Pragmatics mitigates the cost of negation: A first step toward investigating predictability effects in negation processing

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Previous investigations on how prediction contributes to negation processing suggest a secondary role, which may conflict with views of prediction as a primary mechanism in language processing: in verification tasks, word predictability does not seem to influence the classic interaction between sentence truth value and polarity that is typically reported in the negation literature[1] (e.g., faster verification for "A robin is a bird" than "A robin is a tree" but the reverse pattern for these sentences' negative counterparts). In addition, boosting the contextual salience of an object in a visual scene (to increase the likelihood of it being mentioned) only reduces the cost of negation under appropriate pragmatic circumstances, such as when the question under discussion is polar.[2] However, no study (to our knowledge) has systematically manipulated the contextual predictability of a word in negative constructions while controlling the pragmatic licensing requirements of negation. We argue that a full understanding of the role of prediction in negation processing requires an experimental paradigm that controls both factors to allow for direct comparison with existing literatures on predictive processing and negation processing.

The present experiment takes a first step toward that goal by incorporating pragmatic manipulations into a paradigm previously used to investigate contextual predictability in negation.[1] While we kept predictability constant here, this design is specifically structured to allow for future inclusion of such a manipulation. In our novel task, English-speaking participants (n = 75) viewed displays containing two geometric shapes. These displays, they were told, were being used to train a robot on how to identify shapes. Sometimes the robot printed the right shape but wrong color (or vice versa). A fictional human supervisor, also shown on screen, provided feedback in the form of affirmative or negative sentences, but the supervisor was known to be unreliable. The participant's job was to quickly evaluate the feedback as true or false (Figure 1). Key was that the robot's errors created the opportunity for *corrections*, a felicitous context for the use of negative sentences.[3,4]

Pragmatic context was operationalized as a binary variable (felicitous/infelicitous), and the other independent variables were the polarity (affirmative/negative) and truth value (true/false) of the supervisor sentence. Response times (RTs), measured from the onset of the supervisor sentence, were our dependent variable. We hypothesized that providing an appropriate pragmatic context for negation would weaken the classic sentence polarity-truth value interaction typically observed in verification tasks involving negative sentences.

Participants were overall quite accurate (all conditions > 75%). A linear mixed-effects model fit to log-transformed RTs (accurate trials only) showed that the three-way interaction between the manipulated variables was significant ($p < .001$) (Figure 2). Planned follow-up analyses revealed that the classic crossover interaction between polarity and truth value was obtained in infelicitous contexts (true affirmatives judged faster than false affirmatives, false negatives judged faster than true negatives; both p's $< .001$) but not in felicitous contexts (true affirmatives judged faster than false affirmatives, no significant difference between true and false negatives; $p < .001$ and $p = .16$, respectively).

