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Spatially-Specific Repetition Suppression in Transsaccadic Perception

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Abstract

Brain representations of visual space are predominantly eye-centered (retinotopic) yet our experience of the world is largely world-centered (spatiotopic). A long-standing question is how the brain creates continuity between these reference frames across successive eye movements (saccades). Here we use fMRI to address whether spatially specific repetition suppression (RS) is evident during transsaccadic perception. Nine participants were presented with two successive Gabor patches (S_1 and S_2) displayed in either the upper or lower visual field, to the left or right of fixation. Spatial congruency was manipulated by having S_1 and S_2 occur in the same or different upper/lower visual field. On half the trials, a saccade was cued between S_1 and S_2, which placed spatiotopic and retinotopic reference frames in opposition. Equivalent frontoparietal RS was observed when S_1-S_2 were spatiotopically congruent, irrespective of whether retinotopic and spatiotopic coordinates were in accord or were placed in opposition by a saccade. RS was maximal in the superior parietal lobe and the frontal eye fields ($p < .005$, corrected). Further examination of saccade trials in classically retinotopic visual regions revealed RS for spatially congruent S_2 as early as extrastriate (but not striate) cortex ($p < .005$). Collectively, these results show that transsaccadic RS is contingent on the

spatial congruency of the two stimuli, that spatiotopic representations emerge in extrastriate cortex and that by the level of the frontoparietal network, spatiotopically consistent stimuli can be processed in a similar way irrespective of retinotopic congruency.

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