

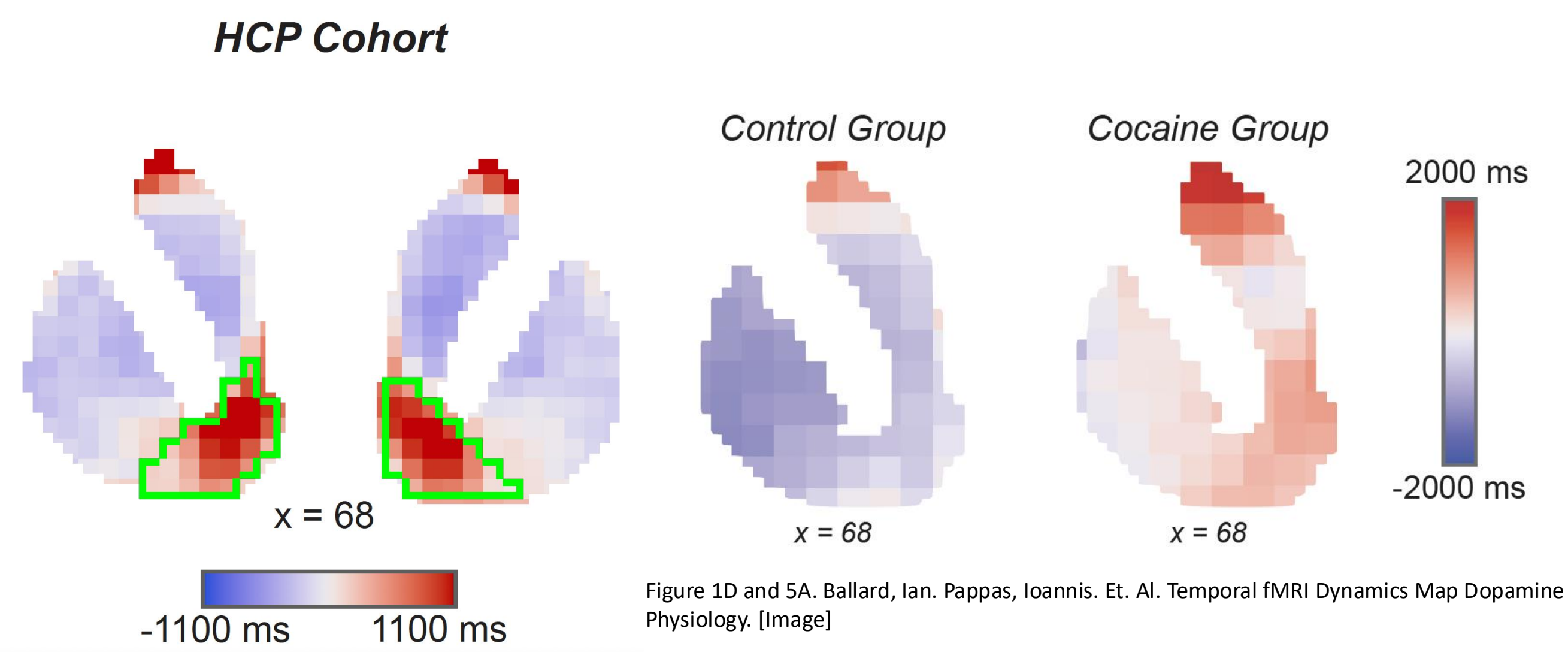


Exploring The Relationship Between Nicotine Use, Reward-Related Personality Measures, and Hemodynamic Latency In Dopaminergic Striatal Areas

Bhakti Patwardhan, Nickilou Y. Krigbaum, Raana A. Mohyee, Ashby B. Cogan, Lauren Weittenhiller, Ann M. Kring, Ingrid R. Olson, Barbara A. Cohn, Mark D'Esposito, Thomas M. Olino, Piera M. Cirillo, Lauren M. Ellman, Ioannis Pappas, Ian Ballard



Hemodynamic latency as a measure of dopamine physiology in healthy and clinical populations

