



Adaptation in Fusiform Face Area (FFA): Image or Person?

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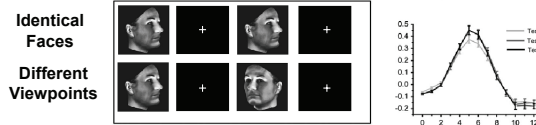
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Background

Viewing faces of different people produces a larger BOLD response in FFA than viewing a block of identical faces (Andrew & Ewbank, 2004).



But changing the viewpoint of the same person also produces a release from adaptation, compared to identical images (e.g., Fang, Murray & He, 2007).



Question

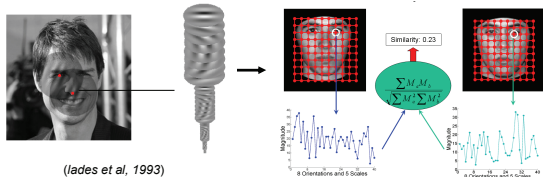
Changes in identity, however, necessarily involve changes in the image. Is the release from adaptation a result of a change in face identity, *per se*, or could it be an effect that would arise from any physical change to the face image?

Experiment Strategy

We assessed the release of adaptation in a fast event-related design when the pair of faces varied in identity, viewpoint, or both. Critically, the physical similarity of viewpoint changes of the same person was scaled to be equivalent to that produced by an identity change. If FFA was sensitive to individuation, we should witness a larger BOLD response with the identity changes than with viewpoint change.

Scaling Image Similarity

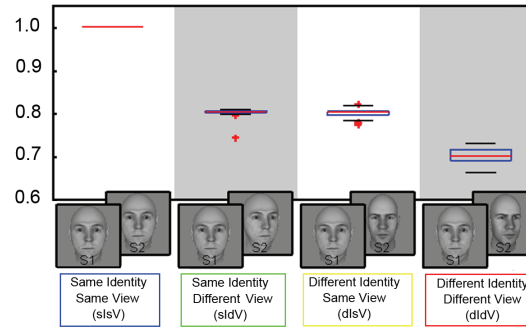
The similarity of face pairs were scaled by the Gabor-jet model, a model that performs multiscale, multiorientation filtering analogous to V1 simple cell activity (Lades et al, 1993). Similarity is computed by the correlation of activation values of corresponding kernels within corresponding jets. The resultant similarity value predicts the psychophysical similarity of faces almost perfectly (Yue et al., 2007)



(lades et al, 1993)

Similarity control of stimuli

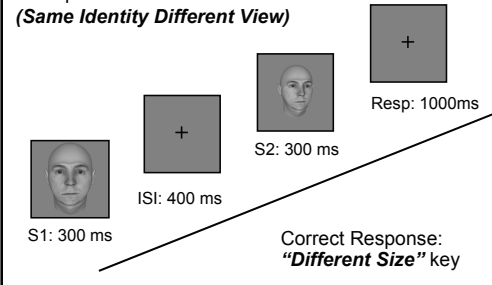
The stimuli were chosen such that the change of identity (different person) and change of viewpoint (~20° rotation in depth) resulted in equivalent image similarity on each trial, rather than as an average in a block of trials as in Grill-Spector et al., (1999).



Fast event-related fMRIa design

Subjects judged, on each trial, whether S1 and S2 were the same size (both 6° or 3°) or not, by a button press. This task was orthogonal to the identity and viewpoint of the faces.

Exemplar Trial of sidV Condition (Same Identity Different View)

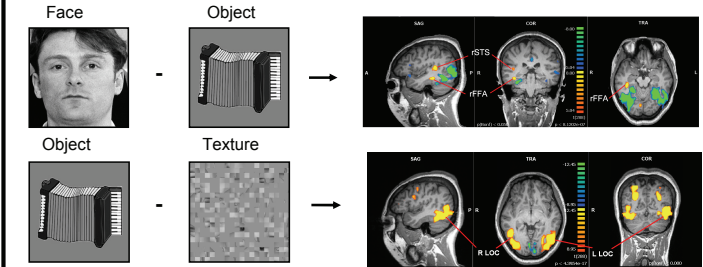


Reference:

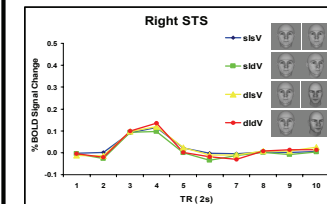
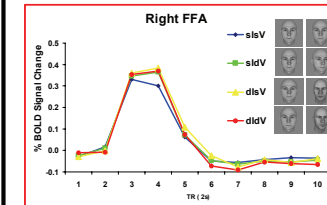
Andrews, T. & Ewbank, M. (2004) Distinct representations for facial identity and changeable aspects of faces in the human temporal lobe. *NeuroImage*, 23, 905-913
 Fang, F. et al. (2007) Duration-Dependent fMRI Adaptation and Distributed Viewer-Centered Face Representation in Human Visual Cortex. *Cerebral Cortex*, 17, 1402-1411
 Grill-Spector, K. et al. (1999) Differential processing of objects under various viewing conditions in the human lateral occipital complex. *Neuron*, 24, 187-203
 Lades, M. et al. (1993). Distortion invariant object recognition in the dynamic link architecture. *IEEE Transactions on Computers*, 42, 300-311.
 Yue, X. et al. (2007). Predicting the psychophysical discriminability of faces and other complex stimuli based on measures of physical image similarity. Presented at the Society for Neuroscience in San Diego, CA.
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Region of Interest (ROI) Localization

Face-selective and non-face-selective ROIs were defined by a localizer scan. The rFFA was found in 8/8 subjects and rSTS was found in 6/8 subjects. For objects, bilateral LOCs were found in all subjects.

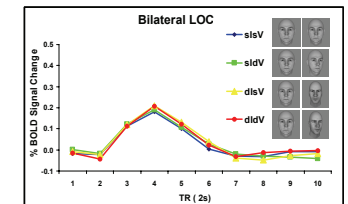


fMRI adaptation Result in ROIs



A change in Identity produced a release from adaptation that was equivalent to that produced by a change in Viewpoint. The combined effects were not greater than the individual effects.

In contrast, no differential effects of Identity or Viewpoint were seen in either right STS or bilateral LOC.



Conclusion

The release from adaptation from changes in Identity and Viewpoint show that FFA is sensitive to these variations of face images. (These effects were not apparent in either LOC or rSTS.) However, the equivalence of their effects in FFA, given the equivalence of their physical image changes in the present experiment, suggest that FFA does not contribute to individuation any more than it codes physical variations of faces in general.