learn the letters' sounds. Kindergarten teachers often spend the same amount of time on each letter, using a "letter of the week" approach. The results reviewed here suggest that such an approach is not ideal. Children have more trouble learning the sound of a letter like *w*, which does not mesh with the letter's name, than the sound of a letter like *v*, which does. Why not spend more time on the harder letters and less time on the easier letters?

Children's reliance on letter names continues as they begin to spell and read. For example, a kindergartner may write "yr" when asked to spell "war," or "yat" when asked to spell "wet" (Treiman et al., 1994). The child has used the name of the letter *y* to infer that it spells /w/—a reasonable guess, but one that happens to be wrong. In this and other cases, certain apparently odd errors make sense if one considers the knowledge that children bring with them to the literacy learning task.

Recently, Rodriguez and I explored children's use of letter-name knowledge in learning to read by examining their ability to learn made-up spellings that embodied different types of relationships between print and speech (Treiman & Rodriguez, 1999). In the sound condition of our study, the letters in the made-up spellings corresponded to some of the sounds in the spoken word, as with BT for "bait." In the name condition, letter-name clues were available as well, as with BT for "beet." In the visual condition, there were no systematic relations between

letters and sounds, but the sizes and positions of the letters were varied to increase the visual distinctiveness of the printed stimuli. For example, ʙT was pronounced as "ham." We found that preschoolers and kindergartners who could read a few simple words derived some benefit from both letter-name and letter-sound relationships, although they found the former more useful than the latter. Nonreaders could benefit only from letter-name relationships, performing better in the name condition than the visual or sound conditions. These results suggest that children search for principled relationships between print and speech from an early age. The relationships that make most sense to young children, it appears, are those based on letter names. Our findings speak against the widespread view that young children are purely *logographic* readers, memorizing associations between printed words and spoken words in a rote fashion (e.g., Gough & Hillinger, 1980).

CONCLUSIONS AND DIRECTIONS FOR FUTURE RESEARCH

Phonological awareness and knowledge about letters are two foundations on which literacy learning rests. I have discussed the trouble spots that children encounter in each of these areas and how these difficulties can lead to particular errors in reading and spelling. Most research on literacy has focused on differences among children, investigating why some children learn to read more easily than others. The research reviewed here broadens the picture by demonstrating differences among linguistic structures. For example, some spoken syllables are harder to analyze than others, and some letters

are harder to learn than others. Both child-based and item-based differences must be considered for a complete understanding of literacy development. The findings also show that phonological awareness and knowledge of letters are closely related. For example, children use their phonological skills to analyze the name of the letter *v* into smaller units. This helps them learn and remember the letter's sound. When learning the sounds of individual letters and when learning to pronounce words, children search for principled relationships between print and speech. They are not limited to rote learning.

The research discussed here, like much of the research on learning to read and write, has looked at English. Additional work is needed to examine other languages and writing systems. In some languages, for example, the names of all the letters reflect the letters' sounds systematically. Does this facilitate the learning process? Research is also needed to identify the precursors of reading problems. For instance, are there some children who rely on rote memorization to learn the sounds of the letters? Are these the same children who later have trouble grasping the alphabetic principle? By identifying difficulties at an early age, we may be able to help children avoid serious reading problems.

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Note

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