Dynamic Connectome-based Predictive Model of Affective Experience during Naturalistic Viewing

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Research Questions

How can we continuously measure affective experience during naturalistic movie watching?

What are the neural signatures of valence and arousal? Can we predict changes in valence and arousal from dynamic fMRI functional connectivity (FC)?

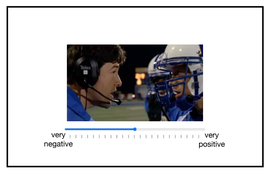
fMRI Dataset

fMRI data: openly available fMRI data from the *Sherlock*[1] (*N*=16) and *Friday Night Lights*[2] (*N*=35) dataset

Participants watched Sherlock (48 min 6s) and FNL (45min 18s) respectively inside a scanner

Behavioral Experiment

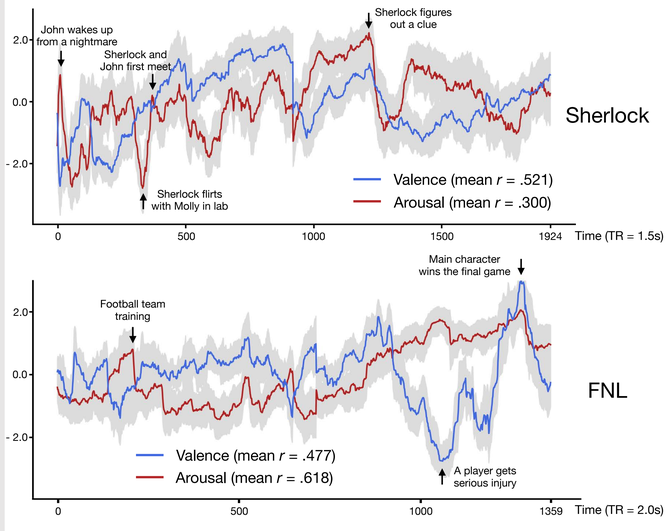
Continuous Rating Task (Valence/Arousal)



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

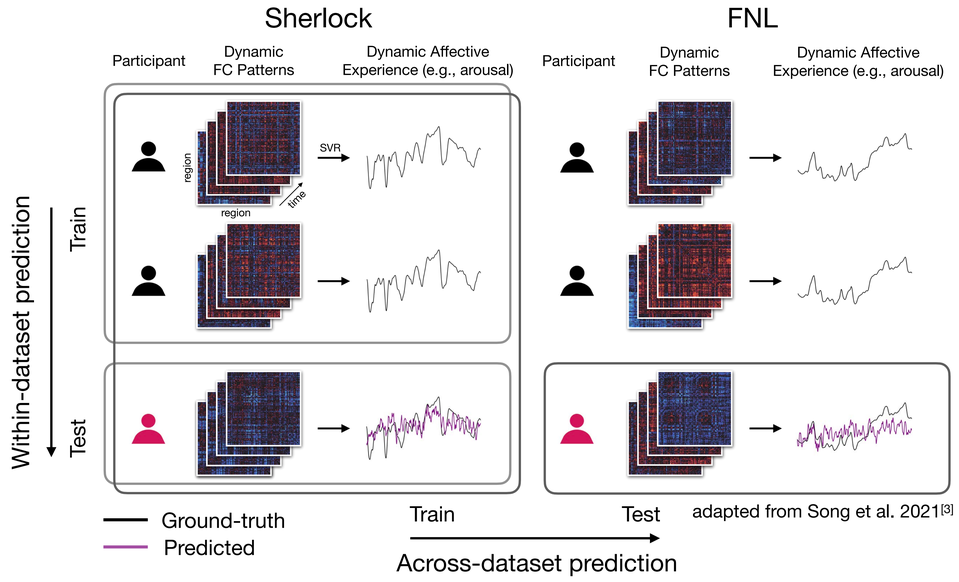
Each participant continuously rated either valence or arousal on a slider bar while watching.

