



# Finding the Correlation Between Social and Emotional Processing Neural Activations: An fMRI Study

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**Pod name:** Graceful Delphinium/The Quiet Bunch



- **Background:**

- Humans are social animals
- Behavioural correlations between social cognition and emotion processing [1]
- Dysfunction = identifier for diagnosis

- **Research Question:**

- Looking for a neuroanatomical relationship
- Neural activations in social cognition correlated with those in emotion processing
- Overlapping functionality

- **Hypothesis:**

- Positive correlation between beta maps of the social cognition and emotional processing tasks
- Neural correlates in the prefrontal cortex and cingulate cortices [2,3]
- Mixed Selectivity Theory

- **Dataset:**

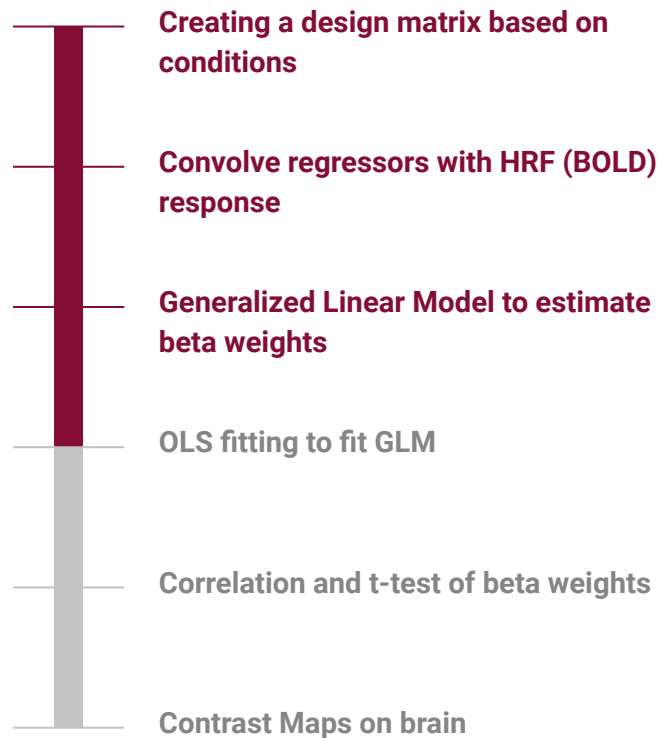
- fMRI time-series data from the Human Connectome Project (HCP) [4]
- 100 participants, 360 brain parcellations each
- Social Cognition (Theory of Mind) task; mental interaction condition, random condition
- Emotional Processing Task; fear condition, neutral condition



