Are all the triangles blue? ERP evidence from German quantifier restriction

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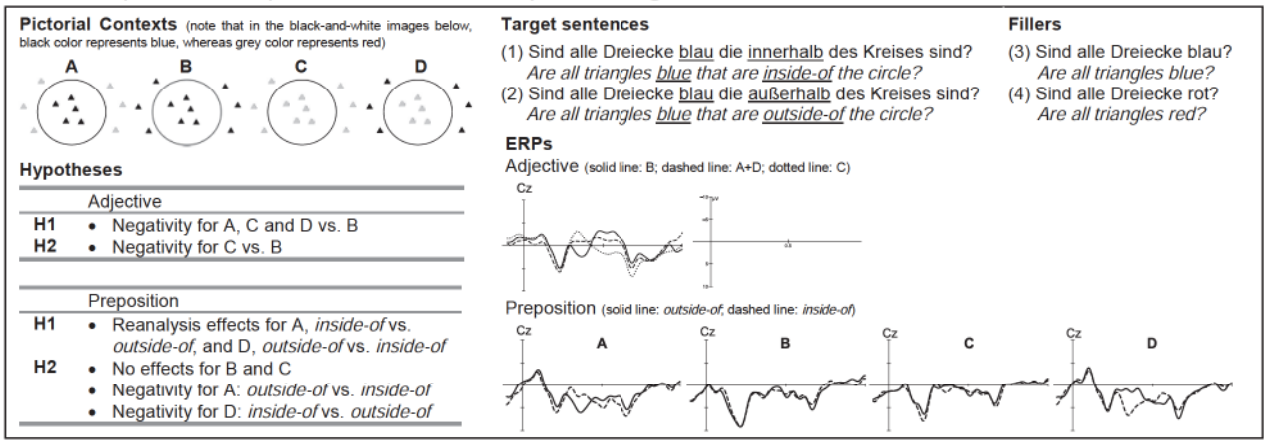
Background: Though sentence meaning is computed rapidly, non-linguistic information may contribute to the overall semantic evaluation, thus leading to processing difficulties when the two domains are not in accord. For instance, pictorial effects have been shown to slow down sentence comprehension in picture-sentence verification tasks. In the ERP literature, such inconsistencies usually elicit negativities with varying onset latencies, which are sometimes followed by late positivities (see Knoeferle et al., 2011, for an overview). These effects might indicate an unsuccessful mapping of a propositional representation elicited by the picture and the following linguistic stimulus (Carpenter & Just, 1975). In the present ERP study, we used a picture-question answering task to investigate the incremental nature of interpreting quantificational restriction.

Methods: We examined pictorial context effects on the processing of questions. An answer to the question is, in principle, already possible on the color adjective. After presenting the context, the question was displayed via RSVP (500ms/word) and participants had to provide a truth evaluation. We compared ERPs at **two sentential positions**: First, from the onset of the **color adjective** (e.g. *blue*), and second, from the position of the **preposition** (*inside-of*/*outside-of*). Based on previous findings from verification tasks, we expected a negativity or a biphasic ERP pattern for picture-question pairs with negative answers. Per condition, 40 picture-sentence pairs were presented. In order to control for strategic effects, we also included 160 filler questions ending on the color adjective, and presented question marks as separate segments in all trials.



Hypotheses: H1. A revision-insensitive version of incrementality predicts an immediate answer generation on the adjective: A negativity is expected for conditions with a locally negative answer (A, C, D vs. B). In complex contexts (A,D), the answer has to be revised on the preposition from *negative* to *affirmative* in half of the trials (A: *outside-of* ; D: *inside-of*). **H2.** If the processor is sensitive to the risk of answer revision, the position of answer selection differs between simple and complex contexts: For C vs. B, mismatch effects are expected on the adjective, and for complex contexts, we expect later mismatch effects on the preposition. Again, a negativity is expected when the preposition requires a negative as opposed to an affirmative answer (A: *inside-of*; D: *outide-of*). These effects should be qualitatively similar to those observed in contexts C vs. B on the adjective.

Results and Discussion: Our findings (n=24) are consistent with **H2**. On the **color adjective**, negative answers (following context C) elicited an early negativity followed by a late positivity when compared to context B. On the **preposition**, a comparable biphasic ERP pattern was restricted to negative answers following complex contexts (A, D). Whereas the early negativity has been associated with mismatch detection (D'Arcy & Conolly, 1999), the late positivity might reflect an unsuccessful mapping between linguistic and non-linguistic information (Bornkessel & Schlesewksy, 2006). In sum, the present results demonstrate that quantificational restriction is processed incrementally in the absence of a risk of reanalysis.

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