Additive effects of phonetic distinctions in word learning

Joseph Pater*, Christine Stager† and Janet Werker‡

*Department of Linguistics, University of Alberta, Edmonton, Alberta, Canada T6G 2E7
†Department of Psychology, University of British Columbia, Vancouver, BC, Canada V6T 1Z4

Abstract: It has often been suggested that at the initial stages of word learning, children’s lexical representations do not encode certain phonetic distinctions. This ‘initial underspecification hypothesis’ is intended to explain the failure of children to distinguish minimally different words in particular experimental tasks. In this paper, we present data from a habituation/dishabituation procedure that appears to be consistent with this hypothesis, though we note the plausibility of a non-representational account based on processing load. We then propose a general method of potentially falsifying the underspecification-based explanation, and present an implementation of this method.

BACKGROUND

Using a habituation/dishabituation procedure with looking time as the dependent variable, Stager and Werker (1) show that following habituation to a novel word-object pairing, English-learning infants of 14 months fail to respond when the place of articulation of the initial consonant is switched ([b] vs. [d]). Fig. 1, Experiment 1, shows that the mean looking time for infants presented with a ‘switch’ trial after habituation is not significantly different from that of infants presented with a ‘same’ trial, in which the aurally presented word is not changed. This contrasts with the results depicted in Fig. 1, Experiment 2, in which looking time is significantly higher in the switch than in the same trials when the words are not at all phonetically similar ([l] vs. [n]; (2)). This demonstrates that 14-month-olds can establish word-object associations in this procedure only when the words are sufficiently distinct. Furthermore, when the procedure is modified only in that the aural presentation of minimally different words is accompanied by a visual display of a checkerboard pattern, which infants are unlikely to treat as a nameable object, looking time is again significantly higher in the switch trials. This indicates that 14-month-olds can perceptually discriminate the [b]/[d] contrast.

![Figure 1. Previous results](image-url)
In addition to the results of Experiment 3, the findings that younger infants are sensitive to a wide variety of phonetic contrasts, and tune in to those of their native language by 10-12 months (3, 4) make it particularly unlikely that the lack of an effect for a switch in consonantal place in the word-object habituation paradigm is simply due to perceptual inability. One plausible interpretation of these results is that though 14-month-olds can perceive the consonantal place distinction, it is not encoded in lexical representations, so that words differing in only on this dimension are treated as identical. Alternatively, one might argue that processing, rather than representational factors are at issue, in that the increased processing load of forming a word-object association inhibits attention to relatively fine phonetic detail (1). These accounts can potentially be differentiated by falsifying the representational account, which predicts that if two featural distinctions are each independently shown not to be discriminated, then a pair of words differing by both of these two features should also fail to be distinguished; if the features are not represented, they should not be able to produce such additive effects. To implement this approach, we conducted two experiments using the same habituation/dishabituation procedure with children of the same age as the previous experiments (1,2): the first employs switch in the voicing of the initial consonant ([bm]/[pm]), and the second a switch in both place and voice ([dn]/[pn]).

PROCEDURE

For each experiment, sixteen 14-month-old infants were presented with a brightly coloured moving object on a video screen, while simultaneously hearing one of the syllables being spoken by a recorded female voice over a loudspeaker. Each trial lasted 14 seconds, and included 7 repetitions of the syllable. Trials were repeated until habituation, which was reached when the mean looking time across two sequential trials fell below 65% of the mean of the first four trials. Following habituation, infants participated in two test trials: for one half of the subjects the same trial preceded the switch trial, for the others the switch trial was presented first. The starting syllable (e.g. [bm] or [pm]) was counterbalanced across infants, and the sex of the infants was counterbalanced across each of these sub-conditions.

PRELIMINARY RESULTS

For the first experiment, in which the minimal pair differed in voicing, preliminary analyses indicate there was no significant difference in looking time between the post-habitation switch and same trials. This indicates that 14-month-olds fail to respond to the [voice] switch. If this is due to lexical underspecification of the [voice] feature, this result, along with the lack of response to a [place] switch in Experiment 1 above, leads to the prediction that a combined place and voice switch should also be ignored. Preliminary analyses of the data from our second experiment are consistent with this prediction, as there continues to be no significant difference in looking time between 'switch' and 'same'. Thus, both the representational and the processing explanations for the failure of 14-month-olds to discriminate minimal pairs when engaged in a word-learning task continue to be viable.

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REFERENCES


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