Visual cortical architecture in autism spectrum disorders

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**Background**

Individuals with autism spectrum disorders (ASD) may show greater “local processing” e.g. reduced illusions like the Ebbinghaus and an enhanced ability to ignore context in perceptual tasks.

**Is autism associated with finer spatial tuning in visual cortex?**

**Methods**

Population receptive field (pRF) analysis is a model-based approach to retinotopic mapping using fMRI. Instead of only estimating the visual field location each voxel responds to, it optimizes the parameters of the two-dimensional retinotopic field profile that best predicts the observed fMRI response to visual stimulation.

Inside the scanner, participants with ASD (n=14) and demographically matched neurotypical controls (n=12) viewed traversing, high-contrast bar stimuli while performing a simple fixation task. The overlap between the pRF profile and the stimulated part of the visual field at each time point was used to predict the neuronal pRF response. This prediction was further convolved with the hemodynamic response function (HRF) estimated through an independent scan. (Siemens 3T Trio, TR=2.55s, 30 slices, 2.3mm isotropic voxels).

**Comparison with schizophrenia**

We also scanned 12 participants with schizophrenia under the same stimulus conditions. Schizophrenia has also been linked to reduced contextual interactions in visual perception. Interestingly, pRF sizes were smaller in schizophrenia for para-foveal eccentricities in V1 only.

**Conclusion and Discussion**

We found no evidence of finer spatial tuning in visual cortex of individuals with ASD. Instead pRF sizes were generally larger in most extrastriate regions (but not in V1). Cortical magnification was also greater for the central visual field in V2 and V3.

These differences could be due to differential deployment of attention or result from enhanced responses to visual stimulation. Future research must seek to disentangle these possible mechanisms by testing the effect of spatial attention on pRFs.

Interestingly, we find a dissociation with schizophrenia where pRFs in para-foveal V1 were smaller than in controls. This may point towards different neural mechanisms underlying reports of weakened contextual effects in ASD and schizophrenia.