Investigating Attentional Repulsion as a Mechanism for Anisotropic Position Shifts around Moving Objects

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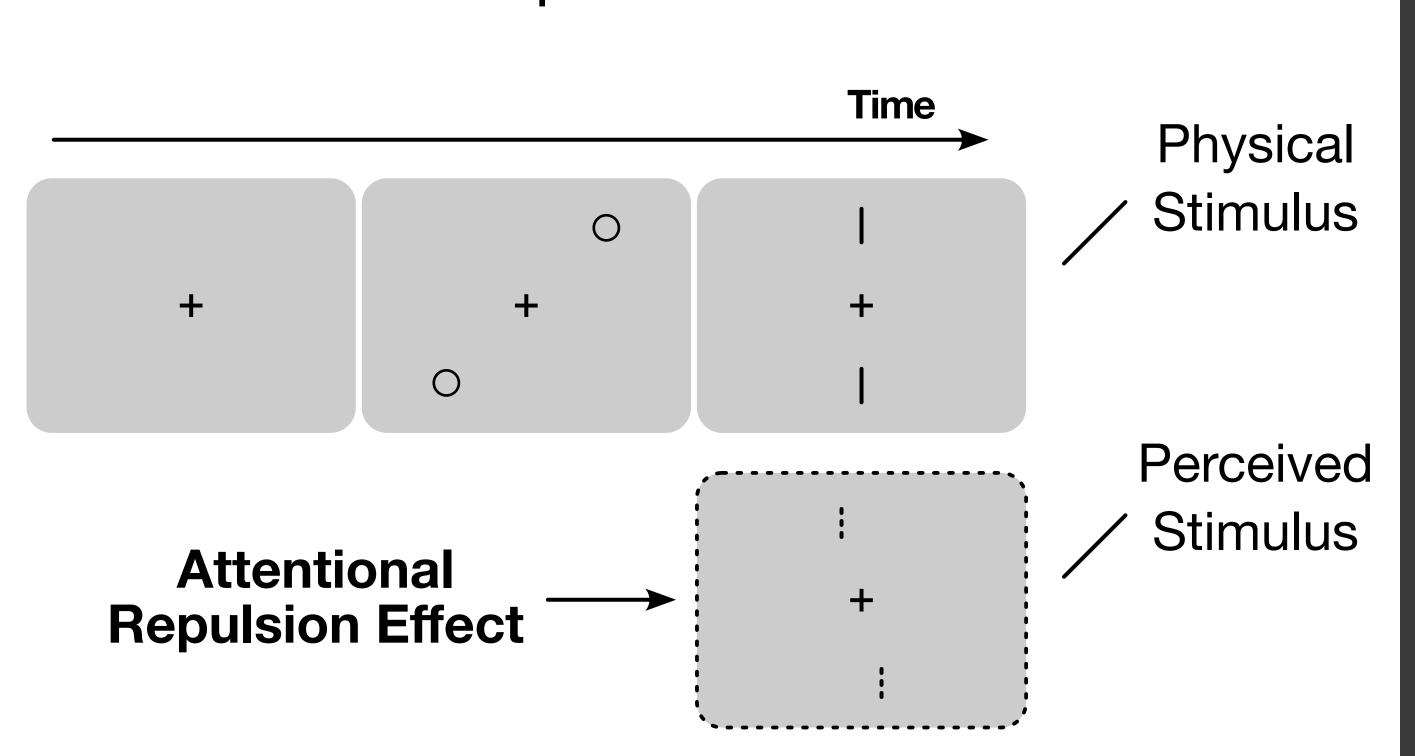
INTRODUCTION

Moving objects shift the perceived position of a nearby flash^{1,2}.

This shift is asymmetric: flashes ahead > flashes behind 3,4.

Attention leads moving objects⁵.

Can attentional repulsion⁶ cause the shift?



METHOD

General

Monitor: 1920x1080 LCD Stimulus design & control:

PsychoPy 2022.1.4 running in Python 3.8

Participants indicated the remembered location of the flashed probe using the mouse.

