



Preverbal infants' use of labels in visual working memory: An eye-tracking study using Delayed Match Retrieval



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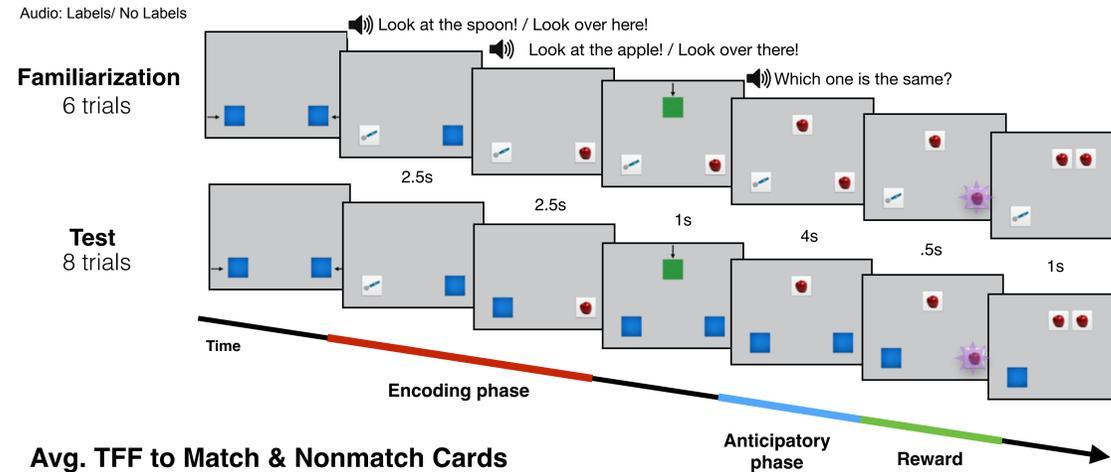
Background

- In order to remember multiple objects, adults and children as young as eight often implicitly label those objects; this assists in later recall¹⁻⁴.
- Though not self-generated, younger children also benefit from the presence of redundant labels in visual memory tasks^{5,6}, however no studies have tested this in infancy.
- Labels enhance infants' performance on several cognitive tasks including categorization⁷, object individuation⁸, and rule learning⁹. Proposed mechanisms underlying these performance gains, such as enhanced perceptual object processing¹⁰ and improved individuation⁸, may have also have positive downstream effects on visual working memory (VWM).
- Additionally, infants and toddlers are able to use labels to reorganize to-be-remembered information, which in turn enhances performance^{11,12}.
- Using Delayed Match Retrieval (DMR), it was previously shown that 10-, but not 8-month-old infants can hold 2 object-location bindings in VWM¹³.
- Question:** Do the presence of redundant labels improve visual working memory for objects in preverbal infants?

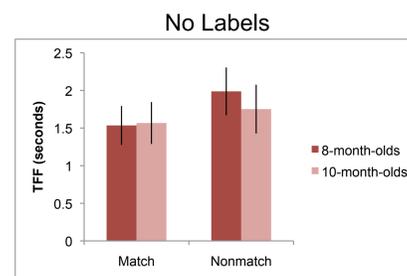
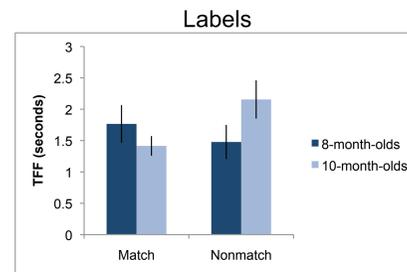
Method

- Participants: 33 healthy, monolingual infants (age range: 7;00-11;00, 17 F) split into two conditions: labels (n = 17) and no labels (n = 16), as well as two age groups: 8-month-olds (7;00-8;30, n = 20) and 10-month-olds (9;00-11;00, n = 13). An additional 14 infants were excluded for fussiness or not meeting inclusion criteria.
- Apparatus: Tobii T120 Eyetracker, sampling at 60 Hz
- Stimuli: Card 'faces' were two pairs of stock photos of objects that 6-8 m/o infants typically know the label for: apple and spoon, and hand and bottle (Bergelson & Swingley, 2012).
- Procedure: Delayed Match Retrieval (anticipatory looking task; Kaldy et al., 2015). Two between-subjects experimental conditions: labels present (i.e. *Look at the spoon!*) and labels absent (i.e. *Look over here!*). For inclusion, participants completed ≥ 3 test trials, defined by a fixation to either the match or nonmatch card.
- Measures: Average time to first fixation (TFF) for each the match and nonmatch cards during the anticipatory period; looking time preference for match card relative to the whole screen during the anticipatory period.

