

# Implicit multisensory statistical learning influences visual perceptual selection

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## Background

Predictive context (e.g., prior motion information in streams of rotating gratings) impacts the first percept selected during binocular rivalry (Denison, Piazza, & Silver, 2011).

“Low-level” motion congruency (Conrad et al., 2010) and “high-level” semantic congruency (Chen, Yeh, & Spence, 2011) between rivalrous images and simultaneous sounds impact perceptual selection of those images.

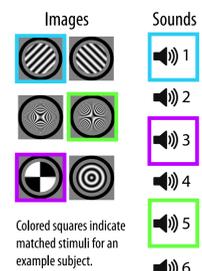
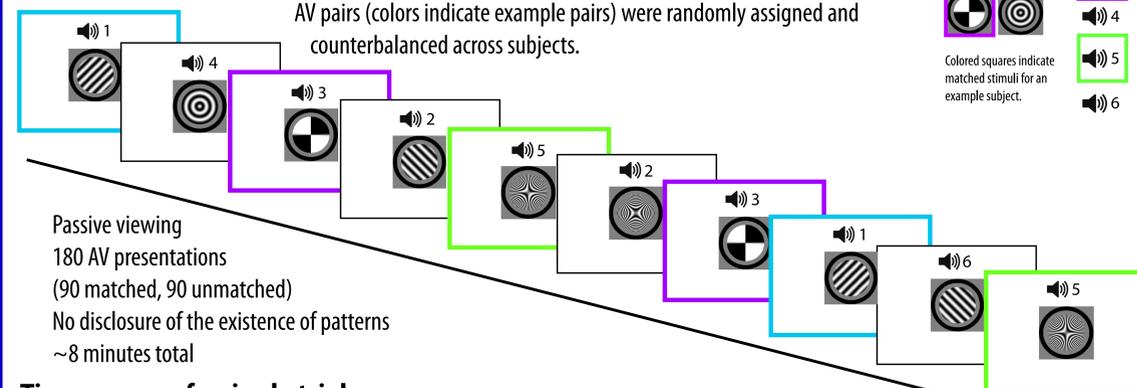
Adults and even infants can rapidly, implicitly learn statistical regularities in sequences of images (Fiser & Aslin, 2001), tones (Saffran et al., 1996), and auditory-visual stimuli (Kim et al., 2009).

Can recent, implicit learning impact perceptual selection?

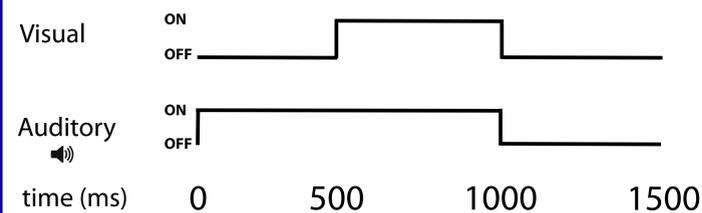
## Exposure

N = 13

Stimuli: 6 images (3 rivalry pairs), 6 sounds  
For each subject, 3 images (one from each rivalry pair) were consistently matched with 3 sounds during exposure.  
The other images and sounds were randomly intermixed during exposure.  
AV pairs (colors indicate example pairs) were randomly assigned and counterbalanced across subjects.



### Time course of a single trial

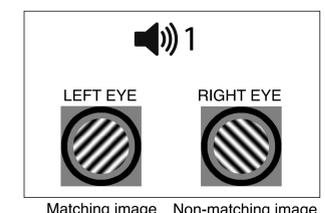
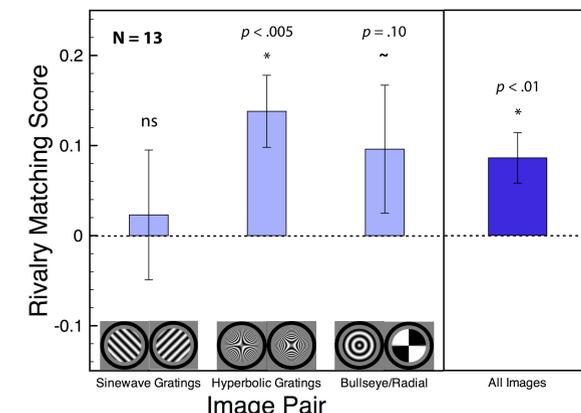
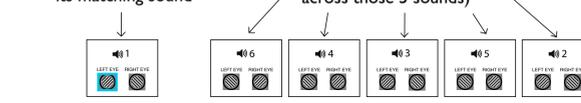


