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# The developing role of prosody in novel word interpretation

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ABSTRACT

This study examined whether children use prosodic correlates to word meaning when interpreting novel words. For example, do children infer that a word spoken in a deep, slow, loud voice refers to something larger than a word spoken in a high, fast, quiet voice? Participants were 4- and 5-year-olds who viewed picture pairs that varied along a single dimension (e.g., big vs. small flower) and heard a recorded voice asking them, for example, "Can you get the *blicket* one?" spoken with either meaningful or neutral prosody. The 4-year-olds failed to map prosodic cues to their corresponding meaning, whereas the 5-year-olds succeeded (Experiment 1). However, 4-year-olds successfully mapped prosodic cues to word meaning following a training phase that reinforced children's attention to prosodic information (Experiment 2). These studies constitute the first empirical demonstration that young children are able to use prosody-to-meaning correlates as a cue to novel word interpretation.


## Introduction

The issue of how young children infer the meaning of novel words has been investigated from a variety of different perspectives. The roles of syntax (e.g., Hall, Waxman, & Hurwitz, 1993; Klibanoff & Waxman, 2000; Naigles, 1990; Tomasello & Akhtar, 1995; Waxman & Markow, 1998), social pragmatics (e.g., Carey & Bartlett, 1978; Clark, 1988), and conceptual knowledge and lexical biases (e.g., Markman, 1989, 1992; Markman & Wachtel, 1988; Waxman, 1990; Waxman & Hall, 1993) all have been explored in depth. However, one potential source of information about word meaning that has not been systematically explored is prosody—tone of voice (TOV), rhythm, and pitch. Prosody has the potential to help constrain word meaning by directing attention to particular referents or

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particular features of a referent. For example, a parent might introduce the word "enormous" as a new word to a child using a loud low voice with wide pitch modulations and elongated vowels in an attempt to direct the child's attention to the magnitude of the referent's size.

The goal of the current investigation was to explore the potential role of prosody in children's inferences about the semantic properties of a word's referent. A large body of research exists in both the child and adult literature supporting the idea that prosodic cues, such as pitch, stress, intonation, and rhythm, aid in language processing. However, the bulk of the research has focused on how prosody facilitates identification of the structure of language. Specifically, research has primarily examined the role of prosody in speech segmentation and syntactic bootstrapping—the ability to locate word and phrase boundaries in the speech stream (Aslin, Woodward, LaMendola, & Bever, 1996; Cutler, 1996; Echols, Crowhurst, & Childers, 1997; Fisher & Tokura, 1996; Johnson & Jusczyk, 2001).

Less well known is whether prosody plays a role in the semantic or meaning-based processing of spoken language. We propose that human discourse is characterized by prosodic modulations that not only reinforce or disambiguate syntax and segmentation but also reflect semantic properties of words and that such prosodic cues to word meaning may facilitate children's ability to interpret novel words.

Although children's sensitivity to the relationship between prosody and *word meaning* has not been examined, researchers have investigated children's sensitivity to the relationship between prosody and the *affective state* of a communicative partner. This research has focused on whether infants are aware of, and can identify, the affective or emotional tone of an utterance. The literature on infants' ability to recognize affect from TOV reveals that infants make use of prosody or vocal cues to emotion quite early on, perhaps even earlier than visual cues to emotion provided by facial expressions (Fernald, 1991; Mumme, Fernald, & Herrera, 1996; Walker-Andrews & Grolnick, 1983). Acoustic analyses of emotional speech have revealed systematic differences in acoustic properties associated with different emotions (Bachorowski & Owren, 1995; Murray & Arnott, 1993; Scherer, Banse, Wallbott, & Goldbeck, 1991), supporting the hypothesis that prosody alone is sufficient to convey emotional meaning to infants.

Fernald (1992) argued that infants possess an inherent ability to detect emotional content of speech from prosodic contours and suggested that this forms a basis for children's eventual comprehension of language. She argued that the relation between prosody and emotion is mediated by the autonomic arousal responses in infants induced by the prosodic contour. For example, if a mother yells "Stop!" as an infant is reaching toward a hot stove, the intensity of the TOV will cause the child to become startled, open his or her eyes, and orient himself or herself toward the speaker even though the child might not understand the meaning of the word. Eventually, the endpoint response evoked by the TOV used during this exclamation becomes associated with the word. The parent can exploit the child's natural responses to different vocal tones and use this to teach the meaning of emotion-related utterances (Fernald, 1992).

Although prosodic cues to emotion are identified by infants early in development, Morton and Trehub (2001) found that preschool- and early school-aged children inhibit attention to emotional prosody, relying more heavily on propositional content. They tested 4- to 10-year-olds' and adults' interpretations of either happy or sad sentences spoken in either a happy or sad TOV. Children and adults were equally successful at identifying the emotion of the speaker when content and TOV were congruent. However, a developmental difference emerged on trials where content and TOV conflicted (e.g., the phrase "My dog died" spoken in a happy TOV). Adults' responses as to the emotion of the speaker were based exclusively on TOV. In marked contrast, 4-year-olds responded mainly on the basis of propositional content rather than prosody. Between 5 and 10 years of age, children began to rely increasingly more on expressive TOV.

The finding that younger children rely more heavily on content than affective prosody to interpret a speaker's emotional state is interesting given the very early (in fact, prelinguistic) sensitivity to prosodic cues to emotion. One might predict that younger children would be even more reliant on prosody than their older counterparts given their relative lack of experience with semantic and syntactic content of language. Indeed, Morton and Trehub (2001) showed that 4-year-olds did not lack the ability to use prosodic cues to emotion. They found that when 4-year-olds heard sentences spoken in a foreign language with either happy or sad emotional expression, they had no difficulty in classifying the sentences based on emotional prosody.