Generalizable Neural Representations of Emotional Arousal Across Individuals and Situational Contexts

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Research questions

How can we track human everyday affective experiences from the brain dynamics?

Does dynamic functional connectivity encode generalizable representations of arousal and valence?

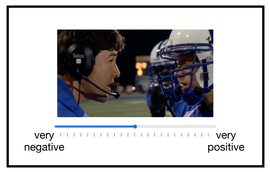
fMRI datasets

Openly available fMRI data from the *Sherlock*[1] and *Friday Night Lights*[2] datasets

16 and 35 participants watched *Sherlock* (48 min 6s) and *FNL* (45min 18s) respectively insider a scanner

Behavioral experiment

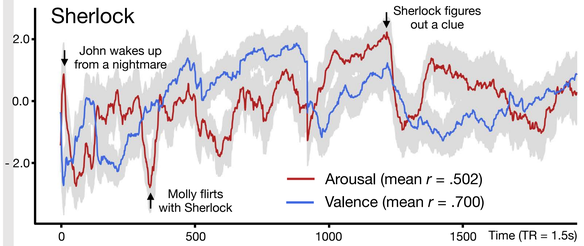
Continuous Rating Task (Arousal/Valence)

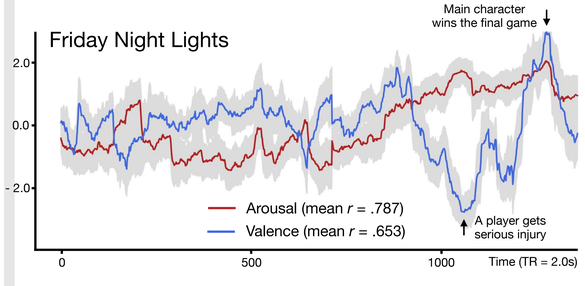


Participants (N = 120) watch *Sherlock* or *Friday Night Lights*.

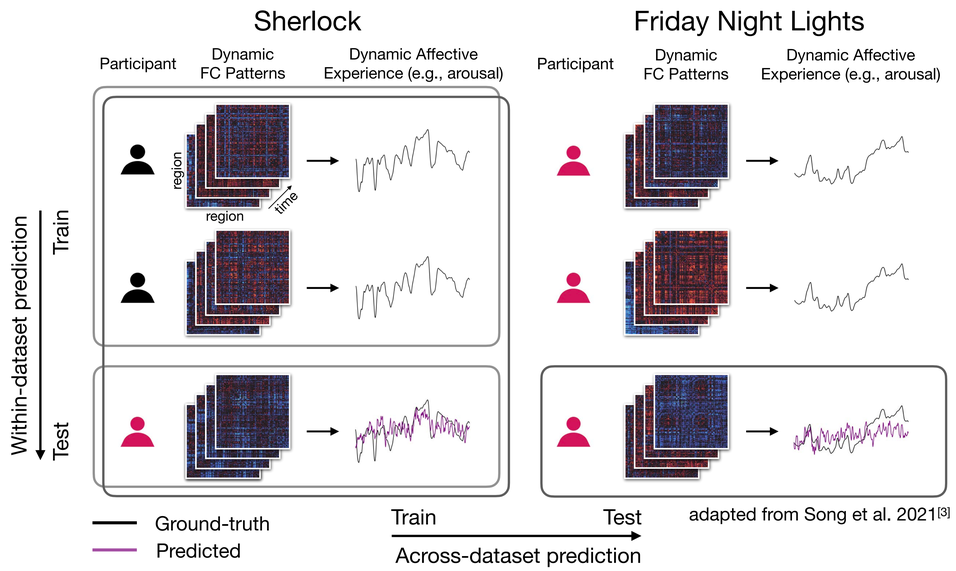
Each participant continuously rated either arousal or valence on a slider bar while watching.

Group-average Arousal and Valence

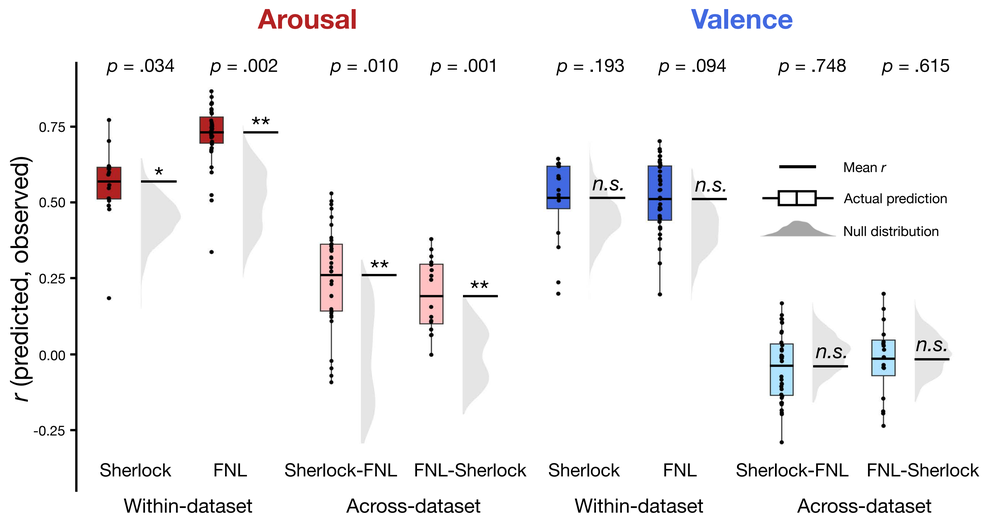




Connectome-based predictive modeling (CPM)