Refresh rate: 60 Hz Eye to monitor: 70 cm Probe radius: 0.3 dva Flash duration: 33 ms

Bar width: 0.1 dva Bar length: 2 dva

Experiments 3

Motion duration: 800 ms Motion radius: 5 dva Motion arc: 60°

Experiments 1

Experiment 2

Motion duration: 800 ms

Motion duration: 500 ms

Motion path length: 5 dva

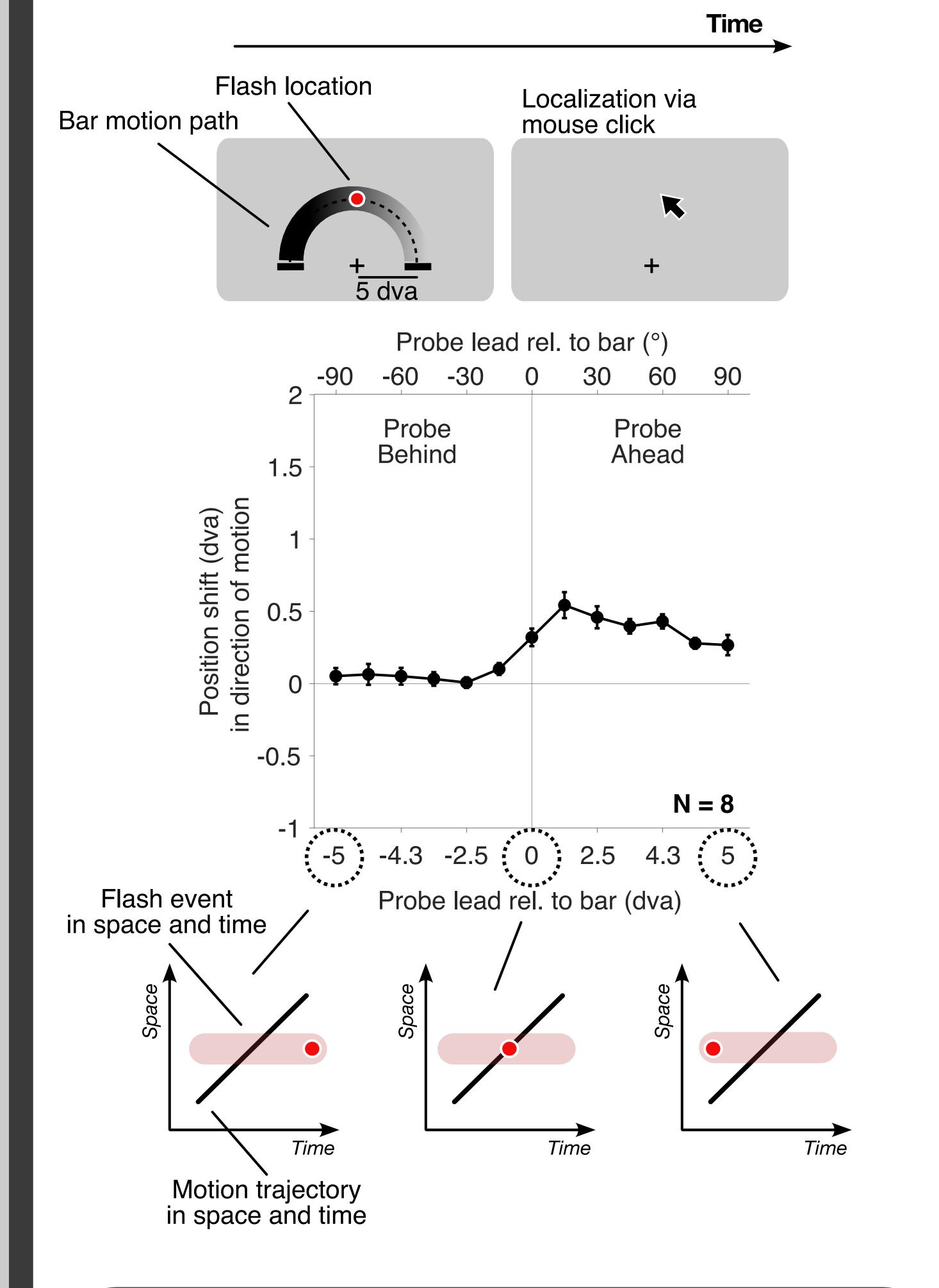
Probe eccentricity: 4 dva

Motion radius: 5 dva

(-15 to +45 rel. probe loc.)

