

Infants' visual working memory for shape, luminance (and color) tested with equally salient objects.



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Summary

The question of whether infants can use one visual feature developmentally before another (e. g. shape before color, color before luminance) can only be studied legitimately if those features, or manipulations to those features, are equally **salient** (Káldy, Blaser, & Leslie, 2006). The goal of this study was to compare infants' visual working memory for three object features: shape, luminance and color.

An initial calibration phase – **'Interdimensional Salience Mapping'**– allowed us to generate a luminance, a color and a shape comparison object whose salience differences from a common baseline object were equal.

Using the calibrated pairs we compared visual working memory for two of these three features in infants. Infants remembered shape, but not luminance where, crucially, the feature changes were equally salient. (Data collection is ongoing for the color comparison.)

What is salience?

The bottom-up prioritization of visual information that depends on context. It is not an inherent property of objects.

Operational definition: direction of first look.



General Method

Infants sat on their parent's lap and watched a computer animated movie on a 21" LCD monitor.



Iso-salience (Step 1)

Method

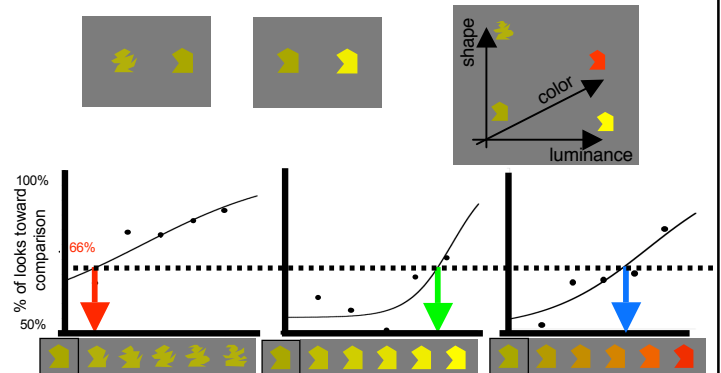
Salience for three feature changes was calibrated by pairing a baseline object (a yellow geometric figure) with another object that differed from the baseline either in shape, color or in luminance. Shape changes were achieved by varying the perimeter and number of edges in the comparison object, while keeping the area equal to that of the baseline object. A classic preferential looking paradigm was applied and the direction of the infant's gaze (left/right) was coded.

Subjects

23 9-month-old infants (range: 8;15 - 9;15, mean: 8;23).

Results

We have successfully measured psychometric functions of salience in infants for all three dimensions. Then we chose values along these dimensions - at 66% preference - that we used in the memory tests (Step 2).



Testing visual working memory (Step 2)

Method

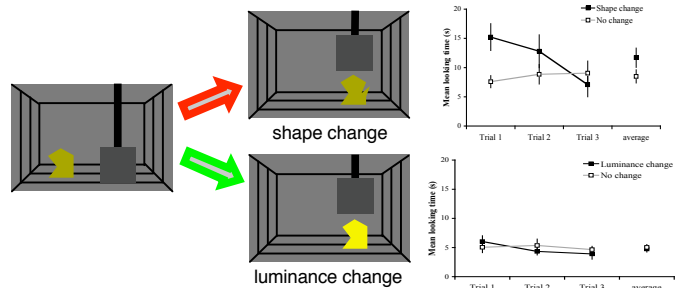
Infants were first familiarized to a pair of objects that differed in either shape, color or luminance. 4 familiarization trials (with alternating objects) were followed by 3 test trials. In test trials, infants were shown one of the two objects in the pair, which then disappeared behind a screen. After a 2 sec delay, either this same object or the other object from the pair was revealed. Looking times were measured.

Subjects

35 9-month-old infants (range: 8;15 - 9;15, mean: 9;1).

Results

9-month-old infants reacted to the shape change, which is evidence for the maintenance of shape information in visual working memory. Infants failed to note the change in luminance, as predicted from earlier studies. (The color study is ongoing.)



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 these stimuli in a visual working memory test where, crucially, changes in to-be-remembered stimuli were equally salient. Our present results are consistent with our "Ecological Memory" hypothesis, which predicts that more stable features of objects are better remembered; shape is a more reliable feature for identification than luminance.

Reference

Káldy, 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.

Acknowledgments

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