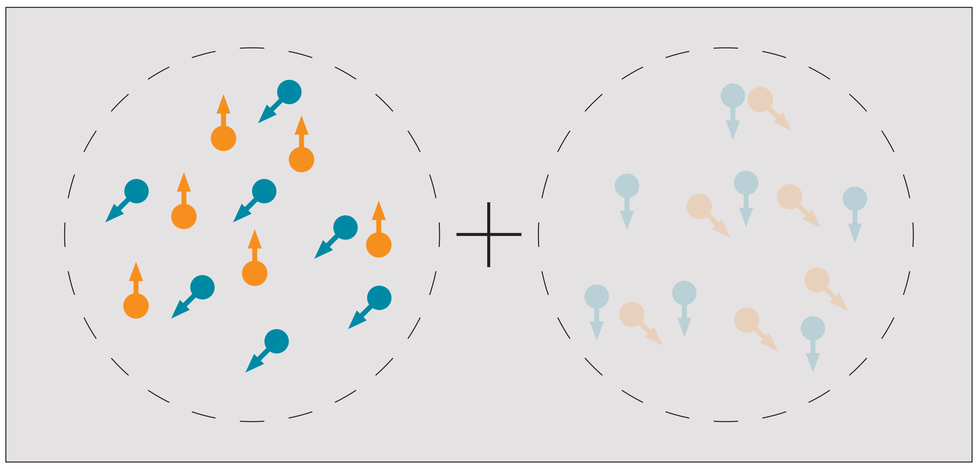
Putting spatial and feature-based attention on a shared perceptual metric

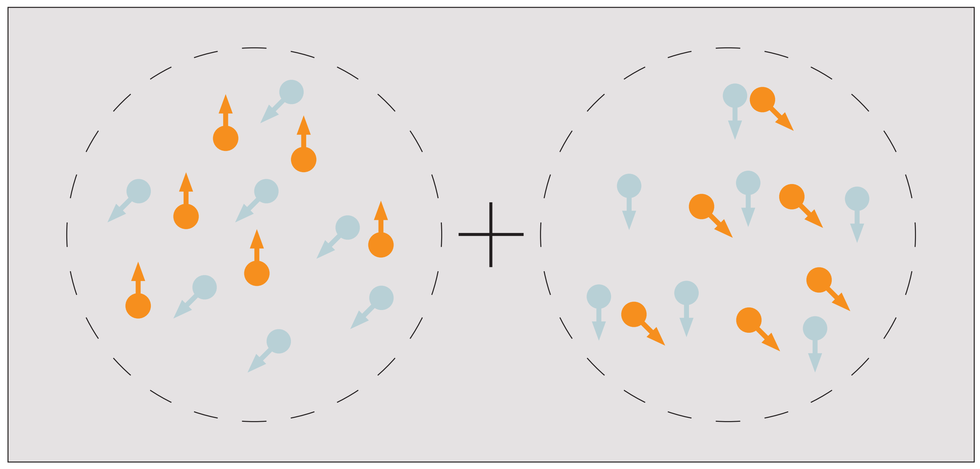
1. Introduction

How can we compare different forms of sensory selection? We used two tasks designed to measure perceptual sensitivity in which observers could either select information by location or by feature (e.g. color).

Selection by location:



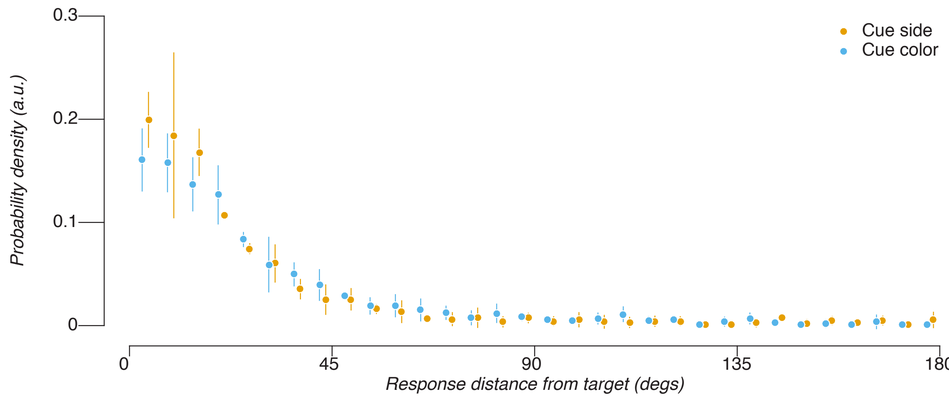
Selection by feature (color):

