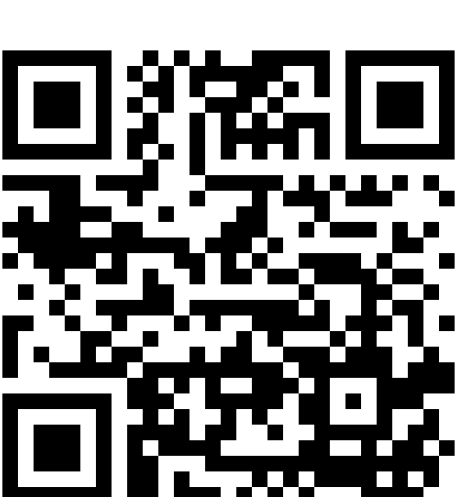




Examining the precision of spatial representations within visual cortex

IM Bloem^{1,2}, JFM Jehee^{3*}, SO Dumoulin^{1,2,4*}

¹Netherlands Institute for Neuroscience, ²Spinoza Centre for Neuroimaging, ³Donders Institute for Brain, Cognition and Behavior, ⁴Vrije Universiteit Amsterdam, *joint last authorship



Background

Spatial information within visual cortex is not uniformly organized:

Most prior work has focused on the rapid decline in precision with eccentricity

e.g. Hess & Hayes, 1994



Recent work shows asymmetries in behavioral performance at the meridians

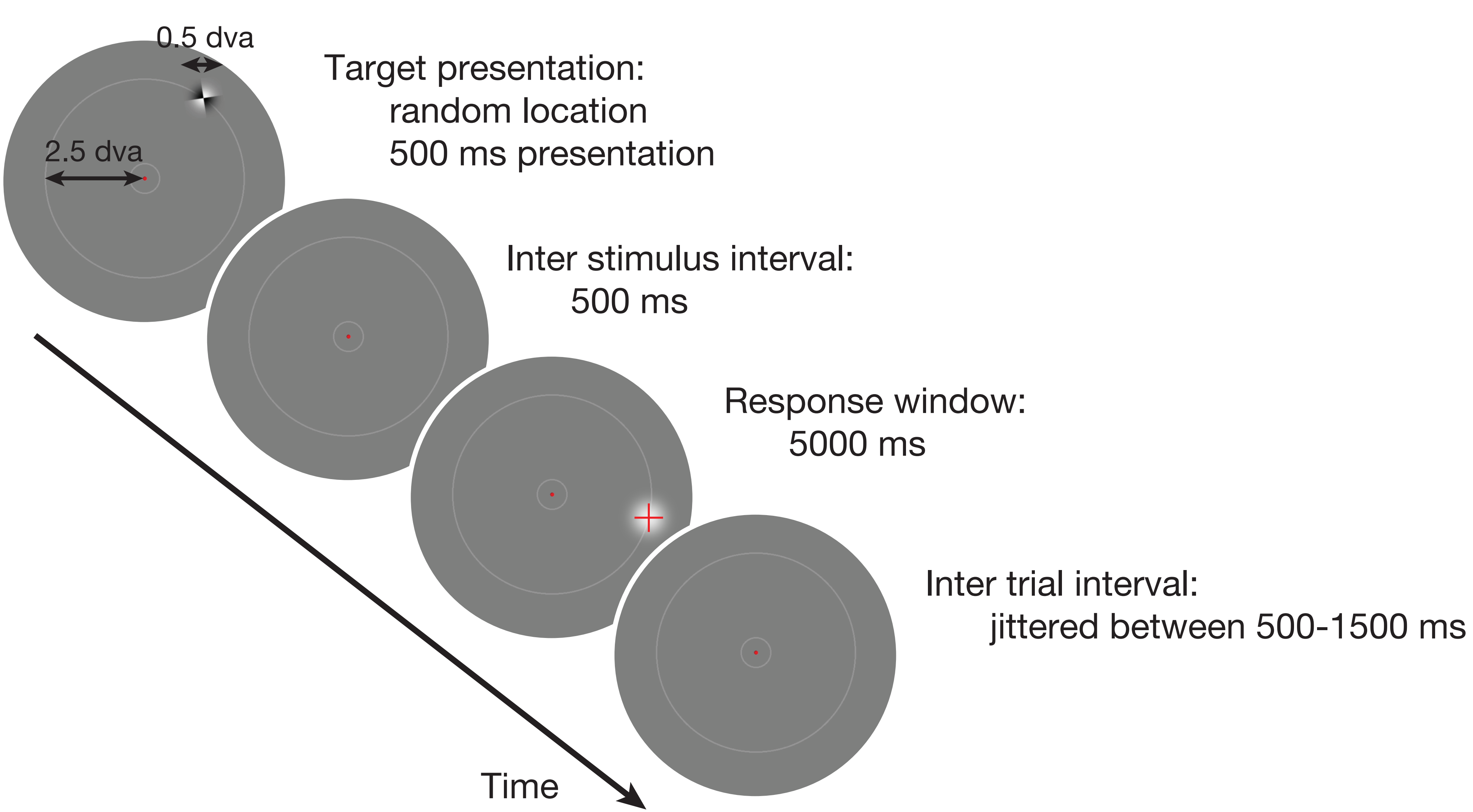
e.g. Himmelberg, Winawer & Carrasco, 2023

