## METHODS

We conducted a partial report, post-cue iconic memory test for color, revealing a five-object capacity in 6-month-olds. Given that this was the first-ever test of infants' iconic memory, we had to develop a new methodology. It is worth discussing here some of its aspects, and how it varied from traditional tests of iconic memory in adults; adjustments were made to stimuli, pacing, cueing, and reporting.

For instance, we tested memory for color instead of using a more traditional alphanumeric identity task to make the memory task more appropriate for infants, more amenable to quantification (say, for calibrating difficulty in follow-up experiments by varying the salience of to-be-remembered color changes (Kaldy & Blaser, 2009)), and in order to sidestep concerns about contamination from figural afterimages (Coltheart, 1980). In adults, there have been a few studies of iconic memory for features such as size, shape and motion (Palmer, 1988; Treisman, Russell, & Green, 1975) with results similar to those using alphanumeric stimuli.

As well, our trials began (after an attention-grabbing sequence) with a 1 second exposure of the display. This relatively long exposure helped to slow the pacing of trials, giving infants a better chance to orient to the display before cueing. Exposures in classic iconic memory tests are typically much shorter (Gegenfurtner & Sperling, 1993) due to fears that observers might code the display into long-term memory. Given the dynamic nature, considerable trial-to-trial memory interference, and infants' lack of both semantic coding and task knowledge, we felt there was little risk of the formation of useful long-term memories.

After 1 second of exposure, a pair of to-be-remembered objects disappeared, with their offset itself serving as the post-cue to remember them. For adult observers, it is trivial to implement partial report; adults understand cues. However, most cues that come to mind—arrows, surrounding boxes, auditory cues—are inappropriate for infants. We used stimulus offset because it required no cognitive interpretation and no additional visual events, but yet could drive selection in a ‘bottom-up’ exogenous fashion to the relevant objects stored in iconic memory. (Note too here that this procedure allows for the rest of the display to remain visible, again, so as not to distract infants with the introduction of irrelevant visual events.) Useful post-cues must follow quickly after stimulus offset, lest the relevant contents of iconic memory decay before they have a chance to be read out (Gegenfurtner & Sperling, 1993; Graziano & Sigman, 2008) into more ‘durable’ short-term storage (Coltheart, 1980). This offset cue has the benefit of being effectively a zero-latency post-cue. (Our results show that the offset cue was effective. In general, cueing has been shown to be effective as early as 4 months of age (Johnson & Tucker, 1996; Farroni, Johnson & Csibra, 2004).).

After the cue, there was a 500 ms retention interval. A longer retention interval such as this does run the risk of allowing for decay from short-term memory—meaning we may be underestimating overall performance—but has the advantage, again, of slowing the pace of the experiment for infants. Whatever information was successfully read out from iconic memory following the offset cue, and stored in short-term memory during this retention interval, could then be queried during report.

Of course, infants cannot be directly asked what they remember, so here the reappearance itself of the pair initiates ‘report’ by prompting a before/after comparison that exploits infants’ novelty preference. Each trial was then treated as a two-alternative forced-choice between the Changed and Unchanged object: Infants will fixate the Changed object longer if and only if they note that its present color does not match its remembered color. However, with this type of before/after procedure, there is a concern that infants may orient to the Changed stream because of a potential ‘flicker’ artifact generated by two stimuli of disparate luminance occurring in succession, as the change in color may produce a concomitant change in luminance. The usefulness of this sort of artifact, though, should not be affected by set size (Philips, 1974), yet we find significant effects of set size (for our adult observers, too). As well, this sort of artifact is both masked by the relatively large luminance change that accompanies the offset and re-onset itself, and diminishes with longer delays between the offset and re-onset. Indeed, work by Ross-Sheehy, Oakes and Luck (2003), showed that while 6.5-month-olds are sensitive to flicker when there is no delay between exposures, they are wholly insensitive with a delay of just 250 ms, *even with 26 repetitions of the exposure sequence per trial*. Given this, we are confident that our single exposure trials with a 500 ms delay are free from flicker artifacts.

Finally, performance was coded for each set size in terms of percent correct, that is, the percent of trials in which the participant preferred the Changed item. Coding data in this way, as opposed to dealing with raw fixation durations, or latency to first fixation, allows for the straightforward comparison between infant and adult data. To fit infants’ pattern of performance as a function of set size, we estimated two parameters: asymptotic performance and Cowan’s K. The values that minimize the sum of squared error are 61.2% correct and a capacity, K, of 5. For adults, we assumed asymptotic performance of 100% and only estimated capacity; K = 5.75. These fits are shown here. (see Supplementary Figure S1).

*Supplementary Figure S1*. Cowan's K fits. Gray curves show fits to observed performance for infants (open symbols) and adults (closed circles; error bars reflect standard errors).

# References

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