Do Labels Help? Exploring the Interaction Between Visual Working Memory and Verbal Labels in Very Young Infants

Nilam Thaker, Allison Fitch, & Zsuzsa Kaldy, PhD
University of Massachusetts Boston, Developmental and Brain Sciences

BACKGROUND

Adults employ a variety of strategies to remember objects in day-to-day life. In particular, using linguistic labels (that is, naming objects) have commonly been shown to facilitate learning and memory.

Similarly, research with infants also support that the use of linguistic labels, compared to tones and other nonlinguistic auditory stimuli, provide an extra benefit to learning and memory (Ferry, Hespos, & Waxman, 2010; Fulkerson & Waxman, 2007; Balaban & Waxman, 1997). Further, these labels have been shown to help infants across a spectrum of skills and cognitive tasks. For example, even at 3-4 months of age, infants who heard linguistic labels showed better categorization (Ferry, Hespos, & Waxman, 2010).

However, despite being such a widely used cognitive strategy among adults and a learning strategy that helps a variety of cognitive tasks in infants, the specific link between labels and visual working memory has not been explored in infants.

Question: Do verbal labels help young (preverbal) infants to keep track and remember visual objects?

Exp. 1. Goal: to demonstrate that 10-month-old infants can remember two objects without labels in our task.

Exp. 2. In an earlier study, 8-month-olds were found not to be able to perform above chance in this task *without labels* (Kaldy et al., 2016). Can adding labels help them succeed?

METHOD

Participants:

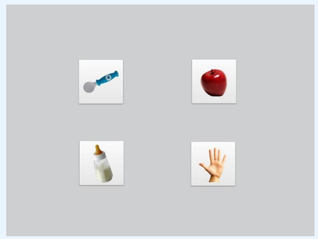
Exp. 1: 16 healthy, full-term infants
(age range: 278-335 days, M=302 days, 5F)
Exp. 2: 16 healthy, full-term infants
(age range: 216 -268 days, M=237 days, 8F)
*Add'l 7 infants excluded for fewer than 3 valid trials

Apparatus:

Tobii T120 eye-tracker, sampling at 60 Hz

Stimuli:

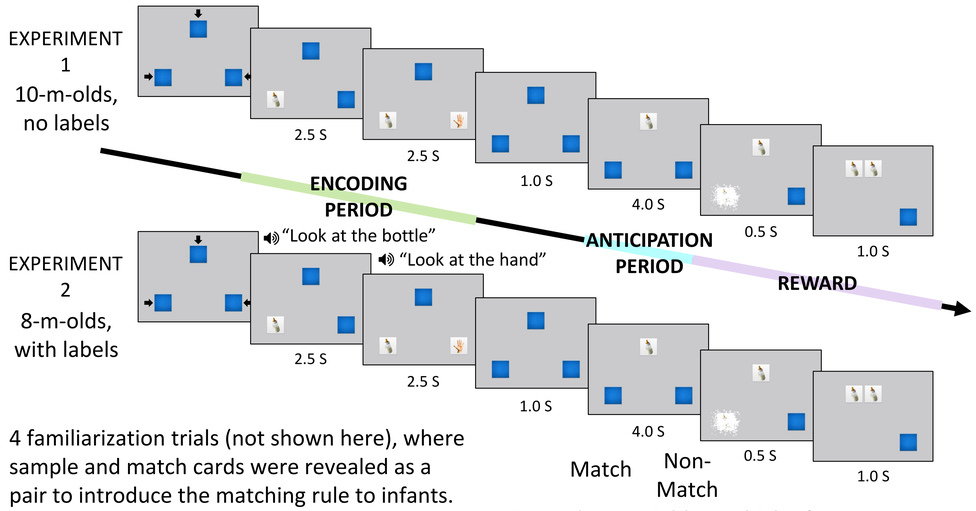
A set of three virtual 'cards' which are first presented face-down, then flip face-up to reveal one of four to-be-remembered objects (Kaldy et al., 2016).



Measures:

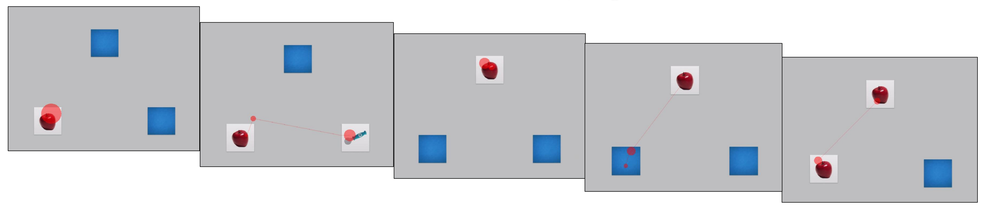
Percent correct responses based on first looks (time to first fixation, TFF) and looking time (total visit duration, TVD).