How do we sample spatial information along a continuum of polar angle?

Behavioral experiment

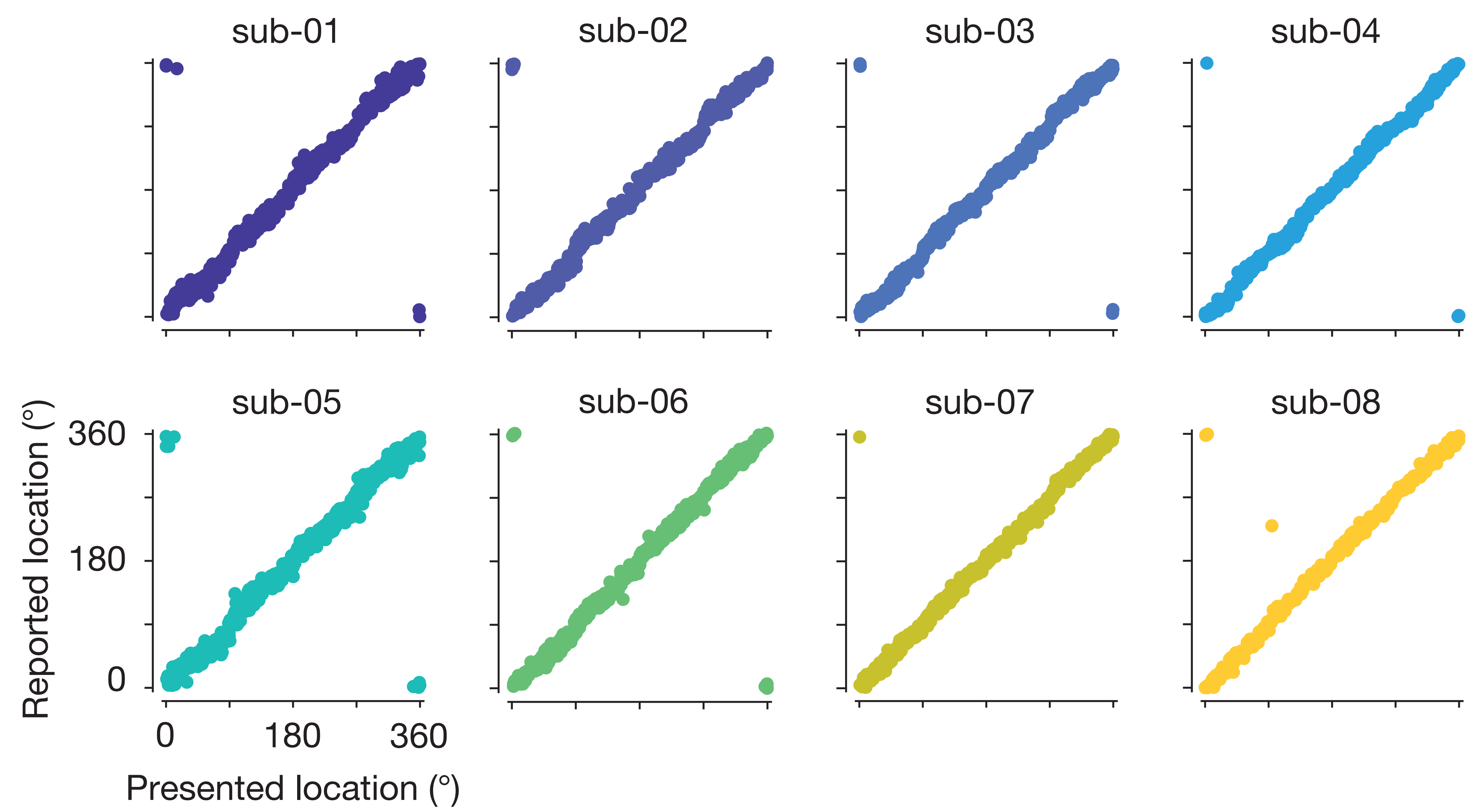
Task: Replicate the location of the target stimulus as precisely as possible

