The Impact of Multifocal Attention on Population Receptive Fields in Human Visual Cortex – A Tale of Unexpected Complexities

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background

• How does the brain allocate attention to multiple task-relevant visual objects?
• To tackle this question, we used functional magnetic resonance imaging (fMRI) to estimate population receptive fields (pRFs) when observers performed a rapid serial visual presentation (RSVP) task.

fMRI experiment - RSVP task

N = 5 | 2 sessions à 4 runs per condition | 1.5T | multiband EPI

searchlight back-projection

visual field profile mean visual field profile cortical profile voxel-wise back-projection searchlight-wise statistics

results - simple

Similar profiles for eccentricity, pRF size, amplitude, and goodness-of-fit across conditions in early visual cortex

R² ≥ .025

results - comparisons

Radial inwards or outwards position shift for all comparisons in early visual cortex

R² ≥ .025

results - null comparisons - odd and even runs

Radial inwards or outwards position shift for null comparison in early visual cortex

Partial persistence of these patterns even with a more stringent goodness-of-fit threshold

R² ≥ .2

Reconfiguration of some of these patterns depending on the shape/distribution of the visual field map

R² ≥ .025

discussion

• Simple back-projections: The increase in pRF size and eccentricity from the central to the peripheral visual field for each attention condition demonstrates the general validity of the visual field maps.

• (Null) comparison back-projections: The outwards shift for eccentricity that is absent in the direction profiles can be explained by pRFs moving radially from one visual field quadrant to another, rendering the interpretation of eccentricity increases/decreases inherently ambiguous. The radial inwards shift itself seems to be an artifact converging towards the center of mass of a given visual field map.

references


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