



Linhares et al.: Cross-situational Word Learning in Toddlers with Varying Language Proficiency

Olivia Cayward, Julia Linhares, & Allison Roberge
Department of Communication Disorders, Sacred Heart University, Fairfield, CT, USA

Advisor: Elizabeth Schoen Simmons, Ph.D.

Sacred Heart
UNIVERSITY
DEPARTMENT OF COMMUNICATION DISORDERS

Introduction

- Infants and toddlers learn words in perceptually demanding environments where they must make some assumptions about which words go with which objects.
- For example, when mom says, “doggie”, the toddler must figure out if she is referring to the furry animal that barks or the round object that bounces.
- Infants and toddlers resolve this referential ambiguity by tracking the co-occurrences of words and their referents across many different learning opportunities and generate hypotheses about which words map to which objects in their environment (Yu & Smith, 2007).
- This is referred to as cross-situational word learning and has been demonstrated in infants as young as 12-months (Smith & Yu, 2008).
- Late talkers (LTs) are toddlers with small expressive vocabularies in absence of overt neurodevelopmental disorders and sensory impairments (Collison et al., 2016).
- There has been very little research on how LTs learn words and if they employ cross-situational learning opportunities to add to their lexicon.

Objective

- To evaluate cross-situational word learning in typically developing and late talking toddlers.

Methods

Participants

- Toddlers ($N=23$), 18-36 months, were divided into two groups based on expressive language skills from the MacArthur-Bates Developmental Communicative Inventories (MB-CDIs, Fenson et al., 2007)
 - Typically developing (TD):** Expressive vocabularies $\geq 19^{\text{th}}$ percentile.
 - Late talker (LT):** Expressive vocabularies $\leq 15^{\text{th}}$ percentile.
- See Table 1.

Methods (cont.)

Table 1. Participant Characterization

	Group	
Characteristics	TD ($n=16$)	LT ($n=7$)
Mean age in Months (SD)*	27 (4)	24 (5)
% Male	50	57
Mean # of words produced on MB-CDIs (SD)	436 (212)	80 (79)
Mean Percentile on MB-CDIs (SD)	55 (30)	10 (5)
Maternal Education (% with \geq college)	100	71

*Note. NS difference in age between TD and LT groups ($t = -1.5(22)$, $p = .13$).

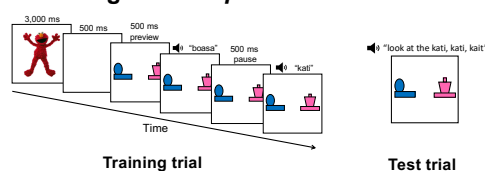
Materials

- Six novel spoken word-object pairs.

Experiment

- Cross-situational word learning paradigm (Smith & Yu, 2008; see Fig. 1) using preferential looking.
- Participant's eye gaze was recorded during the training and test phases.
 - Training trials.** Two novel spoken words and two novel objects were presented in each trial. Word-object mappings were ambiguous within trials.
 - Test trials.** Two novel objects from training were presented along with a verbal direction to look at one of the objects (target).

Figure 1. Experiment structure



Data acquisition

- Data were collected using Lookit, an online data collection platform (Scott & Schultz, 2017).

Coding

- Participant's gaze was coded, frame-by-frame for every trial, using ELAN software (Version 6.3; 2022).
- Looks were categorized based on direction of gaze, left or right.
- Ambiguous looks or looks away from the screen (e.g., looking at parent) were not coded.

References

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Methods (cont.)

Reliability

- A random ~20% ($n=5$) of the sample was re-coded by a second coder to establish inter-rater reliability.
- Agreement on direction of gaze (left or right) for frames was $>80\%$.

Data analysis

- Duration (in seconds) of looking to the left or the right side of the screen (i.e., looking at the objects) was calculated for all training and test trials.
- Linear mixed effects models were used to compare differences in time spent looking at objects during training and test trials for each group.
- Participant was included as the random variable (slopes) for all models.
- Analyses were conducted in R (Version 1.1.463; R Core Team, 2020).

Results

- TD and LT groups spent similar amounts of time looking at the objects during training trials ($b = 0.27$, $SE = 0.26$, $t = 1.05$, $p = .30$; see Fig. 2).
- The TD group looked significantly longer at the target object compared to the distractor object during test trials ($b = 0.29$, $SE = 0.08$, $t = 3.60$, $p < .001$; see Fig. 3).
- The LT group spent more time looking at the distractor object during test trials, although this was not significant ($b = -0.07$, $SE = 0.014$, $t = -0.49$, $p = .62$).

Figure 2. Time spent looking at objects during training

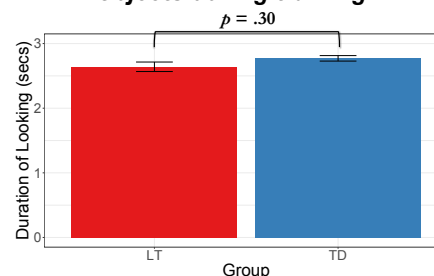
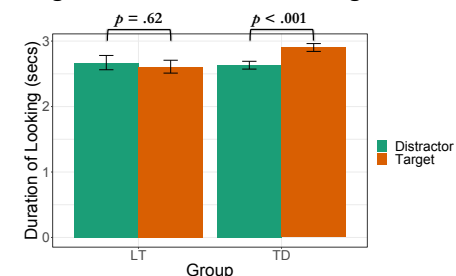


Figure 3. Time spent looking at targets vs. distractors during test



Discussion

- Both groups spent a similar amount of time attending to the objects during training, suggesting visual attention was comparable between groups while learning.
- Typically developing toddlers learned the novel word-object mappings, as evidenced by more time spent looking at the labelled object (correct object) than the object that was not labelled (incorrect object).
- Late talking toddlers did not show the same pattern of learning; rather, they looked negligibly longer at the incorrect objects compared to the correct, labelled objects during testing.
- Findings suggest that toddlers with language delay may be less sensitive to cross-situational learning opportunities and LTs may be less efficient at leveraging this input to acquire new vocabulary words.

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simmons3@sacredheart.edu

Next Steps

- Data collection will continue in order to validate the effects found in this pilot study.
- Contributions of other variables on learning, such as cognition, were not evaluated but individual differences measures will be included in future iterations of this work.