

The role of color in transsaccadic object correspondence

Research question:

What types of information are used by the visual system to determine transsaccadic object correspondence?

Background:

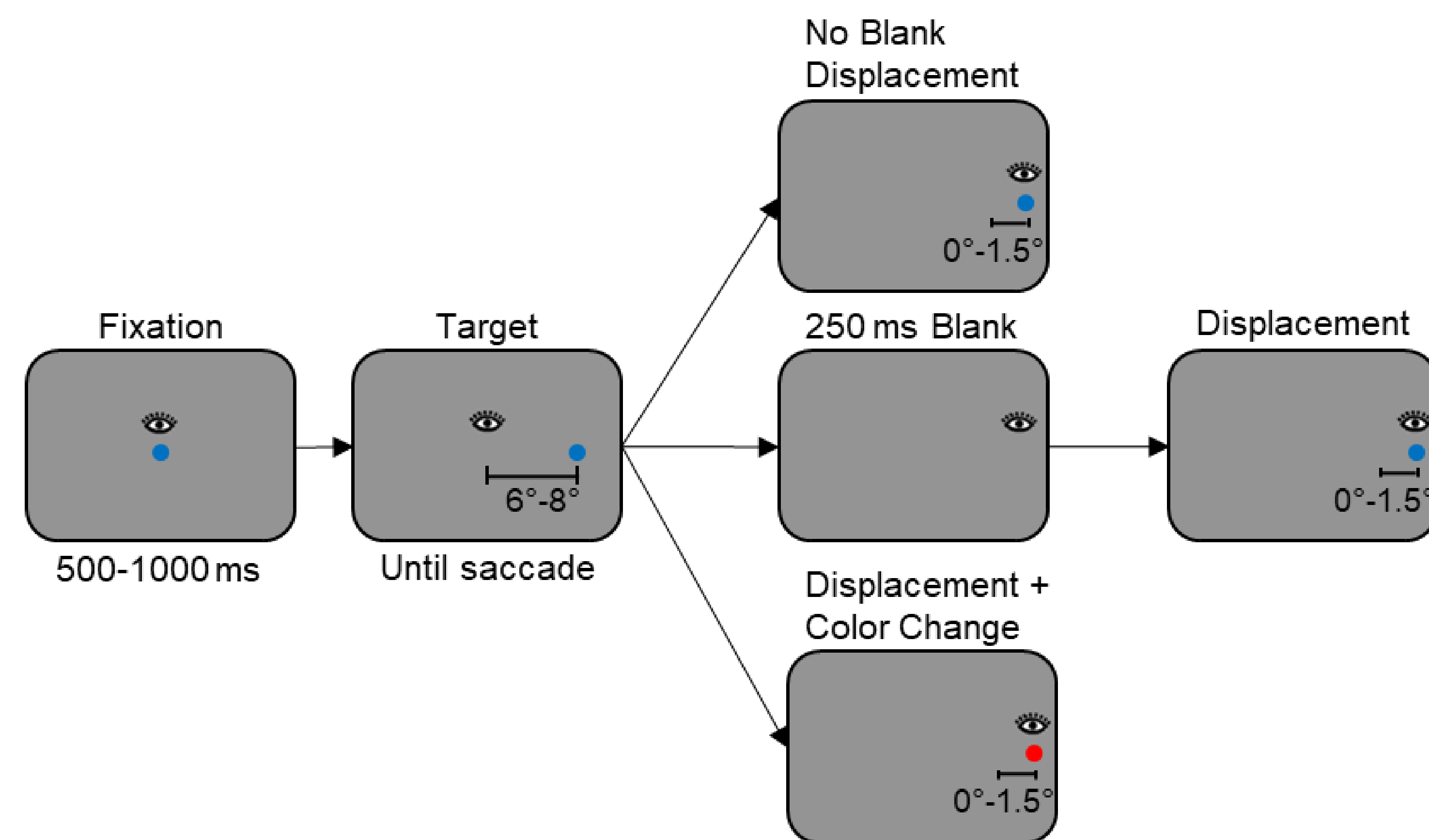
Previous studies showed that participants do not perceive object position changes if these changes occur during saccades¹. Displacement detection performance can be improved by changing some features of the saccade target but not others.

- Blanking (presence/absence of an object)^{1, 2, 3, 4} ✓
- Contrast polarity² ✓
- Object identity² ✓
- Shape³ ✓
- Orientation⁴ ✗

Method

Current study investigates whether color is an important feature for the visual system to determine object correspondence across saccades.

We predicted that smaller color changes are less likely to improve displacement detection performance compared to larger color changes.