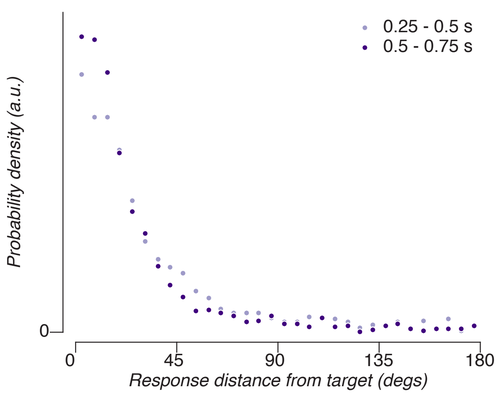


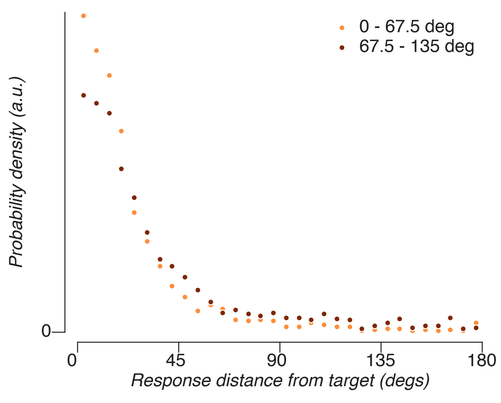
2. Similar strength of selection

Observers (n=4, >600 trials per subject) were asked to average the motion direction of two patches, selected by color or side.

Todo-task figure

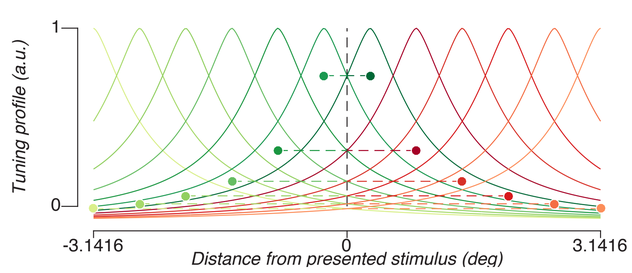


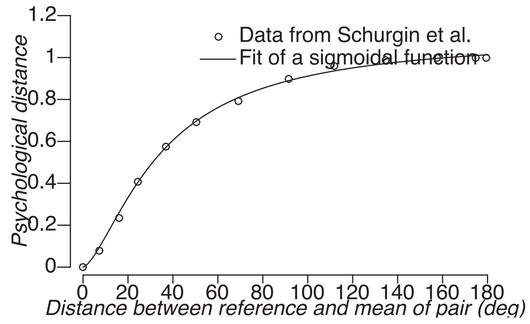




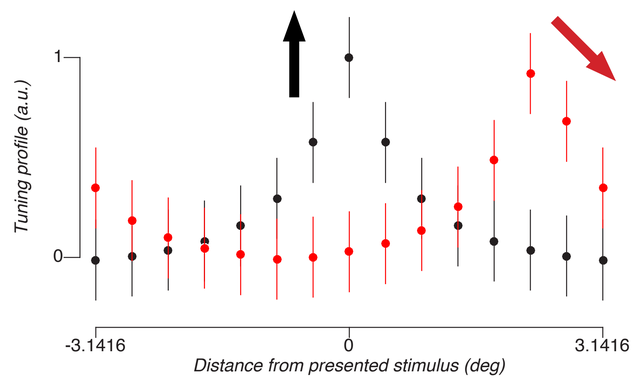
3. Model details

The model encodes the stimulus in independent “channels” tuned to the stimulus properties[1]. The number of channels controls the precision of predictions.





In the averaging task, two population codes are combined to solve the task.



The population codes can become more or less sensitive, or the readout can be biased by the codes of the irrelevant stimuli.

4. Just as good?

Averaging by spatial location and by color are about the same. Where do the small differences come from? Using a task with a single recall can show whether bias or perceptual sensitivity changes during selection.

