# Faces we know: Neural processing of parent, partner and own faces

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Background:

There is general agreement that the neural network underlying the processing of familiar faces shares areas also associated with emotional[1,2], self and other social knowledge processes[1,3]. Understanding the neural mechanisms for processing personally familiar faces such as parent, partner and own faces may have important clinical implications, as impairments in face processing are associated with disorders such as schizophrenia and autism spectrum disorders.

Current Study:

Using functional magnetic resonance imaging (fMRI) we examined the neural substrates of parent, partner, own, famous and unfamiliar faces. We addressed the following questions: i) are personally familiar faces processed with the same functional mechanisms as unfamiliar faces and ii) are there activation differences in terms of localization and laterality across these categories of personally familiar faces?

Method:

*Participants.* We studied 10 participants, 4 males, mean age 35.1 years (8.1 *SD*), who lived with their partner for at least two years and grew up with both their parents and could provide pictures of them.

*Stimuli.* Forty trials of each face type (parent, partner, own, famous and unfamiliar) were presented pseudo-randomly. The faces were presented for 500ms and ISI was jittered between 1.7 and 2.0s.

*fMRI acquisition.* MR imaging was conducted on a 1.5T Signa Twin EXCITE3 scanner (GE Medical Systems, WI) with a standard quadrature head coil. A set of high resolution T1-weighted 3D SPGR images covering the whole brain was acquired (116 slices, voxel size=1x1x1.5mm, 2 NEX) as an anatomical reference. Functional images were acquired with a standard gradient-recalled echo-planar imaging sequence (TE/TR/alpha = 60ms/ 2000ms/90deg, voxel size=3.75x3.75x5mm) over 27 contiguous axial slices with interleaved acquisition. Data analysis was carried out in AFNI, using motion correction, 8mm spatial blur, signal intensity normalization for percent signal change and deconvolution using a fixed haemodynamic response function, for all subjects. Individual results were transformed into Talairach space and put into a random effects analysis of variance thresholded at $p < 0.01$ (corrected[4]).

Results:

Group results showed that compared to baseline (i.e., fixation cross), all personally familiar faces activated the fusiform gyrus bilaterally (Fig.1). Partner faces also activated precuneus, parahippocampus, thalamus and middle frontal gyrus. Own faces activated the lingual gyrus, cuneus and precuneus. Compared to unfamiliar faces, personally familiar faces activated bilateral cingulate gyrus. Partner faces also activated BA 47, amygdala, thalamus, insula, parahippocampus, middle frontal and medial frontal gyri. The medial frontal gyrus was also activated for own faces and the superior frontal gyrus was activated for parent faces. ROI analyses and laterality indices in the fusiform and cingulate gyri showed distributional differences when processing personally familiar faces (also evident in Fig. 1, z=-11; and Fig. 2, z=31).

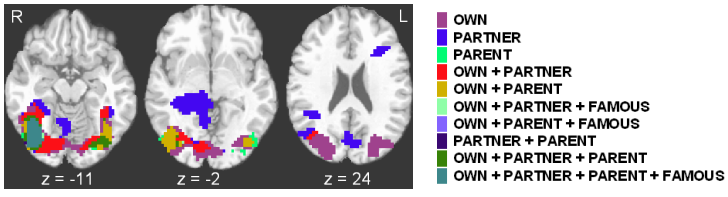


Fig1. All faces types minus baseline

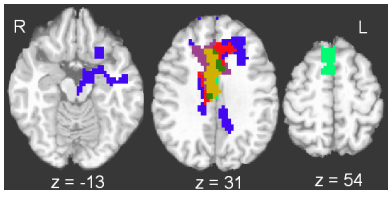


Fig2. Personally familiar minus unfamiliar faces

Discussion:

Our results support the involvement of both the core visual system and extended systems of emotional and person knowledge networks in the processing of personally familiar faces. Our findings show that there are anatomical distinctions in processing personally familiar faces within the fusiform gyrus and the cingulate gyrus as shown by the ROI and laterality indices analyses. Furthermore, there were differences among types of personally familiar faces, a very intriguing result that requires further investigation. The neural distinctions posed by personally familiar faces play a central role in our understanding of face processing and the long term influences on the brain of a face's repeated exposure.

References:

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