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**Is the pragmatics of negation taken into account during reading? Evidence from an eye-tracking study**

## 1. Introduction

Negated utterances are associated with specific pragmatic inferences (Moeschler, 1992). Usually, negation is used when the negated proposition was already mentioned prior in the discourse, or when it constitutes a plausible assumption (Clark & Clark, 1977). Thus, negation implies that the speaker assumes the listener holds something for true. Consequently, a sentence such as *Last Christmas, I didn't go skiing* is only pragmatically felicitous if the speaker assumes that the listener knows the speaker always goes skiing on Christmas. In the current eye-tracking study, we examined these pragmatic aspects of negation. In particular, we investigated eye-movements for pragmatically infelicitous negative sentences, and compared them with eye-movements for pragmatically felicitous sentences describing possible or implausible situations.

We built upon the material used by Traxler et al. (2000). We used three sentence versions: In Version 1 ("possible condition"), the sentences described a possible albeit not highly likely situation (chopping without an axe, 1a). In Version 2 ("implausible condition"), the sentences described a highly unlikely situation (chopping an axe, 1b). In Version 3 ("negation condition") the sentences described a highly likely situation but by means of a negative sentence, rendering the sentence pragmatically infelicitous (not chopping an axe, 1c). Thus, the sentences differed with regard to plausibility (1c being more plausible than 1a, which in turn is more plausible than 1b) as well as pragmatic adequacy (1a and 1b being pragmatically felicitous, 1c being pragmatically infelicitous). With respect to lexical associations, the sentence versions did not differ. In all versions, the subject noun, object noun and verb were highly associated.

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|---|---|
| (1a: possible) | Der Holzfäller hackte ohne Axt früh am Morgen.<br>*The lumberjack chopped without an axe early in the morning.* |
| (1b: implausible) | Der Holzfäller hackte die Axt früh am Morgen.<br>*The lumberjack chopped the axe early in the morning.* |
| (1c: negation) | Der Holzfäller hackte keine Axt früh am Morgen.<br>*The lumberjack chopped no axe early in the morning.* |

We were especially interested in the reading times on the target word, the patient (*axe* in 1a to 1c). Our predictions were as follows: If target reading times are mostly determined by lexical associations, all versions should yield similar results because the target word is always highly associated with the subject NP and the verb of the sentences. If plausibility of the described situation matters most, processing times should be shortest in the negation condition, followed by the possible condition followed by the implausible condition. If target reading times are mainly determined by whether or not the developing sentence is pragmatically felicitous, we would expect prolonged reading times in the negation condition, as these are the only pragmatically infelicitous sentences in the present experiment. If plausibility as well as pragmatics plays a role, we expect shortest reading times in the possible condition.

## 2. Methods

35 participants took part in the study. We used 36 experimental sentences. Each sentence had three versions as in (1a) – (1c). Additionally, we used 72 filler sentences. Each participant saw only one version of an experimental sentence.

**3. Results**

We analyzed first fixations, total duration of all fixations and rereading times of the target word. There were no differences between sentence versions in the first fixation data ($F_1$(2,68) = 1.07, $p$ = .35; $F_2$(2,70) = 1.17, $p$ = .32). A main effect of sentence version showed for the total duration of reading time ($F_1$(2,68) = 5.21, $p$ = .008; $F_2$(2,70) = 10.69, $p$ < .001). Planned comparisons showed a significant difference between the implausible and the negation condition in the by-items analysis ($t_1$(34) = 1.61, $p$ = .116; $t_2$(34) = 2.20, $p$ = .034), and a significant difference in in both analyses for the comparision between the negation and the possible condition ($t_1$(34) = 2.75, $p$ = .009; $t_2$(35) = 4.83, $p$ < .001), and between the implausible and the possible condition ($t_1$(34) = 2.01, $p$ = .053; $t_2$(35) = 2.35, $p$ = .025). Reading time was shortest for targets in the possible condition, and longest for targets in the negation condition. A main effect of sentence version also showed for rereading times ($F_1$(2,68) = 11.58, $p$ < .001; $F_2$(2,70) = 7.29, $p$ = .001). Rereading times were marginally faster for the implausible condition compared to the negation condition ($t_1$(34) = 1.75, $p$ = .089; $t_2$(35) = 1.49, $p$ = .15), and faster for the possible condition as compared to the implausible ($t_1$(34) = 2.97, $p$ = .005; $t_2$(35) = 2.20, $p$ = .034) and the negation condition ($t_1$(34) = 5.29, $p$ < .001; $t_2$(35) = 4.09, $p$ < .001).

**4. Discussion**

We investigated whether comprehenders take into account the pragmatics of negation during online sentence processing by comparing sentences with a pragmatically infelicitous negation to pragmatically felicitous sentences describing possible or implausible situations.

The results were rather clear-cut. No effects of sentence version showed on early measures (first fixation), possibly reflecting the fact that early on, mainly lexical associations between the target word and the words in the sentence determine processing ease. The target word was always highly associated with the subject noun and verb of the sentence, leading to relative processing ease in all conditions. In measures of later processing (total duration and re-reading), the sentence versions differed. The negated condition showed (marginally) longer processing times than the implausible condition, which in turn showed longer processing times than the possible condition. Apparently, readers take into account both the plausibility of the described situation as well as the pragmatics of negation during sentence processing. Thus, pragmatic infelicity as well as implausibility can be powerful disrupters of reading fluency.

Alternatively, the longer reading times in the negation condition might be due to the negation marker “kein”. However, this is not very plausible as the possible condition of the current experiment also contained a negation, namely the implicit negation “without” (“ohne”). If the presence of a negation were responsible for the prolonged processing times, the possible condition involving an implicit negation should not have been the fastest. Nevertheless, to ensure that the prolonged reading times in the negation condition of the current experiment indeed reflect pragmatic aspects, future studies should compare the current negation sentences to pragmatically felicitous negation sentences.

**References**


Clark, H. H., & Clark, E. V. (1977). *Psychology and language*. New York: Harcourt Brace Jovanovich.

Givón, T. (1978). Negation in language: Pragmatics, function, ontology. *Syntax and Semantics*, *9*, 69-112.

Moeschler, J. (1992). The pragmatic aspects of linguistic negation: Speech act, argumentation and pragmatic inference. *Argumentation*, *6*, 51-76.

Traxler, M. J., Foss, D. J., Seely, R. E., Kaup, B., & Morris, R. K. (2000). Priming in sentence processing: Intralexical spreading activation, schemas, and situation models. *Journal of Psycholinguistic Research, 29*(6), 581-595.