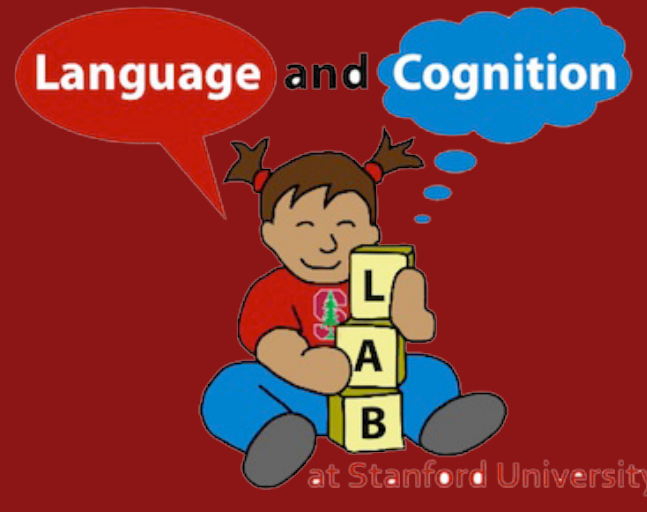


# Preschool children reason about third-party goals when evaluating acoustic environments

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## Introduction

### Children as flexible learners

- Learning flexibility in children includes:
  - Adjusting attention to stimuli that is learnable (Gerken et al., 2011; Kidd, 2011)
  - Using emotional expressions as cues for novel object exploration (Wu & Gweon, 2021)
  - Reasoning about environmental structure and goals to determine approach strategies (Meder et al., 2021)

### Background noise and learning

- Acoustic noise is ubiquitous
- Repeated noise exposure influences learning and development in critical ways:
  - Reduces speech perception and word recognition (Klatte et al., 2013; Bjorklund et al., 1990)
  - Decreases word learning (McMillan & Saffran, 2016)
  - Impinges on already limited cognitive resources for adaptive strategy building (Loh et al., 2022)

### (Ecological) Active learning

- Traditional active learning:
  - Learners interact with individual stimuli within their environment (Settles, 2009)
  - Accurate stimuli labeling is a primary goal
- Ecological active learning:
  - Children learn by tracking environmental features and adapt their exploration strategies accordingly (Ruggeri, 2022)
  - Exploratory strategies for learning are context-dependent
  - Exploit statistical regularities in the environment to reduce demands on cognition

### Environmental selection

- Learners preferentially select acoustic environments that align with a set of goals
- Emphasizes acoustic information
- Goal-directed
- Addresses variabilities across environments
- Children can rely exclusively on acoustic information to make exploration decisions

