

MORPHEME SEGMENTATION IN SCHOOL-AGED CHILDREN

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1 Introduction

One of the major questions in the cognitive science of language is how children learn the

patterns. However, because on this route the learner knows the meaning of words, it is less likely that the learner will mis-parse words (e.g., *fuss* as a plural).

Previous research addressing how morphology might be learned has suggested that distributional cues alone are not sufficient to learn linguistic categories and sub-categories. Rather, they have suggested that phonological (Brooks, Braine, Catalano, & Brody, 1993; Frigo & McDonald, 1998; Gerken, Wilson, & Lewis, 2005) and semantic cues (Braine et al., 1990) must serve as the foundation to learning the morphological regularities of language (MacWhinney, Leinbach, Taranan, & McDonald, 1989; Maratsos & Chalkley, 1980). These studies suggest that it is impossible to learn morphologically marked categories without additional cues to category structure (Gomez & Gerken, 2000). However, recent evidence suggests that learners can use distributional information to acquire categories and subcategories, as long as the distributional regularities are rich enough (Reeder, Newport, & Aslin, 2009, 2010).

Outside of studies of category formation, research examining the learning of morphological patterns in language is relatively scarce. Much of the previous research focusing on morphology acquisition has tested how children learn the meaning of a morpheme rather than how children learn the systematic structure of the morphological patterns (Braine et al., 1990; MacWhinney, 1983). Braine et al. (1990) taught children inflectional locative affixes (e.g., *to*, *from*, *at*) in an artificial grammar learning setting. In this case, learning the form of the affix was dependent on the semantic context associated with the form. However, when form and meaning are coupled, it is impossible to differentiate between difficulties in learning the meaning of the affixes and difficulties in learning the sound patterns associated with those affixes.

The present study explores how morphological patterns are learned independently of meaning. One might think that without associated meanings, ‘morphological patterns’ are really just phonotactic or phonological patterns. However, it is important to note that morphological patterns differ systematically from phonotactic or phonological patterns in language, apart from the meanings that they signal. The phonotactics of a language are the restrictions on co-occurrence of sounds within a word, and they dictate possible words in a language. For example,

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words with similar phonological forms might be morphologically related, they must have a way

The design and procedure was based on Finley and Newport (2010 and in preparation). We created a miniature language (named Silly Speak) using the same

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learners to generalize familiar stems to novel unfamiliar affixes (referred to as NewSuffix-Old(Scrambled)). Participants chose between a stem containing a novel affix (AB-Q) (where Q a syllable not heard in training) with its scrambled counterpart (AQB). Examples of the Stem Parsing test items can be found in (2)

their job was to tell the experimenter which item they believed was the word from Silly Speak (the first or the second).

3 Results

We performed analyses separately for the Stem Parsing tests and the Suffix Parsing tests.

3.1 Stem Parsing

We combined the data from Languages A and B, as they were not significantly different from each other, $F < 1$. There was no effect of test item

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results in that adults were relatively more accurate than children on all test items (except for Old-New test items). That is, while both the adults and the children showed results greater than chance, adults' responses were slightly higher. There are two possible reasons for this. One is that the children in the present experiment were highly variable, but it is unclear whether the variation was due to learning ability or task related reasons (e.g., motivation, interest and understanding of the task). The other is that children may require longer amounts of time to learn the pattern. Adults in Finley and Newport (in preparation) were given approximately 20 minutes of exposure, which is about the same amount of time that the children were given on the two days combined.

According to the critical period hypothesis for language learning (Lenneberg, 1967), children are much more likely to reach native proficiency when learning a new language than are adults. This might lead one might expect that children should be faster at learning new languages than adults. While the children in the present study did not appear to be faster learners, there are important considerations to keep in mind. First, children were able to learn the same morphological pattern that adults learned in our previous studies. This is important because adults in Finley and Newport (2010 and in preparation) were given longer listening times and were able to rely on more extensive cognitive resources, more years of schooling, and more practiced test-taking strategies to perform well on the task. The children were at a disadvantage in all of these respects, but were still able to learn the pattern, perhaps suggesting language learning abilities that are different from the adults. Second, the exposure phases in both the adult and the child studies were very short. It is possible that children may be better language learners than adults in terms of building structural regularities over input, but this learning may not be any faster at the very initial stages (which is the focus of the present paper).

While the results of the present study demonstrate that suffixing patterns can be learned through distributional information, more work is needed to understand the precise role of this information in learning morphological systems. Finley and Newport (in preparation) demonstrated that adult learners are able to parse stems from prefixes as well as suffixes from input like that in the present experiment, but that parsing more complex morphological patterns, such as infixation and non-concatenative morphology, requires exposure to a larger set of distributional patterns. Importantly, when non-concatenative patterns were augmented to be more like natural languages (e.g., including additional affixes and larger amounts of variation), adult learners can learn to

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