PHONEME RESTORATION METHODS REVEAL PROSODIC INFLUENCES ON SYNTACTIC PROCESSING

Iglika Stoyneshka, Janet Dean Fodor and Eva M. Fernández

The experiments we report made use of the phoneme restoration effect (Warren, 1970): when white noise is substituted for one or more phonemes in a word, listeners perceive the word as intact and congruent with sentence context. If that word disambiguates an otherwise ambiguous sentence, the phonemes 'heard' will reveal which interpretation was assigned to the sentence.

The advantage of this method is its naturalness (no conscious judgments, no interrupting task, no anomalous sentence/prosody pairings). Subjects typically believe there really was an intact word in the 'noisy' stimulus, and are unaware that in reporting it they are revealing their resolution of a syntactic ambiguity.

In Experiment 1, participants were offered two visually presented words to choose between after hearing the sentence. We then progressively increased response spontaneity by changing the task to post-stimulus sentence repetition (Experiment 2), and on-line speech shadowing (Experiment 3).

Two types of structural ambiguity in Bulgarian were tested:

(A) Clause-coordination: Items contained three NPs between the clauses, groupable either as 2+1 (yielding object-coordination in the first clause) or as 1+2 (subject-coordination in the second clause). Noise replaced number-agreement on the verb 'be' in the second clause, creating syntactic ambiguity.

Nakraia sreshtnahme Ani i Ivan i Mimi b[noise] vav vaztorg. (beshe / biaha)
In-the-end meet-past-1p.pl Ani and Ivan and Mimi was/were in ecstasy. was were
'In the end (we) met Annie and Ivan and Mimi was/were ecstatic.'

(B) Relative clause attachment: Items contained N1of N2 RC. Noise replaced gender-agreement on the relative pronoun, creating syntactic ambiguity.

Podtseniha advokata na pevitsata k[noise]to kupi imenieto. (kojto / koiato)
Underestimate-past lawyer-m-det of singer-f-det who-m/f buy-past estate-det who-m who-f
'(They) underestimated the lawyer of the singer who bought the estate.'

Stimuli were recorded by a trained native Bulgarian speaker. They contained IPh boundaries signaled by continuation rise, pre-boundary lengthening, and pause. There were three different prosodic contours for each construction:

Prosody-1: Boundary following the first noun. **N1]**
Prosody-2: Boundary following the second noun. **N2]**
Prosody-3: No boundaries; continuous neutral intonation. **Neutral**

Results: Effects of prosody
Interpretation was strongly influenced by prosodic boundary placement for both coordination and RC-attachment ambiguities, in predicted directions; see Table below. The N1] prosody favored the subject-coordination reading in (A) and low RC-attachment in (B). The N2] prosody favored object-coordination in (A) and high RC-attachment in (B). The neutral prosody showed a mild preference for disambiguation in the same direction as the N1] prosody. There were interesting differences in

prosodic sensitivity between the two constructions, which we will relate to Clifton, Frazier & Carlson (2006) and other findings in the literature.

Results: Effects of task
Outcomes were quite similar for the three response modes (word-choice, repetition, shadowing), indicating that the influence of prosody is rapid and is independent of awareness of the presence of an ambiguity to be resolved. Also noteworthy is that with neutral prosody the task became more difficult (significantly more no-responses), especially in shadowing, suggesting that syntactic ambiguity did disrupt normal parsing in the absence of any biasing cue.

Table: Ambiguity resolution as revealed by restoration response

CONSTRUCTION	PROSODY	WORD CHOICE	REPETITION	SHADOWING
COORDINATION: % object coordination	N1]	10	11	5
	N2]	88	99	97
	Neutral	36	44	65
RC ATTACHMENT: % high attachment	N1]	12	8	12
	N2]	82	80	71
	Neutral	39	33	40