

## **Failure teaches success: Linking real-time event processing & production with negation**

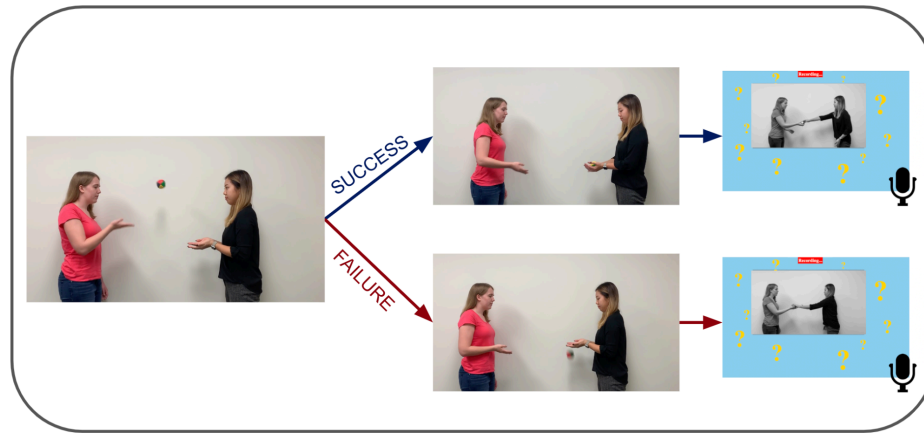
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Within research on language production, eliciting the production of negation (e.g., “not an apple”, “not jumping”) has been challenging<sup>1</sup> and has been found to require a discourse to establish explicit contrast with affirmative alternatives<sup>2</sup> (“John has an apple. Mary doesn’t have an apple.”). These findings suggest that generation of negation may require explicit contrast with an affirmative linguistic variant. It also suggests negation would be difficult to learn because successful acquisition would require a learner with advanced understanding of discourse. Yet, adults are known to naturally produce negation in null discourse contexts (“It isn’t raining!”), and learners obtain command of sentential negation fairly early (possibly as early as 18 months<sup>3</sup>). Inspired by work on event perception and perception of absences, here, in a study of adults and children, we explore the possibility that production of negation in null discourse contexts may arise under conditions of prediction failure in event perception. A number of event-based auditory illusions, for example, have also been found to work for contrastive silence, suggesting a timecourse comparable to sound recognition.<sup>4</sup> Given other work showing that event processing is sensitive to abstract categories, like thematic roles<sup>5</sup> or aspect<sup>7</sup>, these “event files”<sup>7</sup> may exhibit structure and systematicity which play a role in language production.

