Binocular scotoma mapping and eye movement patterns in central field loss

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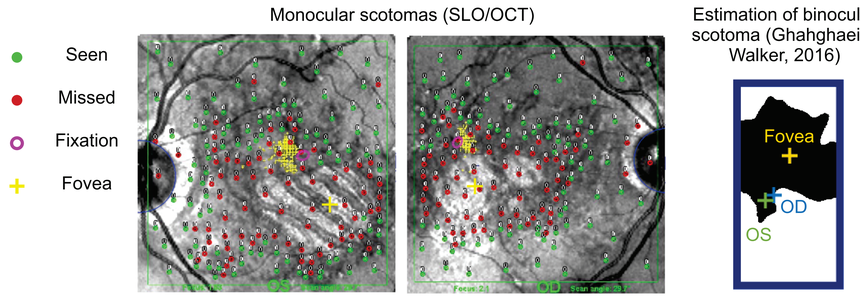
INTRODUCTION

When the scotoma is binocular, it often obscures objects of interest, causing individuals with macular degeneration (MD) to miss information. Furthermore, the majority of individuals with MD are unaware of their scotoma, which causes further difficulties in tasks of daily living.

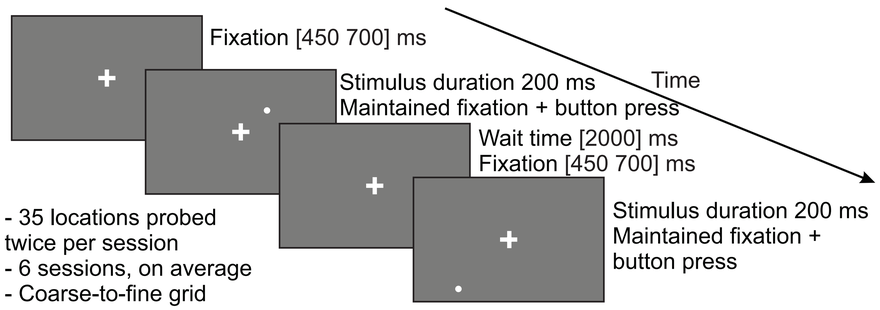
We propose methods to map precisely the binocular scotoma and to investigate eye movement strategies to recover information hidden by the scotoma.

Bilateral macular degeneration



METHODS

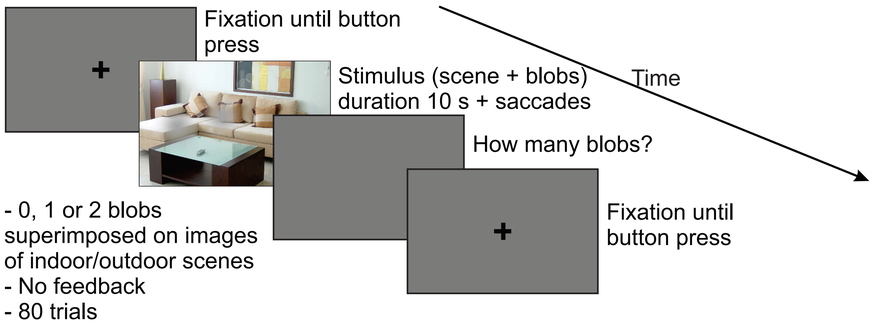
Study 1: Binocular scotoma mapping



- 35 locations probed twice per session
- 6 sessions, on average
- Coarse-to-fine grid

Participants: 4 with a binocular scotoma (B; age: 57-87), 3 with monocular scotomas (M; age: 75-79) and 4 controls (C; age: 61-74)

Study 2: Visual search



- 0, 1 or 2 blobs superimposed on images of indoor/outdoor scenes
- No feedback
- 80 trials

CONCLUSION

- A regular eyetracker can be used to precisely assess the residual functional retina in binocular vision.
- Individuals with binocular scotoma tend to look in the direction of their scotoma, although this strategy does not completely uncover information hidden by a large scotoma.
- Training a strategy according to the scotoma size and location might be the key for a better generalization of learning (Janssen & Verghese, 2016).

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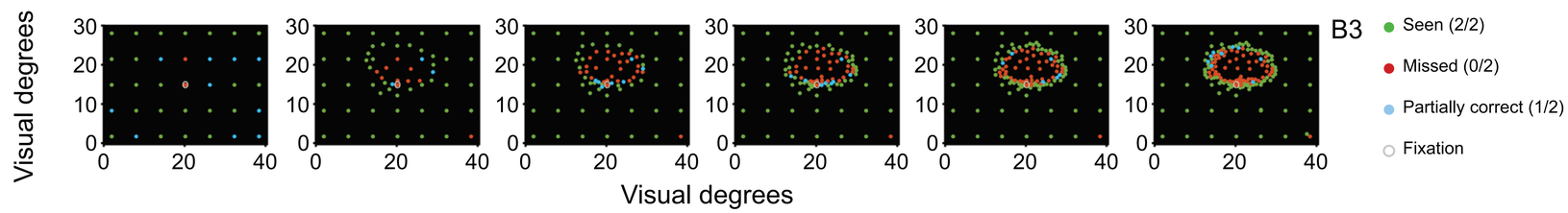
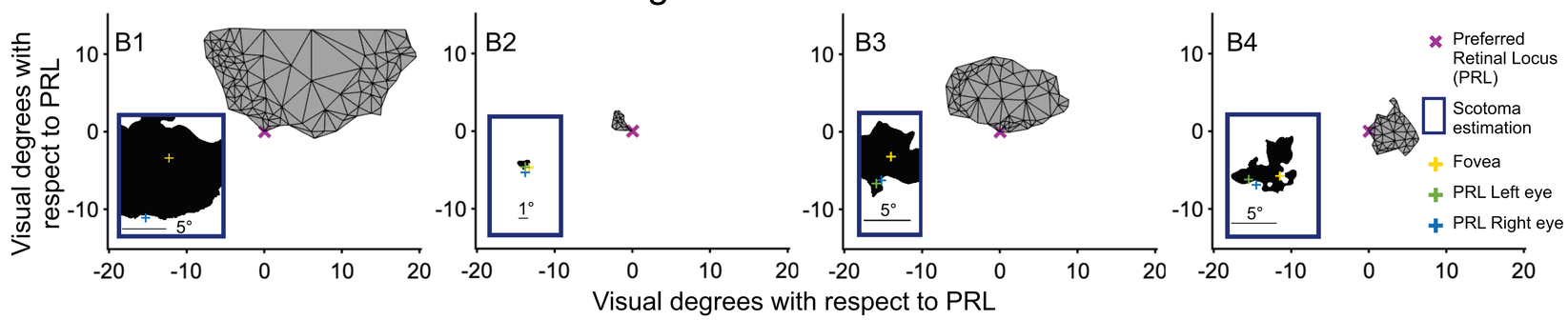
RESULTS