Group-average Valence and Arousal

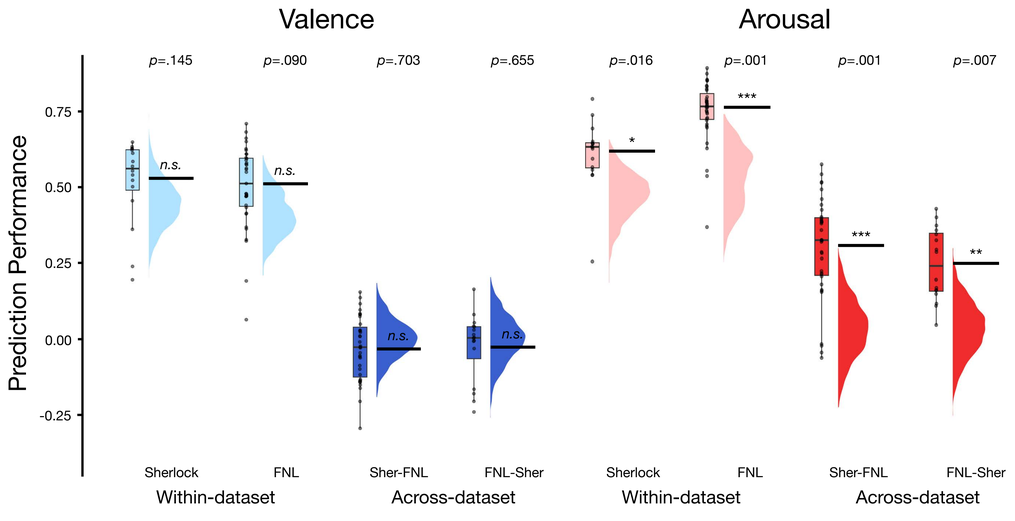


Affective experience during narrative perception fluctuates overtime, and is synchronized across individuals

Dynamic Connectome-based Predictive Modeling (CPM)

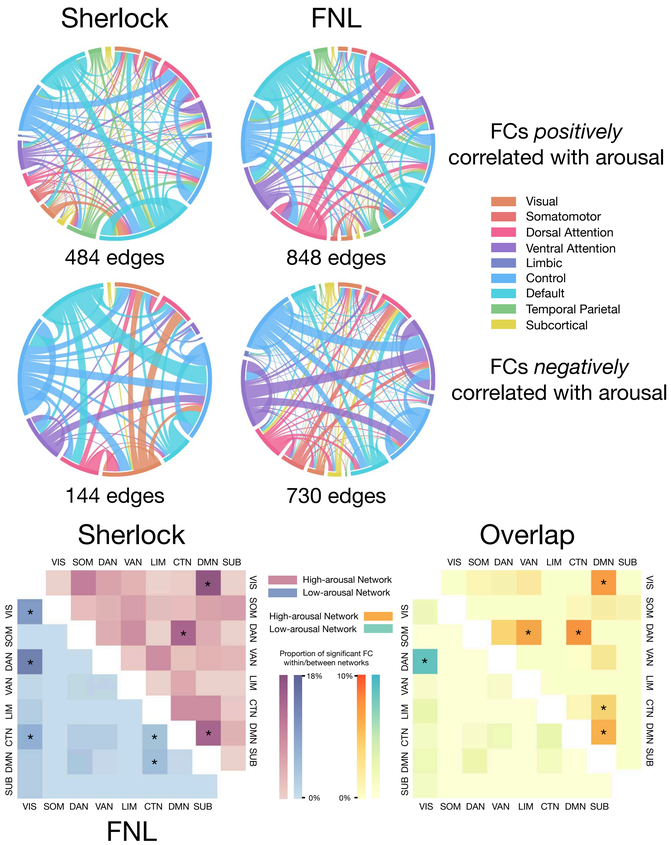


Dynamic FC Predicts Arousal but not Valence



1) CPMs predicts arousal, but not valence, with above-chance accuracy within dataset.
2) The arousal, but not the valence, model generalized across datasets.

Functional Anatomy of Arousal



1) The high- and low-arousal networks span numerous cortical and subcortical brain regions.
2) Within- and between-network FCs, mainly in the DMN, CTN, and DAN, predict arousal across narratives.

Multivariate & Univariate Predictions

1) Multivariate patterns of activation magnitude do not predict valence or arousal.
2) Univariate GLM on valence and arousal do not exhibit consistent results across narratives.

Conclusions

Continuous rating while watching captures affect dynamics during naturalistic movie watching. Affective states are synchronized across participants.

Connectome-based predictive models successfully predict subjective feelings of arousal but not valence. This suggests that dynamic functional brain connectivity encodes narrative-general arousal, but potentially not valence.

References

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

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

[3] Song et al. (2021). *PNAS*
https://github.com/hyssong/NarrativeEngagement