Morphological knowledge and learning new words

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Children's vocabulary is crucial to their ability to communicate and their comprehension of written text (Deacon & Kirby, 2004; Nagy, Berninger, Abbott, Vaughan & Vermeulen, 2003; Ouellette, 2006) and thus to their general academic achievement. There are significant individual differences in children's vocabulary size when they start school (Huttenhocher, Haight, Bryk, Seltzer & Lyons, 1991) and these differences are likely to grow larger over time because knowing a large number of word meanings tends to facilitate the learning of new words (Penno, Wilkinson & More, 2002). Therefore, it is of great importance to understand which factors underpin vocabulary growth; this knowledge can guide researchers and teachers in the development of methods to promote children's vocabulary growth. This study aimed to investigate one of the cognitive factors that might affect children's vocabulary learning – namely, morphological awareness.

Morphemes are the smallest units of meaning in words. The word homes, for example, is formed of two morphemes: "home", which is the stem, and "s", which is a suffix that indicates that you are referring to more than one home: i.e. it marks the plural of nouns. Many words in English are single morpheme words: think, dog, hat, for example, are words that have only one morpheme. These words can also be used to form other words by adding other morphemes to them. "Think", for example, can be used to form the word "unthinkable", which has three morphemes: "un", "think" "able". Each one of these parts has meaning: "un" is a prefix (because it is used before the stem) that expresses negation and "able" is a suffix (because it is used after the stem) that transforms a verb into an adjective. Similar words formed with the same affixes but different stems would be "unforgettable", "undesirable" and "unimaginable". Suppose you know a few words such as these and you also know the word "answer". You are reading a book and you come across the word "unanswerable",

which you never heard or read before. You can use your knowledge to figure out the meaning of unanswerable and you will be pretty certain to get it right. It is a reasonable hypothesis that knowing that words are formed with morphemes and knowing the meaning of prefixes and suffixes can help you develop your vocabulary. Just to illustrate: the MRC psycholinguistic data base lists 1,158 adjectives that end in the suffix "able". Therefore it is very helpful to be aware that "able" is a suffix and how it changes the meaning of verbs if you are a child learning to read a language such as English or Portuguese, in which there are many multimorphemic words. This sort of knowledge is known as morphological awareness: i.e. awareness of morphemic patterns in words and their meanings.

It is estimated that the written vocabulary that a child in primary school needs to read with comprehension is tens of thousands of words larger than the child's oral vocabulary (Nagy & Anderson, 1984). So the child needs to be able to read and understand words that were never heard before. In order to understand how this is possible, we first analyse the processes that are involved in learning new words. We then raise two hypotheses about the role of morphology in learning words. Finally, we report a study that tests the second of these hypotheses using a correlational analysis.

How children learn new words

In order to learn new words, children must do two things: (1) they must be able to remember the sequences of sounds that form the words and (2) they must attribute meanings to these sequences of sounds.

It has been assumed that morphological awareness plays an important role in the second step. Several researchers (e.g. Anglin, 1993; Wysocki & Jenkins, 1987) have suggested that children can use information from stems and affixes to work out the meaning of new words. Nagy and Anderson's (1984) analysed printed school English and noted that, for every word learned, there are at least three derivatives whose meanings are recognisably related to the stem. Thus, being able to utilize morphological information can provide children with a powerful tool in working out the meaning of words for themselves. Indeed, much of children's receptive vocabulary growth from early to middle childhood can be accounted for by their growing understanding of morphologically complex words (particularly derived multi-morphemic words) and their ability to deduce the meaning of unfamiliar words on the basis of morphemes (Anglin, 1993).

In this study, we tested the hypothesis that children's awareness of morphology also participates in the first step in the process of vocabulary acquisition: remembering the sounds that make up the word.

