Decoding Emotions:

Using MVPA to explore neural overlap in emotion experience and understanding

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Introduction & hypotheses

Emotions are constructed when **sensorimotor** and **interoceptive signals** are integrated with **situationally-relevant concepts** and experience -- a process called situated conceptualization (**1**,**2**).

We argue that the same constructive process underlies perception and understanding emotional states in others (**3**). In this project we ask whether these processes capitalize on the same brain networks.

Using Multivariate Pattern Analysis (MVPA) on fMRI data, we hypothesized that:

1: We can decode the neural representation of self-imagined emotional **actions**, **interoceptive sensations** and **situations**.

2: Using the neural representations from the **self**-task, we can decode how people understand the emotions of **others**.

Methodology

Self

Imagine performing **actions or expressions**, having certain **bodily feelings**, or experiencing particular (emotional) **situations**.

Other

Think about **HOW** people are expressing their emotions, **WHAT** people might feel inside their bodies, or **WHY** people feel they way they do.

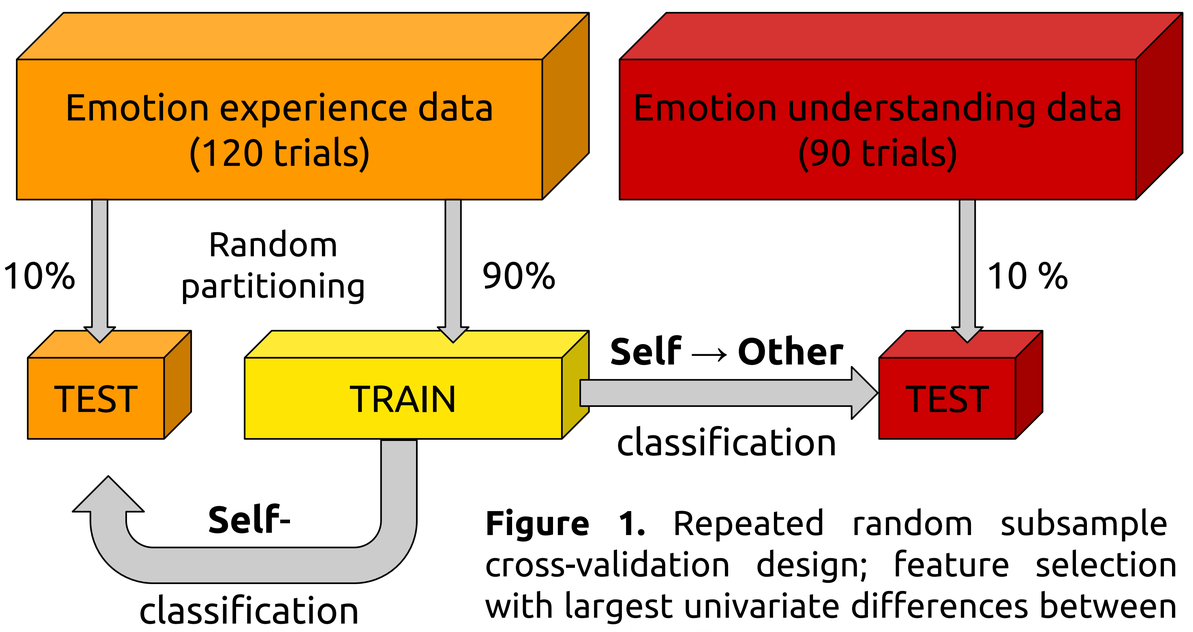
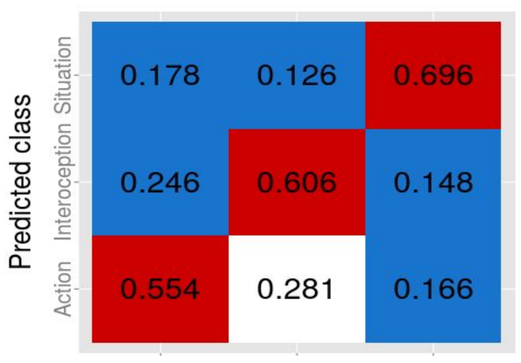


Figure 1. Repeated random subsample cross-validation design; feature selection with largest univariate differences between classes; classification with LIBSVM.