Example trial:

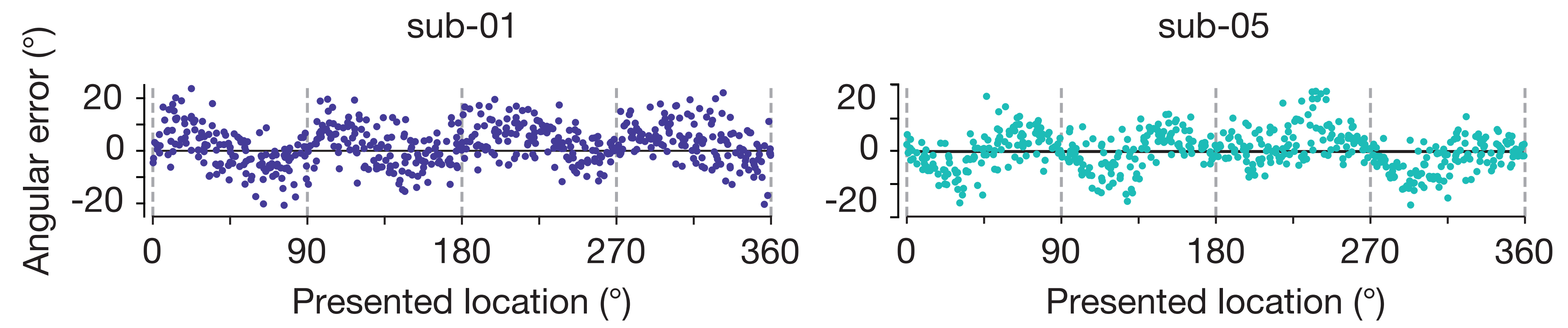


Behavioral results

Observers location judgements are close to veridical



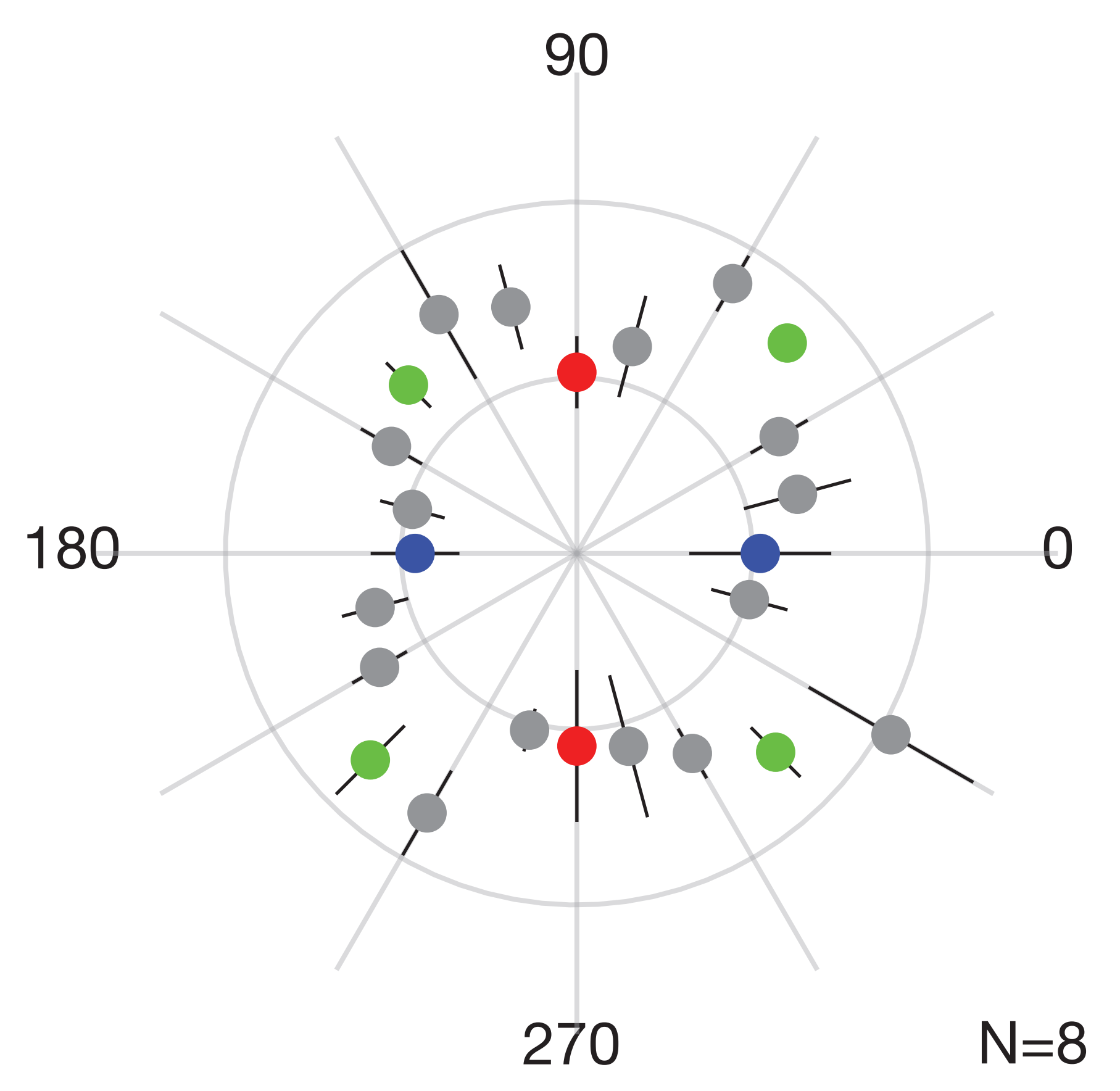
Categorical biases in the reports:



Systematic misrepresentations of spatial location

Precision in behavioral location judgements

