

Erik Blaser, Zsuzsa Káldy, Henry Lo & Marisa Biondi

Department of Psychology, University of Massachusetts Boston, 100 Morrissey Blvd., Boston, MA 02125

Goal: Compare memory for different features.

Challenge: How can we be sure that, e.g., our color memory test is equally difficult to our motion one?

Solution: Calibrate memory stimuli to be iso-salient

Introduction

To what extent infants use one feature dimension developmentally before another can only be studied legitimately if experimental manipulations to those features are equally *salient* (Kaldy, Blaser, & Leslie, 2006; Kaldy & Blaser, 2009).

The goal of this study was to compare infants' visual working memory (VWM) for static features (color, luminance) and a dynamic feature: rotation speed.

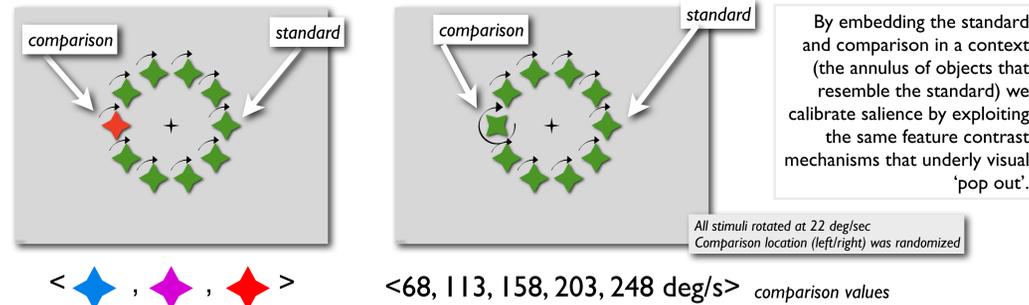
An initial salience-mapping calibration allowed us to find changes to an object's appearance (color, motion or luminance) that were equally salient.

Just as boxers are matched by weight class, memory for these iso-salient changes could be fairly compared in before/after tests of VWM.

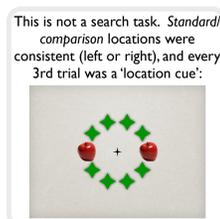
Salience calibration

A *comparison* object was pitted against a *standard* object (a green, slowly rotating star).

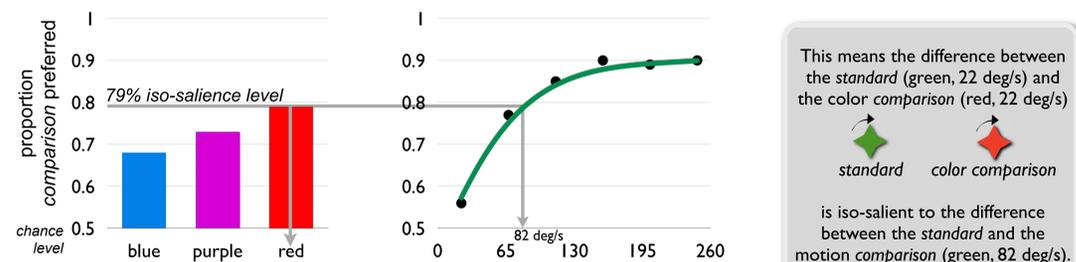
In color blocks, the *comparison* took 1 of 3 color values randomly from trial-to-trial; in motion, 1 of 5 speeds.



We monitored infants' gaze to see how often infants preferred (fixated longer) the differently-colored (or faster-spinning) comparison as opposed to the standard, as a function of the comparison's value.



Infants were tested with 2 blocks. Each block had 20 test and 6 location cue trials.



We can then use an iso-salience level to define comparisons that have equally salient differences from the standard.

Data collected for luminance did not yield high enough preference levels and was not used.

Results

We used a novel salience-mapping method to calibrate the salience of feature differences.

Data collection is ongoing, but early trends point to better memory for color than for motion, importantly, when the difficulty of the memory tasks has been equalized.

