



DETECTION VS. SALIENCE OF COLOR AND MOTION-DEFINED STIMULI IN 6-MONTH-OLD INFANTS

Zsuzsa Kaldy, Erik Blaser and Melissa Kibbe
University of Massachusetts Boston, Department of Psychology



Summary

Basic visual functions develop rapidly during the first year of life. Since infants' endogenous attention system is not yet quite matured, visual salience (bottom-up priority value) has a primary role in controlling their visual attention. However, little research has compared the salience of different visual features (but see Kaldy and Blaser, 2004) and looked at the relationship between detectability and salience in infants. **Are visual features that are equally detectable also equally salient? Is detectability the only factor driving salience?**

First, we measured detectability of two perceptual features, color and spatial frequency, varying in contrast from a base background pattern of Gabor patches. We established which color and spatial frequency differences were iso-detectable.

Second, we pitted iso-detectable stimuli against each other using a preferential looking paradigm.

Our results indicate that detectability does not, by itself, predict salience. When iso-detectable stimuli are pitted against each other, five-month-old infants show a preference for spatial frequency. The results we present here suggest that salience values are determined by other factors besides detectability.

General Method

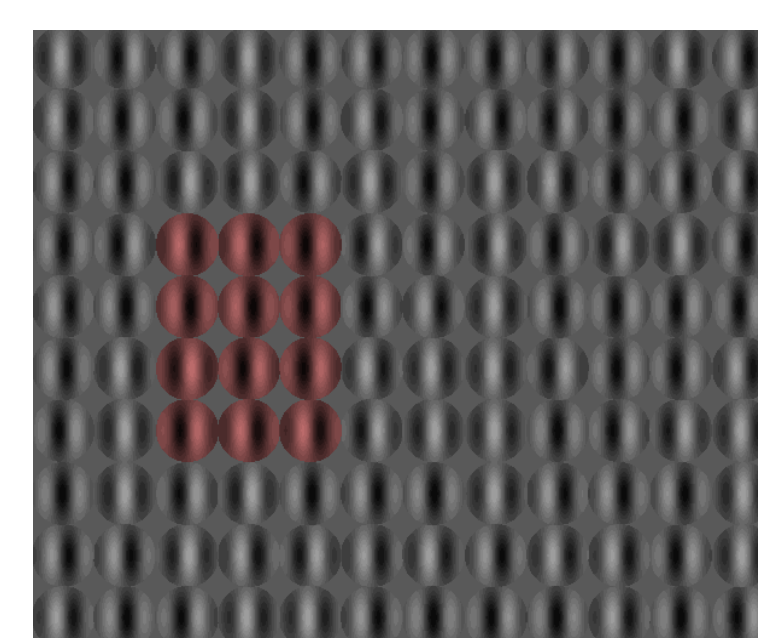
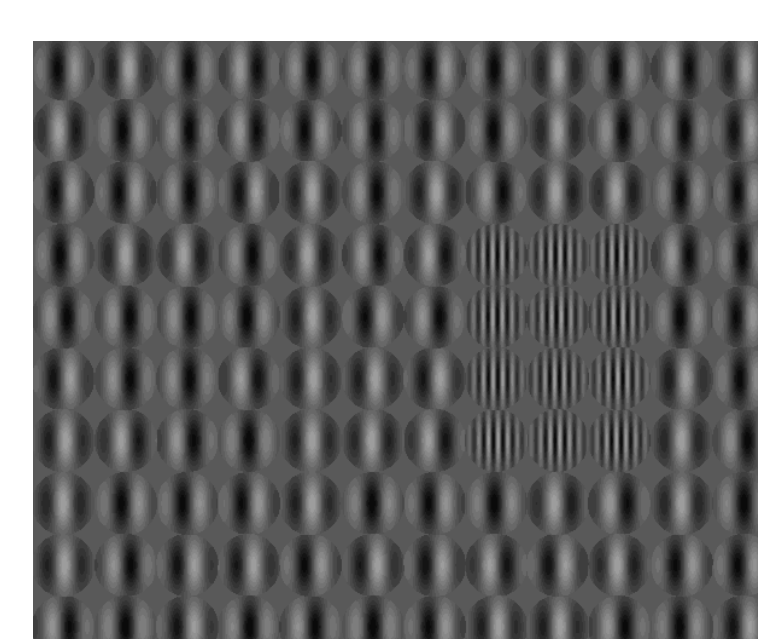
We measured detection thresholds, and then salience relations between iso-detectable stimuli, using the forced-choice preferential looking technique in 5-month-old infants.

Infants viewed stimuli on a 21" LCD while sitting on their parent's lap, at a viewing distance of approx. 60 cm.



Step 1: Calibrating Iso-detectability

Using a preferential looking paradigm, we measured detectability of two different visual features, color and spatial frequency, relative to the background.