It has been previously assumed that the process of remembering the sounds of new words is basically, if not solely, rooted in children's phonological skills- i.e. their ability to discriminate and remember the sounds that make up the words. Gathercole and her colleagues have convincingly shown that children's phonological skills – more specifically, their phonological short-term memory – are strongly associated with their ability to learn new words (Gathercole, Service, Hitch, Adams & Martin, 1999; Gathercole, Service, Hitch, & Martin, 1997; Gathercole, Willis, Emslie & Baddeley, 1992). Their main assessment of phonological short-term memory consisted in asking the children to listen to some made-up words and to repeat them; this is the "non-word repetition task". The children's performance on this task was shown to correlate with one measure of their vocabulary, which was taken at the same time and also with another measure of vocabulary that was given to the children about one year later.

The ability to remember sequences of sounds undoubtedly involves phonological skills, but it is unlikely that all sequences of sounds are remembered in the same way, irrespective of whether they are morphemes or not. If you are presented with non-words that cannot be easily analysed into morphemes, such as almost all of the non-words in Gathercole's non-word repetition task ("hampent", "stopograttic", "woogalamic or "dopelate"), you have to rely mostly on your phonological skills when trying to remember them. You might remember these sequences by their syllabic units; the more syllables a non-word has, the more difficult it will be to remember it. However, if the non-words could be easily analysed into morphemes (such as "concentrationist", "unsausagish", "winteriser" or "computerist"), you could work with different units when attempting to remember them: "winteriser" can be remembered in three units (winter – ise – er) that are its constituent morphemes. You could do the same with, "concentrationist", "computerist" and "unsausagish". In all these examples, there are fewer morphemes than syllables, so if you use morphemes to remember them, the task should be easier.

We made two predictions about children's performance in a non-word repetition task in which the non-words have an obvious morphological structure. First, children would perform significantly better in this task than in a non-word repetition task in which the items do not have an obvious morphological structure. Second, the children's performance in the non-words with a morphological structure would be significantly related to their morphological awareness after controlling for their phonological awareness.

Method

Participants were 57 children in the age range 9 to 11 years, all attending state supported primary schools in England.

Measures

The children were given three measures.

(1) Sentence analogy is a measure of morphological awareness developed by Nunes, Bryant, and Bindman (1997). The children hear a pair of words in which the second word is derived from the first: for example, art-artist. They are then given a third word and asked to make an analogous transformation: for example, magic (magician). We use some pairs in which the morphological transformation is analogous but the suffix may be different as well as pairs in which the suffix is the same.

(2) Phoneme deletion is a measure of phonological awareness. Children hear a word and are asked to say it without its first sound: for example, they hear the word "train" and have to say "rain".

(3) A non-word repetition task, with two sets of items: in one set, the non-words had an obvious morphological structure and in the second set, the items were not composed by morphemes, and were taken from the Gathercole et al. (1997) non-word repetition task. The items with a morphological structure were matched in number of syllables to the non-words in the original task. In order to ensure that there were definitely two types of non-words in the task, we presented the complete set mixed and in random order to two adults, native speakers of English, whom we asked to count the number of syllables in the non-words and to identify their morphemes, if the non-words could be entirely analysed into morphemes. All the non-words that we created were easily identified as formed by morphemes and one of those used by Gathercole ("diller") was also analysed into morphemes. So we excluded it from our study in order to have two different types of item, one with a morphological structure and the other one without.

Procedure

The children were seen individually by a researcher, who administered all three tasks orally. In order to ensure that the procedure for the non-word repetition task was

identical for all the children, the non-words were tape-recorded by a native speaker. The researcher played the non-word and the child repeated it. The child's repetition was audio-recorded, using a second tape-recorder. A sample of responses was scored as accurate or not by two independent judges. The inter-judge reliability was very high so one of the judges scored all the remaining answers. The children's answers all three tasks were assigned a 1 (correct) or 0 (incorrect). The children's score on each of the measures was the total number of correct responses.

Results

Our prediction was that, if children use the morphemic structure to remember the new sequences of sounds in non-words, they would perform significantly better in the non-words with a morphemic structure than in those without this structure. Out of a possible score of 23, the children scored 18.7 in the non-words with a morphological structure and 17 in the non-words without a morphological structure. This difference was statistically significant according to a t-test for correlated measures ($\underline{t}$ = 5.01; df=55; $\underline{p}$<.001). So, we concluded that children used some form of morphological analysis when trying to remember these novel sequences of sounds. This must be the reason they found it easier to repeat non-words that have a morphological structure than those that do not.