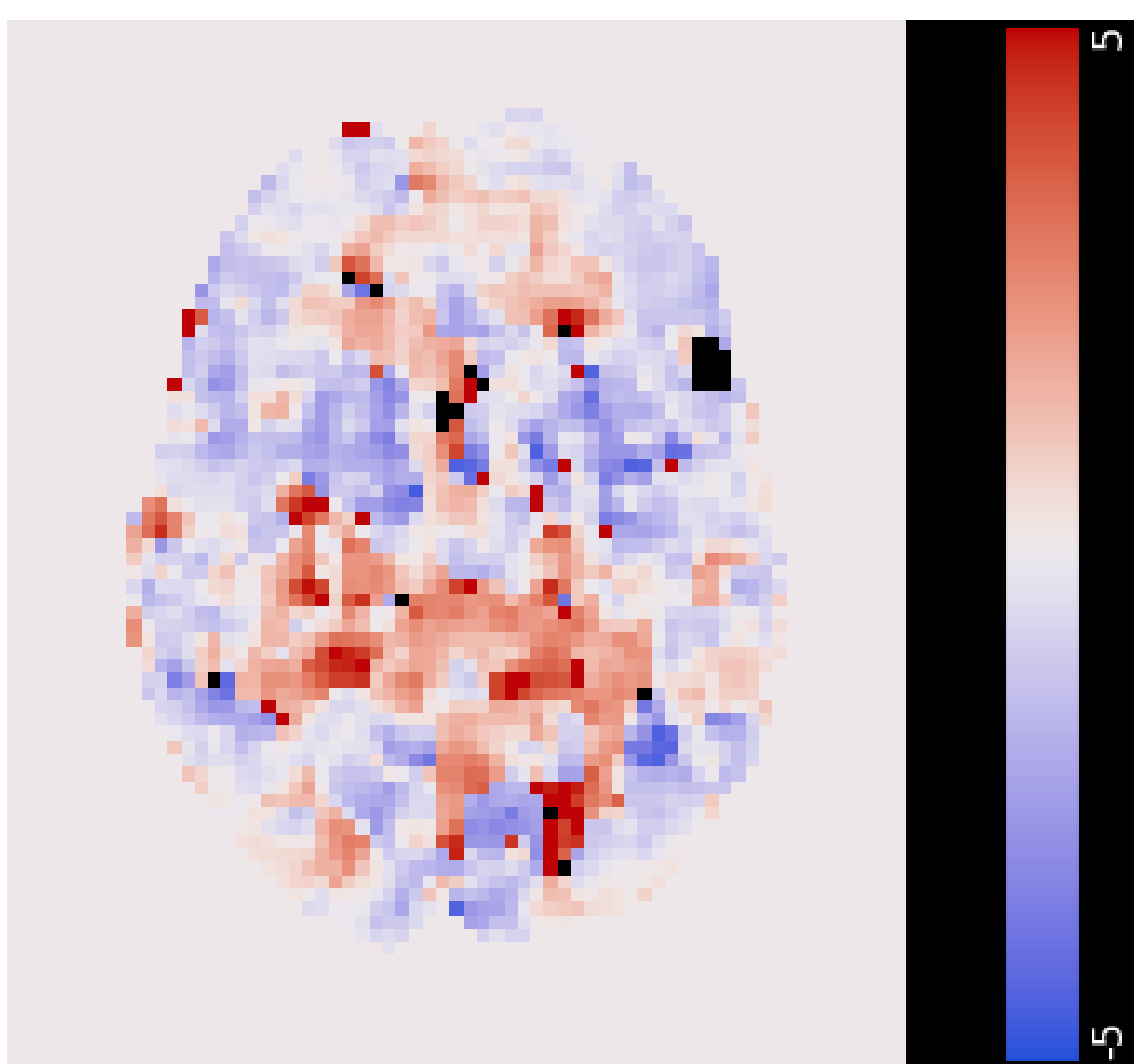


- ❖ Dopamine causes vasoconstriction and influences timing of BOLD signal.
- ❖ Previous work demonstrates that hemodynamic latency traces the anatomical boundaries of the nucleus accumbens where extracellular dopamine persists (Ballard et. al. 2025 preprint).
- ❖ Previous work demonstrates latencies increased in the striatum for groups with cocaine use disorder.
- ❖ Nicotine causes changes in the brain's dopamine system that may persist after cessation of nicotine.

Is history of nicotine use related to altered dopamine physiology?