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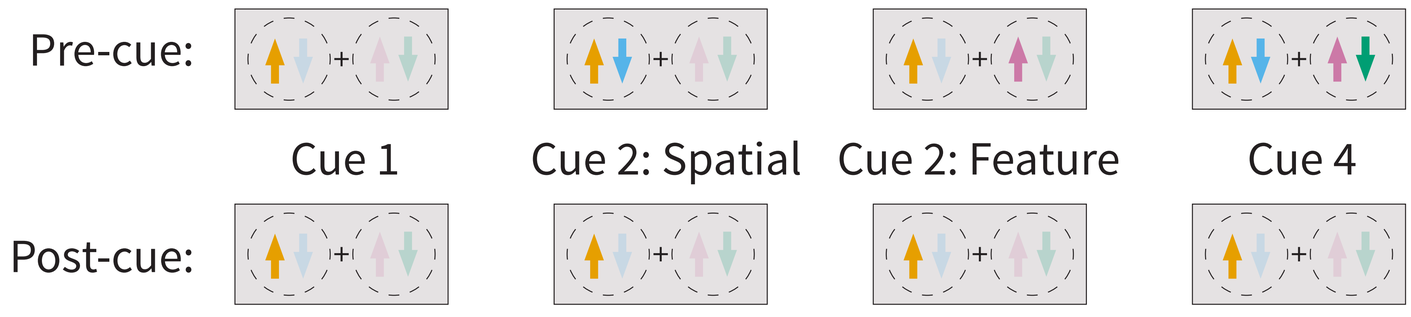
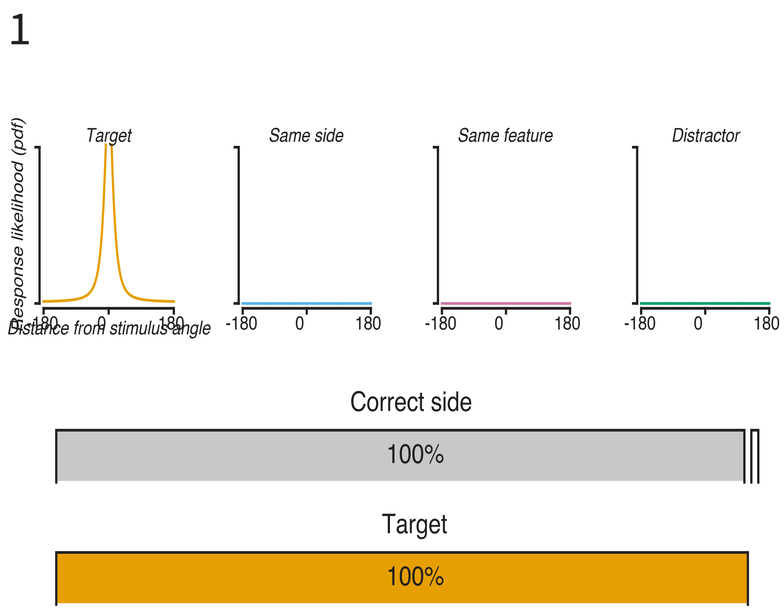
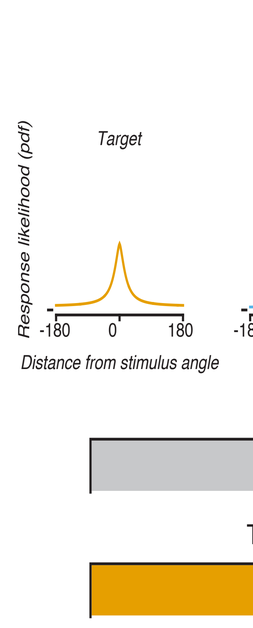
5. Bias due to spatial overlap

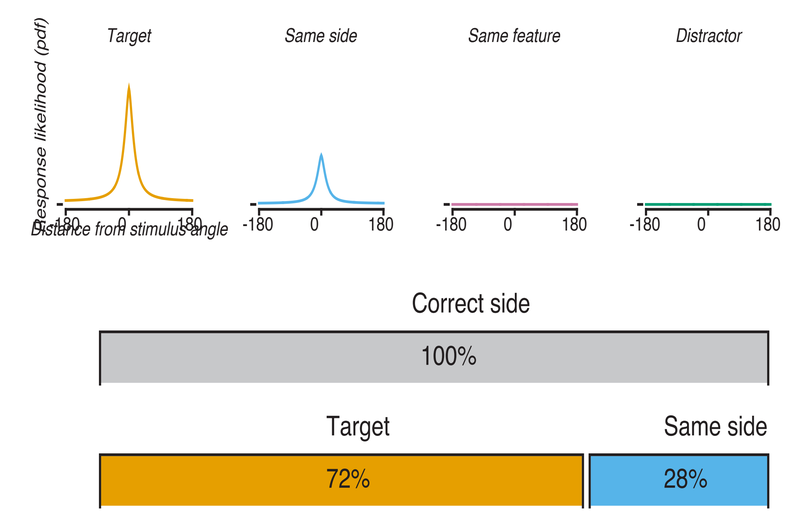
Observers (n=5) were asked to recall the color of a single patch. We varied what information was cued in advance to control sensory selection. (data from 250 ms duration)



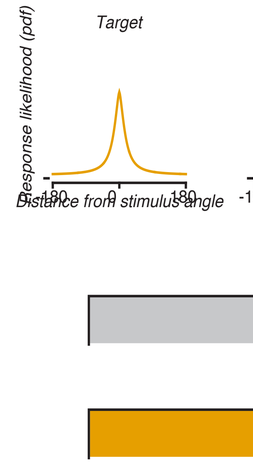




Cue 2: Spatial



Cue 2: Feature



At the time of readout, the channel with maximum activation is reported. Noise in the channels leads to response variability.

5. Similar selection hints at similar implementatio

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[1]Schurgin, M. W., Wixted, J. T., & Brady, T. F. (2018). Psychophysical Scaling Reveals a Unified Theory of Visual Memory Strength. BioRxiv, 325472.