Method

Stimuli consisted of a dense 20x20 array of randomly oriented Gabor patches, where a 3x4 region that differed from the background in either color (red saturation: 6-31%, background: 0%) or spatial frequency (1.5-4.5 cpd, background: 1 cpd) appeared either on the left or the right side of the field. Gaze directions were coded by two independent observers and the trial was only considered valid if the two observers agreed.

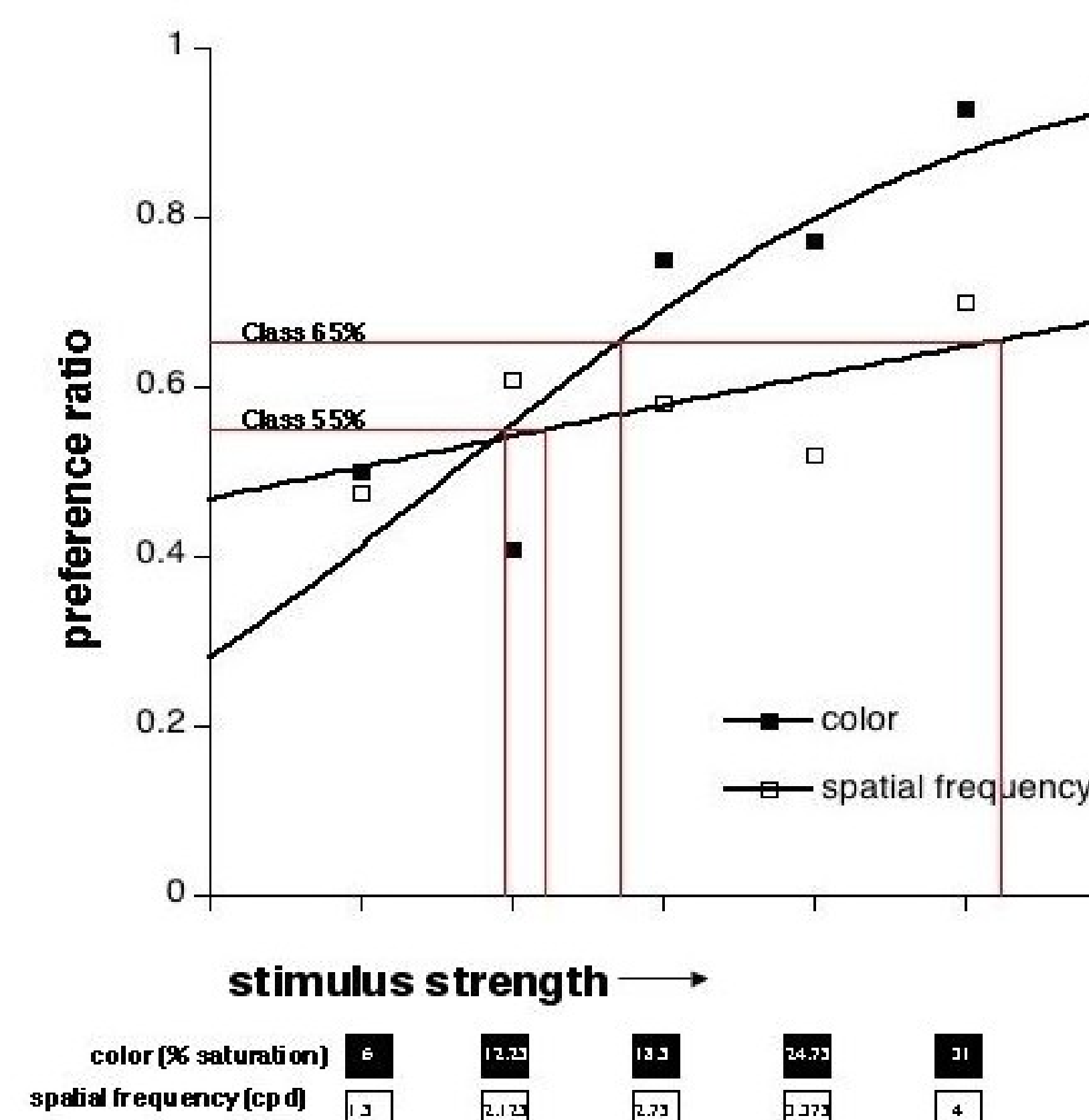
Subjects

Nine 5-month-old (range: 5;0 to 5;29, mean: 5;9) infants participated (2 females). One subject was excluded due to fussiness.

Results

Preference ratios for different color and spatial frequency levels are shown below. From this data, we determined two pairs of color and spatial frequency values which are iso-detectable: at 55% preference and at 65% preference for color vs. spatial frequency.

A hybrid pair was also constructed using the following values: class 65% color and class 55% SF vs. class 55% color and class 65% SF.

