Retinal Position and Object Category Effects in the Human Lateral Occipital Cortex

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Object-selective regions of human cortex, including the lateral occipital complex (LOC), are known to be sensitive to the retinotopic position of object stimuli and to object category. However, there has been little quantitative measure of the extent, organization or relative magnitude of these effects. We sought to relate measures of object selectivity and retinotopy with a series of fMRI experiments. We imaged six subjects in a 3T MRI scanner using standard traveling wave checkerboard retinotopic mapping experiments, as well as block-design experiments in which objects from different categories were presented at six distinct retinotopic positions. We then examined responses in region LO, a subset of the LOC positioned posterior to hMT+ on the lateral surface.

We found substantial retinotopic modulation by checkerboard traveling wave stimuli in LO. LO exhibited a modest overlap with the visual field maps LO-1 and LO-2 (<20% for most subjects, with a greater degree of overlap with LO-2), and retinotopic modulation (polar angle and eccentricity) in LO extended well beyond the boundaries of LO-1 and LO-2. We also observed a pronounced lower visual field bias in LO: more LO voxels represented the lower contralateral visual field during the retinotopic mapping experiment and the mean LO response was higher to object stimuli presented below fixation than above fixation. Finally, LO responses were higher for contralateral than ipsilateral stimuli.

We also examined how object category and retinal position affect the distributed response patterns across LO. We found a stronger effect of position than category on the distributed response: the correlation between response patterns to objects from different categories presented at the same position was higher than the correlation between response patterns to objects from the same category at different positions. Overall, these results demonstrate that retinal position modulates LO responses more than object category, and position effects can be explained by retinotopic organization in LO.

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