The development of visual working memory over the second year of life

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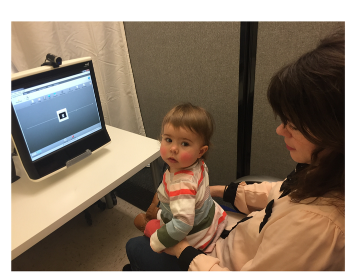
Introduction

- Visual working memory (VWM) emerges early, and is critical for nascent cognitive abilities and predicts academic achievement.
- While studies showed rapid development in VWM during the first year of life (e.g., Kaldy & Leslie, 2005; Cuevas et al., 2012), few studies have investigated its developmental trajectory during the second year longitudinally. One challenge has been to find a behavioral task that is suitable for both infants and toddlers.
- Previous longitudinal studies that examined the development of Executive Functions during the second year of life (e.g. Johansson et al., 2015; Miller & Marcovitch, 2015; Wiebe et al., 2010), found age-dependent increases, but results regarding individual stability over time were mixed.

Here we used Delayed Match Retrieval (Kaldy et al., 2016) to track VWM development longitudinally over the 2nd year of life.

Participants & Stimuli



T120 Tobii Eye Tracker

N = 30 infants (13 F)

Visit1: M = 15.6 months (range: 14.3 - 17.4 months);

Visit2: M = 19.5 months (range: 17.8 - 22.6 months);

Complex, abstract objects were used on the faces of virtual cards:

Acknowledgement & References

This project was supported by NIH #1R15HD086658. Contact: chen.cheng001@umb.edu

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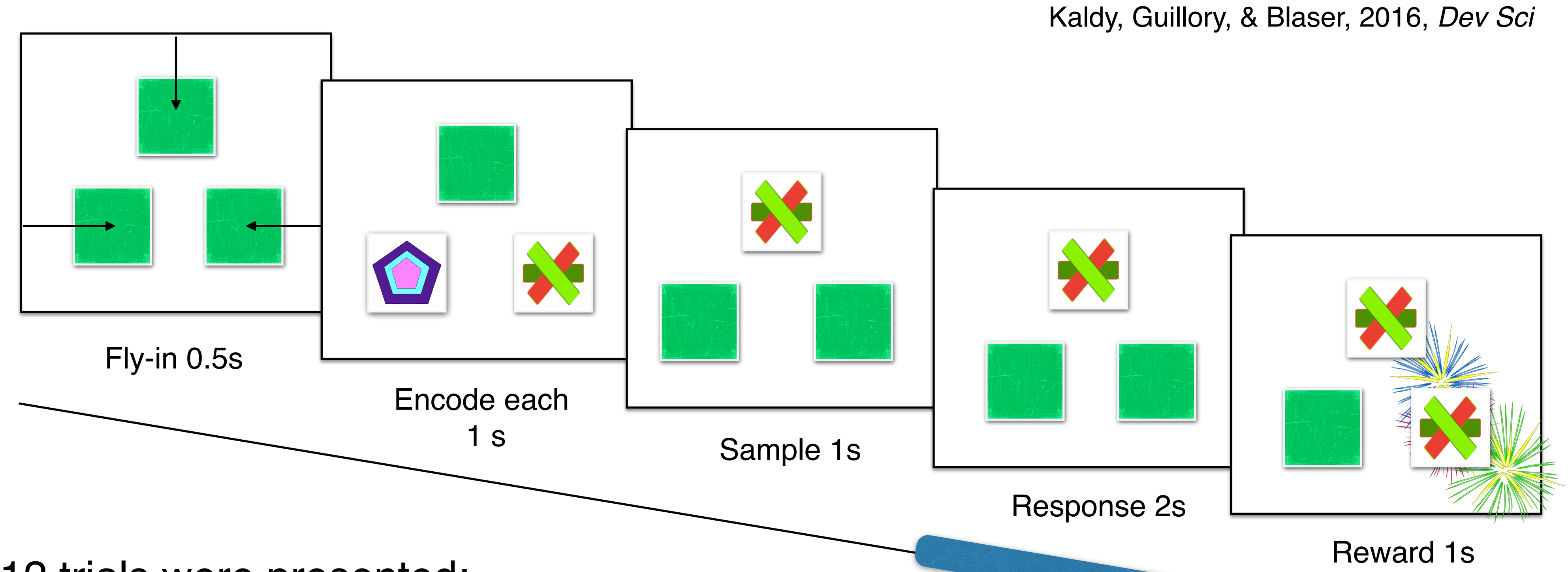
- Cuevas, Bell, Marcovitch & Calkins (2012). Electroencephalogram and heart rate measures of working memory at 5 and 10 months of age. *Dev. Psych. 48*: 907–917
- Johansson, Marciszko, Brocki, & Bohlin (2016). Individual differences in early executive functions: A longitudinal study from 12 to 36 months. *Inf. Child. Dev. 25*: 533–549.
- Kaldy, Guillory, & Blaser (2016). Delayed Match Retrieval: A novel anticipation-based visual working memory paradigm. *Dev. Sci. 19*: 892–900.
- Kaldy & Leslie (2005). A memory span of one? Object identification in 6.5-month-old infants. *Cognition 57*: 153–177.
- Miller & Marcovitch (2015). Examining executive function in the second year of life: coherence, stability, and relations to joint attention and language. *Dev. Psych. 51:* 101–114,
- Wiebe, Lukowski, & Bauer (2010). Sequence imitation and reaching measures of executive control: A longitudinal examination in the second year of life. *Dev. Neuropsychol. 35*: 522–538.

