Representation of Valence Across Studies

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Introduction

Hedonic valence describes the pleasantness or unpleasantness of psychological states elicited by stimuli and is conceived as a fundamental building block of emotional experience. Multivariate pattern analysis (MVPA) approaches contribute to the study of valence representation by allowing identification of valence on a trial-by-trial basis. However, the issue of construct validity arises in that there is always the possibility that classification results from a single study are driven by factors other than valence, such as the idiosyncrasies of the stimuli. In this work we address this issue by identifying valence across participants from five different fMRI studies, thus increasing the likelihood that classification is driven by valence and not by the specifics of the experimental paradigm of a particular study.

Methods

The five studies included a total of 73 participants and differed on materials, task, trial duration, number of participants, as well as scanner parameters[1-5]. All data were preprocessed in the same (standard) way. A pair of images was generated for each participant, one for positive and one for negative valence.

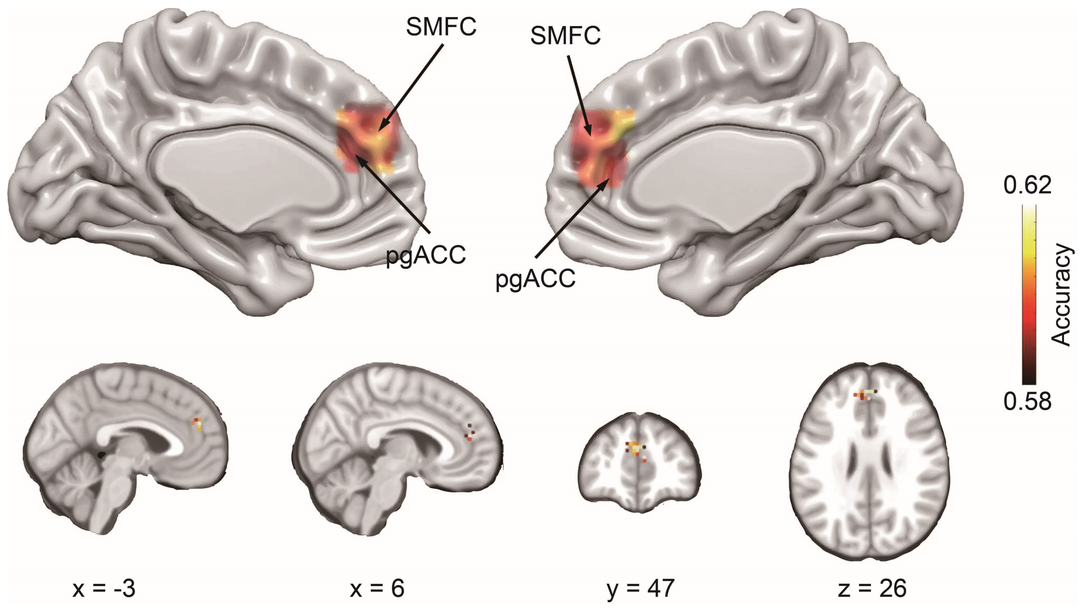
To demonstrate a reliable distinction among positive and negative valence states we trained the classifiers on participant data from four studies and predicted valence states for each of the participants in the fifth study. This procedure was repeated five times, predicting valence states for each of the five studies in a leave-one-study-out cross validation. Average classification accuracy across five cross-validation folds was reported either in a whole-brain or searchlight analysis.

Whole brain analysis: replicability feature selection (1000 vxls), Gaussian Naïve Bayes (GNB) classifier.

Searchlight analysis: 5 x 5 x 5 voxels cube, GNB, permutation-based thresholding (n = 1000).

Results

In cross-participant cross-study classification, we have demonstrated a reliable distinction between positive and negative valence states (whole-brain, 77% accuracy, $p < .001$). Bilateral pregenual anterior cingulate cortex (pgACC) and superior medial frontal cortex (SMFC) were sensitive to valence information.



Summary

The demonstrated cross-study classification of valence enhances the construct validity and generalizability of the findings from the combined studies.

References

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