Learning and Transfer of Feature-Based Attentional Modulation

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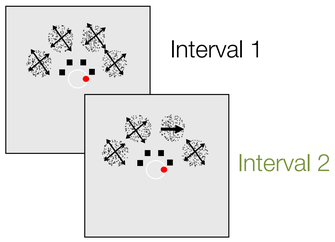
Introduction

- Under certain training conditions, perceptual learning can transfer across spatial location (Xiao et al., 2008; Zhang et al., 2013)
- Since feature-based attention is spatially global, learning to attend to features should transfer across spatial positions (Byers & Serences, 2012)

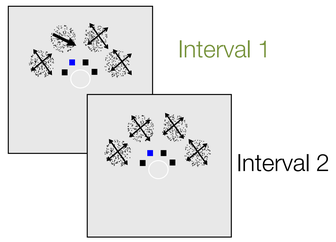
Question: How do feature-based attentional cues and spatial attention cues impact the magnitude of perceptual learning and its transfer?

Stimulus & Methods

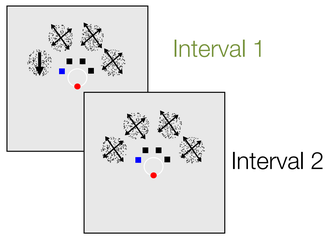
Feature Cue



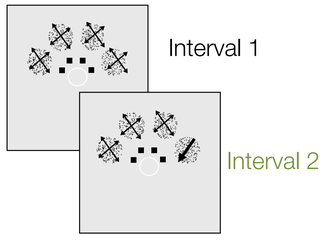
Spatial Cue



Combined Cue



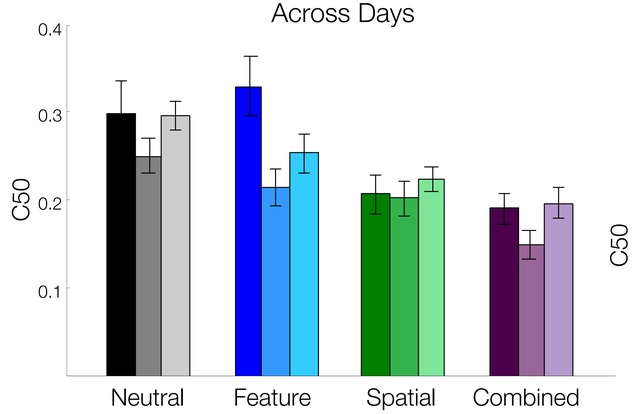
Neutral Cue



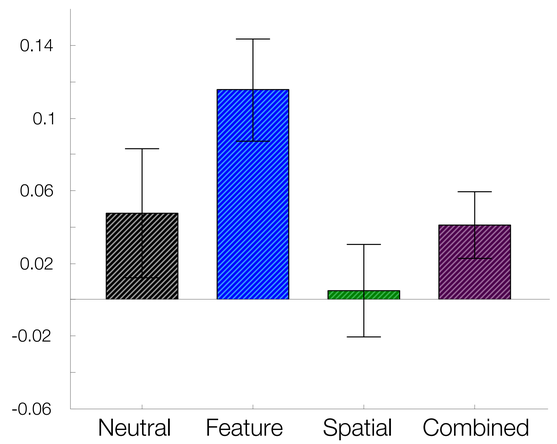
- 2IFC task: which interval had patch with coherent motion
- Cues 100% valid
  - Feature: direction of coherent motion
  - Spatial: location of patch with coherent motion
  - Combined: both feature and spatial cues
  - Neutral
- 6 target coherence levels
  - 0, 5, 10, 20, 40, 80%
- Distractors always 0% coherent

Feature-based attention, but not spatial attention, modulates learning and transfer

