

Understanding Neural Responses to Financial Offers using Facial Expressions

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Objective: Our study seeks further proof of the notion that “Responders” in the Ultimatum Game (UG) experience moral disgust when receiving small financial offers [1]. We defined neural “fingerprints” of disgust by combining fMRI with a computer vision system for the analysis of facial expressions (Emotient SDK; <http://www.emotient.com>) [2]. Our goal was to test whether these “fingerprints” overlap with brain activity associated with small offers in the UG.

Methods: Twelve participants were scanned while playing the *Pictures Task* (PT) and the UG. In the PT, participants saw neutral, positive or disgusting IAPS images [3] (30 pictures × 2 runs). Additionally, participants played the role of “Responder” in the UG (25 offers × 2 runs). During the experiment, we collected videos of participants’ faces, using the Emotient SDK to determine their facial display of disgust. We trained two classifiers to predict whether participants were viewing a disgusting image in the PT. The “Voxels-to-Picture Classifier” (V2P) used a distributed pattern of fMRI signal. V2P is based on the equivalency “disgusting image = experience of disgust.” Instead, the “Voxels-to-Face Classifier” (V2F) was trained to use fMRI signal to predict the continuous measure of disgust assessed using facial expressions. The resulting multi-voxel “fingerprint” of disgust was then employed to classify picture types. Both models performed better than chance.

Results: We tested whether the disgust detectors trained on the PT data could predict small offers (€1-€3 out of €10) in the UG dataset. While V2P performed poorly (accu. = 52%; *n.s.*), V2F was very accurate (accu. = 64%; *p* < 0.0001). The neural “fingerprint” used by V2F included voxels from anterior insula (R/L), amygdala (R), and caudate (L). V2F accuracy suggests that small offers in the UG trigger moral disgust, and that the rich description of affective experiences captured by facial expressions can be used to generate reliable multi-voxel patterns of emotions.

Conclusions: We were able to isolate a configuration of voxels associated with the facial expression of disgust in the PT, and we showed that this “fingerprint” predicts offer amount in the UG. Our findings reinforce the notion that small financial offers elicit moral disgust, and provide a detailed neural representation of this experience, which generalizes from visual (PT) to moral (UG) disgust. The novel approach exemplified by V2F can promote substantial advancements in the identification of the neural substrate of emotions. Additionally, reliable neural “fingerprints” can be employed to build and test quantitative theories on the role of emotions in decision-making processes.

References:

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