

## The pitfalls of strong predictions: Learning new words from discourse

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Children learn words by attending to a variety of cues [1,2,3], some of the most informative of which come from the surrounding linguistic discourse. For instance, even two-year-olds use discourse to identify the target referent as a drink on hearing ‘*I’m thirsty! Look, there’s a pliff, show me the pliff*’ [4]. To use these contexts, children must process the component sentences, drawing on their increasing skills at linguistic prediction [5]. Here, we asked whether children’s developing prediction skills might limit their ability to process and learn, when discourse cues require them to revise expectations [6, 7, 8]. Specifically, we tested how children learn from discourse contexts containing the causal connective *so* compared to the contrastive connective *but*.

In Study 1, 118 two- to eight-year-olds and 18 adults were asked to select a picture that best describes a novel word in one of three sentence types (8 items per condition, Latin Squared) [Figure 1]:

- 1a. Katy wore a *flug* on a cold day. [Control condition: no connective]
- 1b. Katy was cold, so she wore a *flug*. [Causal connective]
- 1c. Katy was cold, but she wore a *flug*. [Contrastive connective]

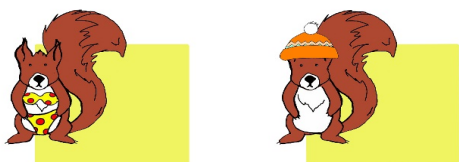
The connective *so* implies that the meaning of the novel word follows from the first clause (*flug* means “hat”), while the connective *but* implies that the meaning of the novel word contrasts with the first clause, requiring listeners to revise their expectations (*flug* means “bikini”). Figure 2 shows that accuracy on control sentences (like 1a) and *so*-sentences (like 1b) improved monotonically from childhood through adulthood. Accuracy on *but*-sentences, however, deteriorated to age 5, suggesting a “U”-shaped pattern of development (or, more accurately, “J”-shaped). In Study 2, we replicated this finding (n=16/age), without the control condition and using an improved set of items. Again, performance in the *but*-condition declined in five-year-olds and then improved [Figure 3].

Study 3 (n=16) tested whether five-year-olds’ difficulty is caused by predictively preparing a motor response before hearing the contrastive connective, and failing to inhibit that response. Participants only saw the pictures after hearing the full sentence. They still, however, chose incorrectly, suggesting that the difficulty lies in revising their linguistic prediction.

Study 4 tested if five-year-olds understand that *but* is contrastive. Looking at a set of three pictures, they heard the first part of a sentence with either *but* or *and...also*, and were asked to complete it [Figure 4]. When the sentence contained *and...also*, continuations tended to repeat the first noun, but when the sentence contained *but* their continuations mentioned the contrast [Figure 5], suggesting that five-year-olds understand that *but* is contrastive, but have difficulty using *but* when their predictions are strong.

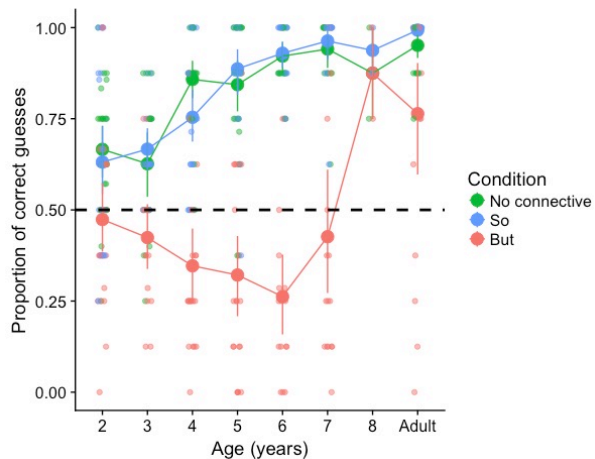
These results illustrate how learning language and processing language interact. They confirm that predictions are strong and important in language processing during the preschool years and show that just as children have difficulty revising syntactic expectations[7], they also have difficulty revising discourse expectations. Importantly, children’s difficulty revising discourse expectations can strongly interfere with word-learning. The question remains how children eventually overcome this obstacle.

**Word count:** 500

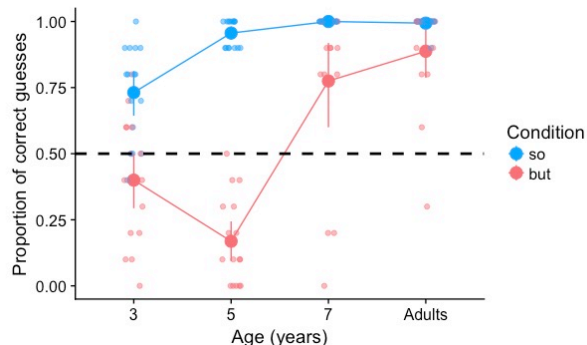


- 1a. Katy wore a *flug* on a cold day. [Control condition with no connective]  
 1b. Katy was cold, **so** she wore a *flug*. [Causal connective]  
 1c. Katy was cold, **but** she wore a *flug*. [Contrastive connective]

**Figure 1.** Example of stimuli in Study 1.



**Figure 2.** Accuracy by age and condition in Study 1.

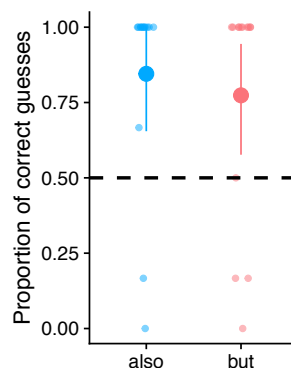


**Figure 3.** Accuracy by age and condition in Study 2.



Mae is wearing a jumper, **and** Freddie is **also** wearing a ... / **but** Freddie is wearing a... [child completes sentence]

**Figure 4.** Example of stimuli from Study 4.



**Figure 5.** Accuracy in Study 4 (i.e., repetition for *also*, contrast for *but*).

- [1] Frank, M. C., Goodman, N. D., & Tenenbaum, J. B. (2009). Using speakers' referential intentions to model early cross-situational word learning. *Psychological science*, 20(5), 578-585.  
 [2] Smith, L., & Yu, C. (2008). Infants rapidly learn word-referent mappings via cross-situational statistics. *Cognition*, 106(3), 1558-1568.  
 [3] Gleitman, L. (1990). The structural sources of verb meanings. *Language acquisition*, 1(1), 3-55.  
 [4] Sullivan, J., & Barner, D. (2016). Discourse bootstrapping: Preschoolers use linguistic discourse to learn new words. *Developmental science*, 19(1), 63-75.  
 [5] Mani, N., & Huettig, F. (2012). Prediction during language processing is a piece of cake—but only for skilled producers. *Journal of Experimental Psychology: Human Perception and Performance*, 38(4), 843.  
 [6] Rabagliati, H., Gambi, C., & Pickering, M. J. (2016). Learning to predict or predicting to learn? *Language, Cognition and Neuroscience*, 31(1), 94-105.  
 [7] Trueswell, J. C., Sekerina, I., Hill, N. M., & Logrip, M. L. (1999). The kindergarten-path effect: Studying on-line sentence processing in young children. *Cognition*, 73(2), 89-134.  
 [8] Huang, Y. T., & Arnold, A. R. (2016). Word learning in linguistic context: Processing and memory effects. *Cognition*, 156, 71-87.