

Thickness of deep layers in FFA predicts face recognition performance

Isabel Gauthier
Rankin W. McGugin
Benjamin Tamber-Rosenau
Allen Newton

Department of Psychology, Vanderbilt University, Nashville, TN, USA
Department of Psychology, Houston University, Houston, TX, USA

[Department of Radiology and Radiological Sciences](#), Vanderbilt University, Nashville, TN, USA

Individual differences in expertise with non-face objects has been positively related to neural selectivity for these objects in several brain regions, including in the fusiform face area (FFA). Recently, we reported that FFA's cortical thickness is also positively correlated with expertise for non-living objects, while FFA's cortical thickness is negatively correlated with face recognition ability. These opposite relations between structure and visual abilities, obtained in the same subjects, were postulated to reflect the earlier experience with faces relative to cars, with different mechanisms of plasticity operating at these different developmental times. Here we predicted that variability for faces, presumably reflecting pruning, would be found selectively in deep cortical layers. In 13 men selected to vary in their performance with faces, we used ultra-high field imaging (7 Tesla), we localized the FFA functionally and collected and averaged 6 ultra-high resolution susceptibility weighed images (SWI). Voxel dimensions were 0.194x0.194x1.00mm, covering 20 slices with 0.1mm gap. Images were then processed by two operators blind to behavioral results to define the gray matter/white matter (deep) and gray matter/CSF (superficial) cortical boundaries. Internal boundaries between presumed deep, middle and superficial cortical layers were obtained with an automated method based on image intensities. We used an extensive battery of behavioral tests to quantify both face and object recognition ability. We replicate prior work with face and non-living object recognition predicting large and independent parts of the variance in cortical thickness of the right FFA, in different directions. We also find that face recognition is specifically predicted by the thickness of the deep cortical layers in FFA, whereas recognition of vehicles relates to the thickness of all cortical layers. Our results represent the most precise structural correlate of a behavioral ability to date, linking face recognition ability to a specific layer of a functionally-defined area.

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