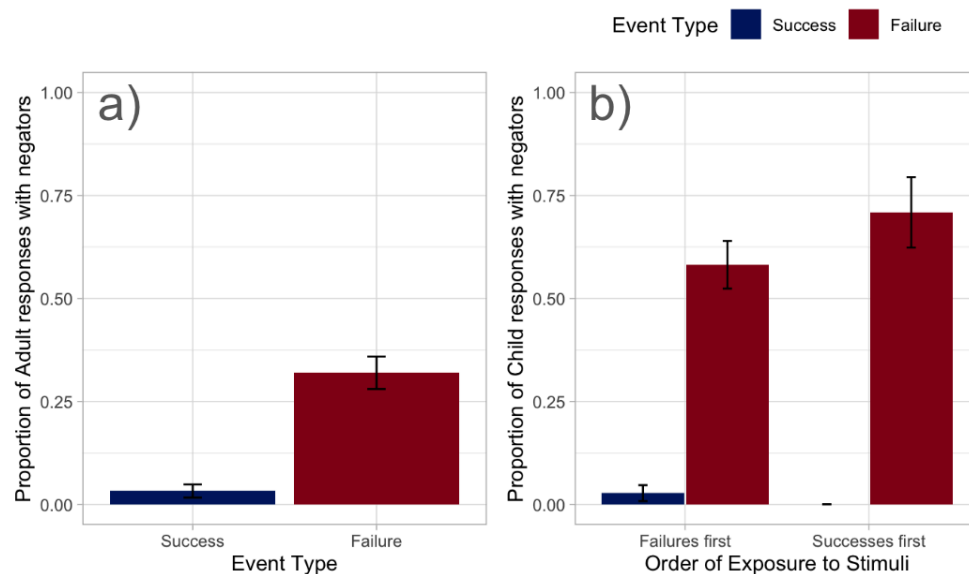
Here we explore the possibility that the dynamics of event perception may influence how events are described. We propose that when describing a failure, speakers will still have the goal (successful completion of the event, e.g., HIT) in mind as a result of early-arriving cues to event-categorization, and that thus the related lexical entry is activated. In producing a description, speakers may either “flush” these words and fetch new ones, or integrate them into a negative description. For reasons of economy we therefore predict that event failures will result in significantly more use of negators than successes, even though in both cases both affirmative (“miss”) and negative (“not hit”) are available, as well as alternative construals, like “try” or describing another aspect of the scene. Adult native-speakers of English (N=36) described artificially constructed video stimuli. We constructed both a success and failure version of 12 everyday events, resulting in 24 videos. We asked adults to guess how a parent would describe such a video to their child, and found that adults were significantly more likely to include negators in their productions if the video depicted a Failure (Fig. 2a;  $\beta=-2.767$ ,  $SE=1.38$ ,  $z=-2.00$ ,  $p<0.05$ ). We created a child-friendly version of the task for 4-7yos. This task differed in one crucial way to reduce potential switch costs: whereas adults watched success, failure, and filler videos intermixed, children watched the Success and Failure videos in separate blocks. As such, the child study included a between-subject condition of Order of Exposure (Failures First vs Successes First), to ensure that any effect found is not solely due to a participant’s immediately prior experience with a success version. Like adults, children (n=20) were much more likely to use negators to describe Failures than Successes (Fig. 2b;  $\beta=-3.12$ ,  $SE=0.609$ ,  $z=-5.126$ ,  $p<0.001$ ). Additionally, Exposure Order did not significantly affect negator production, nor interact.

In a production study involving perception of failures, we found that both adults and children spontaneously produce negation in null discourse contexts. We suggest that when observing an event with a predictable outcome, it may be encoded before the event is accomplished. Any ensuing violation results in an alternative worthy of comment, encodable via

negation. Parental comment on failure may offer potent learning moments for negation, even for young learners who have limited access to linguistic discourse context.



**Fig. 1:** Example Video Stimuli. Two versions were shot, one with successful catching and one without. Other examples of actions included: opening (a door), touching (toes), crushing (a cup).



**Fig. 2a:** Proportion of adult responses with negators for Failure and Success videos, with error bars indicating  $\pm 1$  SE. **Fig. 2b:** Proportion of child responses with negators for Failure and Success videos. Data are presented by Exposure Order with error bars indicating  $\pm 1$  SE.

<sup>1</sup>Klimacka, L., & Brunger, K. (1999). Elicitation in verb morphology. *Child Language Teaching and Therapy*, 15(3), 247-259. | <sup>2</sup>Thornton, R., D'Onofrio, E., & Rombough, K. (2018). Elicited Production of Past Tense Affirmative and Negative Sentences in Young Children. In *BUCLD (42nd: 2017)* (pp. 764-776). Cascadia Press. | <sup>3</sup>de Carvalho, A., Crimon, C., Barrault, A., Trueswell, J., & Christophe, A. (2021). "Look! It is not a bamoule!": 18- and 24-month-olds can use negative sentences to constrain their interpretation of novel word meanings. *Developmental science*, 24(4), e13085. | <sup>4</sup>Goh, R. Z., Phillips, I. B., & Firestone, C. (2023). The perception of silence. *Proceedings of the National Academy of Sciences*, 120(29), e2301463120. | <sup>5</sup>Hafri, A., Papafragou, A., & Trueswell, J. C. (2013). Getting the gist of events: Recognition of two-participant actions from brief displays. *Journal of Experimental Psychology: General*, 142(3), 880. | <sup>6</sup>Ji, Y., & Papafragou, A. (2017). Children's sensitivity to abstract event structure. In *Poster presented at the 42nd Annual BUCLD, Boston, MA*. | <sup>7</sup>Hommel, B. (2004). Event files: Feature binding in and across perception and action. *Trends in cognitive sciences*, 8(11), 494-500.