



The effect of stimulus contrast on pre-saccadic orientation discrimination



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Introduction

- ✓ Objects that are briefly flashed around the time of saccades are grossly mislocalized (e.g., Honda, 1991; Ross et al., 1997).
- ✓ Low-contrast targets are mislocalized more than high-contrast ones (Zhang et al., 2008).
- ✓ Perceptual grouping by contrast and spatial distortions induced by saccades significantly interact (Tong et al., 2012).
- ? How does contrast affect pre-saccadic orientation discrimination, in crowded and uncrowded conditions?

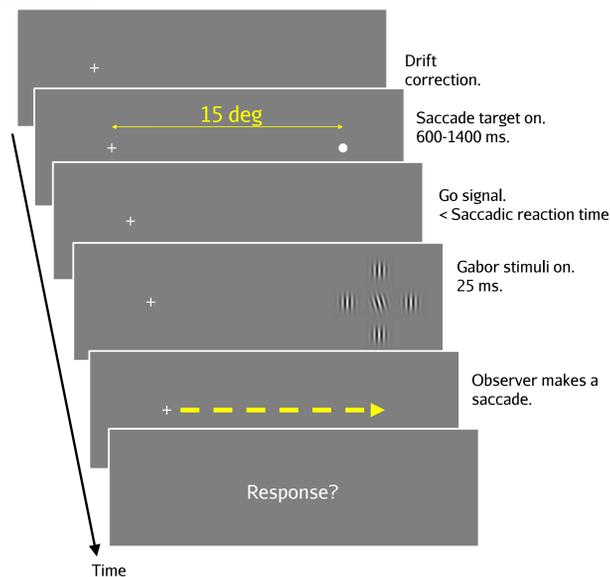
Methods

- Task:** Whether the target Gabor is tilted clockwise or counterclockwise.
- Participants:** Seven observers with normal or corrected-to-normal vision.
- Apparatus:** Eyelink 1000. Display++ monitor. 120 Hz at 1920x1080. 76cm distance.
- Stimulus conditions:** Gabor patches: 2 cpd, 0.5 deg SD. Flanker-target distance: 4 deg. Flankers: Always vertical. Target orientation: A value corresponding to ~80% discrimination performance

- Blocked:**
- 1) Fixation : 600 trials per observer
 - 2) Saccade : 3000 trials per observer

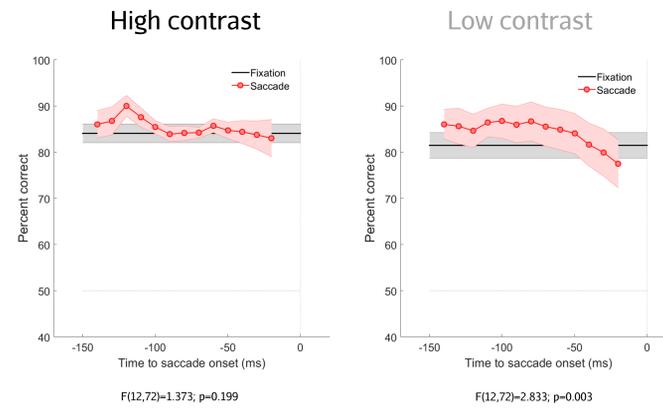
- Randomized:**
- i) Unflanked – high contrast (100%)
 - ii) Unflanked – low contrast (25%)
 - iii) Both target and flankers high contrast
 - iv) Target low contrast, flankers high contrast
 - v) Target high contrast, flankers low contrast
 - vi) Both target and flankers low contrast

Procedure:

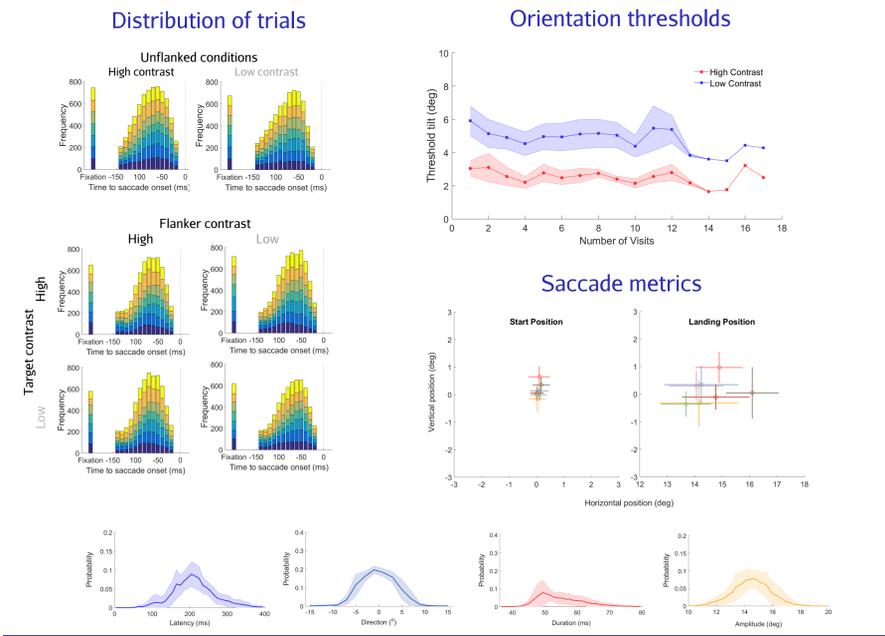
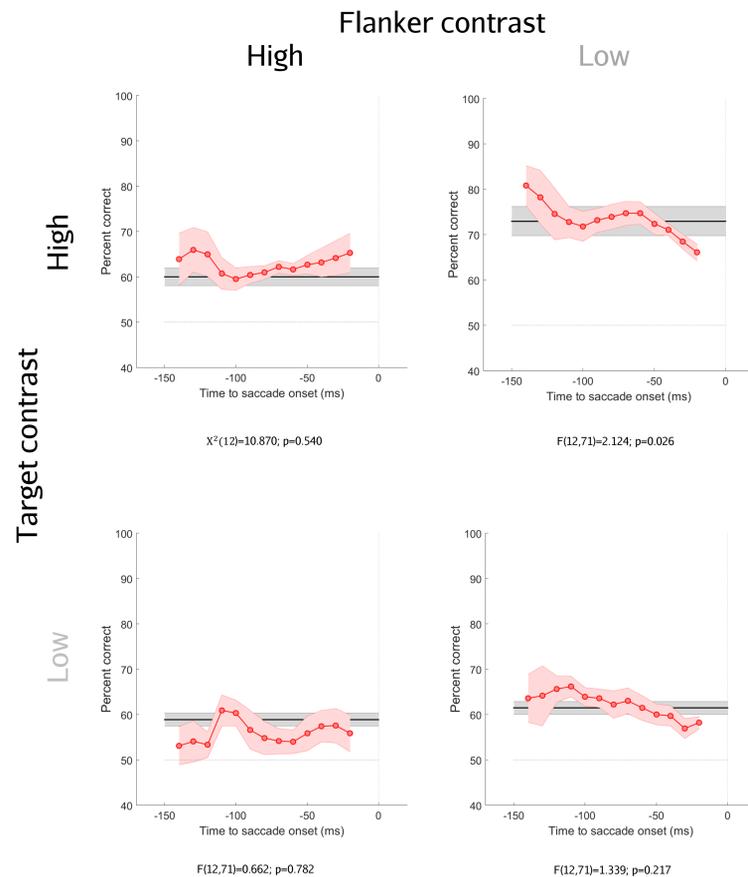


