Differences in preferred retinal loci of fixation in monocular and binocular vision

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Introduction

With high-resolution scanning laser ophthalmoscopy, the preferred retinal locus of fixation (PRL) can be determined precisely in vivo. Because vision in everyday life is a binocular process for most people, the **aim of this study was to investigate fixation behavior by means of fixation locus and fixation stability under monocular and binocular viewing** and to identify potential differences between these conditions.

Material & Methods

Experimental & Imaging Design:

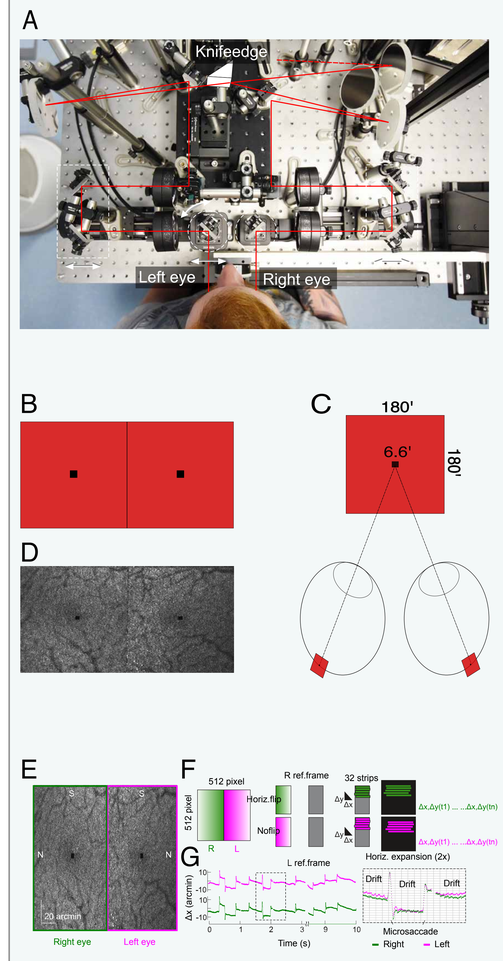
- 10 healthy participants (5 male, 5 female)
- Imaging of the retinae of both eyes via high-resolution binocular scanning laser ophthalmoscopy (bSLO) (A)
- during fixation of a centrally displayed small, 6.6 arcmin black square (B-D)
- 2 viewing conditions (monocular and binocular)
- 5 videos (10 sec.) were recorded in each condition

Analysis:

- extracting fixational eye movements by strip-wise image registration of bSLO videos (E-G)
- motion trace correction for artefacts
- pooling the data from 5 videos to generate a single set of retinal coordinates

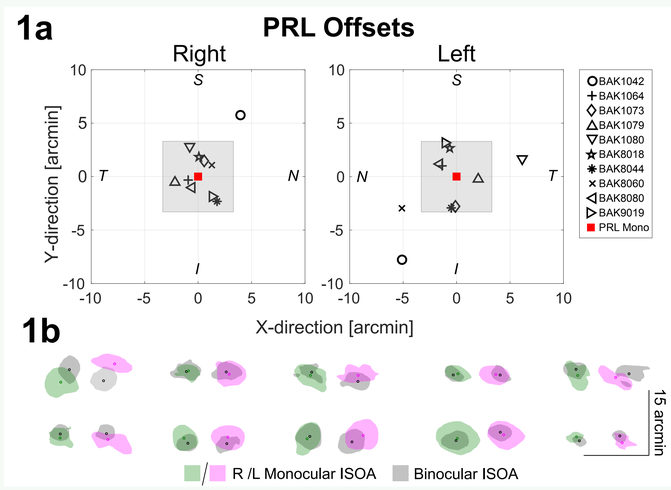
Parameters of interest:

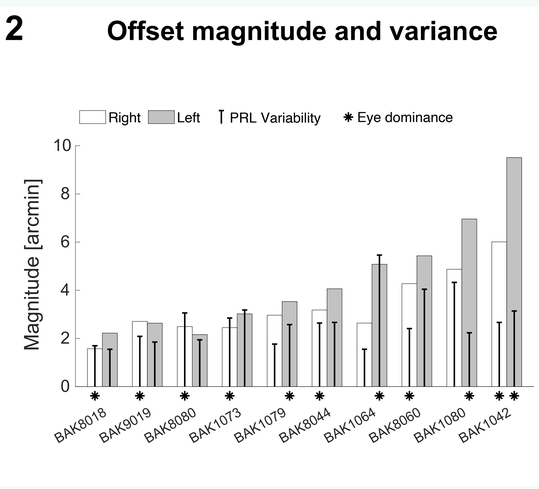
- PRL: median x- and y-coordinate of all registered gaze positions within one condition
- PRL offset: PRL difference between monocular and binocular conditions quantified as their Euclidean distance on the retina
- PRL variability: average distance between single repeated PRL measurements within the same viewing condition (non pooled)
- ISOA: probability density area (68%) of all registered gaze positions

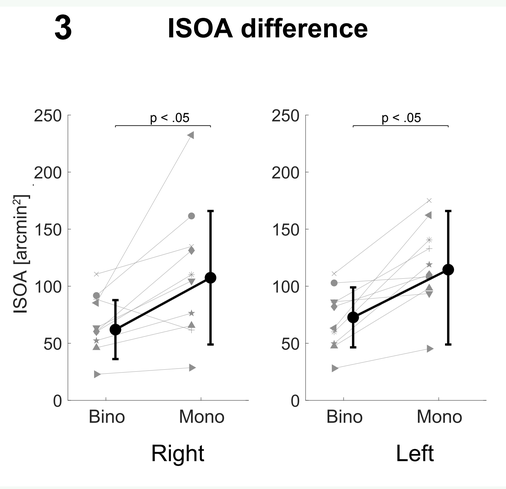


Results

- PRL offsets between monocular and binocular fixation were between 0.98 - 9.30 arcmin
- PRL offsets were statistically different ($p < .05$, paired t-test) in 6 of 10 participants (fig. 1, 2)
- Average binocular ISOA was 62.01 (±28.83) arcmin^2 in right eyes and 72.72 (±26.27) arcmin^2 in left eyes, and 107.43 (±58.49) arcmin^2 in right eyes and 114.52 (±37.09) arcmin^2 in left eyes during monocular fixation
- Binocular ISOA's were significantly smaller than monocular ISOA's across participants ($p < .05$) (fig. 3)







Bottom Line

- Small but significant inter-individual differences of the PRL in monocular versus binocular vision were observed which points to normal but not exact binocular coordination during fixation
- Fixation stability was about twice as high during binocular fixation