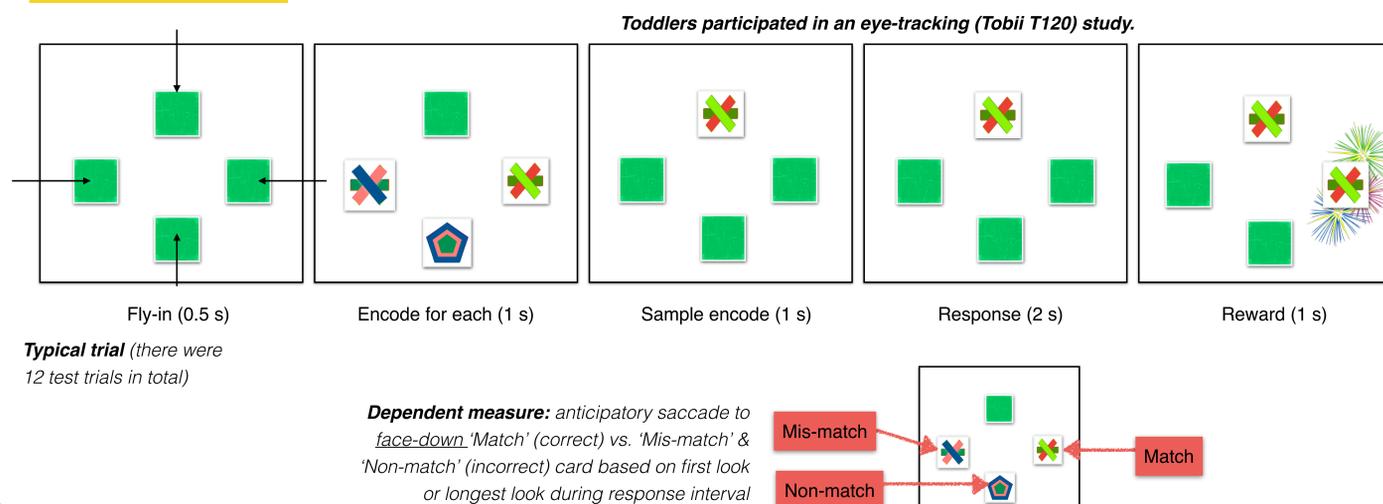


Background

- Effective VWM requires both capacity, and the ability to retain information about object features.
- VWM capacity increases rapidly over early development, but feature memory develops later, and more slowly:
 - Heterogeneous objects help to overcome VWM limits in 18-month infants (Zosh & Feigenson, 2014);
 - Precision of VWM increases in 4- to 7-years old (Guillory et al., 2017; Simmering & Patterson, 2012).
 - Protracted development in resolution of VWM during childhood and early adolescence (Heyes et al., 2012).

Methods

Procedure *Delayed Match Retrieval*



Stimuli

Trial type		Match (Target)	Mis-Match (Distractor)	Non-Match (Non-target)
Color	Single-feature			
	Multi-feature			
Shape	Single-feature			
	Multi-feature			

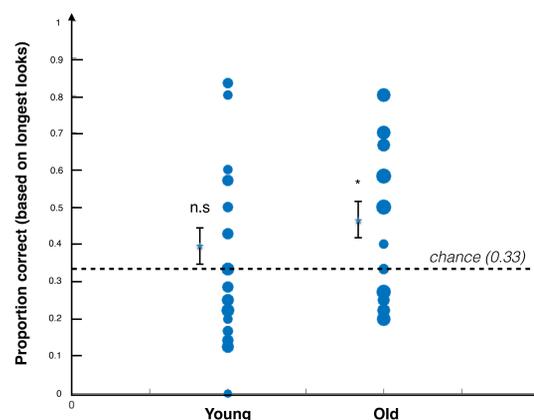
Research question

- Little is known about feature memory in the 'toddler gap', 2- to 3-year olds. We applied Delayed Match Retrieval (DMR; Kaldy et al., 2016) to determine:

Can we expose biases and limitations in feature memory by looking at how toddlers misremember?

Are there measurable improvements in feature memory during toddlerhood?

Results



	Match	MisMatch	NonMatch
Young	39%	27%	34%
Old	45%	27%	28%

Proportion correct (based on longest look)

	Match	MisMatch	NonMatch	
Young	Correct	0.47s	0.22s	0.42s
	Incorrect	0.23s	0.43s	0.41s
Old	Correct	0.48s	0.24s	0.25s
	Incorrect	0.23s	0.39s	0.40s

Average dwell time on face-down cards during Response interval (2 s)

Overall performance in Delayed Match Retrieval VWM task

- The older group performed significantly better than chance ($t = 2.44, p = 0.028$) based on longest look.
- The younger group was not significantly above chance.

Interactions with trial type

- There was no significant difference in the rate of mistakes to the MisMatch vs. NonMatch card, in either age group.
- Both groups tended to perform better in single-feature trials than multi-feature trials, but not significantly (in old: $M=47%, t=1.76, p = 0.1$).
- Performance was better on Shape than Color trials, but only for the older age group (performance on Shape trials was significantly above chance ($M=48%, t=2.21, p=0.04$), while performance on Color trials was not).
- For both groups, dwell time on the Match card when correct, and the MisMatch and NonMatch cards when incorrect, were similar.

Discussion

- We found a developmental increase in VWM in 2- to 3-year olds.
- However, there were no significant trends, with respect to similarity, in how toddlers *misremembered*; there was no bias to mistakenly choose the MisMatch card over the NonMatch, even though it was nominally more similar to the Match.
- We found a suggestive trend toward better performance on the simpler, single-feature trials. As well, older children seemed to exhibit a 'shape-bias', performing better on trials where remembering shape was sufficient for success.
- Taken together, at least with these (complex) stimuli, it seems that objects are remembered - and forgotten - as a whole.

Acknowledgement & References

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 Guillory, S. B., Gliga, T., & Kaldy, Z. (accepted). Quantifying attentional effects on the fidelity and biases of visual working memory in young children. *Journal of Experimental Child Psychology*.
 Burnett Heyes, S., Zokaei, N., van der Staaij, I., Bays, P. M., & Husain, M. (2012). Development of visual working memory precision in childhood. *Developmental science*, 15(4), 528-539.
 Kaldy, Z., Guillory, S. B., & Blaser, E. (2016). Delayed Match Retrieval: a novel anticipation-based visual working memory paradigm. *Developmental science*, 19(6), 892-900.
 Simmering, V. R., & Patterson, R. (2012). Models provide specificity: Testing a proposed mechanism of visual working memory capacity development. *Cognitive development*, 27(4), 419-439.
 Zosh, J. M., & Feigenson, L. (2015). Array heterogeneity prevents catastrophic forgetting in infants. *Cognition*, 136, 365-380.
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Participants

Two groups of toddlers participated in the study.
 Young: N = 19, Mean = 28 months, range = 25;19 - 30;04
 Old: N=16, Mean = 33 months, range = 32;00 - 37;24