## Binocular Rivalry Test

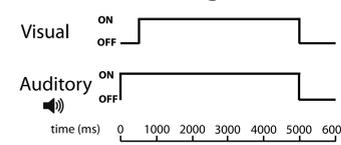
72 trials (~15 minutes)

### Rivalry matching score

% of 1st responses for a given grating when paired with its matching sound  
% of 1st responses for same grating when paired with non-matching sounds (averaged across those 5 sounds)



### Time course of a single trial



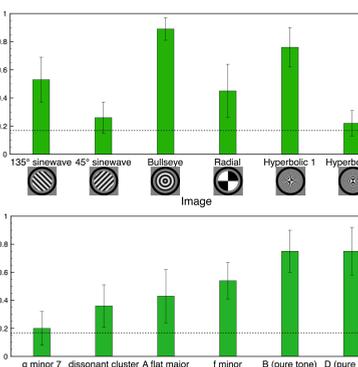
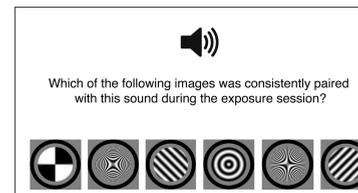
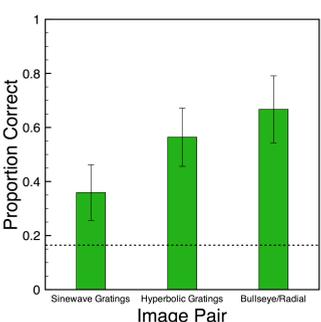
Rivalrous images were more likely to be initially selected when preceded by their matching sound than when preceded by non-matching sounds.

## Recognition Test

Directly followed the exposure phase

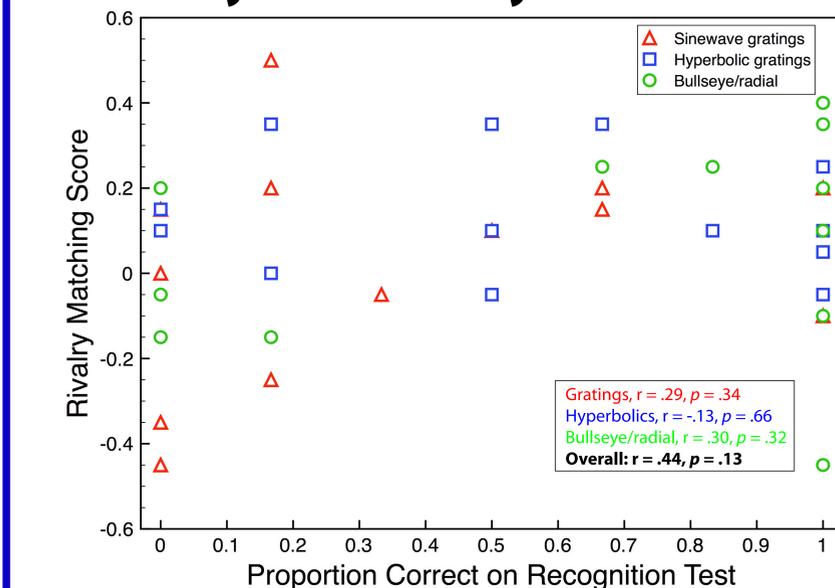
6 trials per matched sound (18 trials total, ~3 minutes)

Subjects selected from all 6 images (simultaneously presented and randomly ordered on the screen).



Subjects demonstrate above-chance recognition of the auditory-visual pairings immediately after the end of the exposure period, but it varies across sounds and images.

## Relationship Between Recognition Accuracy and Rivalry Effect



No significant correlation between recognition of a given pairing and the effect of exposure to that pairing on rivalry, which suggests that implicit learning of the pairings drives the rivalry effect

## Summary & Conclusions

After brief exposure to consistent, arbitrary pairings between sounds and images, subjects were more likely to initially select images during binocular rivalry when those images were preceded by their matched sound.

Ability to recognize a given pair was not correlated with the rivalry matching effect for that pair, indicating that unconscious learning drives the effect on perceptual selection.

Recent, implicit, cross-modal learning can impact what we see when faced with ambiguous stimuli, indicating an influence of rapid plasticity on perceptual selection.

## References & Acknowledgments

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