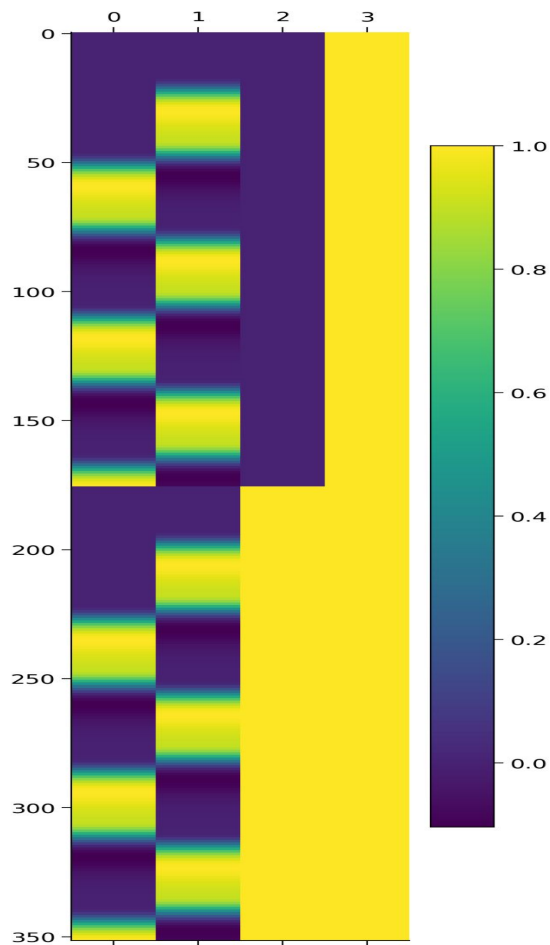
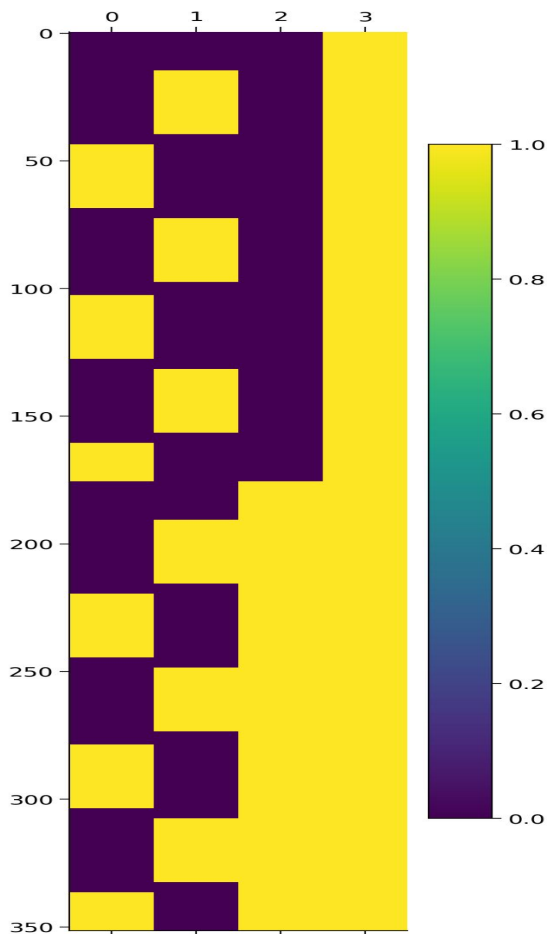
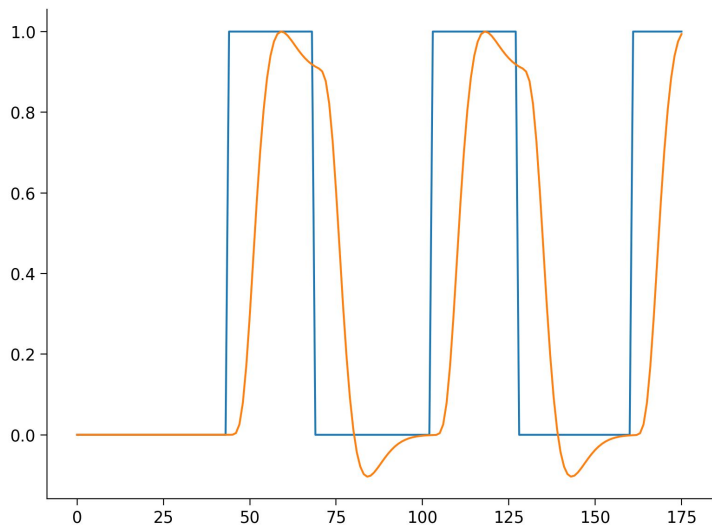
Ambitious! But how would we accomplish this?