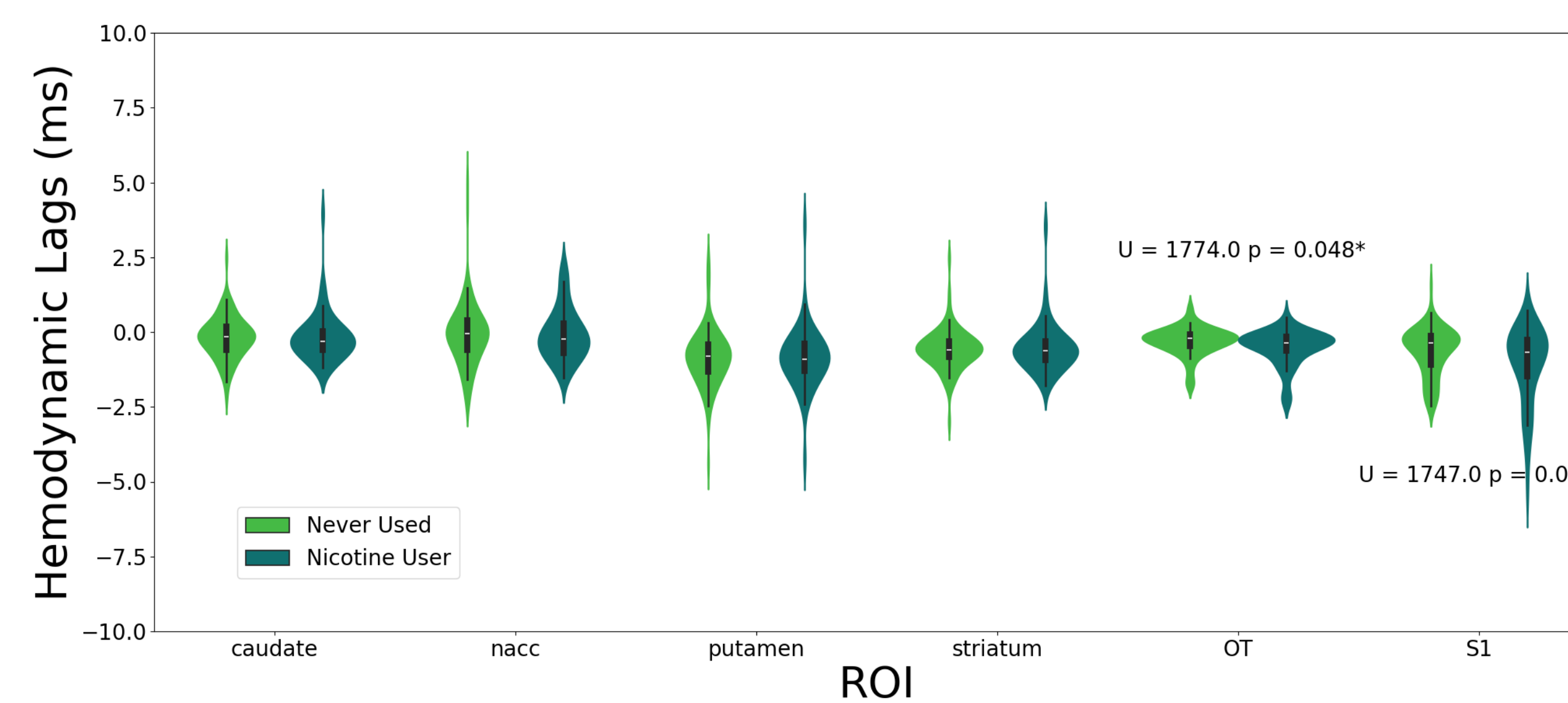
1. Does change in the dopamine system (measured using hemodynamic latencies) persist for healthy adults with a history of nicotine use?
2. Is change in the dopamine system related to reward-related personality attributes?