Discussion

Our main goal was to call attention to the need for carefully calibrated stimuli in infancy research and to demonstrate an empirical methodology for achieving psychophysically comparable stimuli. We employed such stimuli in a visual working memory test where, crucially, to-be-remembered changes made to stimuli were equally salient.

Researchers in infant cognitive development have argued that motion is central to establishing object representations (e.g. Rakison & Lupyan, 2008).

However our preliminary results showed no significant memory for motion (rotation speed).

These results are consistent with our ecological principles hypothesis that holds that infants better remember features that are more reliably diagnostic of object identity (e.g. color and shape, as opposed to speed and luminance).

References

Kaldy, Z., Blaser, E., & Leslie, A. (2006). A new method for calibrating perceptual salience across dimensions in infants: The case of color vs. luminance. *Developmental Science*, 9, 482-9.

Kaldy, Z. & Blaser, E. (2009). How to compare apples and oranges: Infants' object identification tested with equally salient shape, luminance and color changes. *Infancy*, 14, 222-43.

Rakison, D. H. & Lupyan, G. (2008). Developing object concepts in infancy: An associative learning perspective. *Monographs of the Society for Research in Child Development*, 73, 1-110.

What is salience?

A bottom-up prioritization of visual information that depends on context.



It is not an inherent property of objects.

General Method & Participants

Infants sat on their parent's lap and watched computer generated animations.

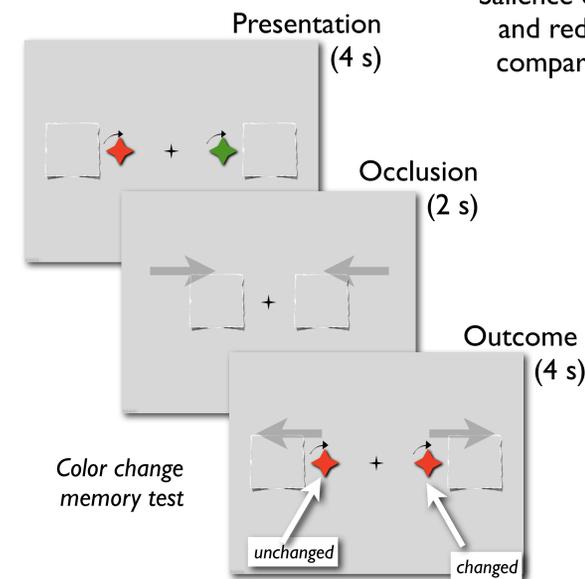


Infants' gaze was monitored using a Tobii T120 eye tracker.

Participants, Salience-mapping: Twenty-seven 6-month-old infants (range: 5;0 - 6;30). Motion: 9 infants (4 females, 170+/-16.5 days); Color: 8 infants (4 females, 186+/-23.6); Luminance: 10 infants (4 females, 165+/-16.9). Memory: Thirteen 6-month-old infants (range: 5;0-6;30, 6 females, 178+/-18 days).

Memory tests

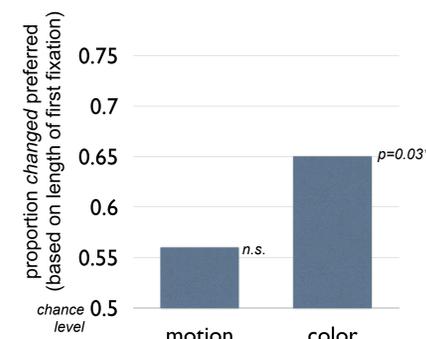
Salience calibration gave us two stimulus pairs: a color change pair (standard and red comparison) and a speed change pair (standard and fast-spinning comparison). These pairs were employed in our before/after VWM tests.



Infants were run in 2 blocks. Each block had 3 familiarization trials followed by 12 test trials.

We monitor gaze to determine if infants prefer (look longer at) the changed object.

Will infants more readily note a color or rotational speed change made to a briefly occluded object?



Preliminary results show that infants look significantly longer at the changed as opposed to unchanged outcome, but only in the case of color changes, not speed.

This is evidence for better maintenance of color, as opposed to motion, information in VWM.