Applying what we learnt in neuromatch tutorials

# Analysis Project Pipeline

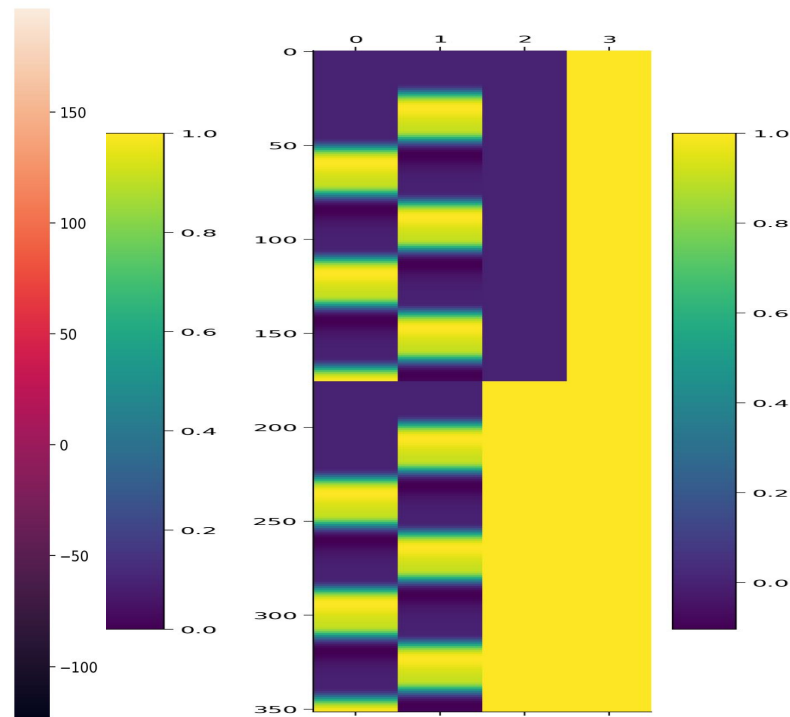
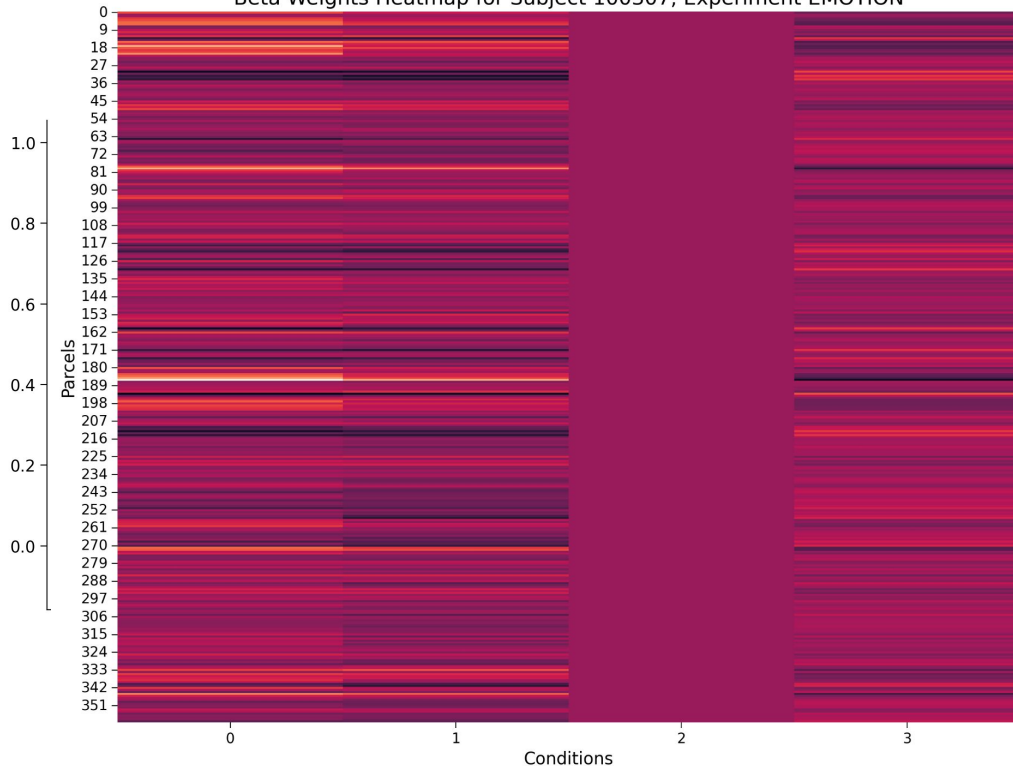