Results

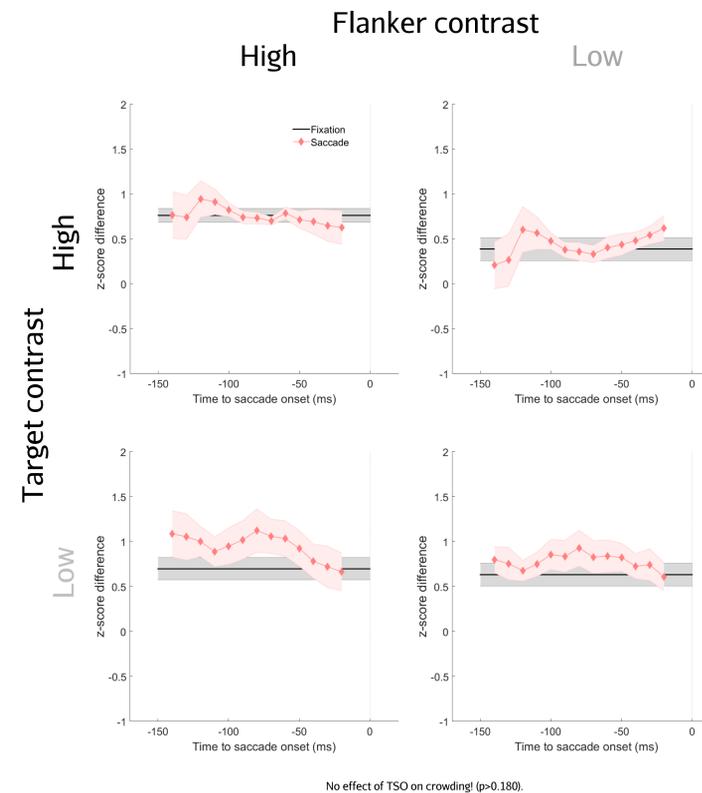
Unflanked conditions



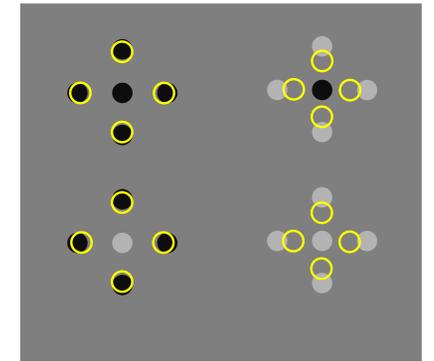
Flanked conditions



Crowding strength



A potential account



- Since perisaccadic perceptual mislocalization is stronger for low-contrast stimuli, perceived flanker-target distance will be smaller for low-contrast flankers compared to high-contrast flankers.
- Stronger modulation of apparent flanker-target distance before saccades will lead to stronger modulation of pre-saccadic discrimination performance.

Conclusions

- Discrimination performance was worse in the presence of flanking Gabors, for both the fixation and saccade conditions—the crowding effect.
- In saccade conditions without flankers, significant reductions in discrimination performance as a function of target-to-saccade-onset were observed for low-contrast target Gabors.
- In the presence of flankers, saccades modulated performance similarly only for low-contrast, but not for high-contrast flankers.
- These results can be explained by a contrast-dependent perisaccadic compression of space. However, additional experiments are needed.
- In contrast to a recent report (Harrison et al., 2013), crowding strength was not significantly different between fixation and saccade conditions.

Acknowledgments

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References

Honda, H. (1991). The time courses of visual mislocalization and of extraretinal eye position signals at the time of vertical saccades. *Vision Research*, 31(11), 1915–21.

Ross, J., Morrone, M. C., & Burr, D. C. (1997). Compression of visual space before saccades. *Nature*, 386(6625), 598–601.

Zhang, Z. L., Cantor, C. R., & Schor, C. M. (2008). Effects of luminance and saccadic suppression on perisaccadic spatial distortions. *Journal of Vision*, 8(14), 22 1–18.

Tong, J., Zhang, Z.-L., Cantor, C. R. L., & Schor, C. M. (2012). The effect of perceptual grouping on perisaccadic spatial distortions. *Journal of Vision*, 12(10), 10.

Harrison, W. J., Mattingley, J. B., & Remington, R. W. (2013). Eye movement targets are released from visual crowding. *The Journal of Neuroscience*, 33, 2927–33.

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