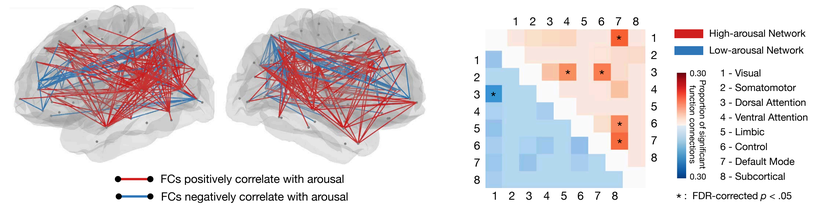


Dynamic FC predicts arousal but not valence



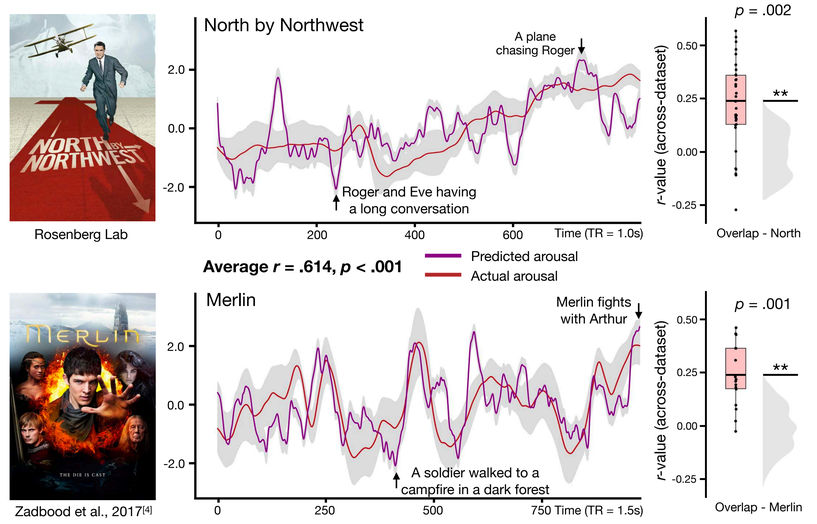
Patterns of dynamic functional connectivity encode moment-to-moment fluctuations in emotional arousal but not valence.

Functional anatomy of arousal

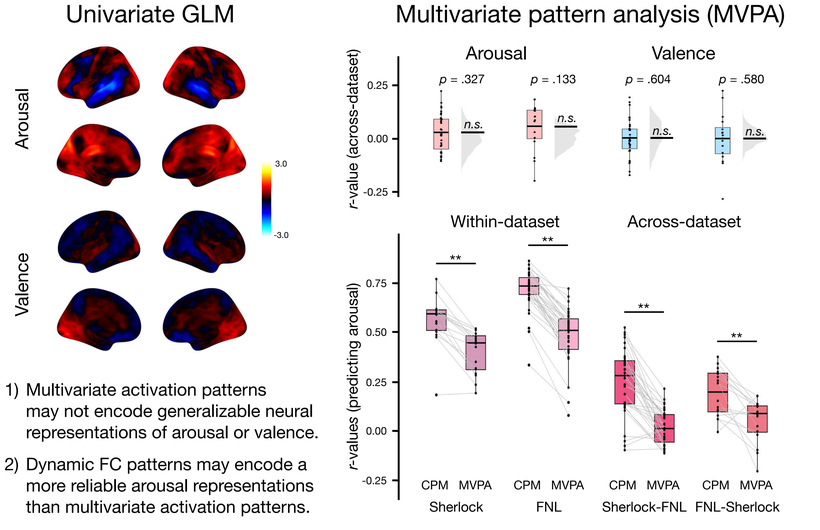


Generalizable neural representations of arousal are encoded in FC patterns within and between distributed large-scale functional networks.

Arousal CPM generalizes to more datasets



Univariate and multivariate pattern analysis



1) Multivariate activation patterns may not encode generalizable neural representations of arousal or valence.
2) Dynamic FC patterns may encode a more reliable arousal representations than multivariate activation patterns.

Code & manuscript availability

GitHub

bioRχiv

Conclusions

1) Dynamic functional connectivity encodes generalizable neural representations of arousal.
2) This reveals an intrinsic similarity in how arousal is encoded in the human brain across individuals and situational contexts.

References

[1] Chen et al. (2017). *Nature Neuroscience*

[2] Chang et al. (2021). *Science Advances*

[3] Song et al. (2021). *PNAS; JNeurosci*

[4] Zadbood et al. (2021). *Cerebral Cortex*