Task: Displacement detection with five magnitudes of displacement: -1.5, -1, 0, 1, 1.5 dva

Experiment 1:

No-blank, blank, 15° color change, 180° color change

Experiment 2:

No-blank, blank, 30° color change, 45° color change

Analyses

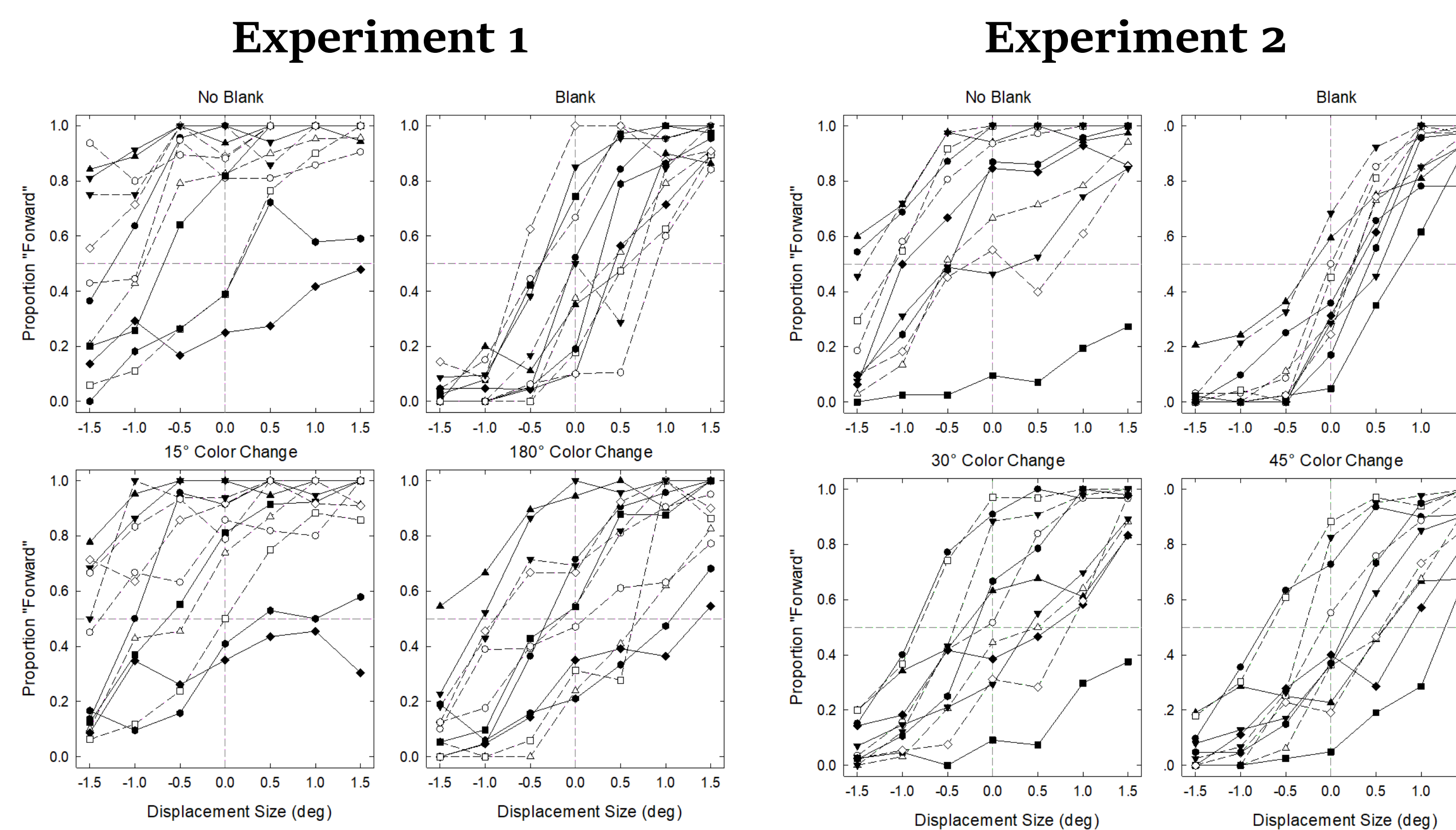
- Each subject's proportion forward response data were fit with the sigmoid function with two parameters:

$$f(x) = \frac{1}{1 + e^{-X*(displ-Y)}}$$

where **X** represents how fast the function increases, therefore **sensitivity**, and **Y** represents **bias** to respond either forward or backward.

- **Perceptual threshold** was calculated as the difference between 50% and 75% in sensitivity parameter.