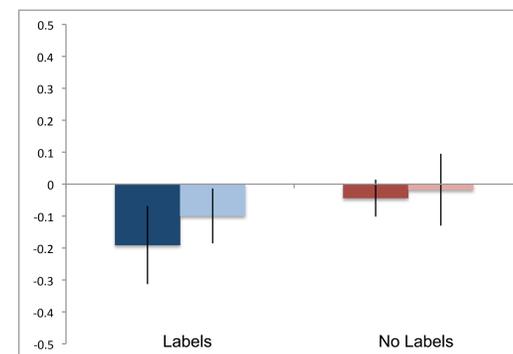
Procedure & Results



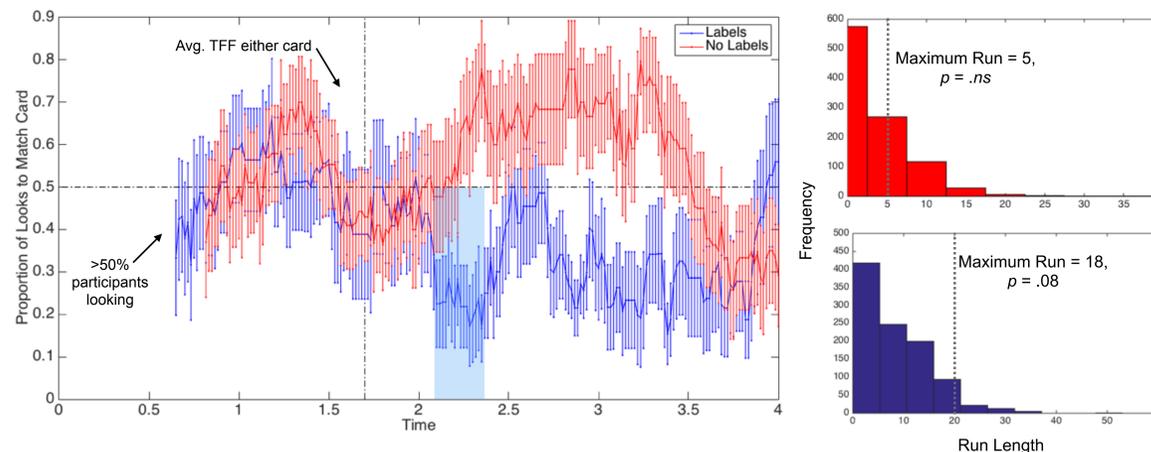
Avg. TFF to Match & Nonmatch Cards



Avg. Looking Time Preference for Match Card



Proportion of Looks to Match Card Across Anticipation Period by Condition



Results Summary

- When averaging across the entire anticipatory period, no differences were found between conditions or age groups in how fast participants fixated the match card, nor how long they looked at it.
- However, gaze patterns diverge after 2s: participants whose objects were previously labeled looked marginally longer to the nonmatch card, while those whose objects were not labeled preferred the match card (but this was not significantly different from chance).

Conclusions

- Regardless of age, the label group had a marginally significant bias toward a single card across test trials, suggesting that they remembered two object-location bindings. The no-label group, however, had no such preference.
- Because the label group's preference was for the nonmatch, the role of labels in the DMR paradigm may be both in rule-learning as well as memory.
- Unlike the original DMR study, the "choice" card was not clearly selected until $>2s$ in both conditions, suggesting that infants may take longer to process the cross-modal stimuli. This may also explain why the 10-month-old infants in the no-label condition performed at chance¹⁴.
- None of the analyses has revealed an age difference between 8- and 10-month-olds, which suggests that 8-month-olds may be able to hold two object-location bindings in memory under labeling conditions. Data collection with older infants is ongoing and will provide more power for these analyses.

References

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Acknowledgments This project was supported by NIH #1R15HD086658 and Grant #319294 from the Simons Foundation under the auspices of the Simons Center for the Social Brain at MIT.