Method

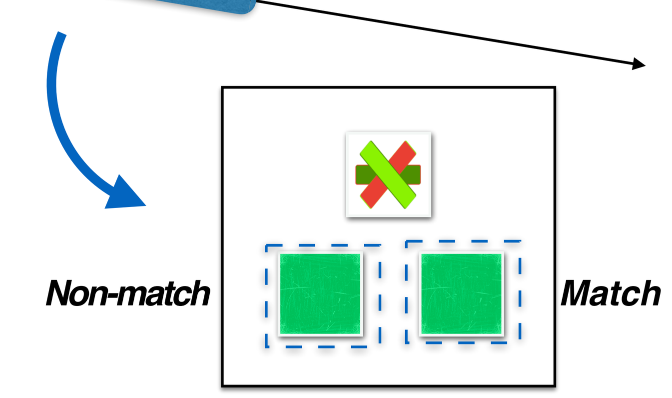
Delayed Match Retrieval (aka 'Memory Game')

Kaldy, Guillory, & Blaser, 2016, *Dev Sci*

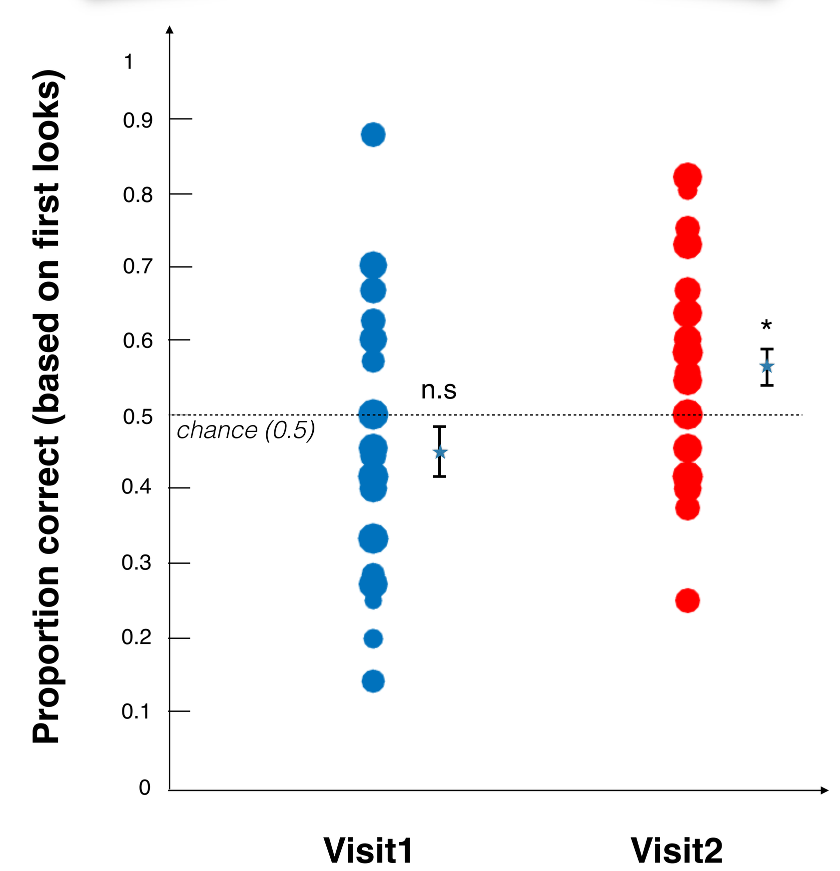


