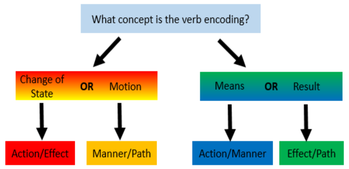
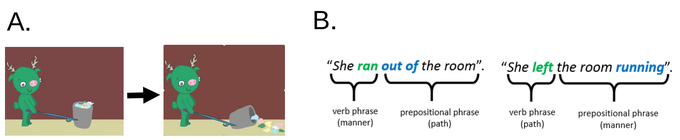
# What are verb concepts made of?

Anna Serrichio, Melissa Kline, and Jesse Snedeker

## Introduction

People form lexicalization biases based on previous experiences regarding their predictions of the meanings of novel verbs. There is some evidence that adults' biases formed from change of state (action and effect) verbs can systematically affect their predictions of the meanings of motion (manner and path) verbs. However, it is unclear whether children are capable of altering their biases in a similar way and what the mechanisms behind this process might be. Here, we explored whether four- and five- year old English speaking children learn these biases by determining what dimensions are important as they encounter events, or by using a unifying conceptual framework to distinguish between means and results more broadly. We predicted that if action and manner and effect and path are conceptually related and grouped together under a broader framework, providing evidence for either action or effect for novel change of state event verbs would affect children's predictions of whether novel motion event verbs encoded manner or path.

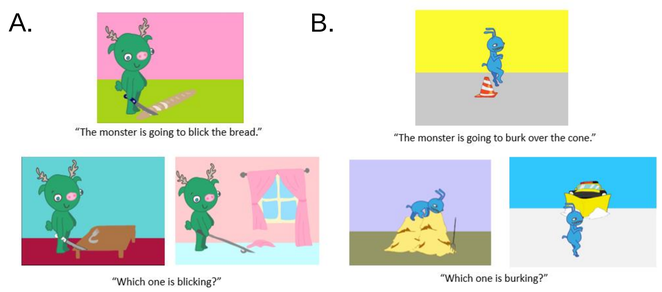



A. Change of state events are described in terms of action and effect. B. Motion events are described in terms of manner and path, which can be encoded in grammatically distinct ways.

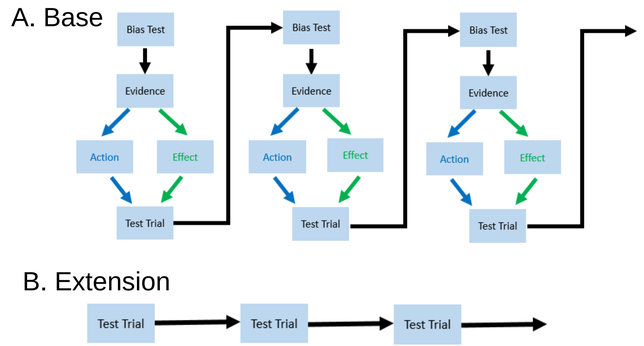
## Methods

### 1. Stimuli




Novel verbs described a character performing a change of state or motion event. A. Change of state events consisted of an object-directed goal with a means (action) and outcome (effect). B. Motion events consisted of a movement that varied in its manner and path.

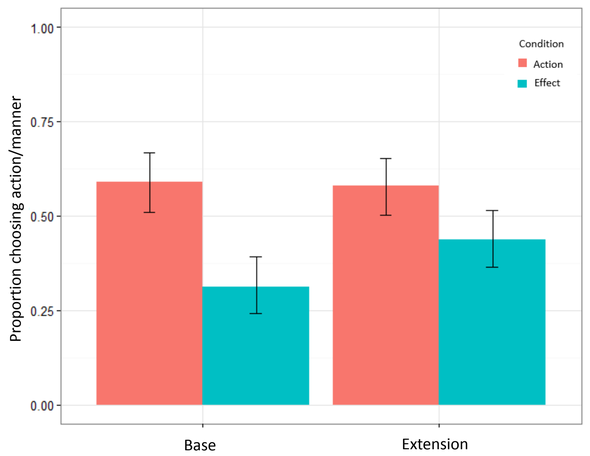
### 2. Procedure




The procedure consisted of 8 base and 8 extension trials. A. During base phase trials, participants were first given a bias test. They were then exposed to several verbs that encoded either encoded action or effect, depending on the condition the participant was in, and responded to a test trial. B. During extension phase trials, participants responded to a single bias test that tested whether they predicted novel verbs encoded manner or path, without prior evidence.

## Results

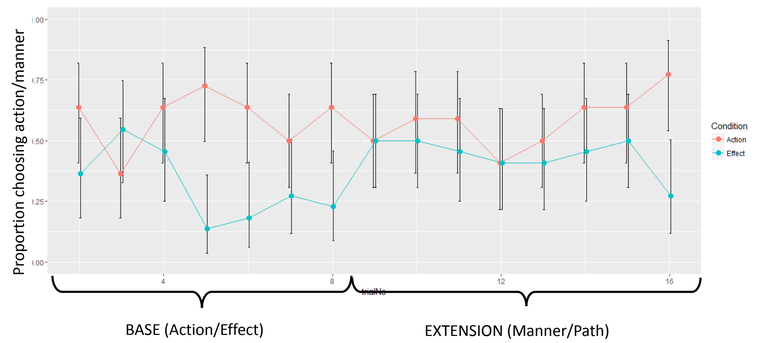
### Action/Effect to Manner/Path Mapping




In the base phase, participants in the action condition were more likely to interpret verbs in the bias tests as encoding action, while participants in the effect condition were more likely interpret novel verbs as encoding effect. This was significant with a mixed effects linear regression ($p < 0.006$). Participants in the action condition were also more likely to interpret novel verbs in the extension phase as encoding manner than participants in the effect condition ($p < 0.039$), indicating that prior evidence on action or effect affected participants' predictions of verbs encoding manner or path.

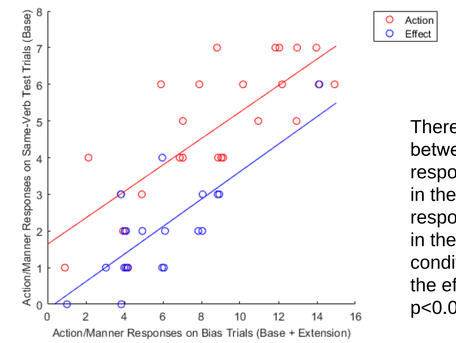
### Comparing Base and Extension Trials

#### 1. Strength of bias increases with trials




During the base phase, participants' responses gradually differentiated more between conditions with more trials. Responses between the two conditions during the extension phase did not show as clear of a pattern.

#### 2. Training performance predicts bias test responses




There was a significant correlation between participants' proportion of responses choosing action or effect in the base phase and proportion of responses choosing manner or path in the extension; for both the action condition ($r = 0.7682$, $p < 0.0001$) and the effect condition ($r = 0.756$, $p < 0.0001$)

## Conclusions

1. Lexicalization biases are flexible and can be updated on the basis of experience.

2. Lexicalization biases are abstract and reflect underlying unified conceptual structure that distinguishes between means and result.

3. Biases reflect prior linguistic experiences.