

Emotional valence modulates self vs. other activation in mPFC

Eric C. Fields^{1,2}, Kirsten Weber^{2,1}, Ben Stillerman^{2,1}, Nathaniel Delaney-Busch^{1,2}, Candida Ustine³, Ellen F. Lau⁴, & Gina R. Kuperberg^{1,2}

¹Tufts University; ²Martinos Center for Biomedical Imaging, Mass. General Hospital; ³Medical College of Wisconsin; ⁴University of Maryland

ABSTRACT

The medial prefrontal cortex is associated with self-related processing. We used functional MRI to determine how the emotional valence of social vignettes modulates the effect of self-relevance in the mPFC. We saw a self-relevance effect (self>other) in positively-valenced scenarios, but not in neutral or negative scenarios.

SUMMARY

The region of the brain most consistently associated with self-related processing is the medial prefrontal cortex (mPFC). While the mPFC has sometimes been argued to be specialized for self-related processing, it has more often been seen as being part of a broader “mentalizing” network that is used for thinking about both the self and others (Denny, Kober, Wager, & Ochsner, 2012; Legrand & Ruby, 2009; Saxe, 2009).

Previous work in our lab using event-related potentials (ERPs) has shown interesting interactions between self-relevance and emotional valence. Using the N400 component of the ERP as a measure of semantic expectancy, we showed that participants were more likely to expect for positive information in a context that was self-relevant (versus other-relevant) (Fields & Kuperberg, in revision). We interpreted these results in a self-positivity bias framework: much work in social psychology has shown that most people have (often unrealistically) positive views of themselves, and we interpreted our N400 effect as resulting from greater expectations for positive outcomes in self-relevant contexts. Building on this work, we were interested in how emotional valence would modulate the effect of self-relevance in mPFC.

The present study used a 2 (Self-Relevance: self-relevant, other-relevant) x 3 (Emotion: positive, neutral, negative) design. We presented two-sentence social vignettes in the 2nd person (self-relevant) or 3rd person (other-relevant) with a neutral, positive, or negative critical word in the second sentence (e.g., *A man knocks on Sandra's/your hotel room door. She/You see(s) that he has a tray/gift/gun in his hand.*). All scenarios appeared in a different condition across six lists with 36 scenarios in each condition per list. 17 right-handed, female native English speakers with no history of psychiatric or neurological illness read these vignettes and answered comprehension questions while undergoing functional magnetic resonance imaging (fMRI).

Results revealed an interaction between Self-relevance and Emotion within mPFC: there was more mPFC activity to self-relevant than other-relevant positive scenarios (significant at voxel-threshold .001 uncorrected, cluster-level threshold of 0.05 FWE corrected), but no effect of self-relevance on neutral or negative scenarios.

Interestingly, this mirrors the interaction we observed in our previous ERP study on the N400 (Fields & Kuperberg, in revision). Thus one interpretation of the present fMRI results is that participants maximally engaged the mentalizing network when they their self-relevant expectations about positive incoming

information were confirmed by the input. This may have been less likely in both negative and neutral scenarios.