12 trials were presented; each trial was followed by an attention grabber.

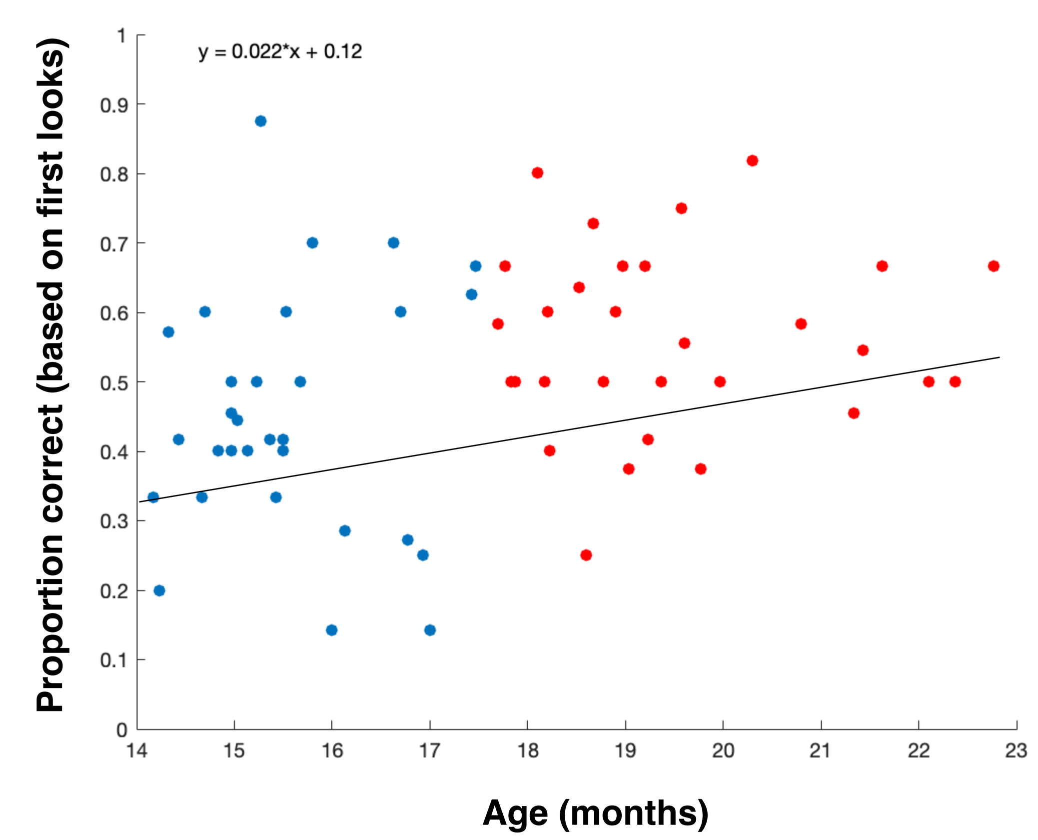
Dependent variable: Proportion of of trials with **first looks** to *Match* card during *response phase*