## Research Question

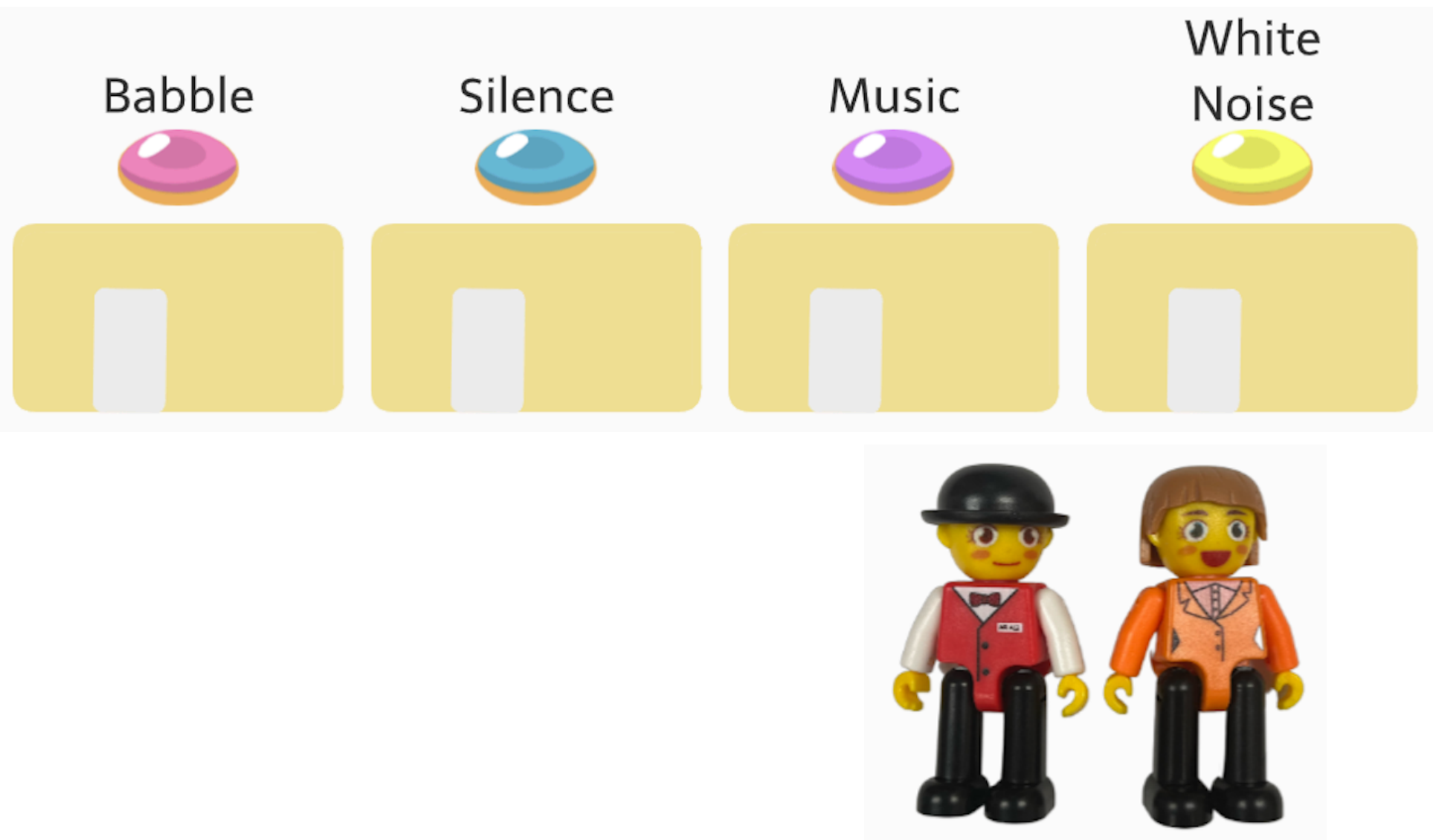
To what extent do preschool children use environmental selection as an adaptive strategy for learning in noisy acoustic environments?}

