Functional Connectome Fingerprinting of People with TMD and their subjective pain experience

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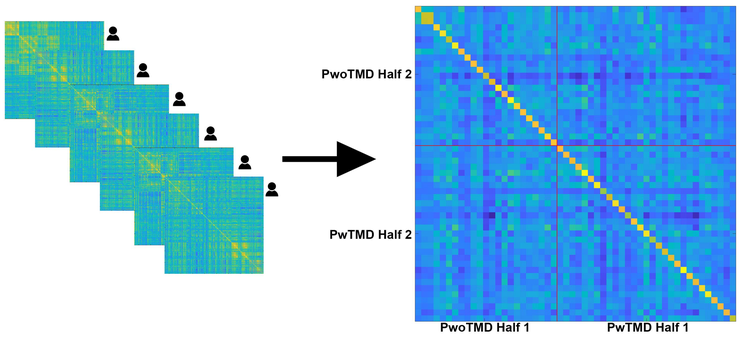
Functional Connectome Fingerprinting

Functional connectome fingerprinting calculates correlations between each individual's connectome and:

- allows for the individual identification of participants (Finn et al. 2015)
- exploration of what connections are driving these individual differences. (Amico et al. 2018)
- predict pain thresholds (Tu et al. 2019)
- correlates with individual experiences (Tolle et al. 2024).



Study Design

Group	N	Sex	Age (mean ± std)
People Without TMD (PwoTMD)	23	Male: 6 Female: 17	36 ± 14 yrs
People with TMD (PwTMD)	29	Male: 2 Female: 27	40 ± 15 yrs

PwTMD Average Years with Pain (mean ± std): 10 ± 10 yrs

See preprocessing pipeline here:

Functional Connectome fingerprinting was calculated in Matlab using the code from Tolle et al. (https://github.com/eamico/Psilocybin_fingerprints)

References:

- Amico, E., & Goñi, J. (2018). The quest for identifiability in human functional connectomes. Scientific Reports, 8(1), Article 1. https://doi.org/10.1038/s41598-018-25089-1
- Finn, E. S., Shen, X., Scheinost, D., Rosenberg, M. D., Huang, J., Chun, M. M., Papademetris, X., & Constable, R. T. (2015). Functional connectome fingerprinting: Identifying individuals using patterns of brain connectivity. Nature Neuroscience, 18(11), Article 11. https://doi.org/10.1038/nn.4135
- Tolle, H. M., Farah, J. C., Mallaroni, P., Mason, N. L., Ramaekers, J. G., & Amico, E. (2024). The unique neural signature of your trip: Functional connectome fingerprints of subjective psilocybin experience. Network Neuroscience, 8(1), 203–225. https://doi.org/10.1162/netn_a_00349
- Tu, Y., Zhang, B., Cao, J., Wilson, G., Zhang, Z., & Kong, J. (2019). Identifying inter-individual differences in pain threshold using brain connectome: A test-retest reproducible study. NeuroImage, 202, 116049. https://doi.org/10.1016/j.neuroimage.2019.116049