Results

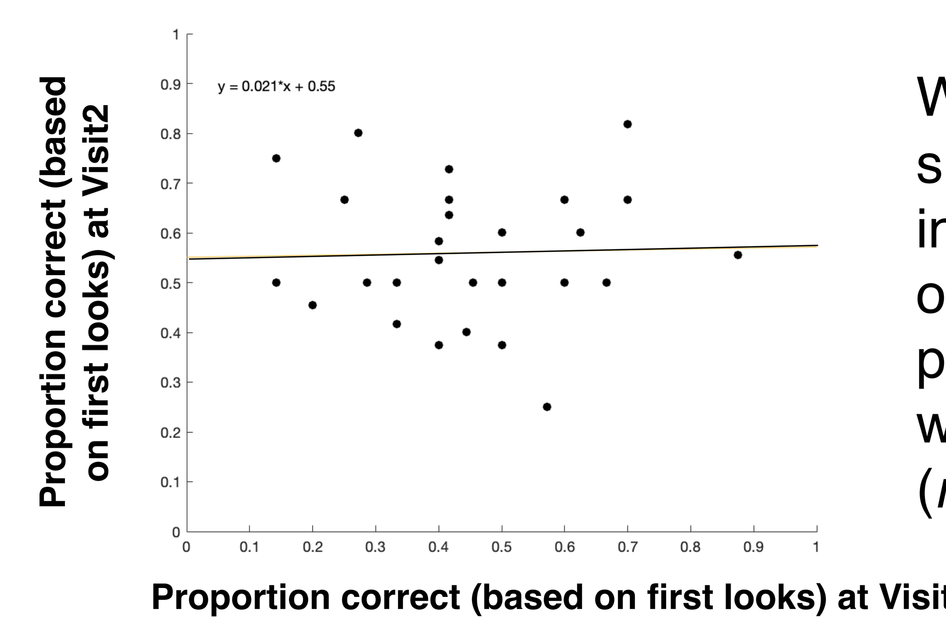


Performance was at chance at Visit1 (45% correct, p = n.s.), but was significantly above chance at Visit2 (56% correct, p = 0.019).

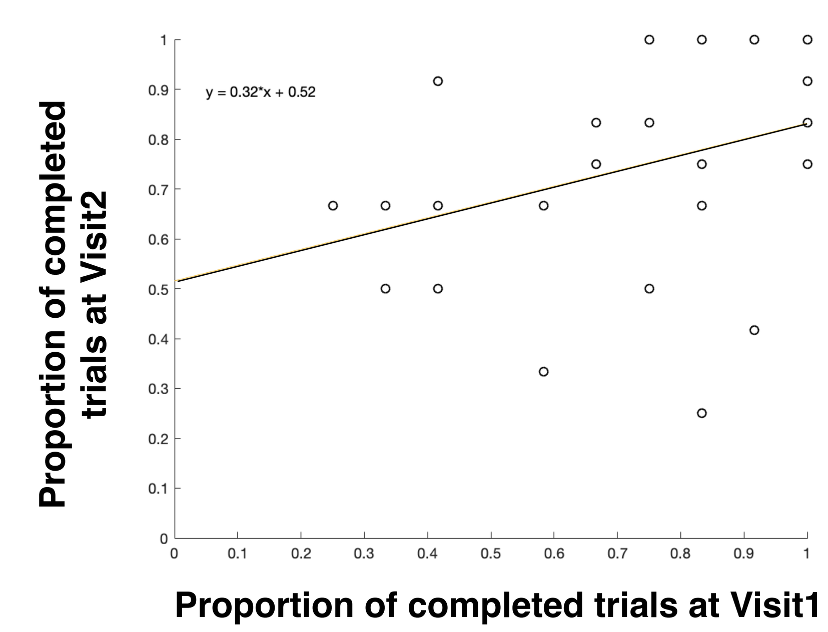


We found a significant age-related increase in VWM performance (r = 0.32, p = 0.014).

The correlation between performance and number of completed trials was not significant (r = 0.10, p = n.s.).



We did not find significant individual stability of VWM performance within our sample (r = 0.03, p = n.s.).



The correlation between the number of completed trials at Visit1 and Visit2 was marginally significant (r = 0.36, p = 0.054).

Discussion

- VWM performance improved from 16 to 20 months of age.
- Similarly to previous studies (Wiebe et al., 2010; Miller et al., 2015), we did not find significant within-individual stability of performance in our VWM task.
- However, the number of completed trials correlated between the two visits, that is, sustained attention showed some individual stability. Number of completed trials did not correlate with VWM performance (similarly to findings by Choudhury & Gorman, 2000)
- (Overall VWM performance was lower than in Kaldy et al. (2016), since the target items were visually more complex, abstract shapes.)