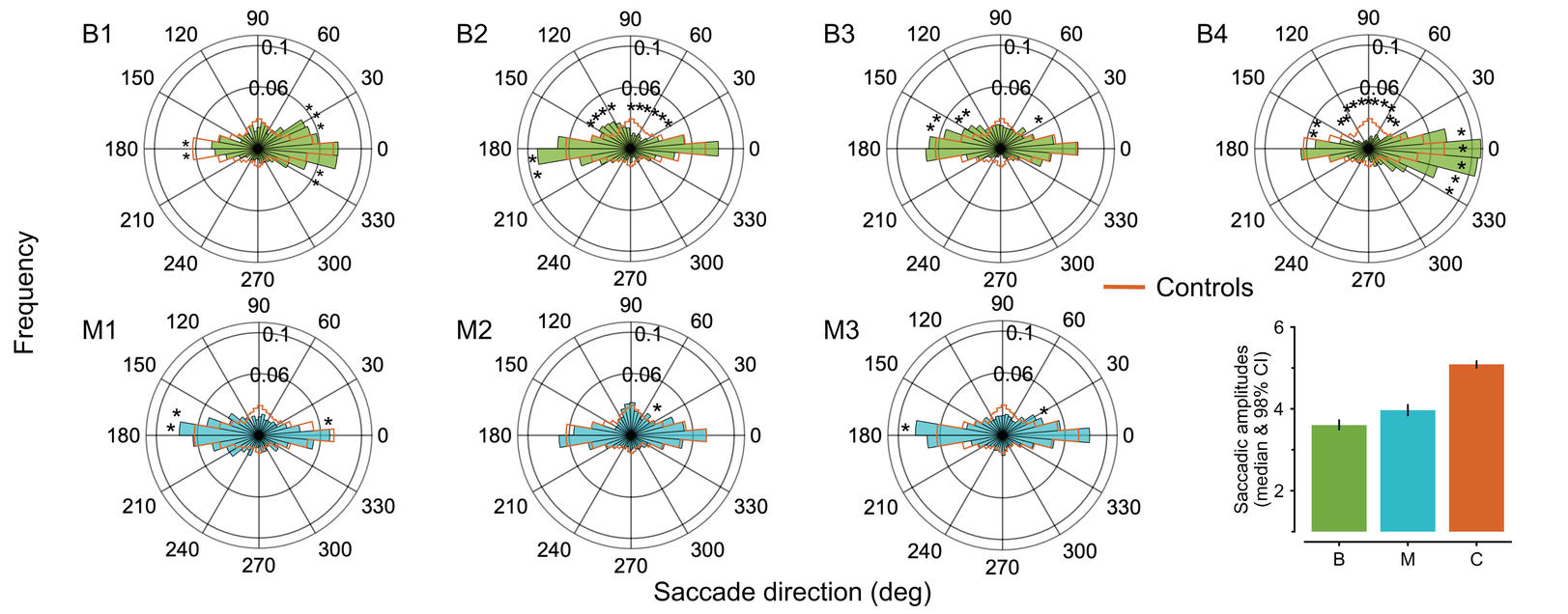
Manual selection of probed locations yields fine details of scotoma edges



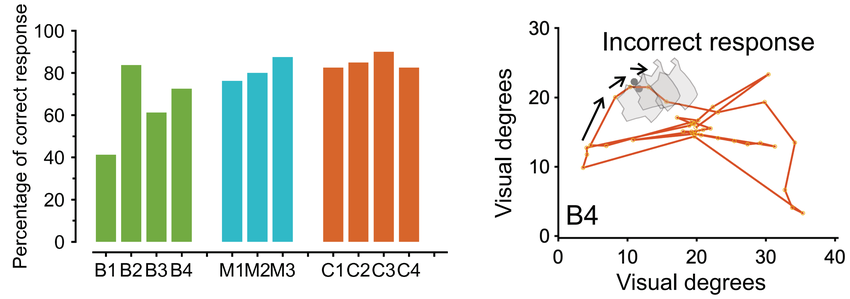
The size and shape of binocular scotoma from the eyetracker is similar to the algorithm's estimation



Individuals with binocular scotoma tend to saccade towards scotoma



Visual search performance is impacted by the size of the binocular scotoma
Saccades in the direction of the scotoma compensate only partially



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REFERENCES

Ghahghaei & Walker (2016). SKERI-Optos: A graphical user interface to map scotoma and PRL with the Optos OCT/SLO. *Journal of Vision, 16(4)*, 40-41
Janssen & Verghese (2016). Training eye movements for visual search in individuals with macular degeneration. *Journal of Vision, 16(15):29*, 1-20.