Results

Classification results

- **Self**-classification: 61%



- **Self → Other**: 40 %

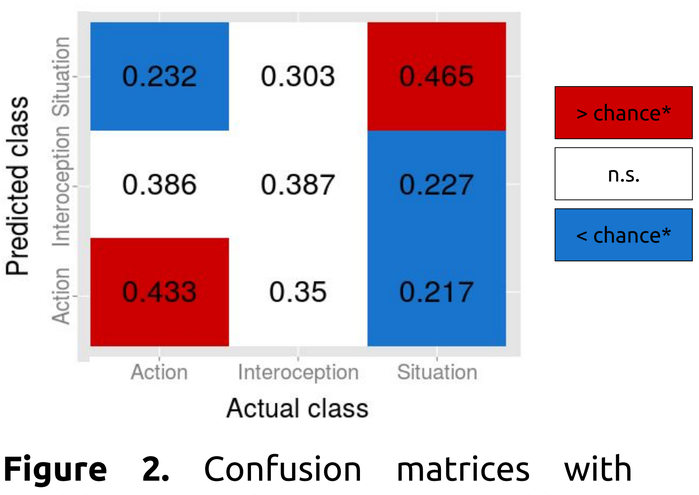


Figure 2. Confusion matrices with Positive Predictive Values; * Significance at α = 0.05, using permutation-statistics. Note that *chance level is 33%.*