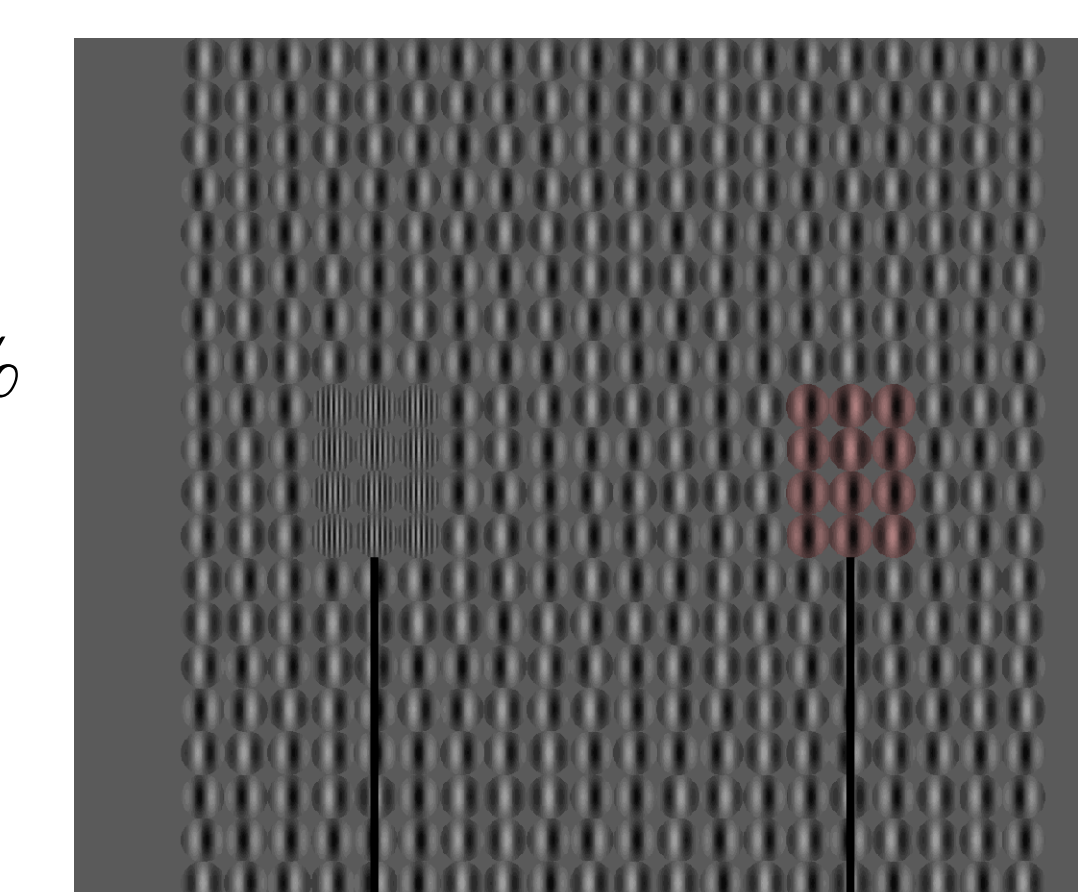


Step 2: Salience

We used a preferential looking paradigm with the pairs of iso-detectable stimuli that were calibrated in Step 1 to test whether stimuli which are iso-detectable will also be iso-salient.

Method

Two equally detectable (55% preference and 65% preference for color vs. spatial frequency) and a hybrid pair were pitted against each other on the same background as in the detection task. Gaze directions were coded the same way as in Step 1.



59% 41%

Subjects

Eight 5-month-old (range: 5;2 to 5;22, mean: 5;9) infants participated (5 females). One subject was excluded due to fussiness.

Results

When iso-detectable stimuli are pitted against each other, infants show a strong tendency to prefer the spatial frequency stimulus in the 65% detectability class (55 out of 93 trials, **59%** preference, χ^2 test: $p < 0.07$). In the hybrid pair comparison, there was an even stronger preference for the higher spatial frequency stimulus (54 out of 86 trials, **62%** preference, χ^2 test: $p < 0.02$), which corroborates the previous result. For the 55% detectability class comparison, we believe that the actual values may have been too close to infants' threshold to yield consistent results.

Conclusions

We found that **detection alone is not sufficient to predict salience**. When iso-detectable stimuli are pitted against each other, infants show a preference for spatial frequency. Our main result is congruent with the recent study of Zemach and Teller (2004). Our current studies explore different regions of the feature space for both detectability and salience.

References

- Kaldy, Z., Blaser, E. & Leslie, A. M. (in press). A new method for calibrating perceptual salience across dimensions in infants. *Developmental Science*.
- Zemach, I. & Teller, D. (2004). Infants' spontaneous hue preferences are not due solely to variations in perceived saturation. Poster presented at VSS, Sarasota, FL