Our results align with prior literature highlighting the role of pragmatic factors in modulating the crossover interaction between sentence polarity and truth value.[5] Notably, the manipulation succeeded even though in principle participants could have focused solely on the supervisor sentence and totally ignored the pragmatic manipulation. Methodologically, our approach bridges paradigms for investigating word predictability and pragmatics in negation processing, opening the door to (already planned) follow-up studies that simultaneously manipulate both factors. This can be done, for instance, by varying one or two shape features in addition to color (such as size and texture), resulting in different levels of predictability for the attribute mentioned in the supervisor sentences.
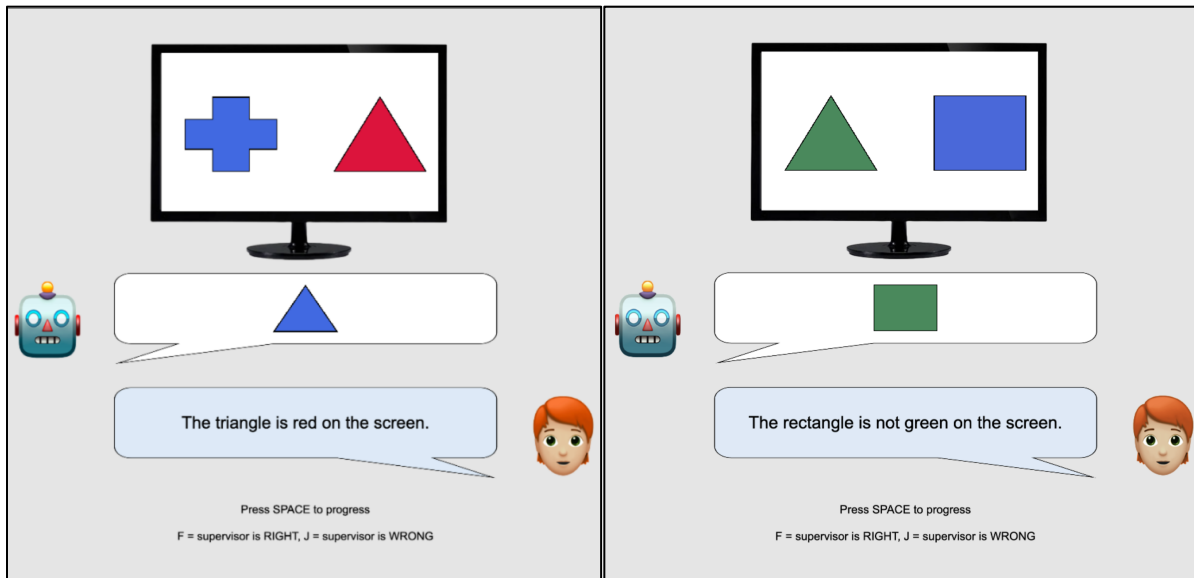
Figure 1: example trial screens for two felicitous, true supervisor sentences. Left: affirmative. Right: negative. The pragmatic context manipulation provides a situation in which either sentence polarity is felicitous for a correction.
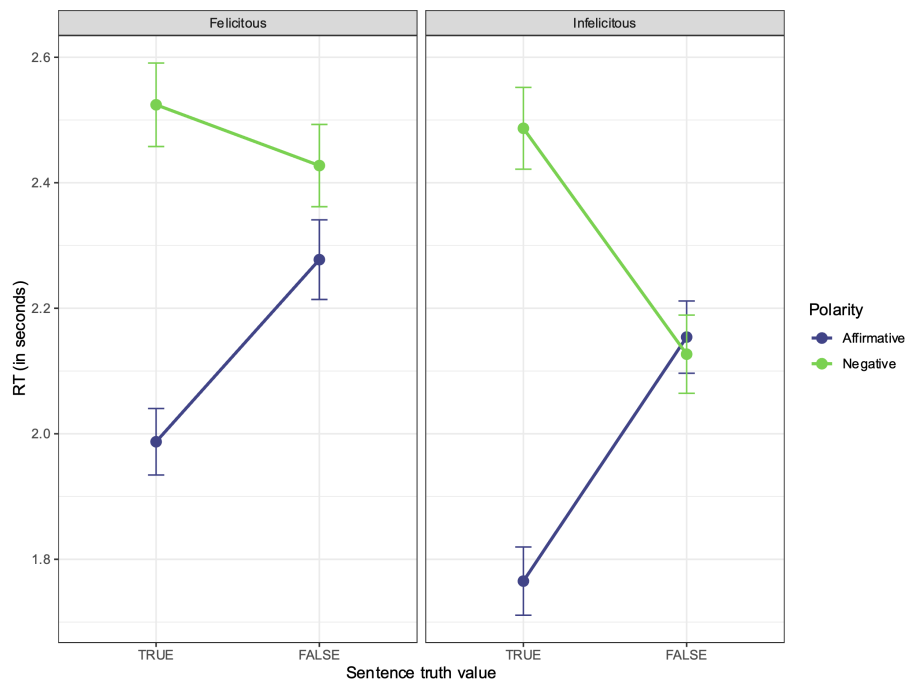

Figure 2: mean RT per condition, error bars represent 95% within-subject CIs.

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