EXP. 1: Fixed Location, Variable Timing

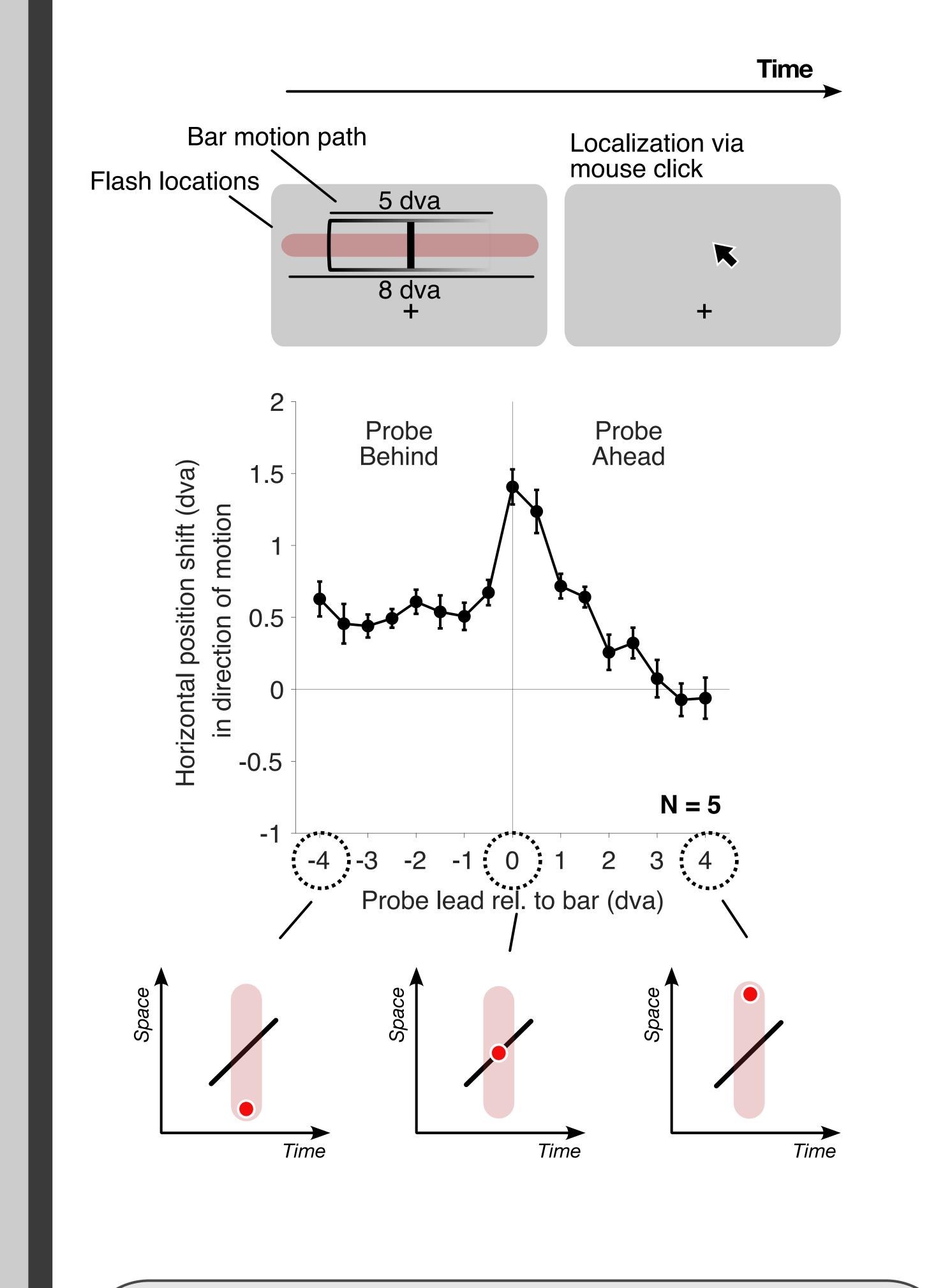
If the flash location is predictable, attention is more likely to be allocated to it, resulting in a relatively smaller position shift.



Larger shift for probe in front of moving bar. Position shift peaks for flashes 15° ahead of bar. Maximum position shift is less than 0.6 dva. Position shift behind moving bar almost zero.

