**A protracted developmental trajectory for English-learning children's detection of consonant mispronunciations in newly learned words**

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Conventionally, children are said to learn the consonants and vowels of their language in infancy. Though refinement of these categories extends throughout childhood, toddlers are expected to know their language's phonological distinctions and to encode and differentiate words using those sounds. This account is supported by demonstrations of native-language category formation, mispronunciations hindering word recognition, and minimal-pair learning. However, there are some wrinkles. Word recognition is blocked at 11 months when stressed syllables (e.g., Swingley, 2005), but not unstressed syllables (Segal et al., 2020) are mispronounced. Toddlers are poor at learning novel neighbors (Stager & Werker, 1997; Swingley & Aslin, 2007) and even 30-month-olds don't spontaneously consider novel neighbors to be new words (Swingley, 2016). To what extent, then, do toddlers really have mature phonology? We addressed this question in a series of word-learning experiments with children, at 19, 24, and 30 months, and adults, included as a developmental endpoint. All children were monolingual native English speakers.

Taught a novel word, adults' and 30-month-olds' recognition is impaired when the stressed vowel is altered, but not when a distinct pitch contour is used (Quam & Swingley, 2010; also Ma et al., 2017; Singh et al., 2014). Here, we evaluated interpretation of consonants—which are widely argued to play a leading role in word differentiation—vs. pitch. We taught a novel word, "deebo," in an English narrated, animated story followed by ostensive labeling. The word was always pronounced with a consistent intonation contour: rise-fall or low-falling. A second novel object was present but never labeled. Then, recognition was tested in a language-guided looking task. The two objects appeared on the screen, and a spoken sentence presented the correct pronunciation (CP) of the target word, "deebo," or a version with a one-feature consonant mispronunciation ("consonant MP": "teebo"). In 18-month-olds and adults, we also tested interpretations of a version with the pitch-contour mispronounced ("contour MP") from rise-fall to low-falling or vice-versa, as in Quam and Swingley (2010; for 24- and 30-month-olds, pitch interpretations are reported elsewhere). We measured whether participants looked less at the *deebo* for either MP.

Adults (N=18) were each tested with both MPs (**Fig. 1**, left). They showed the expected reduction in recognition for consonant MPs relative to correct pronunciations, $t(17) = 4.62$, $p < .001$, and no reduction for contour MPs. Nineteen-month-olds (N=43) were tested with either consonant or contour MPs (**Fig. 1**, right). Recognition performance was above chance, indicating word learning, but neither MP reduced looking, with a (ns) trend toward better performance on consonant MPs. Thus there was no evidence that 19-month-olds weighted phonologically contrastive consonantal-feature variation more heavily than pitch-contour variation. Given this result, we tested 24- and 30-month-olds on the consonant MP (total N=34; **Fig. 2**). Children readily learned the words, but in contrast to 30-month-olds' substantial vowel-MP effects in the same procedure (Quam & Swingley, 2010), here children's recognition was not measurably impaired by a consonantal MP at either age. By comparison, experiments testing highly familiar words nearly always reveal recognition decrements for consonantal MPs (Von Holzen & Bergmann, 2018).

These results suggest that well into the second year, newly learned words may not be represented with intact phonological features. Children can be trained to attend to phonologically relevant lexical distinctions in fully novel words (e.g., Werker's *Switch* procedure), but processing phonologically divergent variants as distinct words does not necessarily follow from this ability. Further research could also investigate whether cue-weighting differences between children and adults could explain children's weaker sensitivity to consonant MPs.

**References**

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## Figures

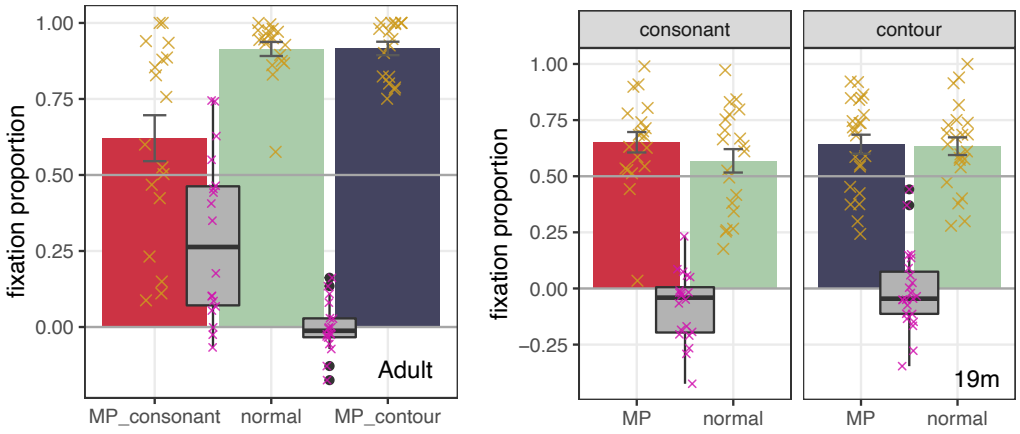


**Figure 1.** Adults' (left) and 19-month-olds' (right) fixation of the *deebo* object in response to the trained pronunciation ("normal") and the two MPs. The horizontal line indicates chance fixation, or 50%. Each adult was tested with both MPs, while each child was tested with either the consonant or pitch-contour MP. Box plots indicate within-subject difference scores between correct-pronunciation and MP trials.

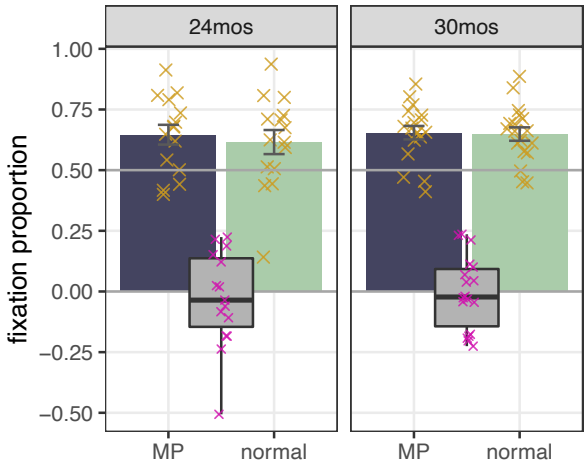


**Figure 2.** 24- and 30-month-olds' *deebo* fixation in response to the trained pronunciation and the consonant MP. Boxplots in gray show within-subjects difference scores.