Background

Individuals with Autism Spectrum Disorder (ASD) have impaired face processing ability. One explanation for this impairment is that fusiform face area (FFA), an area located in temporal fusiform gyrus and normally active during face processing, is not activated by faces in individuals with ASD. However, some studies have found that FFA can be activated in ASD subjects during face processing, suggesting that FFA response in individuals with ASD may be diminished rather than nonexistent. To test this possibility, we used a novel framework for MVPA classifier to examine the FFA sensitivity in ASD subjects to that in controls when face stimuli were presented.

Method

Subjects. Five high functioning individuals diagnosed with ASD were compared to five age-matched neurotypical (NT) controls.

Stimuli. Pictures depicting either a face or an arrow and flanked by two objects, one on the left and one on the right (Figure 1), were presented to subjects one at a time for two seconds.

Task. For each stimulus presentation, subjects were asked to indicate “yes” or “no” whether a target object was being pointed to (arrow condition) or being looked at (face condition).

Results

Behavioral data. Faces were more difficult to process than arrows for both ASD and control subjects. Moreover, ASD subjects generally were less accurate (Figure 2A) and slower than NT controls (Figure 2B).

GLM analysis. The fMRI data were analyzed with the FSL Feat tool (http://www.fmrib.ox.ac.uk/fsl) and the results are shown in Figures 3 (controls) and 4 (ASD).

Note that whereas Figure 3 shows significant activation of FFA in controls, the GLM did not find any significant activation for ASD subjects (Figure 4).

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Summary

These results suggest that while the underlying decoding function for the FFA is nonlinear (conical) for both neurotypicals and individuals with ASD, the strength of the signal from FFA voxels being decoded for faces in ASD subjects appears to be significantly diminished compared to that for neurotypical controls. Given that the underlying decoding functions are similar, it seems likely that the lack of FFA signal for individuals with ASD is due exogenous factors (network failure) rather than something per se about the FFA.

A typical decision space using the QDA classifier for control subjects (shown in Figure 7) indicates a conical decoding of the cortical similarity space.