PROCEDURE AND RESULTS



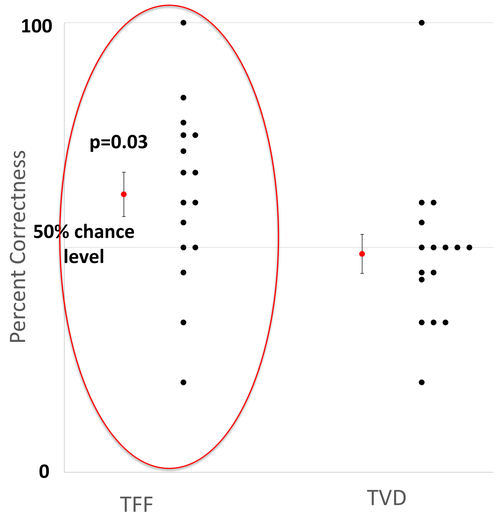
4 familiarization trials (not shown here), where sample and match cards were revealed as a pair to introduce the matching rule to infants. Familiarization trials were followed by 10 test trials.

Dependent variables: Which of the two cards did infants look at first/longer?

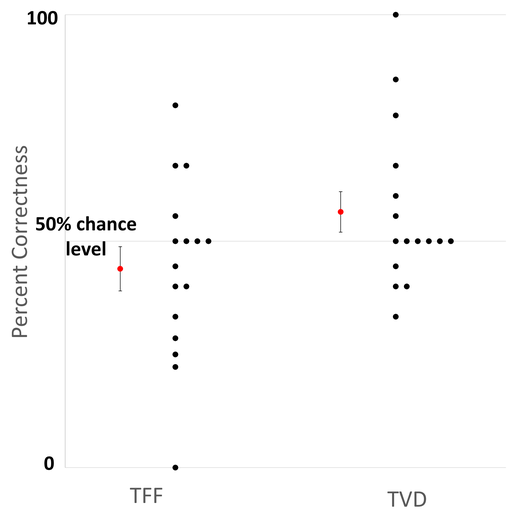


Example eye trace of a correct anticipatory response (depicted as a red dot on screen).

Experiment 1: Percent Correct Responses Measured as TFF and TVD



Experiment 2: Percent Correct Responses Measured as TFF and TVD



Black dots: individual infants' performance, red dots: group averages

RESULTS SUMMARY

When averaging across the anticipation period, TFF measurements in Experiment 1 showed that **the 10-month-old infants performed significantly above chance** at the delayed match retrieval (DMR) task **without labels**, t(16) = 2.39, p = 0.03. (However, in TVD they did not, t(16) = 0.33, p = 0.75).

In, Experiment 2 results in TFF and TVD (from 8-month-olds with labels) were **not significantly different from chance**.

CONCLUSIONS

Results from Experiment 1 provide evidence that 10-month-old infants are capable of performing above chance at the simple DMR task without any associated linguistic labels.

Results from Experiment 2 show that younger, 8-month-old infants cannot significantly perform above chance in our working memory task with the associated linguistic labels, thus providing evidence that the linguistic labels are not helping them remember objects in visual working memory. These results are particularly interesting because these babies are very young and cannot produce words yet (pre-verbal). Instead of helping such young infants, the labels may be distracting them, which may be because of a shared and limited attentional resource.

We are currently conducting a third study, where we are testing 10-month-olds in the same design as was used in Experiment 2. If 10-month-olds cannot perform above chance in that test, that will provide evidence to support that verbal labels actively compete with the encoding of visual information.

ACKNOWLEDGEMENTS

This project was supported by a grant from the National Institutes of Health (R15HD092923).

Please direct correspondence to nilam.thaker001@umb.edu.

REFERENCES

Balaban, M. T., & Waxman, S. R. (1997). Do words facilitate object categorization in 9-month-old infants? *Journal of Experimental Child Psychology*, 64(1):3–26.

Ferry, A. L., Hespos, S. J., & Waxman, S. R. (2010). Categorization in 3-and-4-Month-Old Infants: An Advantage of Words over Tones. *Child Development*, 81(2), 472-479.

Fulkerson A.L. & Waxman S.R. (2007). Words (but not tones) facilitate object categorization: Evidence from 6-and 12-month-olds. *Cognition*, 150(1), 218–228.

Kaldy, Z., Guillory, S.B., & Blaser, E. (2016). Delayed match retrieval: A novel anticipation-based visual working memory paradigm. *Developmental Science*, 19, 892-900.