Remove bias and compute variance of behavioral errors in bins (15°)



Behavioral variability varies with location
Greater uncertainty for off-cardinal locations

fMRI experiment

Use a probabilistic modeling approach to decode spatial representations

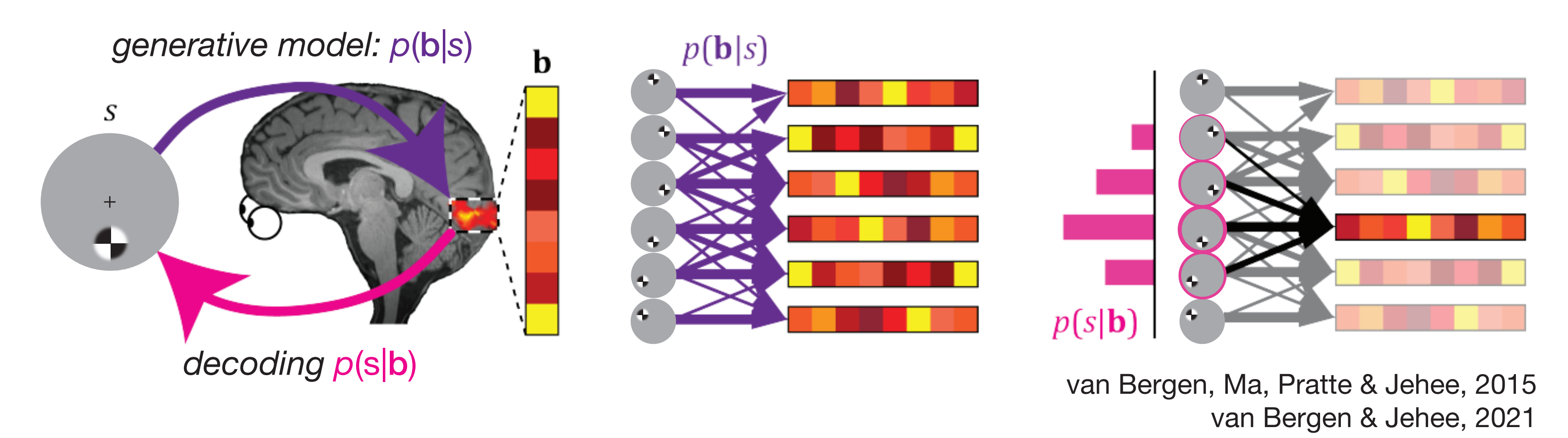
Similar experimental design except:

