Prosodic Guidance: Evidence for the Early Use of Capricious Parsing Constraint

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Abstract

This experiment examines the use of naturally occurring prosodic cues to syntactic structure. Earlier work suggests that the production of informative prosodic cues depends upon speakers' knowledge of the situation: speakers provide prosodic cues when needed; listeners use these prosodic cues when present (Snedeker et al., 2001). The present experiment explores the online use of prosodic information in a world-situated eyegaze task. A referential communication paradigm was used to elicit productions of ambiguous sentences (*Tap the frog with the flower*) and determine whether listeners could use prosodic cues to correctly interpret them. Acoustic analyses indicated that Speakers produced potentially informative prosodic cues. Listeners' responses to the ambiguous sentences strongly reflected the demonstration the Speaker had seen, indicating that they were able to use this information. Analyses of the eye-movements indicate that listeners use prosodic information to inform their parse shortly after the onset of the direct-object noun.

Introduction

Prior work on the use of prosody in online sentence processing suggests that strong cues can have an early influence on parsing preferences (for review see, Kjelgaard & Speer, 1999). Prosody in these studies was typically manipulated by splicing pauses into speech to indicate clause boundaries, manipulating synthesized speech, or asking trained speakers to produce particular prosodic variants of an utterance. But in naturally occurring speech, syntactic structure is only a weak predictor of prosodic variation (for review see Fernald & McRoberts, 1996) Unsurprisingly, a number of researchers have found that naïve speakers produce less consistent prosodic cues for syntactic disambiguation than the informed speakers typically used in comprehension experiments (e.g., Allbritton, McKoon, & Ratcliffe, 1996) The research reported here examines whether listeners' use the prosodic cues produced by naïve speakers in real time.

Methods

This experiment employed a referential communication task, in which a Speaker and a Listener were separated by a divider, allowing for only verbal communication between the two participants. Both participants were given identical sets of objects. The Speaker delivered memorized directions, in an attempt to get the Listener perform particular actions on the set of objects on her side of the screen.

The critical sentences contained globally ambiguous prepositional phrase attachments, such as "Tap the frog with the flower". The phrase "with the flower" can be taken as Instrument (VP-Attachment) or a Modifier (NP-attachment). On each trial both of the subjects received: 1) a Target Instrument, a full scale object that could be used to carry out the action (e.g., a large flower); 2) a Marked Animal, a animal carrying a small replica of the instrument (e.g., a frog holding a little flower); 3) an Unmarked Animal (e.g., an empty-handed frog); and 4) two unrelated objects. The set of toys supported both interpretations of the ambiguous sentence. The Experimenter demonstrated one of two possible actions: an Instrument action (e.g., the Experimenter picked up the large flower and tapped the plain frog) or a Modifier action (e.g., using her hand, the Experimenter tapped the frog that had the small flower).

The Listener wore a head-mounted eyetracker. Trained coders viewed the videotape of the Listener's eye-movements and recorded the onset of each word in the target sentence and the onset and location of each fixation that occurred from the beginning of the instruction until the subject began the action.

Results and Discussion

Demonstration Type (Instrument or Modifier) had a reliable effect on the Listener's actions, the length of the post-verbal pause, the length of the direct-object noun and the pause that followed it, and the length of the prepositional phrase. Demonstration Type also had an early effect on Listener's eye-movements. Within 400 ms after the onset of the direct object noun, Listeners in the Modifier condition showed a preference for the Marked Animal, while Listener's in the Instrument condition divided their fixations between the Marked and Unmarked Animals. We conclude that prosody can be used to rapidly resolve an attachment ambiguity.

Acknowledgments

We thank Michael Felberbaum and Nicora Placa for their assistance, input and patience. This work was supported by NIH Grant 1-R01-HD3750707-01 and a NSF Center Grant to the Institute for Research in Cognitive Science.

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