Our second prediction was that children's awareness of morphemes would correlate with their ability to remember non-words with a morphological structure, but not with their ability to repeat non-words that do not have a morphological structure. The children's performance in the two sets of non-words was highly correlated (r=.71; p<.001); this correlation remained high and significant even after partialling out the effect of the children's age (partial r=.72). However, the factors that explained variance in the two sets of non-words were not identical. The partial correlation (partialling out the effects of age and phoneme deletion) between the children's performance in the sentence analogy task and their performance in the items in the non-word repetition task that had an obvious morphological structure was low (partial r =.27) but significant (p<.05); the partial correlation with the non-words that did not have a morphological structure was not significant.

We concluded that children use their morphological knowledge in remembering the sounds in a new word, when the word has a morphological structure that they recognise. Thus, the better their morphological knowledge, the greater will be their ability to remember new words. Thus the first part of the task of learning a new word – i.e.

remembering the sequence of sounds that make up the word – is influenced both by the children's phonological and morphological skills.

Conclusions and educational implications

This study showed for the first time that morphological awareness contributes to children's ability to remember novel, word-like stimuli, above and beyond the contribution of children's phonological skills. Previous correlational studies (McBride-Chang, Wagner, Muse, & Hui Shu,, 2005; Nagy, Berninger & Abbott, 2006) had showed that morphological awareness was a strong concurrent predictor of vocabulary in kindergarteners and school aged children up to grade 5, and also, although a little less strongly, in grades 6 through 9. However, it was assumed, implicitly or explicitly, that this correlation was based on the impact of morphology on children's ability to deduce the meanings of new words. It is now clear that morphological awareness might also impact their ability to remember words. Because the direction of causality cannot be known in a correlational study, further research combining longitudinal and intervention methods is necessary to clarify this.

This result has clear implications for educational practice. Despite the importance of morphology in English orthography, there is currently in many literacy programs a conspicuous lack of opportunities to develop children's awareness of morphemes. This new result demonstrates that children's awareness of morphemes might influence more than their mastery of orthography and thus adds to the good reasons already known to nurture children's awareness of morphemes in school.

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Resumo

Partindo do princípio que o vocabulário das crianças é fundamental para a comunicação e a compreensão de textos escritos e para o sucesso escolar como um todo, este trabalho visa estudar um dos factores cognitivos que podem influenciar a aprendizagem de vocabulário pelas crianças – concretamente, a consciência morfológica. Os autores crêem que este conhecimento pode ser crucial para o desenvolvimento de métodos de promoção do desenvolvimento do vocabulário das crianças.

O estudo que aqui se reporta demonstra que a consciência morfológica contribui para a capacidade de memorização de histórias e estímulos escritos, muito para além do papel que pode atribuir-se, nessa capacidade, às competências fonológicas dos indivíduos. A investigação conclui pela mais valia do desenvolvimento de competências morfológicas das crianças, mais ainda que as análogas competências em ortografia, como forma de promoção do alargamento do seu vocabulário.

PALAVRAS-CHAVE: Conhecimento morfológico; morfemas; aprendizagem de vocabulário pelas crianças.

Abstract

Assuming that children's vocabulary is crucial to their ability to communicate and their comprehension of written text and thus to their general academic achievement, this study aimed to investigate one of the cognitive factors that might affect children's vocabulary learning – namely, morphological awareness. The authors think that this knowledge can guide researchers and teachers in the development of methods to promote children's vocabulary growth.

This study showed that morphological awareness contributes to children's ability to remember novel, word-like stimuli, above and beyond the contribution of children's phonological skills. This investigation brings a new result that demonstrates that children's awareness of morphemes might influence more than their mastery of orthography and thus adds to the good reasons already known to nurture children's awareness of morphemes in school.

KEY-WORDS: Morphological knowledge; morphemes; children's vocabulary learning