Back-projection of accurately classifying voxels

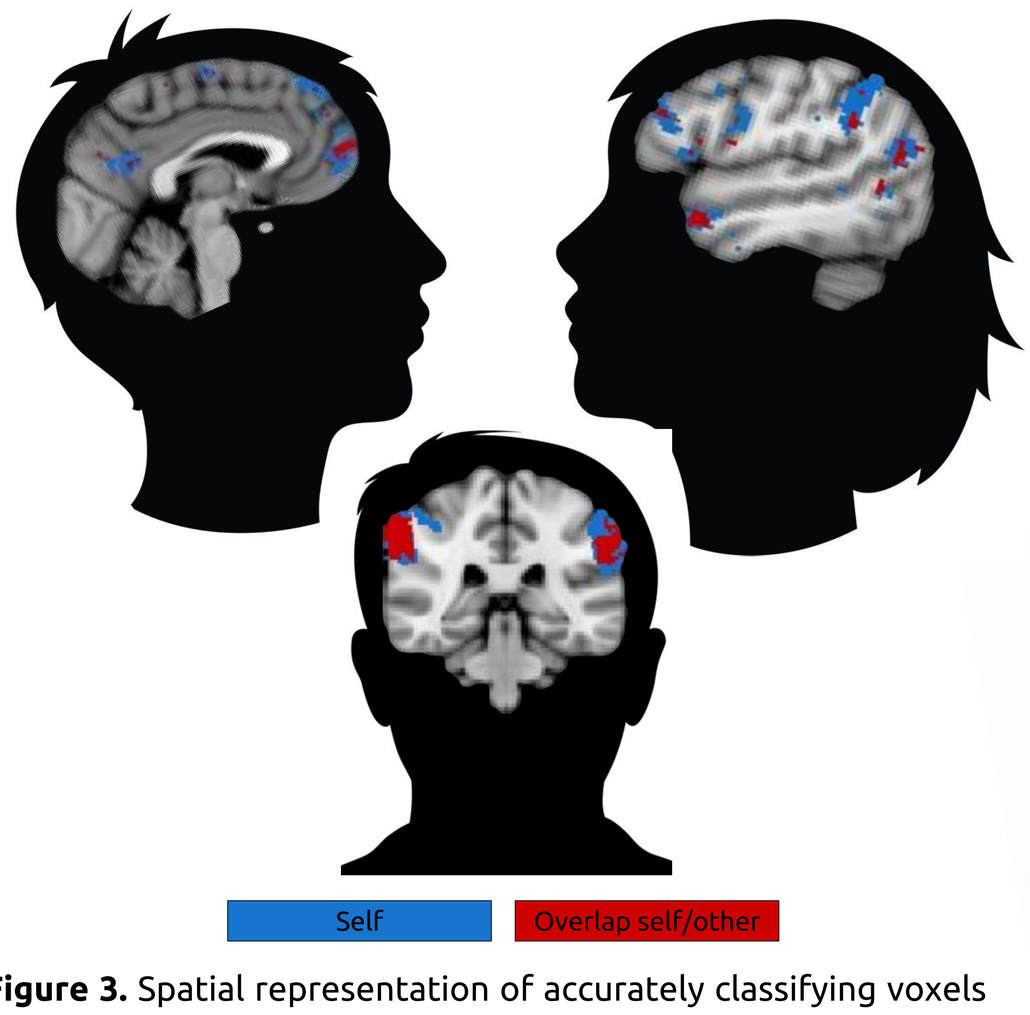


Figure 3. Spatial representation of accurately classifying voxels (>40% correct across iterations) for the *self* and *self → other* classification; on average, 22% of the voxels overlapped between the *self* and *self → other* analysis.

Spatial representations

- mPFC (mentalizing)
- pCC (mentalizing)
- TPJ (mentalizing)
- Precentral gyr. (MNS)
- Temporal pole (concepts)

Representational similarity

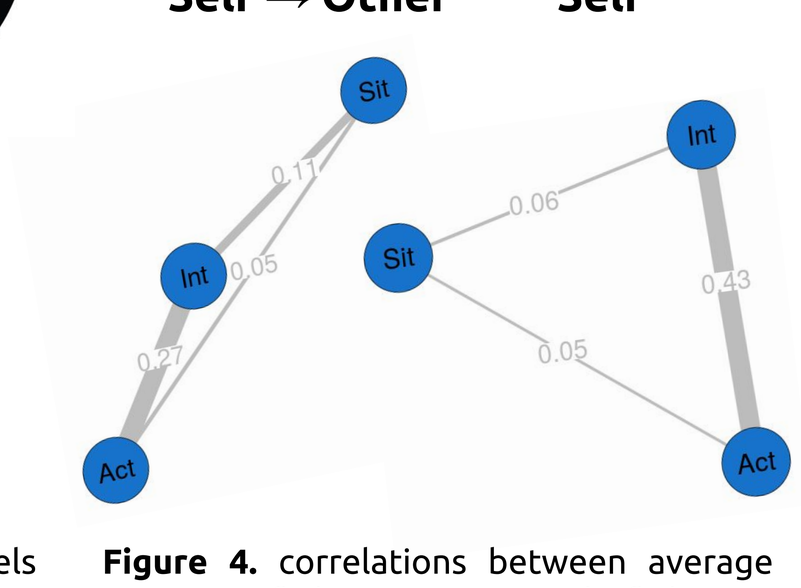


Figure 4. correlations between average patterns of classes, composed of the 100 best-classifying voxels of each class, in a force-directed graph.

Discussion

- Significant classification from self to other suggests that emotion experience (self) and understanding (other) are represented in common networks;
- No neural overlap between self-focused and other-focused interoceptive information processing

Conclusion

This study shows that emotion experience and understanding are mediated by the same global networks involving parts of the sensorimotor and mentalizing network.

References

1. Barrett, L. (2006). *Pers Soc Psychol Rev, 10,* 20-46; **2**. Barsalou, L. (2009). *Phil. Trans. R. Soc. B*, *364,* 1281-1289.
3. Oosterwijk, S, & Barret, L. (2014). Routledge Handbook of Embodied Cognition, Routledge: Oxford.