

# 21-month-old Toddlers Pass an Anticipatory Version of the Invisible Displacement Task



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## Introduction and Background

How do we keep track of 'what goes where'?

- Visual working memory (VWM) for object-location bindings
- Models of VWM involve both storage and updating components
- 18-month-old infants can pass Piaget's A-not-B task with invisible displacement (Piaget, 1954; Corman & Escalona, 1969)

## Goal

To obtain a novel measure of VWM in toddlers:

- We created an eye-tracking task that does not require the ability to follow verbal instructions or additional executive functions such as response inhibition (Kaldy, Blaser & Guillory, 2013).
- Response is based on gaze (Anticipatory Eye Movements, AEM), not reaching.

## Methods

### Participants:

- M = 19;15, range: 18;0 - 20;30, N = 17 (10 f)
- M = 21;21, range: 21;0 - 24;0, N = 16 (6 f)

### Procedure (two conditions, within subjects):

- *No location change* condition: adapted from Kaldy et al. (2013)
- *Location change* condition: see Figure 1b.
- 3 training trials and 8 test trials per condition

### Counterbalancing:

#### Between subjects

- Cards' start position
- Condition order

#### Within subjects

- Reveal order
- Stimulus pair
- Match/non-Match location

## Stimuli

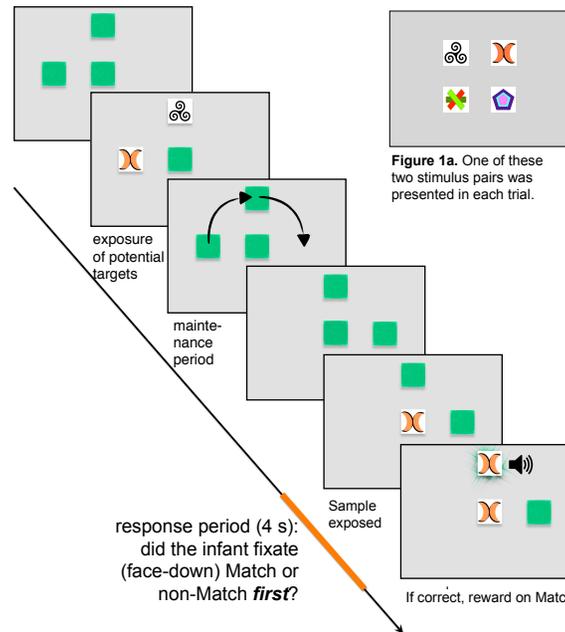


Figure 1b. Sequence of events in the *Location change* condition.

## Stimulus design and control

- Stimuli were designed in Keynote and presented using MATLAB on a Tobii T120 eye tracker.
- Training trials always ended with visual rewards.
- In Test trials, infants received a reward *only if they looked at the correct (matching) card first* during the 4 s response period.
- If infants looked at the non-Match or did not fixate either of the two face-down cards, the trial ended without a reward.

## Results

DV: %correct choice (based on first looks)

Number of completed blocks:

- *No change*: 19-m-olds: 10; 21-m-olds: 13
- *Location change*: 19-m-olds: 13; 21-m-olds: 11

One-sample *t*-tests comparing %correct trials to chance performance (50%):

- 19-month-olds:  $p = n.s.$
- 21-month-olds: see Figure 2a.

There was no significant effect of any of the counter-balanced factors or learning over time (see Fig. 2b).

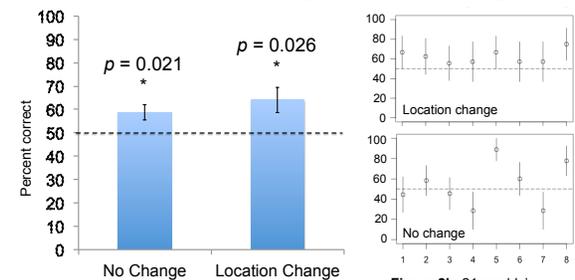


Figure 2a. 21-m-olds' %correct performance.

Figure 2b. 21-m-olds' performance over trials.

## Conclusion

21-month-olds showed evidence for updating spatial information in their VWM in our AEM paradigm. Further studies with younger infants and different reward rules are ongoing.

## References

- Corman, H. H. & Escalona, S. K. (1969). Stages of sensorimotor development: Replication study. *Merrill-Palmer Quarterly*, 15, 351-361.
- Kaldy, Z., Blaser, E., & Guillory, S. (2013). Infants can play the Memory Game: A novel anticipation-based object/location task. *Paper presented at SRCD*, Seattle, WA, April 18-21, 2013.
- Piaget, J. (1954). *The construction of reality in the child*. NY: Basic Books.

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