Influence of rhythmic structure on syntactic ambiguity resolution in reading aloud

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Abstract

I. Background

A prevalent conception concerning prosody in reading holds that it is derived from the lexical-syntactic analysis of the input (Koříš et al. 2002). Bader (1998) and Fodor (1998) suggest that (implicit) prosody not only represents but contributes to the parsing process. (1998) and Fodor (1998) suggest that (implicit) prosody not only represents but contributes to the parsing process. Fodor (2002) discusses this as a paradox in the sense that prosody apparently feeds the same parsing process from which it was derived.

Experiment: The present experiment aims to clarify the role of prosody for syntactic structure building in reading. 24 participants read out sentences without preparation. The sentences are syntactically ambiguous in written representation (ambiguity resolved in spoken speech) were presented in a 2x2 design: compliance with the syntactic analysis of the sentence. According to a prevalent assumption, explicit (and implicit) prosody is solved in spoken speech. To test the influence of prosody for parsing, the prosodic environment of the ambiguous region was systematically varied such that it either a) obeys a rhythmic alternation (prosodically optimal) or b) induces a stress clash (prosodically suboptimal) depending on which reading was chosen by the reader.

Results: Participant’s ambiguity resolution was demonstrably influenced by the prosodic environment: A particular reading was chosen significantly less often when it involved a stress clash than when it was prosodically optimal.

Discussion: The results indicate that prosody has a much stronger role for sentence processing in reading than previously thought. This study motivates a model in which local prosodic-phonological processing (in this case: the rhythmic environment) directly influences parsing decisions in reading, while a global prosodic contour is shaped on the basis of both the local prosodic analysis and the syntactic structure assigned to the string.

References


Koříš et al. (2002): The extraction of structure during reading: Evidence from reading prosody. Memory and Cognition 30, 270–280


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II. Material / Design

Sentences with a local syntactic ambiguity in written representation (ambiguity resolved in spoken speech) were presented in a 2x2 design:

1. Factor: reading
   mehr is ambiguous with respect to part of speech:
   1) stressed comparative adverb
   2) unstressed temporal adverb

2. Factor: stress position on verb
   Verb following mehr has either
   a) initial stress (nachweis
   b) medial stress (erweisen)

Stressed mehr followed by initially stressed verb (1a) involves a stress clash

Procedure:

24 participants read out 24 sentences in 4 conditions (plus 69 fillers) in a latin square design = 576 experimental sentences.

Data analysis:

63 sentences (11%) were affected by slips of the tongue or hesitations. All other sentences were given to two independent judges. To avoid an effect of the disambiguating region on judgments, the sentences were cut after the verb complex. The judges assessed whether more was realized with stress or not. Judges agreed in 96% of the cases.

Results:

Across conditions, mehr was stressed in 23.5% of the sentences.

1. Mehr was stressed significantly less often when followed by a verb with initial stress (z=2.81, p<0.01).
2. Mehr was stressed less often in sentences with a comparative disambiguation (z=1.977, p=0.048).

The interaction of rhythmic environment and disambiguation is non-significant (z=0.976, p=0.33)

III. Procedure and Results

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IV. Discussion

In general, the temporal reading of mehr is preferred over the comparative reading (cf. Bader 1996).

Unexpectedly, readers stress mehr more often when the disambiguating region prohibits stress.

Importantly, as predicted, the rhythmic environment directly affects structure building during reading aloud. Although stress is not explicitly encoded in the written string, it has a significant effect on participants' choice of reading.

Readers avoid renditions that involve a stress clash.

The results support simplicity based theories on sentence processing. Traditionally, these are concerned with syntactic simplicity. The present study motivates an extension towards prosodic simplicity: Readers avoid costly prosodic adjustments in the face of a possible stress clash by adopting a syntactic parse that results in a prosodically inconspicuous representation.

The parser uses rhythmic information for incremental structure building.