## Hypothesis

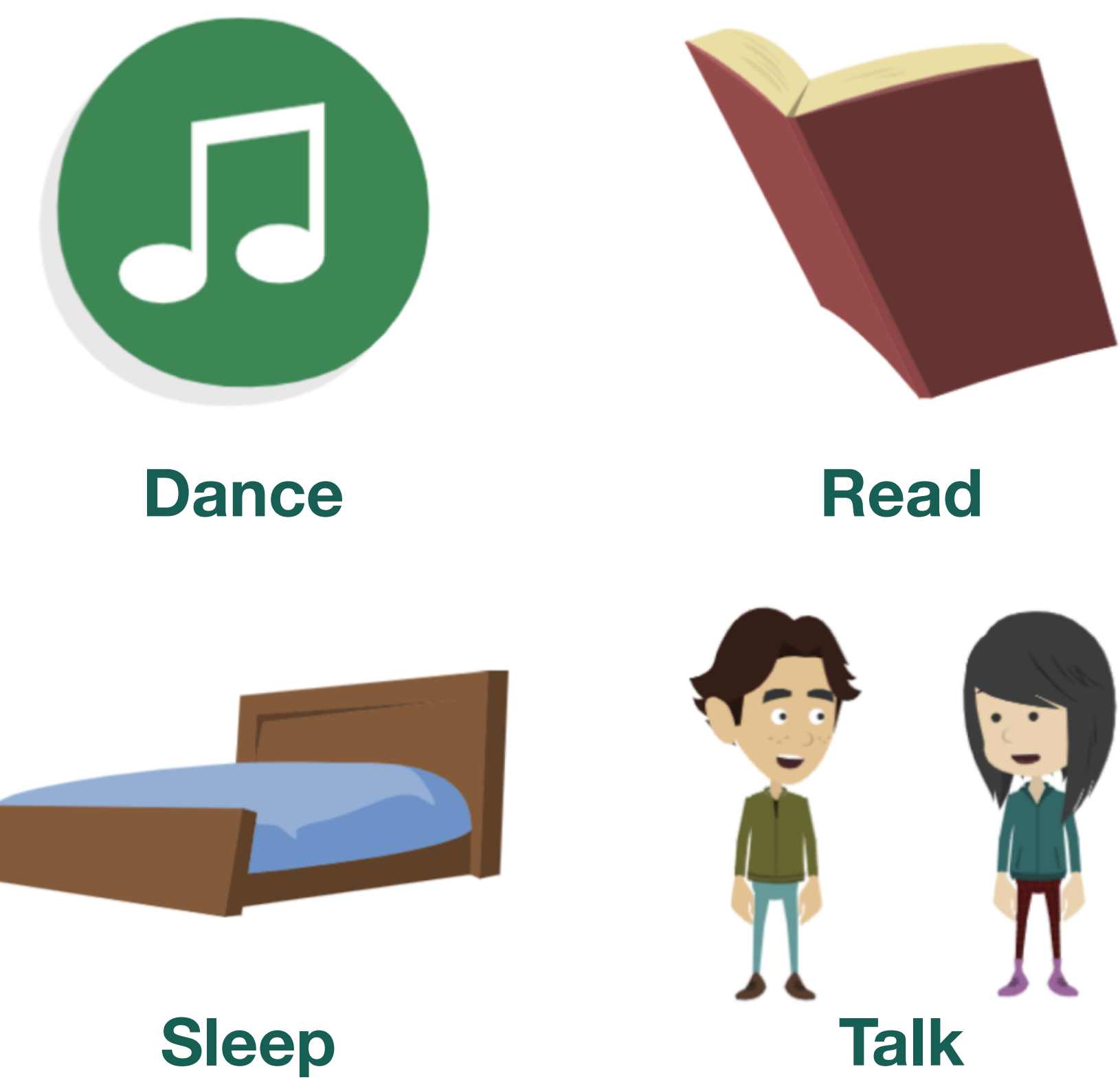
If children use acoustic information to make decisions about how to better maximize goal outcomes, they should also match such goals with acoustic environments that better maximize output.

