Properties of the “Preferred Retinal Locus” in Response to Asymmetrical Progression of Simulated Central Scotomas
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Purpose
People who lose their central visual field in both eyes often adopt a peripheral retinal region, the preferred retinal locus (PRL), for seeing. Although the progression of vision loss is often asymmetrical between the two eyes, little is known about how an adopted PRL responds to asymmetrical changes in the central scotomas.

By simulating a central scotoma separately in the two eyes, this study examined how the properties (i.e. location and stability) of the “PRL” might change in response to the enlargement of the scotoma in one eye.

Methods
A stereoscope combined with eye tracking was used to present a gaze-contingent artificial scotoma to the two eyes separately.

Initial Training:
Subjects made saccades to search for a Tumbling-E Stimulus and identify its orientation (4-AFC task), finishing 720 trials per day for 7-9 days.

Testing:
The scotoma size remained unchanged in one eye but doubled in the other eye. Subjects were tested with visible scotomas first (for 1 day or 4 days) and then with invisible scotomas.

Results

<table>
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<tr>
<th>S1</th>
<th>(scotomas were 3° for training and 3° &amp; 6° for testing)</th>
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<tbody>
<tr>
<td>Left Eye</td>
<td>Right Eye</td>
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| S2 | Shaded circles indicate the location and size of the scotomas. Fixation density maps (colored) are overlapped to show the pattern of fixation in relation to the scotoma; location of peak density (+) is the nominal “PRL”. |

| S3 | Fixation stability can be indexed by the area enclosed by isolines of a given density. |


- During initial training with identical scotomas in both eyes, subjects developed a “PRL” just outside the edge of the scotoma, mostly in the inferior visual field.
- The properties (i.e. location and fixation stability) of the “PRL” remained largely unchanged when the scotoma in one eye did not change while the scotoma in the other eye doubled in size; “PRLs” were similar between the two eyes, showing considerable conjugality.
- The “PRL” was less stable with invisible scotomas, suggesting the role of visible references in maintaining PRL.

Discussion
By simulating an asymmetrical progression of scotomas between the two eyes, our results suggest that the “PRL”, once adopted, remains quite stable in face of a considerable enlargement of the scotoma in one eye.
Rather than pushing the “PRL” outward in response to the enlarged scotoma in the worse eye, subjects rely on the “PRL” in their better eye for visual tasks.

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