

When negation is produced: Looking at the interaction between discourse relations and the polarity of the preceding sentence

Typically, negative sentences are produced less frequently than affirmative ones. This is not surprising: in out-of-the-blue contexts, negative sentences tend to be less informative than affirmative sentences (Xiang et al., 2020). Given this, an open question remains: *in which discourse contexts are negative sentences actually used*, that is, *under which conditions do they become informative?* To address this issue, we examine how the polarity of a preceding sentence, discourse relations (DRs) and their interaction influence the likelihood of producing negative sentences.

It has been proposed that negative sentences often express a violated expectation (Jordan, 1998), as in (1), where the expectation is that one brings sunscreen if the day is sunny. However, this account is only partial, since a violated expectation can also be conveyed by an affirmative sentence, provided that the preceding sentence has negative polarity as in (2):

(1) Marta wants to bring the sunscreen to the swimming pool, but it is not sunny.

(2) Marta does not want to bring the sunscreen to the swimming pool, but it is sunny.

This pattern is explained by the idea that a violated expectation (as in both (1) and (2)) corresponds to a *negative* DR (Jasinskaja & Karagjosova, 2020), whose function is to link the content of one discourse segment to the *negation* of the content of another discourse segment (Knott & Sanders, 1998). At the sentence level, a violated expectation might lead to a polarity reversal between the sentences expressing the two discourse segments. By contrast, positive DRs involve no polarity reversal; instead, they preserve the polarity of the two sentences expressing the connected discourse segments. Within this framework, however, it remains possible that, even for positive DRs, the polarity of one discourse segment still influences the polarity of the following sentence and, consequently, the likelihood of producing a negative sentence.

Based on these premises, we investigate whether i) negative sentences are produced in association with negative DRs when the first discourse segment has positive polarity; ii) negative sentences are produced in association with positive DRs when the first discourse segment has negative polarity. We therefore expect an interaction between the polarity of the DR and the polarity of the preceding sentence: with negative DRs, negative sentences should tend to follow a preceding discourse segment with positive polarity, whereas with positive DRs, they should tend to follow one with negative polarity. To examine these questions, we exploit the association between DR polarity and specific discourse connectors: the connector *but* typically signals a negative DR, whereas *because* and *therefore* generally signal positive DRs (Knott & Sanders, 1998).

We conducted a sentence-continuation task in German with 96 native speakers (age range 21-63, M: 36), who were asked to produce a complete sentence following a prompt. To construct the stimuli, we manipulated a) the polarity of the first discourse segment (*Polarity1*) and b) the connector introducing the second discourse segment (*Connector*). We included *aber* 'but', *weil* 'because' and *deshalb* 'therefore' as well as a baseline condition in which no connector was provided. The experiment followed a Latin-square design with 8 lists (corresponding to the 8 conditions shown in Table 1), each containing 48 items presented in randomized order.

We coded sentence continuations as negative if they contained the sentential negator *nicht* 'not', a negative quantifier such as *niemand* 'nobody' or *nie* 'never', or the constituent negator *kein* 'no'; all other continuations were coded as affirmative. Figure 1 displays the percentage of negated continuations for each condition. We ran a generalized linear-mixed effects model with the polarity of the produced sentence (affirmative vs. negative) as the dependent variable and the interaction between *Polarity1* and *Connector* as the main predictor. Random intercepts for participants and items were included. We found a significant effect of *Polarity1*: in the absence of a connector, participants produced more negative continuations when the first discourse segment was negative than when it was affirmative. In addition, there was a significant interaction between *Polarity1* x *Connector* (*deshalb*), indicating that *deshalb* substantially reduced the tendency to produce a negative sentence following a negative

discourse segment. Finally, we found a significant interaction between *Connector (aber)* and *Polarity1*, indicating that in this condition, the influence of the polarity of the first discourse segment on the production of a negation reverses the tendency observed in the baseline condition.

The study sheds new light on the conditions under which negative sentences are used. We found that negative sentences tend to be produced both in negative DRs where the first discourse segment has positive polarity and in positive DRs where the first segment has negative polarity. Notably, although sentence polarity was influenced by the interaction between DR polarity and the polarity of the first discourse segment, participants still produced substantially more affirmative than negative sentences overall. We hypothesize that this asymmetry may stem from the fact that many polarity reversals were achieved without overt negation. Instead, participants often relied on lexical strategies, such as using implicitly negative expressions like *'to be absent'*, thereby avoiding explicit negation while still conveying a polarity contrast.

Table 1: example item from the sentence continuation task

Polarity of segment 1	Connector	Prompt for continuation
Affirmative	weil	Marta hat den Hund gefüttert, weil... <i>Marta fed the dog because...</i>
Affirmative	deshalb	Marta hat den Hund gefüttert. Deshalb... <i>Marta fed the dog. Therefore...</i>
Affirmative	aber	Marta hat den Hund gefüttert. Aber... <i>Marta fed the dog. But...</i>
Affirmative	none	Marta hat den Hund gefüttert. <i>Marta fed the dog. ...</i>
Negative	weil	Marta hat den Hund nicht gefüttert, weil... <i>Marta didn't feed the dog because...</i>
Negative	deshalb	Marta hat den Hund nicht gefüttert. Deshalb... <i>Marta didn't feed the dog. Therefore...</i>
Negative	aber	Marta hat den Hund nicht gefüttert. Aber... <i>Marta didn't feed the dog. But...</i>
Negative	none	Marta hat den Hund nicht gefüttert. ... <i>Marta didn't feed the dog.</i>

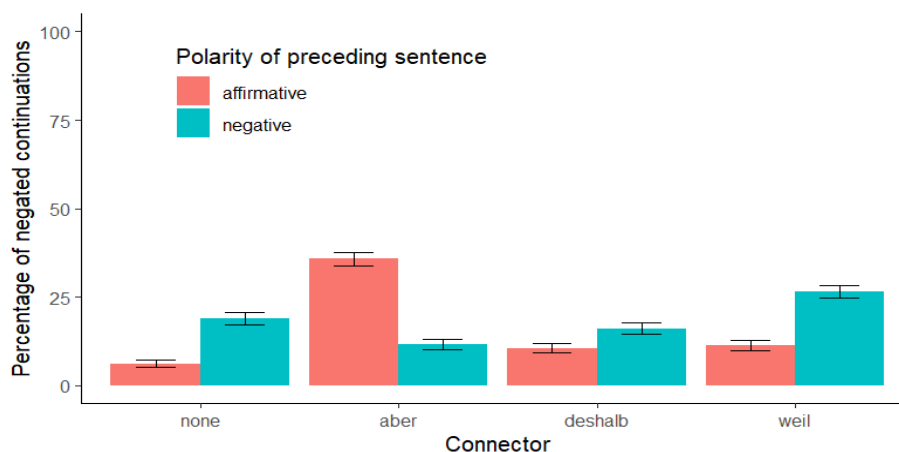


Figure 1: results of the sentence continuation task

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