Semantic and morpho-syntactic priming in sentence reading

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Introduction

Separating between semantic and syntactic aspects of language processing remains a challenge. Most studies measure responses to semantic and/ or syntactic violations (e.g., [1, 3]) or involve non-ecological word-by-word presentation, as in self-paced reading (e.g., [2]). However, these methodologies may not be adequate in describing language processing during normal reading. We have thus developed a novel task in which we try to disentangle semantics from morpho-syntax in natural sentence reading.

In order to do so, we employed the priming effect, i.e., processing of a given word is easier when the target is anticipated by a related word. This effect had previously been observed in behavioural, eye-tracking and ERP studies where words were presented one at a time. However, in our novel design we try to apply this phenomenon to sentence reading, in order to address it under natural reading conditions. For this reason, we have conducted an eye-tracking study in Slovenian language.

Method

We used 160 grammatically correct sentences (e.g., "Bob went out for a run and noticed a dog and a cat just outside his door") in which a target word is preceded by a prime word ("cat" and "dog", respectively, in the example). Primes could be either congruent or incongruent, either semantically or morpho–syntactically, making up a 2–by–2 design with four conditions: "Bob went out for a run and noticed [a dog/a ball/some dogs/some balls] and a cat just outside his door". (Note that in Slovenian no determiner is available to cue the reader on morpho-syntax, i.e., the sentence was identical in all conditions up to the prime word.) As illustrated in the example, carrier sentences and target words were the same across conditions.

Results

We applied linear mixed models on first run dwell time (gaze duration) as a function of semantic and syntactic congruency, with subjects and sentence/target ID as random effects. A significant semantic priming effect emerged ($p=.02$), with no effect of syntactic congruency ($p=.29$). No interaction emerged either ($p=.38$), suggesting that syntax does not modulate the semantic effect (fig1). Interestingly, none of this emerged in earlier measures of eye movement

behaviour, such as first–of–many fixations (all p>.25), despite the fact that we investigated natural sentence reading and thus parafoveal information was fully available.

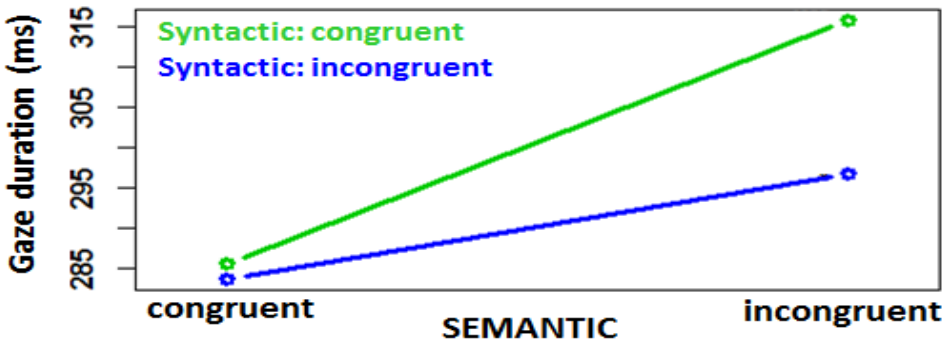

Figure 1: Mean gaze duration on the target for semantically congruent and incongruent conditions, in interaction with syntactically congruent (green line) and incongruent (blue line) conditions.

Discussion

The results of this eye-tracking experiment suggest cross–word priming during sentence reading, but only at a semantic level. Syntax does not seem to play any role, not even in modulating the semantic effect. Interestingly, this can only be observed at relatively later stages of processing, as tracked by gaze duration.

References

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