

The influence of a contrastive context on negation processing

In out-of-the-blue contexts, negative sentences are often harder to process than affirmative ones. However, negation processing can be facilitated by pragmatically supportive contexts (Kaup & Lüdtke, 2006). Here, we investigate whether a context that might lead to the inference of negation can make negation as easy or even easier to process than affirmation.

Our hypothesis is based on the maxims of Grice (Grice, 1975), according to which speakers are expected to provide the right amount of information in the most efficient way. Specifically, our research builds on the maxims of quantity and manner (Grice, 1975), which state that a speaker should not provide more or less information than needed (maxim of quantity) and should avoid ambiguity and be brief (maxim of manner). We apply these maxims to contexts like (1):

(1): *Daniel and Clara are at the adventure park. There is a roller coaster. Clara rides the roller coaster.*

A context like (1) invites the inference that *only* Clara is riding in the roller coaster, whereas this does not hold for Daniel. If Daniel was riding the roller coaster, the listener would expect the speaker to provide this information (maxim of quantity) and to do so using a brief and unambiguous structure like “Clara and Daniel ride the roller coaster” (maxim of manner). By not mentioning Daniel, the final sentence leads to what we refer to as a “contrastive context”, that is, it leads to the expectation of a contrast in the action performed by the two characters. If this inference is generated, a negated sentence expressing this inference explicitly, e.g. “Daniel does not ride the roller coaster” should become easier to process than a) the corresponding affirmative sentence in the same context and b) a negative sentence in a neutral context which does not lead to this inference. We therefore formulate the following research questions:

RQ1: Are negative sentences easier to process in a contrastive context than in a neutral context?

RQ2: In a contrastive context, are negative sentences easier to process than affirmative sentences?

To investigate these questions, we conducted a self-paced reading experiment with 100 adult German native speakers. Experimental items were created by crossing the factor *context* (contrastive vs. neutral) with the factor *sentence polarity* of the target sentence (affirmative vs. negative). Since previous research has shown that givenness strongly facilitates the processing of negative sentences (Lüdtke & Kaup, 2006), the neutral context also explicitly introduced all components of the target sentence into the discourse. The items are therefore constructed to investigate only the influence of contrast, without confounding effects from givenness. Furthermore, two characters were introduced in both conditions, in order to balance out the working memory load. An example item can be seen in Table 1.

Table 1: Example Item in the 4 conditions

Context Contrast: Daniel und Clara sind im Freizeitpark. Da gibt es eine Achterbahn. Clara fährt mit der Achterbahn. <i>Daniel and Clara are at the adventure park. There is a roller coaster. Clara rides the roller coaster.</i>	
Target sentence affirmative	Target sentence negative
Daniel fährt auch [mit der Achterbahn.] _{CR} <i>Daniel rides the roller coaster too.</i>	Daniel fährt nicht [mit der Achterbahn.] _{CR} <i>Daniel does not ride the roller coaster.</i>
Context neutral: Daniel ist mit Clara im Freizeitpark. Da gibt es eine Achterbahn. Man kann mit der Achterbahn fahren. <i>Daniel is at the adventure park with Clara. There is a roller coaster. One can ride the roller coaster.</i>	
Target sentence affirmative	Target sentence negative
Daniel fährt jetzt [mit der Achterbahn.] _{CR} <i>Daniel rides the roller coaster now.</i>	Daniel fährt nicht [mit der Achterbahn.] _{CR} <i>Daniel does not ride the roller coaster.</i>

The Critical Region (CR) for our self-paced reading experiment was the Prepositional Phrase (PP) following the German words *auch* 'too', *jetzt* 'now', or *nicht* 'not' (so *mit der Achterbahn* 'with the roller coaster' in Table 1). This is because these words reveal the polarity of the target sentence to the reader; hence, the effect of condition on reading times (RTs) should emerge immediately after them, that is, on the following PP. We used a Latin-square design with 4 lists to distribute the conditions among participants. Prior to the analysis, we excluded RTs higher than 5000ms and lower than 200ms. Figure 1 shows the RTs in the PP of the target sentence.

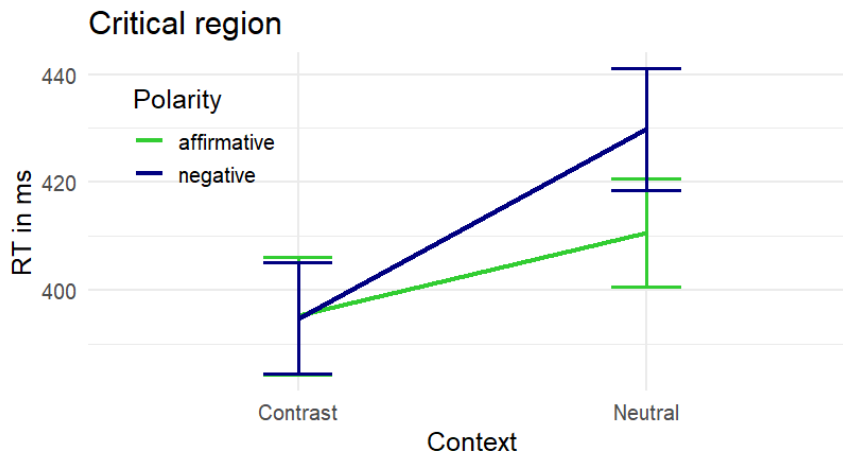


Figure 1: Reading times in the critical region (PP of the target sentence)

We run a linear-mixed effects model with *context* and *polarity* as predictors for RT in the critical region. We included random intercepts for item and random intercepts and slope for *context* by participant. The model revealed a significant main effect of *context* ($p < 0.001$), showing that

independent from polarity, target sentences were read faster when they were presented in a contrastive context than when they were presented in a neutral context. The effect of *polarity* was only significant in the neutral context condition ($p = 0.049$). Although the condition contrast seems to facilitate in particular the processing of negative sentences (see Figure 1), the *polarity* x *context* interaction did not turn out to be significant.

Our results align with previous research showing that negation is not necessarily more difficult to process than affirmation when embedded into a supportive context (Kaup & Lüdtke, 2006). With regard to our RQ1, we can confirm our hypothesis that negative sentences are easier to process when they are presented in a contrastive context than when they are presented in a neutral context. However, contrastive contexts seem to facilitate the processing of affirmative sentences, too – even though to a lesser extent than negative sentences. With regard to our RQ2, negative sentences don't seem to be easier to process than affirmative ones in the contrastive condition, contrary to our hypothesis. One possible explanation is that, in the context contrast, participants generated the inference, and this made negative sentences relatively easy to process, at least compared to the neutral condition. On the other hand, affirmative sentences, which express a violation of the inference in the context contrast, were expected to be associated with an additional processing cost compared to negative sentences. Similar RTs for affirmative and negative sentences may therefore have emerged either because participants were able to quickly accommodate the violation of the inference (in the affirmative sentences) or because negative sentences remain always inherently somewhat costly. Finally, it should be noticed that in our neutral condition, every component of the target sentence was already given at the time the target sentence was presented. The significant, but relatively small effect of negation in this condition is thus in line with the idea that givenness plays a facilitatory role in the processing of negative sentences (Lüdtke & Kaup, 2006).

References:

- Grice, H. P. (1975): Logic and Conversation. In *Syntax and semantics* 3, pp. 41–58.
 Lüdtke, Jana; Kaup, Barbara (2006): Context Effects when Reading Negative and Affirmative Sentences. In *Proceedings of the 28th annual conference of the cognitive science society*, pp. 1735–1740.