People with TMD have altered idiosyncrasy from people without TMD

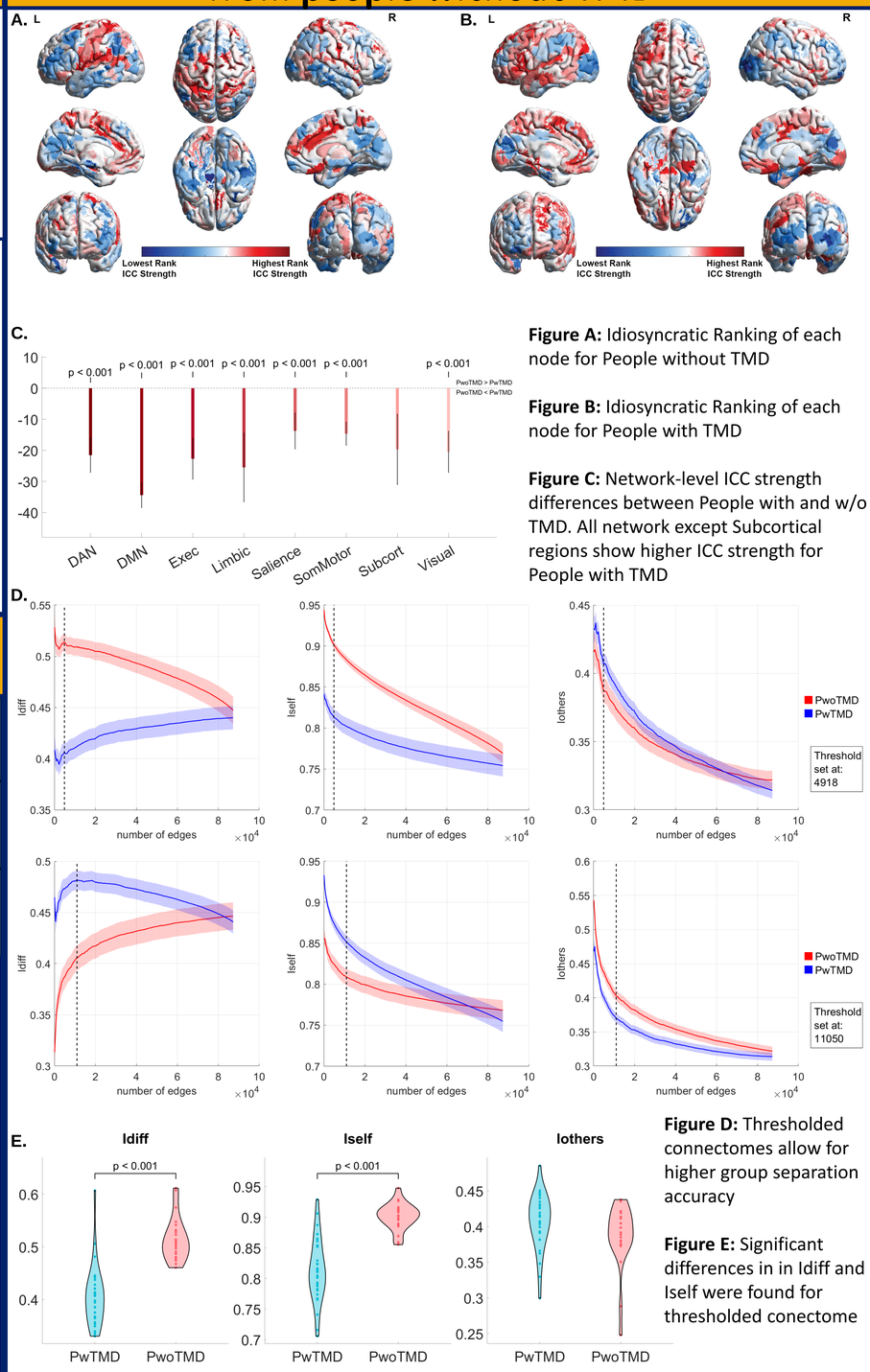


Figure A: Idiosyncratic Ranking of each node for People without TMD

Figure B: Idiosyncratic Ranking of each node for People with TMD

Figure C: Network-level ICC strength differences between People with and w/o TMD. All network except Subcortical regions show higher ICC strength for People with TMD

Figure D: Thresholded connectomes allow for higher group separation accuracy

Figure E: Significant differences in in Idiff and Iself were found for thresholded conectome

Idiosyncratic Connections correlate with Pain

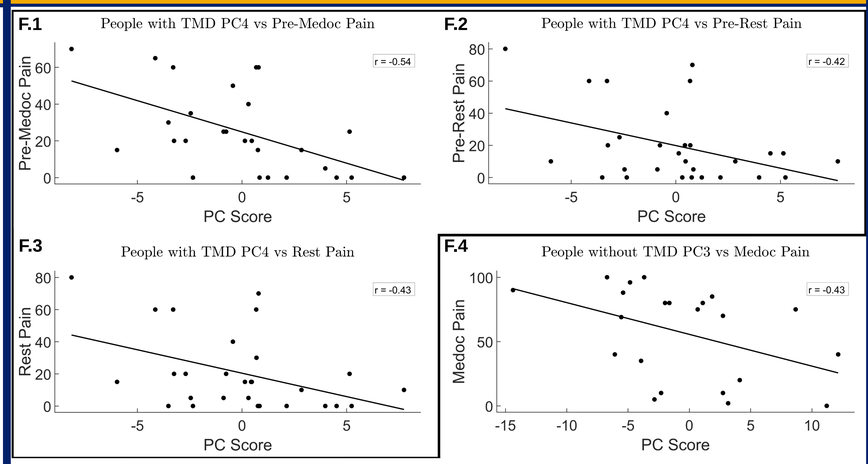


Figure F: 1-3) Correlations between principal components derived from connections from the thresholded connectome of people w/o TMD and resting pain in people with TMD. **4)** Correlation between a principal component derived from connections from the thresholded connectome of people with TMD and thermally induced pain in people without TMD.

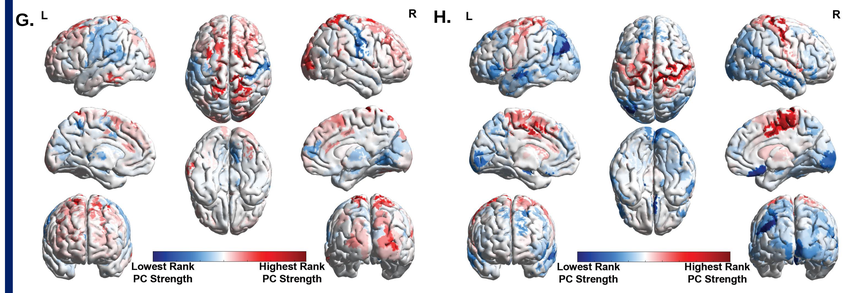
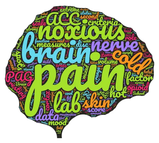


Figure G: Average PC strength distribution for Principal Component 4 in people with TMD derived from the thresholded connectome of people without TMD

Figure H: Average PC strength distribution for Principal Component 3 in people without TMD derived from the thresholded connectome of people with TMD

Conclusions

- TMD alters Idiosyncratic Connections in the Brain
- ICC-Thresholded Fingerprinting allows for accurate Identifiability differences between People with and without TMD
- PCA-derived Components from people without TMD's thresholded connectome show moderate correlations with resting pain in people with TMD
- PCA-derived Components from people with TMD's thresholded connectome show moderate correlations with thermally induced pain in people without TMD
- Future Directions
  - Examining generalizability to all pain conditions
  - Correlation with pain care outcomes



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