EXP. 2: Variable Location, Fixed Timing

If the bar's location is predictable at the time of the flash, attention is more likely to be allocated to it, resulting in a relatively larger position shift.

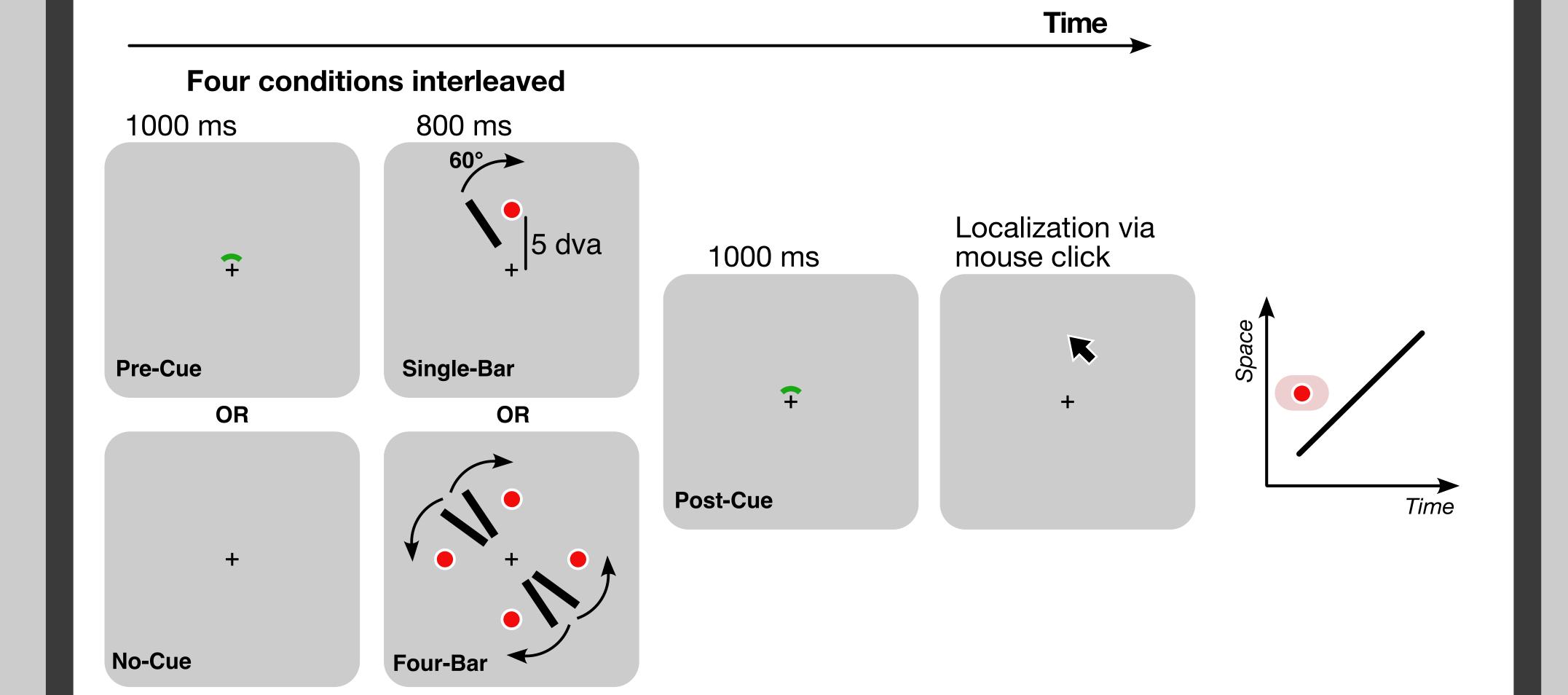


Maximum position shift is about 3x larger than

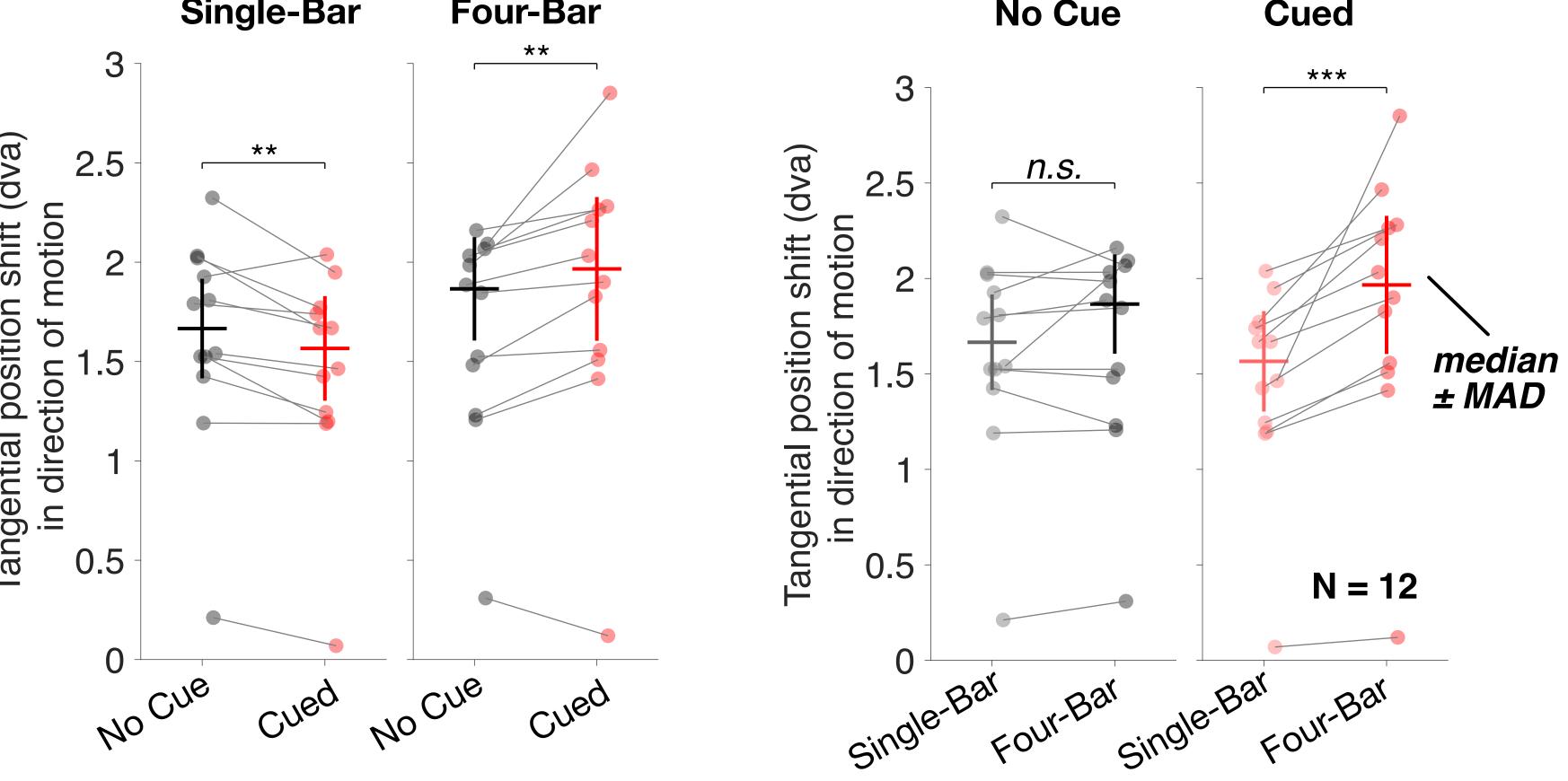
Position shift remains above zero for probes flashed behind.

EXP. 3: Spatial Cue and Distractor

Investigating the contribution of endogenous and exogenous attention to the magnitude of position shift.



Effect of endogenous attention Effect of exogenous attention



Position shift magnitude comparable to that from Exp. 2. in all four conditions.

Effect of spatial cue is contingent on distractor condition.

Position shift largest for cued Four-Bar condition.

Overall cuing and distractors have only small effects.

CONCLUSION

Localization performance is more adversely affected by spatial than by temporal uncertainty

When one of four potential target locations was cued, the position shift was largest, indicating that increased attention was directed towards the target in the presence of known distractors.

With one exception, the effects of cuing and additional distractors were minimal, suggesting either that attention and attentional repulsion are not involved, or that it is difficult to prevent strong attentional allocation to moving targets.

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