- 1 dva target
- 1.5s stimulus duration, longer ISI and ITI
- 8Hz orientation change

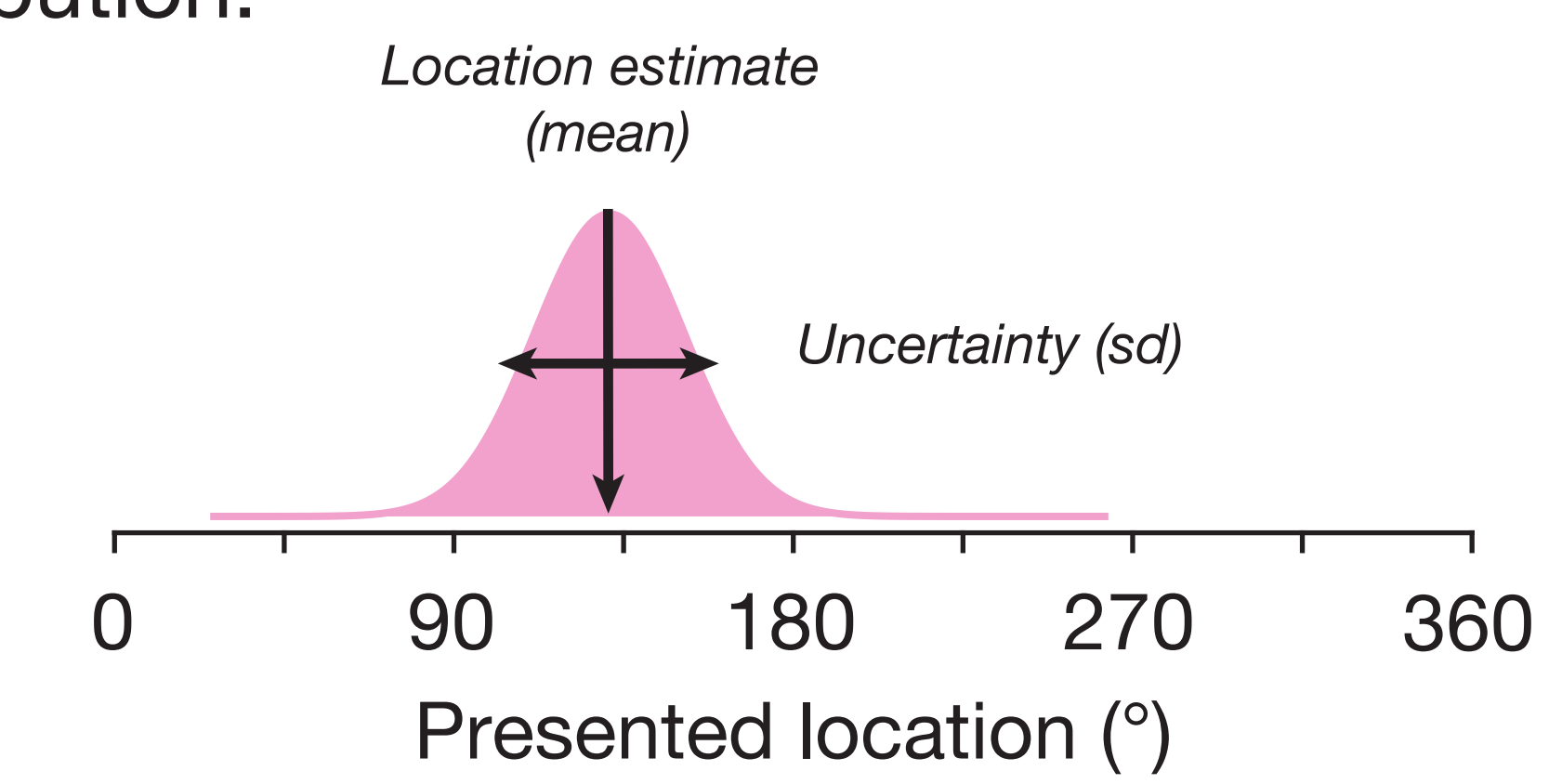
Philips 7 Tesla

- 1.5s TR
- 1.7x1.7x1.8 voxel size
- 12 runs (total of 216 trials)