## Methods

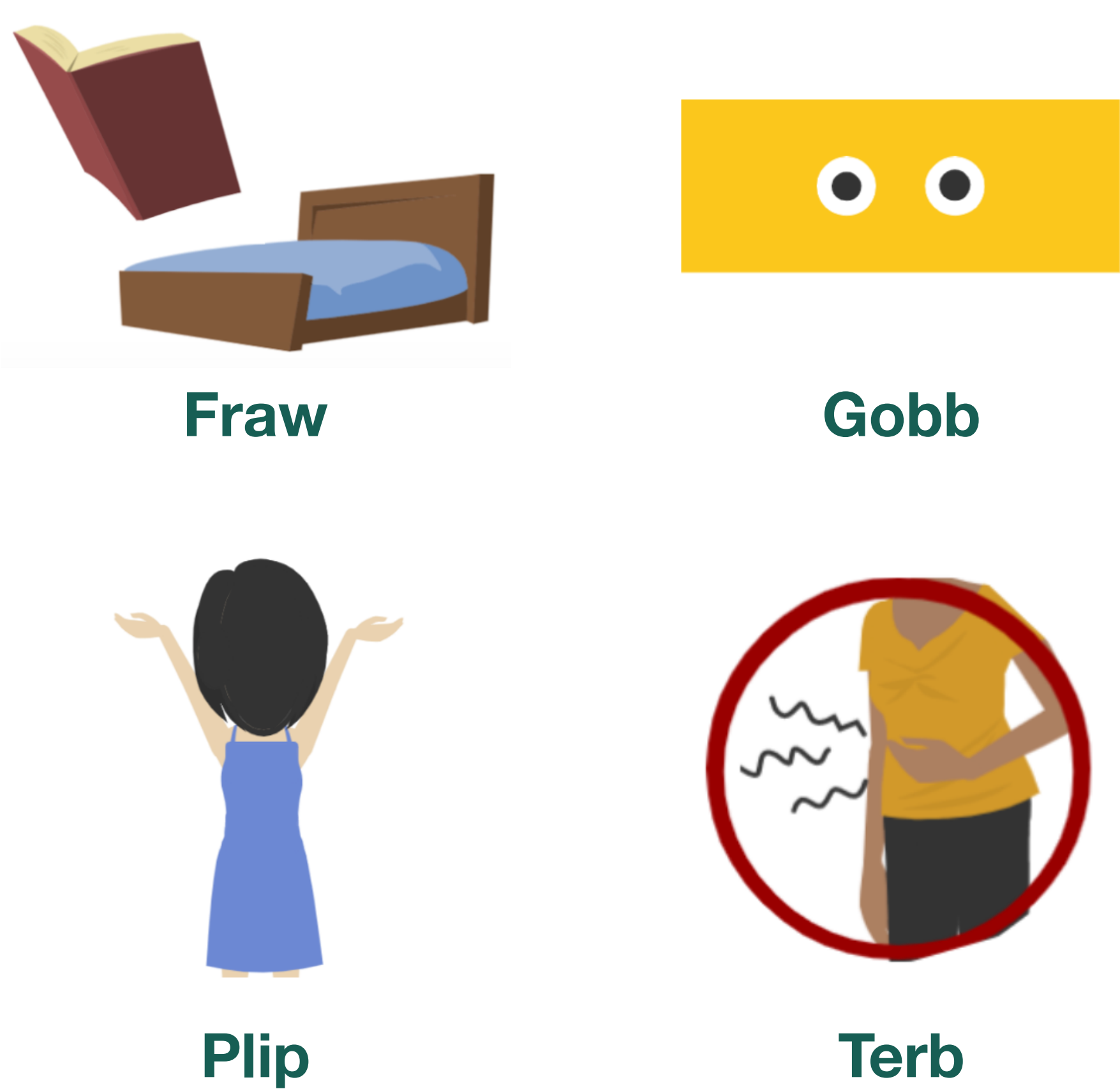
	Experiment 1		Experiment 2	
	Children	Children	Adults	
Sample Size	72	54	37	
Mean Age	4.46 years	4.55 years	40.43 years	
African American/Black	4.2%	3.7%	5.4%	
Asian American/Pacific Islander	23.6%	37%	10.8%	
Caucasian/White	27.8%	31.5%	73%	
Hispanix/Latinx	8.3%	7.4%	8.1%	
Multiracial	26.4%	20.4%	2.7%	
Other	8.3%	0%	0%	