# Design Matrices



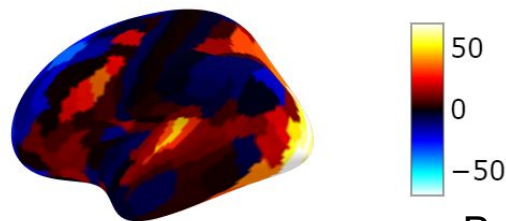
# Design Matrices

Beta Weights Heatmap for Subject 100307, Experiment EMOTION

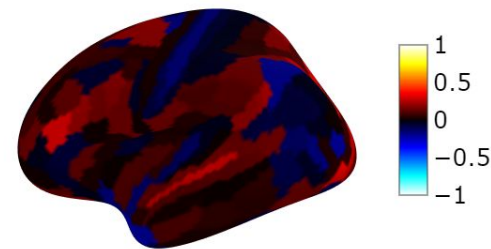


# Results

Brain map for Fear beta values averaged across subjects



Correlation between Fear-Neutral and Mental-Random

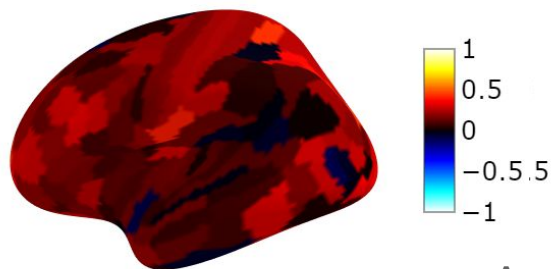


Brain map for Mental beta values averaged across subjects

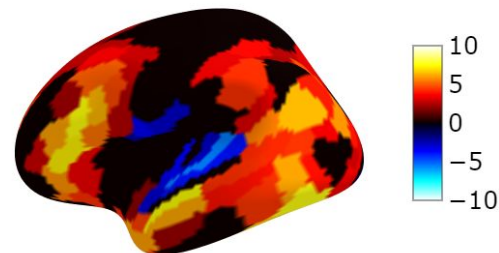


# Results

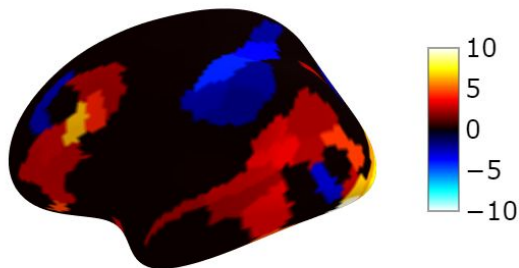
correlation between Fear and Mental beta maps



Averaged Mental-Random contrast values(T-test)



Averaged Fear-Neutral contrast values(T-test)



# Roadblocks and Future Directions

## Roadblocks:

- Individual Differences
- Only measures BOLD signal
- fMRI does not measure subcortical regions (largely involved in emotion) well

## Future directions:

- Testing across different emotions (e.g., happiness, sadness, etc.)
- Gender differences
- Age differences
- Larger sample size



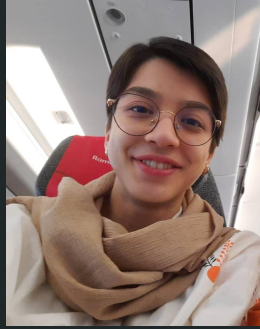
# References

1. Mitchell, R.L.C. and Phillips, L.H. (2015) 'The overlapping relationship between emotion perception and theory of mind', *Neuropsychologia*, 70, pp. 1–10. doi:10.1016/j.neuropsychologia.2015.02.018.
2. Zhou, F. et al. (2021) 'A distributed fmri-based signature for the subjective experience of fear', *Nature Communications*, 12(1). doi:10.1038/s41467-021-26977-3.
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4. Barch, D.M. et al. (2013) 'Function in the human connectome: Task-fMRI and individual differences in behavior', *NeuroImage*, 80, pp. 169–189. doi:10.1016/j.neuroimage.2013.05.033.

# Thank you for listening to the 'usually' Quiet Bunch!



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