

English-learning preschoolers use negative sentences to constrain novel word meanings

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A central topic in language acquisition is how children use linguistic context to learn the meaning of words [e.g., syntactic bootstrapping, 1]. This application of sentence meaning to word meaning requires toddlers to parse and interpret utterances, perhaps in real-time. It is thus surprising that children's understanding of a common combinatory element, negation ("not") has been found to be delayed, with English-learning infants incorrectly interpreting negative sentences as affirmatives [2] and even 2-to-4-year-olds showing difficulty understanding negative sentences in certain tasks [e.g., 2-3]. This is surprising because parents commonly use negation in labeling events ("That's not a stone!") presumably in an effort to restrict/correct generalizations. If children treat negative labeling as affirmative, parents' attempts would be thwarted ("That's a stone!"). Here we show that children ages 2-4 years do correctly parse and interpret negative labeling events and even use such labeling to restrict the meaning of novel words. We argue this occurs because negation requires contrastive support [see e.g., 4-6].

In our experiment, we tested how affirmative and negative labeling influence children's categorization of objects that vary along a perceptual continuum (from 0 to 100%, Fig1). 2-to-4-year-olds ($n=20$; $\text{Mage}=39.5\text{mo}$, from 26 to 46.7months) were presented with a continuum of novel creatures embedded into two videos labeled with a novel word (e.g., *blicket*). Each video was played on different televisions within a single video and introduced by a speaker (see Fig1). In the first video (TV1, common to all participants), participants saw two objects from one end of the continuum (e.g., yellowish objects – exemplars 10% and 30%) labeled several times in the affirmative: "Oh look! These are *blickets*!". In the second video (presented in TV2), participants were assigned to either the negative ($n=11$) or the affirmative condition ($n=9$) and saw two other creatures from the other end of the continuum (e.g., pinkish objects – 70% and 90%). Participants in the negative condition heard sentences like "Oh look! These are **not** *blickets*," (from which they should think that *blicket* only applies to yellowish creatures, not pinkish). Participants in the affirmative condition heard sentences like "Oh look! These are **also** *blickets*!" (from which they should think that *blicket* applies to all creatures). Participants were then tested in a selection task with images side-by-side (a new yellowish object (20%) versus a new pinkish object (80%) and were asked to find the *blicket* (Test Trial 1). After responding and performing on two filler trials with known animals (e.g., *where is the cow?*), participants were asked to find another exemplar of the novel word "Show me the *blicket*!" (Test Trial 2) while seeing a new exemplar similar to a creature labeled as "not a *blicket*" in the teaching phase (e.g., a 85%) vs a novel completely unrelated creature.

The results showed that participants in the negative condition correctly used negative sentences to narrow down the possible referents for the novel words. In Test 1 trials, they selected the exemplar from the bottom of the continuum (i.e., 20% - a new yellowish object) more often than participants in the affirmative condition ($\beta = -1.59$, $\text{SE}=0.64$, $z=-2.49$, $p=.013$). In Test 2 trials, participants in the negative condition chose the unrelated picture more often than participants in the affirmative condition ($\beta=-1.99$, $\text{SE}=0.98$, $z=-2.02$, $p=.043$).

Our results show for the first time that English-learning preschoolers can use negative sentences as a tool to understand the boundaries of a word's meaning. They were even able to remember the restrictive information provided by negative sentences to apply a mutual exclusivity strategy when faced with a novel object (member of the not-blickets family) vs. an unrelated object. The contrasting information provided by negative sentences seem therefore to have helped children to discard the possibility that *blickets* refers to all creature-like objects while without such information, participants in the affirmative condition interpreted both yellowish and pinkish creatures as possibly being "blickets". This study provides direct evidence that preschoolers can take advantage of negative sentences to constrain the extension of a word's meaning.