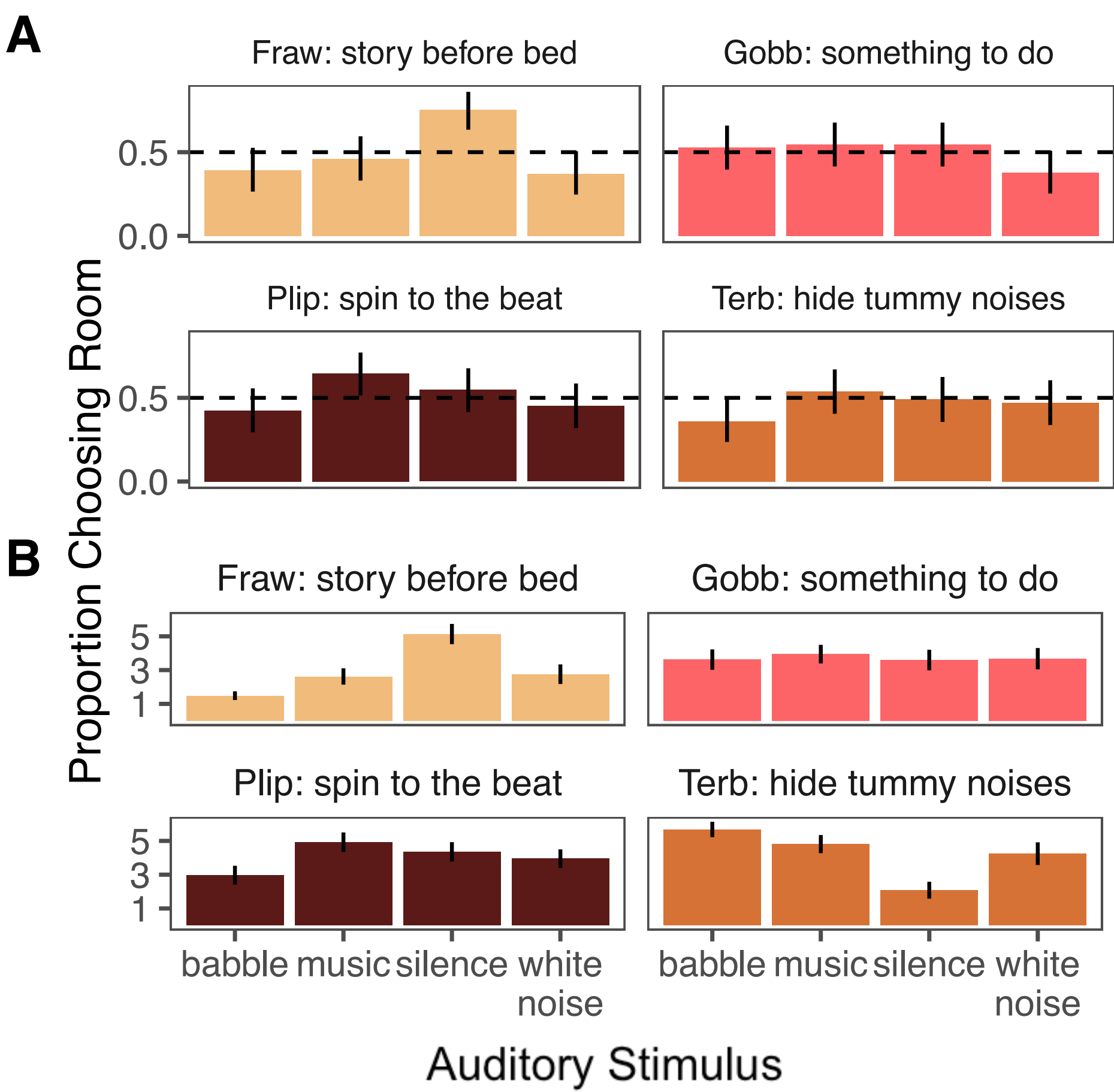
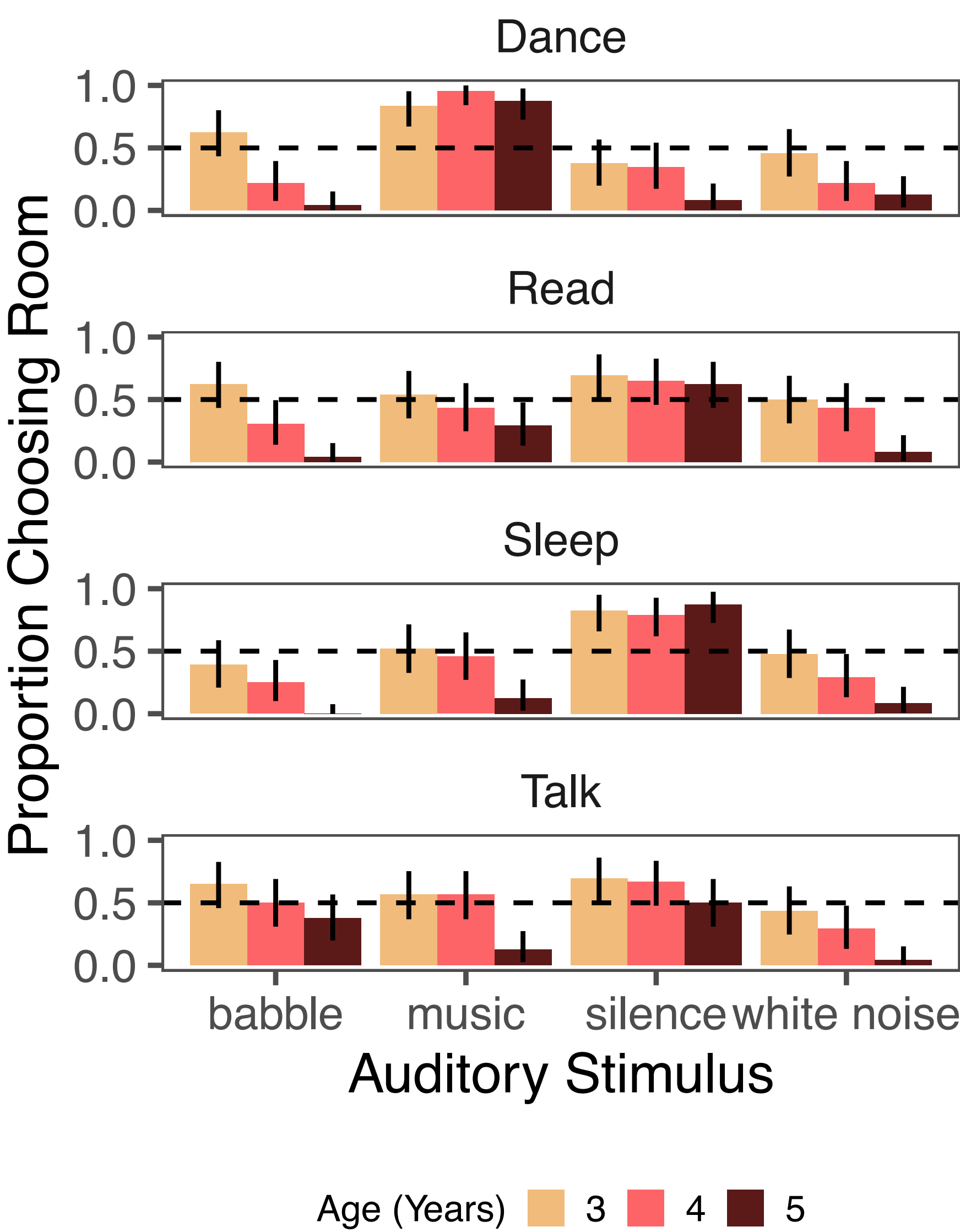
### Experiment 1



### Experiment 2



## Results



## Discussion

- Preschool children reliably matched acoustic environments with third-party goals, regardless of age
- Preschool children generally matched unfamiliar activities with third-party goals as well as adults
- By age 5, young children can adjust their interpretation of more efficient exploration with acoustic input
- Supports an ecological active learning theory in the auditory domain

## References

Bjorklund, D. F., & Harnishfeger, K. K. (1990). *Developmental Review*; Gerken, L., Balcomb, F. K., & Minton, J. L. (2011). *Developmental Science*; Kidd, C., Piantadosi, S. T., & Aslin, R. N. (2012). *PloS One*; Klatte, M., Bergstrom, K., & Lachmann, T. (2013). *Frontiers in Psychology*; Loh, K., Fintor, E., Nolden, S., & Fels, J. (2022). *Developmental Psychology*; Meder, B., Wu, C. M., Schulz, E., & Ruggeri, A. (2021). *Developmental Science*; McMillan, B. T., & Saffran, J. R. (2016). *Child Development*; Ruggeri, A. (2022). *Current Directions in Psychological Science*; Settles, B. (2009). *Computer Sciences Technical Report*; Wu, Y., & Gweon, H. (2021). *Child Development*