Rapidtide: Time delay analysis on low frequency fMRI



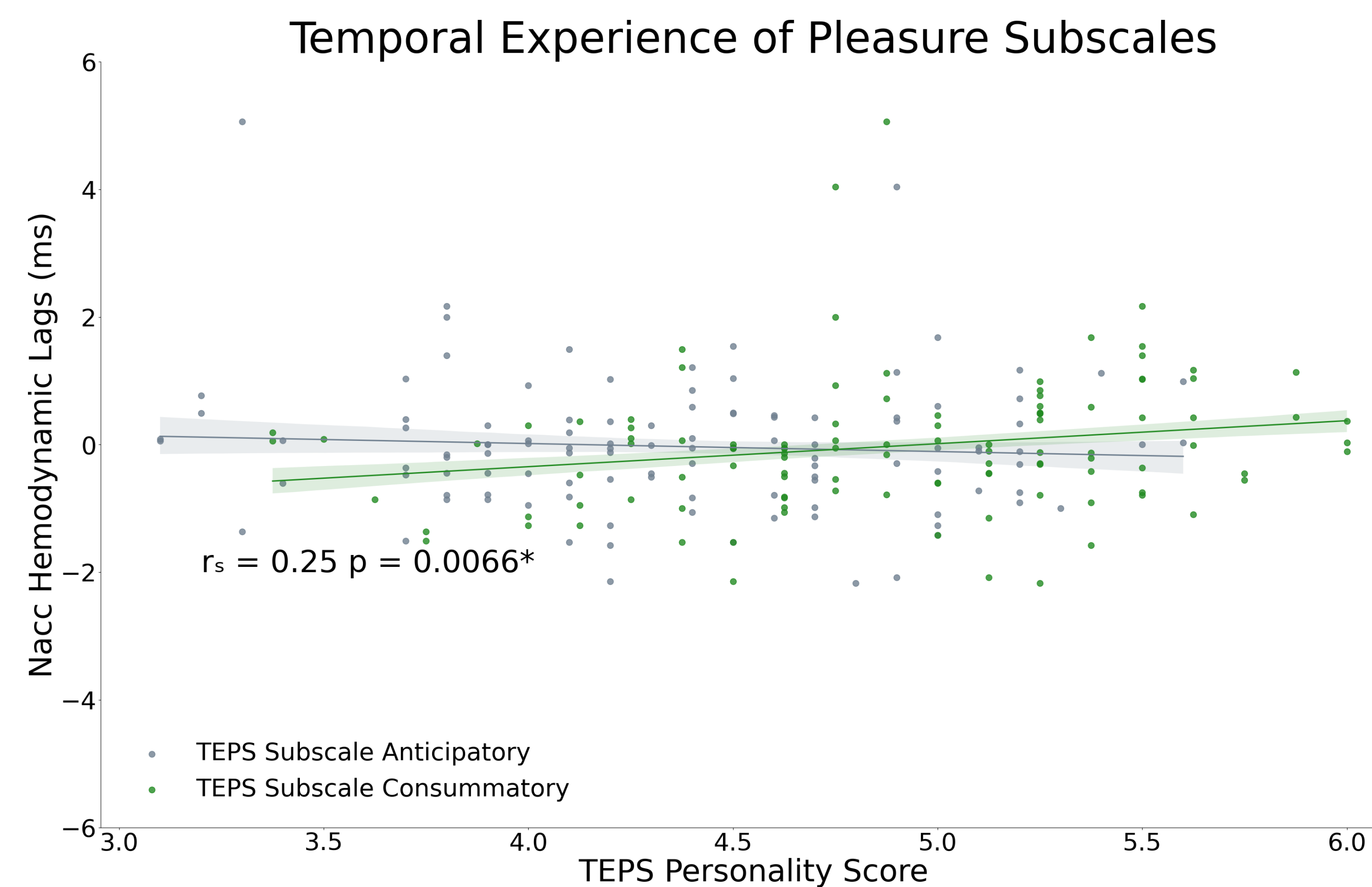
- ❖ Used to calculate lags between ROI and global mean signal.
- ❖ Mann Whitney U test to compare latencies between groups
- ❖ Spearman correlation between personality measures and lags in the nacc.

Compared to non-users, people who have used or currently use nicotine have lower latency in the occipital-temporal lobe and S1



- ❖ S1 past/present users: $\mu = -1.12$, $\sigma = 1.33$; non-users: $\mu = -0.64$, $\sigma = 0.81$
- ❖ OT past/present users: $\mu = -0.52$, $\sigma = 0.60$; non-users: $\mu = -0.30$, $\sigma = 0.49$
- ❖ Other relationships were not significant.

Across all subjects, consummatory pleasure was correlated with hemodynamic latency in the nucleus accumbens



- ❖ Spearman correlation between latency in the nacc for all subjects, and reward-related self-report personality scales (TEPS and MAP)
- ❖ There was a significant positive correlation between TEPS consummatory and latency ($r_s = 0.25$, $p = 0.0066$). Other relationships were not significant.

Participants and Methods

- ❖ 126 late middle-aged healthy participants (μ age 58.70), 111 participants used for analyses, with 15 excluded for incomplete self-report data or bad data quality.
- ❖ MRI scans and self-report measures: Sociodemographic survey, Temporal Experience of Pleasure Scale, Motivation, Pleasure Scale.

Conclusion

- ❖ Hemodynamic latency in the striatum was not significantly different between nicotine non-users and past/present users.
- ❖ Significant different in our controls – the occipital lobe and somatosensory cortex. Current/past users had lower latency compared to non-users.
- ❖ Latency was related to higher consummatory pleasure in nacc

Discussion

- ❖ Latency in the nacc being correlated with consummatory pleasure aligns with previous literature on the link between nacc, motivation, and addictive behavior.
- ❖ This personality-based result adds to previous work's cognitive task results where nacc latency was correlated with perseverative errors in a task where participants applied different rules depending on whether a top or bottom number was highlighted (Ballard et. al. 2025 preprint).
- ❖ Changes in the dopamine system do not seem to persist in the striatum for people with a history of nicotine use.
- ❖ People with a history of nicotine use did have lower latency in non-dopaminergic areas.

Future Directions

- ❖ The relationship between maternal inflammation and development of dopamine physiology in the offspring have been explored in animal research. We aim to explore the relationship between maternal inflammation and hemodynamic latency in this human cohort.
- ❖ In previous research, a classifier was able to predict cocaine use disorder using hemodynamic latency in the striatum. We aim to replicate this analysis and see whether a classifier may be able to predict nicotine use.

References

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Contact Information:

Bhakti Patwardhan bhaktipat@gmail.com