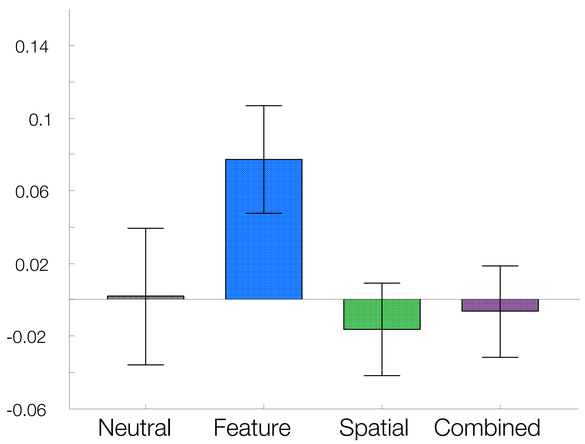
Across Days



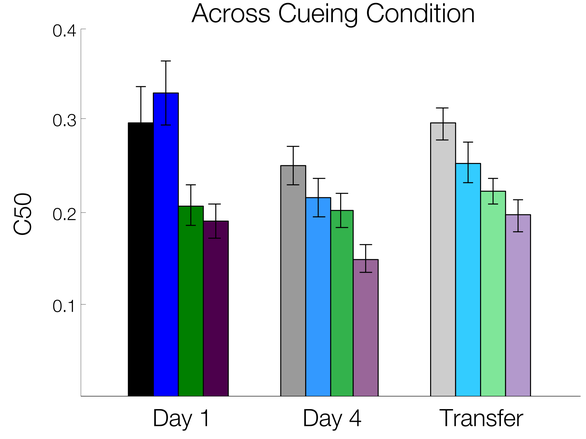
Learning (Day 1 – Day 4)



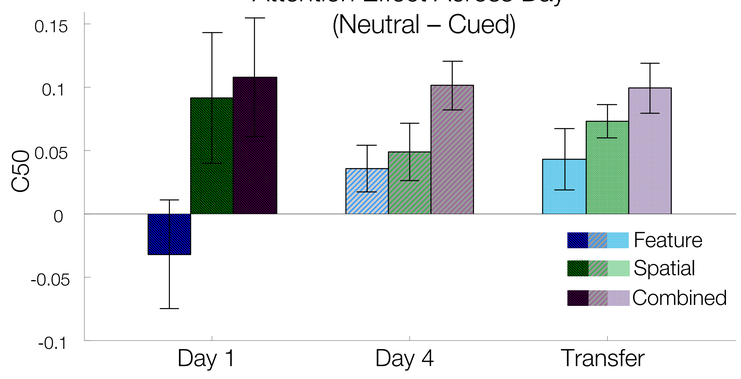
Transfer (Day 1 – Day 5)



Across Cueing Condition

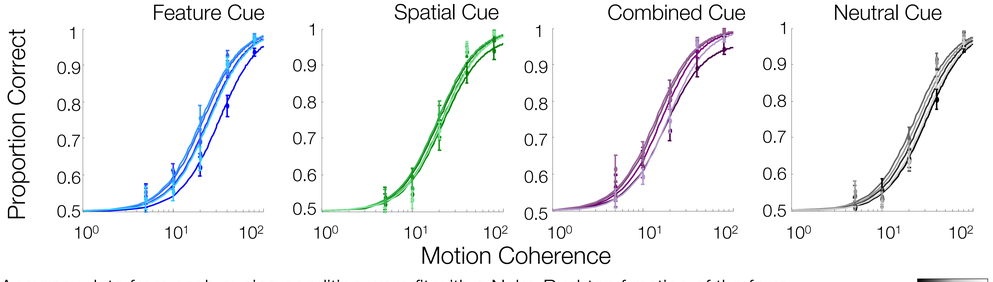


Attention Effect Across Day (Neutral – Cued)



- ❖ Effect of day and attention condition
- ❖ Only feature cue and combined cue trials show significant learning
- ❖ Only feature cue learning transferred across location

Curve Fitting



Accuracy data from each cueing condition were fit with a Naka-Rushton function of the form:

$$R(C) = a * \left(\frac{C^q}{C^q + C50^q}\right) + b$$

with amplitude (*a*) and C50 as free parameters.

C50 estimates were taken as threshold performance for each condition and training session

Conclusions

- Feature-based attention improves with training
- Improved feature-based attention transfers across spatial position
- Spatial attention supports better baseline perceptual performance, but does not improve with training
- Spatial attention and feature-based attention interact during learning

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