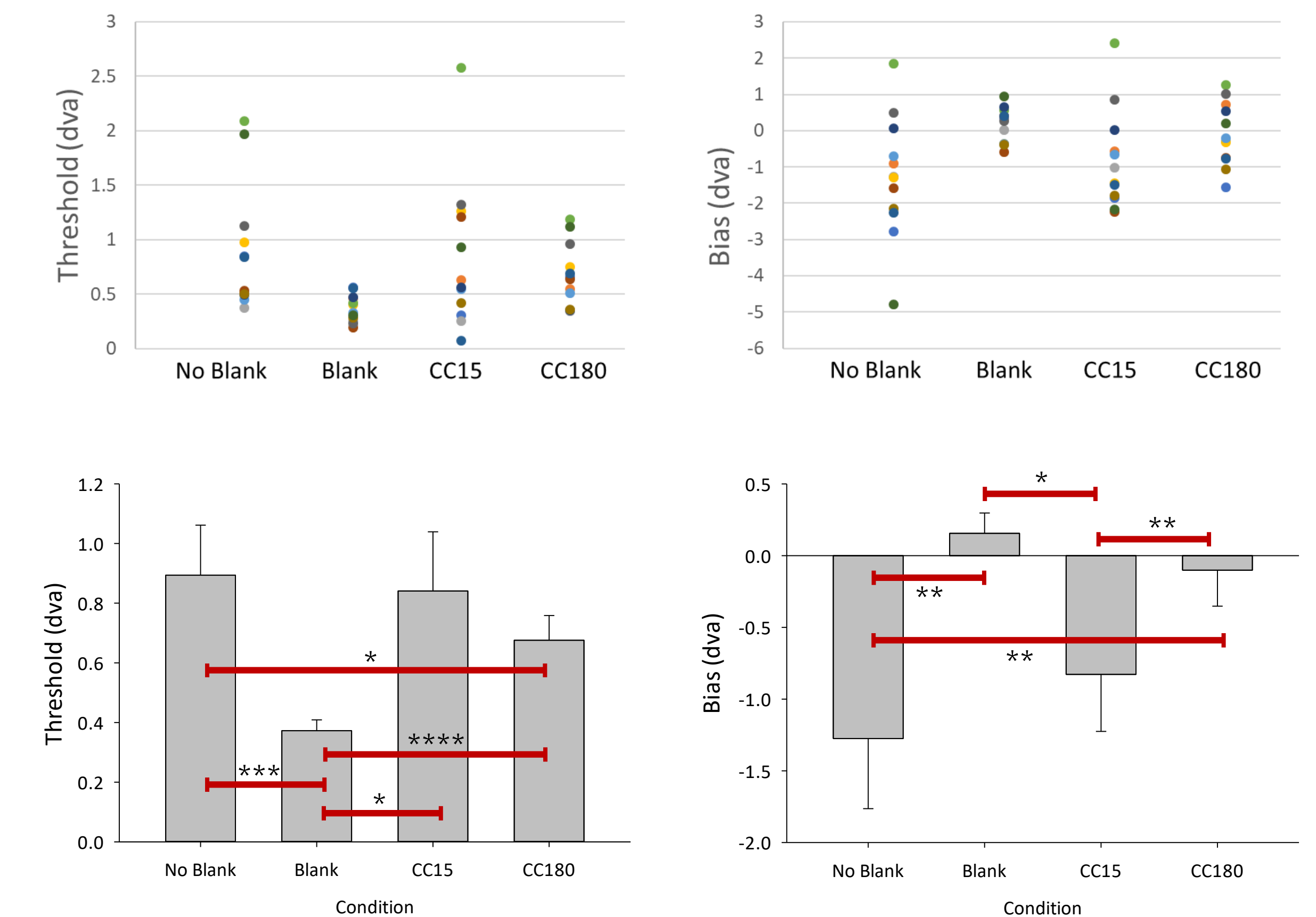
Results



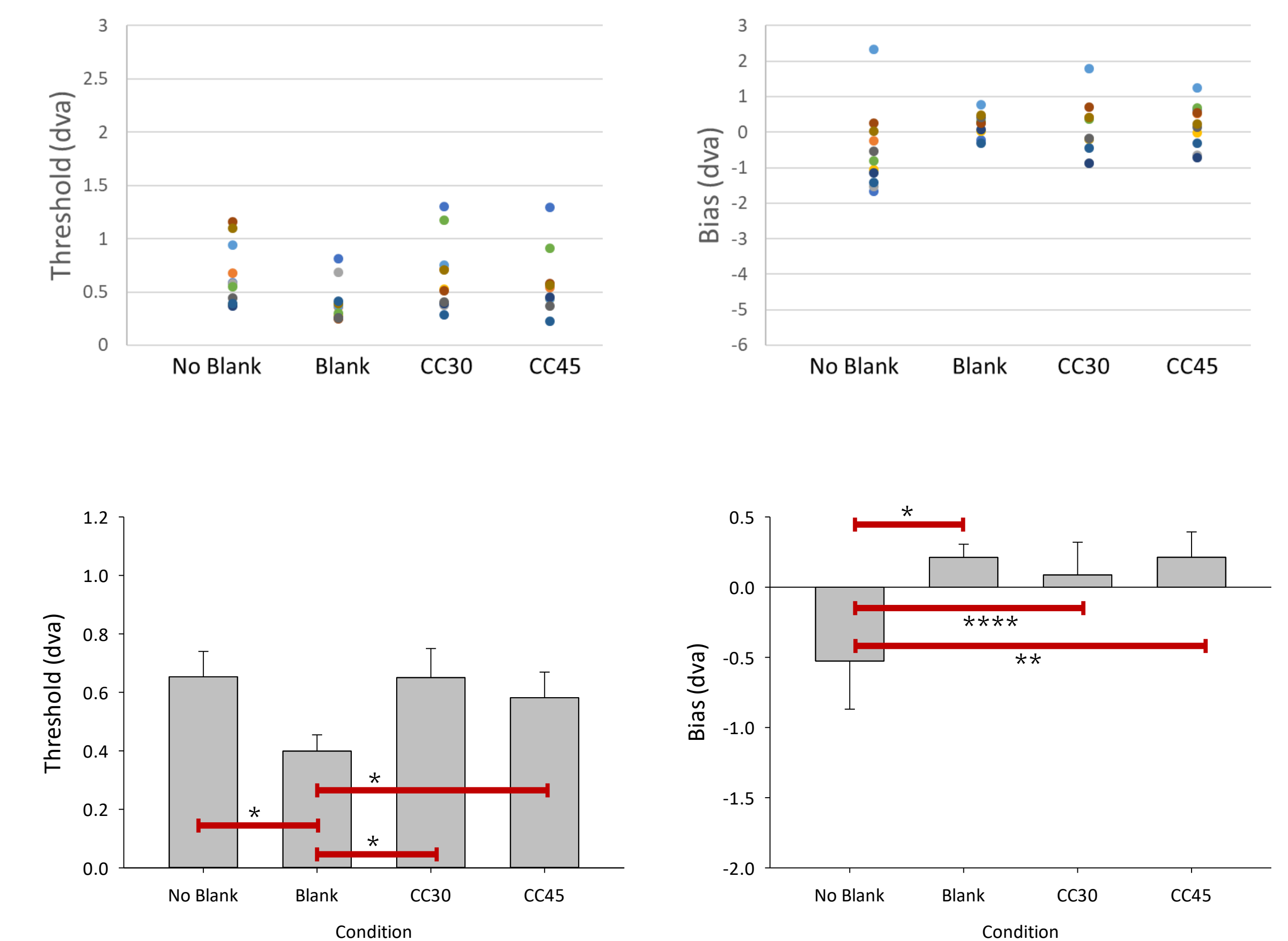
Threshold: The effect of condition on perceptual threshold was significant in both Experiment 1 ($p = .006$) and in Experiment 2 ($p = .041$).

Bias: The effect of condition on bias was also significant in both Experiment 1 ($p = .001$) and in Experiment 2 ($p = .002$).

Experiment 1



Experiment 2



* $p < .05$
** $p < .02$
*** $p < .01$
**** $p < .005$

Summary

- We replicated previous findings that blanking the target object significantly improved displacement detection performance^{1, 2, 3, 4}.
- Small color changes do not affect displacement detection. However, larger color changes significantly increase displacement detection performance, in line with previous research^{1, 2, 3}.
- Similar to accuracy, color changes also affected the bias. We found similar bias for blank and color change conditions, even for smallest color change.

References

- 1 Deubel, H., Schnedier, W. X., & Bridgeman, B. (1996). Postsaccadic target blanking prevents saccadic suppression of image displacement. *Vision Research*, 36, 985-996.
- 2 Tas, A. C., Moore, C. M., & Hollingworth, A. (2012). An object-mediated updating account of insensitivity to transsaccadic change. *Journal of Vision*, 12, 18.
- 3 Demeyer, M., De Graef, P., Wagemans, J., & Verfaillie, K. (2010). Object form discontinuity facilitates displacement discrimination across saccades. *Journal of Vision*, 10(6): 17.
- 4 Balp, R., Waszak, F., & Collins, T. (2019). Remapping versus short-term memory in visual stability across saccades. *Attention, Perception, & Psychophysics*, 81, 98-108.