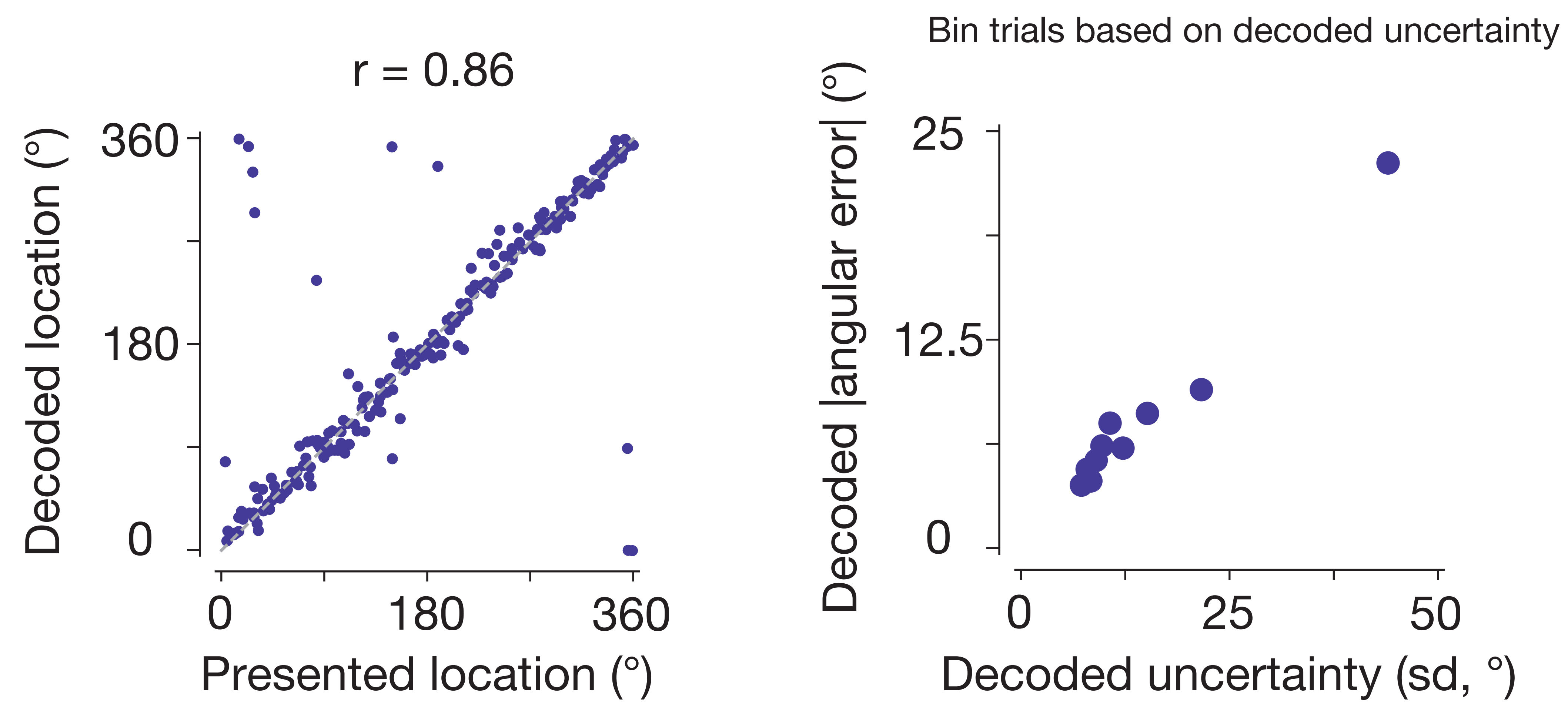
Decoding procedure:



Decoded probability distribution:



Preliminary results in early visual cortex (V1-V3):



Behavioral variability varies along polar angle

Next: does decoded uncertainty predict behavior?