Fixation measures as a function of comprehension accuracy

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This study explores real time processing of sentences containing temporary syntactic ambiguities. The question we aimed to answer is whether different eye movement patterns are associated with correct and incorrect responses.

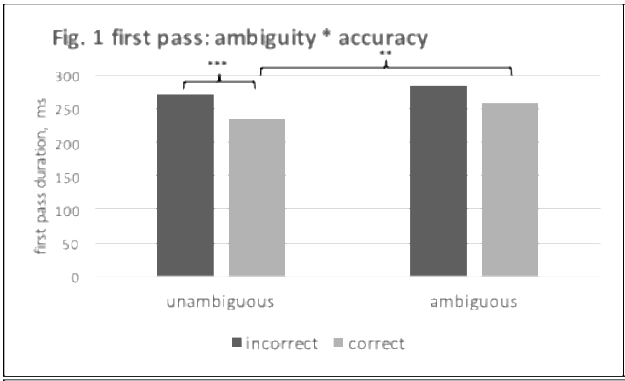
Thirty-eight English speaking young adults (3 males; mean age = 25.08, mean education level = 17.13 years) participated in an eye-tracking during reading experiment. Linguistic stimuli consisted of temporary ambiguous sentences along with their unambiguous version (see Table 1). The distance between the critical noun phrase and the disambiguating region was also manipulated by modifying the noun phrase with a relative clause. There were 20 items per sentence type; each participant read all four versions of each item, across four experimental sessions. Participants were instructed to read carefully and answer specific comprehension questions that followed each target sentence. We asked questions directed at the attachment site of the critical noun phrase and the disambiguating verb. Statistical analyses were carried out in R, using linear mixed effect models. In order to answer our experimental question, accuracy was included in the analyses as a factor.

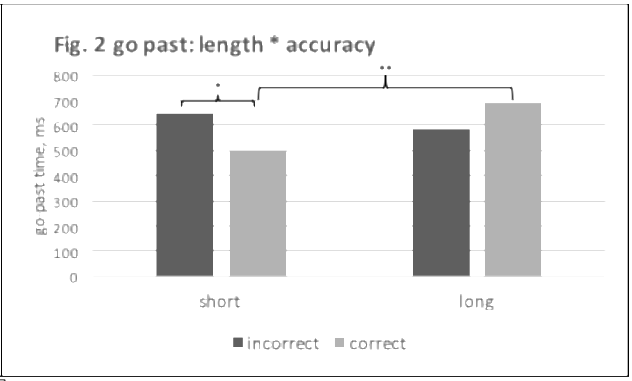
We here report data from trials associated with the questions regarding NP attachment. Participants incorrectly replied YES to the critical question 33% of the time. There were different eye movement patterns in correct and incorrect trials. In correct trials, participants exhibited longer first pass times on the disambiguating verb in short ambiguous sentences than in short unambiguous sentences (Fig.1), and longer go-past times on the same region in long sentences than in short sentences (Fig.2). In incorrect trials, short unambiguous sentences elicited longer first pass times on the disambiguating verb than short ambiguous sentences (Fig.1), and short ambiguous sentences elicited more regressions into the ambiguous region than long ambiguous sentences (Fig.3). The effects of ambiguity and length associated with accurate responses can be interpreted as effects of processing load. The findings associated with errors cannot be attributed to processing load, since longer fixations and more regressive eye movements occurred in the less demanding versions of the sentences. They do not appear to reflect speed-accuracy trade-offs, since error rates were not higher in the sentence versions in which shorter fixations and fewer regressions occurred. The reason for longer fixation durations in easy structures in which participants make errors is unclear.

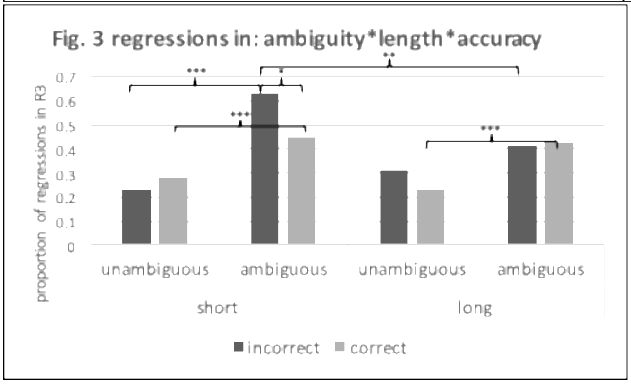
The implications of this study are primarily methodological. Amalgamating responses to trials that are and were not understood correctly may obscure on-line behaviours associated with only one type of trial. Since inferences about parsing operations based on on-line behaviours are based on the assumption that the postulated operations contribute to accurate parsing and interpretation, it is important to base such inference on on-line behaviours in trials in which there is evidence that participants understood the aspect of the sentence to which the postulated parsing operation is thought to contribute. Therefore, it is important both to ask questions about specific aspects of sentences and to examine behaviours as a function of accuracy in responding to such questions. In practice, this will complicate experimental design. It will usually require asking questions about each sentence, as well as questions about other aspects of the sentence to avoid drawing participants' attention to part of the stimulus and developing an *ad-hoc* processing strategy.

Table 1 Experimental design details

Experimental conditions: 1. While the man | hunted | the deer | | ran | into the woods. 2. While the man | hunted,| the deer | | ran | into the woods. 3. While the man | hunted | the deer | that was brown and graceful | ran | into the woods. 4. While the man | hunted,| the deer | that was brown and graceful | ran | into the woods. **Comprehension probes:** (a) Did the man hunt the deer? (b) Did the man run into the woods? (c) Did the deer run into the woods?







Relevant References

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