The acquisition of prosodic prominence to disambiguate compounds and phrases

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In English, prosodic prominence can be used contrastively at the word level. The relative strength of a syllable, which is often modulated by pitch, loudness, and duration, can be used to disambiguate a string of words. For example, Strong-Weak (SW) patterns signal a compound meaning, as in GREENhouse (a structure to grow plants) whereas Weak-Strong (WS) patterns signal a compositional modifier-noun phrase meaning, as in a green HOUSE (a green-colored house). Previous research has shown that children do not make use of prosodic cues to distinguish between the two meanings until as old as 11 years and that they are biased toward the compound meaning for both stress patterns, with a gradual decrease in the bias with age [1, 2]. Compared to other prosodic information that children can use in comprehension, such as contrastive stress and phrasal boundaries, prosodic information to disambiguate compounds and phrases is acquired late [3]. The current study explored acquisition of ability to use prosodic prominence to distinguish compounds and noun phrases both in comprehension and production.

In Study 1, we replicated previous research [1, 2] to investigate whether such ability is acquired late. American English-speaking children (n=61, 7-12 years) and adults (n=23) were shown two pictures (one picture for a compound meaning and the other for a phrase meaning) and were asked to choose the picture that matched an auditory stimulus (SW or WS). As with previous findings, all children preferred the compound pictures for both stimuli. Contrary to previous research that reported a decrease in the bias with age, we observed a stronger compound bias in 11- to 12-year-olds than in 7- to 8-year-olds (Fig. 1). This preference was also stronger than that of the 11- to 12-year-olds in previous work [2].

While it may be the case that such a prosodic contrast is intrinsically hard to acquire, children's overwhelming preference for compounds raised a question of whether they can discriminate the prosodic contrasts. Acoustic analysis of the auditory stimuli revealed that the stress patterns are significantly different from each other in their syllable durations, maximum f0, and maximum intensity. We examined if these acoustic differences were discernible in Study 2. Seventy-five parent-child dyads (7-12 years) were asked to tell whether a pair of auditory stimuli sound the same or different (e.g., between SW and SW or between SW and WS). Children as young as 7 years old performed well above the chance, indicating that they could hear the acoustic differences in the stress patterns (Fig. 2). Participants also completed a modified version of the task used in Study 1. Instead of choosing a picture that matched an auditory stimulus, participants were presented with two auditory stimuli and asked to choose which one matched the meaning of a singular picture. All age groups showed improved accuracy compared to Study 1 (Fig. 3). Further, overall accuracy of 11- to 12-year-olds was comparable to that of adults, and no preference for the compound meaning was observed, except for 7- to 8-year-olds. The results suggest that ability to link stress patterns to meanings is acquired late (by around age of 11 years) and might be measurable only under conditions in which attention is directed to the spoken description. By directing participants' attention to a choice between the spoken picture names instead of to a choice between pictures of objects that might be more and less familiar, the task might be more likely to elicit comparison of the sounds and the choice of the most accurate descriptor.

We also asked participants to produce the target words to see if they provided different stress patterns depending on whether they were asked to say the compound or phrase items. Based on subjective listening, we find that everyone prefers to produce SW patterns, but adults can produce WS patterns to a greater extent. Ongoing analyses are measuring acoustic correlates of prominence to see if there are more subtle cues that talkers use to differentiate the meanings.

Together these results suggest that, in line with previous findings [1-4], as with many prosodic functions, the contrastive use of prosodic prominence is not easy to acquire and is acquired late, both in comprehension and production. Further, these findings have methodological implications.

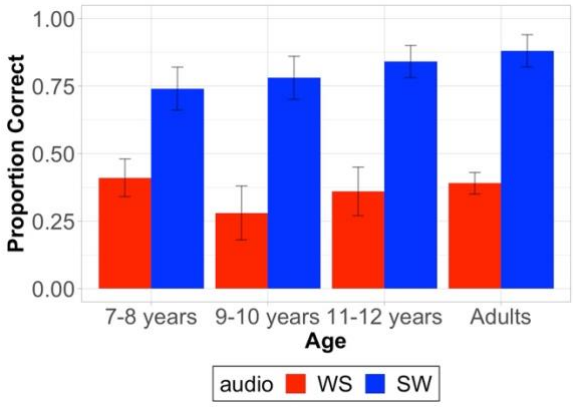

Fig. 1. Proportion of correct responses for each auditory stimulus type by age group in Study 1 (one sound, visual choice). Error bars represent standard errors of by-subject means.

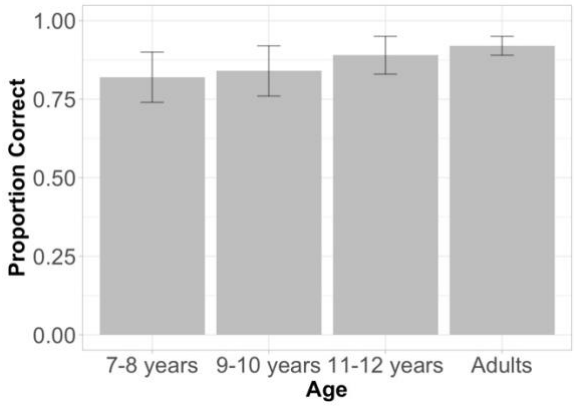

Fig. 2. Proportion of correct responses in the stress pattern discrimination task by age group in Study 2. Error bars represent standard errors of by-subject means.

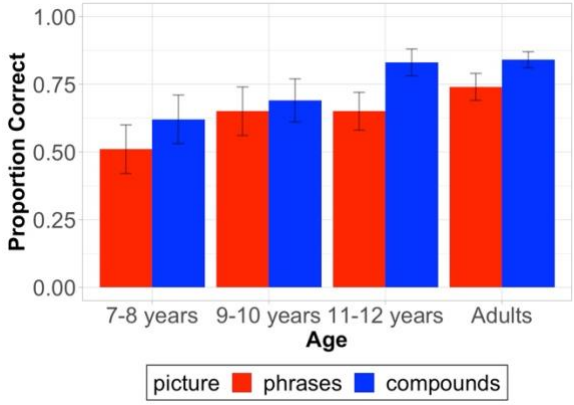

Fig. 3. Proportion of correct responses for each visual stimulus type by age group in Study 2 (one image, auditory choice). Error bars represent standard errors of by-subject means.

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