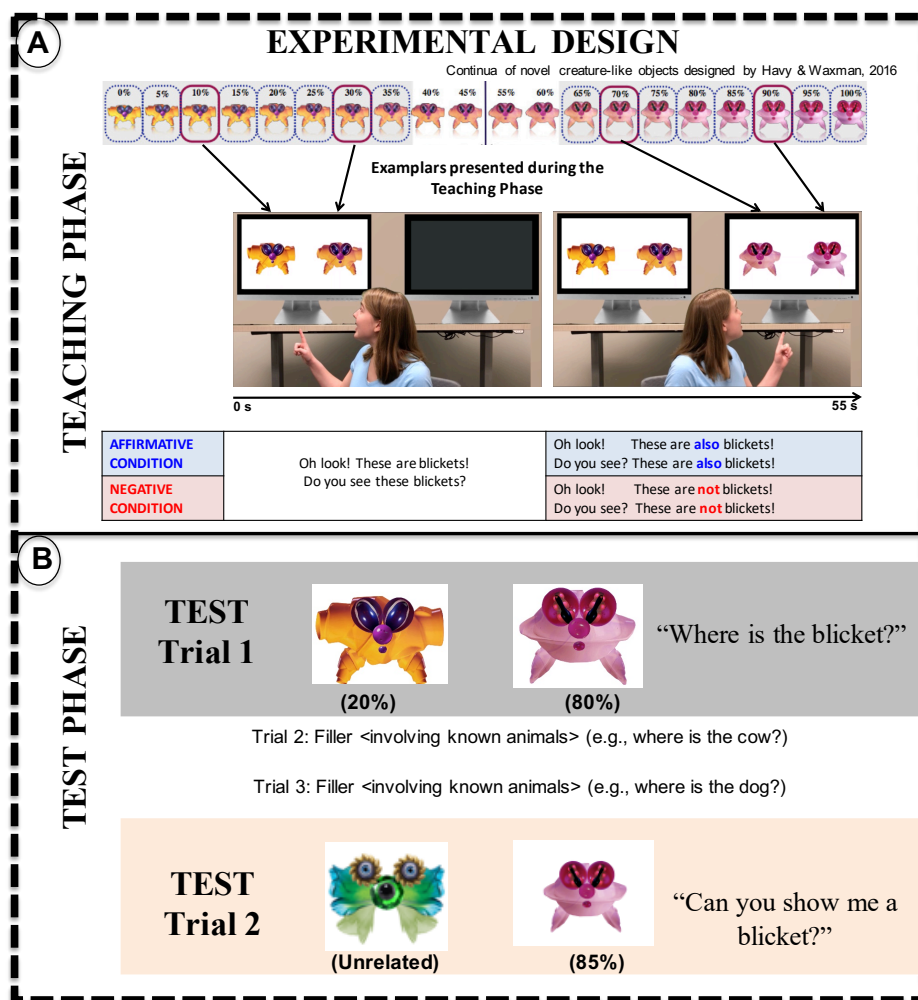


Figure 1: Experimental design - All participants watched the videos in Television 1 and 2 during the teaching phase. The video in Television 1 was the same for all participants. Depending on their condition, in television 2, they heard either negative or affirmative sentences. Finally, they all went through the same test phase with novel exemplars of the continua of novel creature-like objects (e.g., 20% vs 80% in T1 trials or 85% vs unrelated object in T2 trials) and were asked to find the novel word referent (e.g., Where is the blicket?). The experiment contained four novel words in total (2 trials, T1 vs T2, for each novel word). Participants were taught and tested on 4 novel words in this manner, using 4 different perceptual continuums of novel creatures.

Results

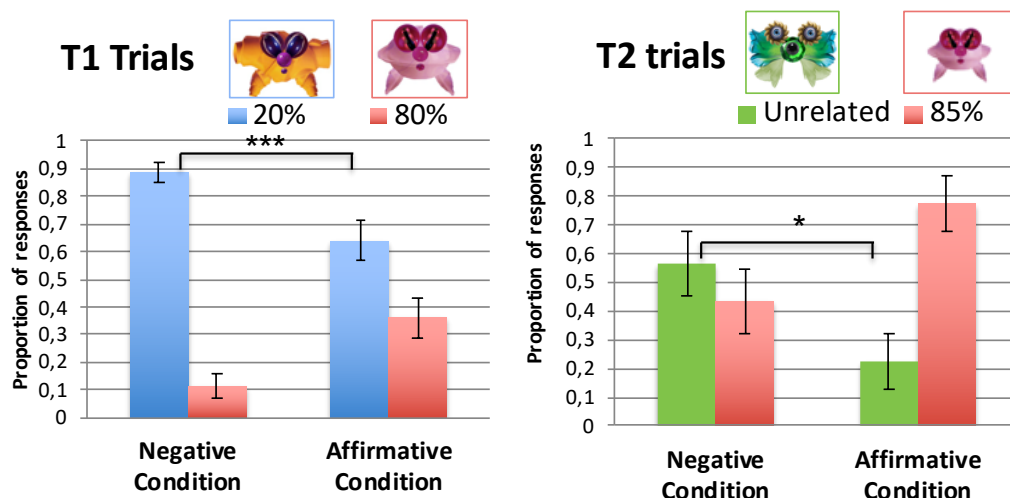


Figure 2: Proportion of picture selection in each type of test trials. T1 trials on the left and T2 trials on the right.

References

- [1] Gleitman, L. (1990). The Structural Sources of Verb Meanings. *Language Acquisition*, 1, 3–55.
- [2] Feiman, Mody, Sanborn, & Carey (2017). What Do You Mean, No? Toddlers' Comprehension of Logical "No" and "Not." *LLD*
- [3] Nordmeyer, A. E., & Frank, M. C. (2014). The role of context in young children's comprehension of negation. *Journal of Memory and Language*
- [4] Reuter, Feiman, & Snedeker (2018). Pragmatic and Semantic Factors in Two- and Three-Year-Olds' Understanding of Negation. *Child Dev.*
- [5] Waxman & Klibanoff (2000). The role of comparison in the extension of novel adjectives. *Developmental Psychology*.
- [6] Gelman, S. A., Wilcox, S. A., & Clark, E. V. (1989). Conceptual and lexical hierarchies in young children. *Cognitive Development*
- [7] Havy & Waxman (2016). Naming influences 9-month-olds' identification of discrete categories along a perceptual continuum. *Cognition*