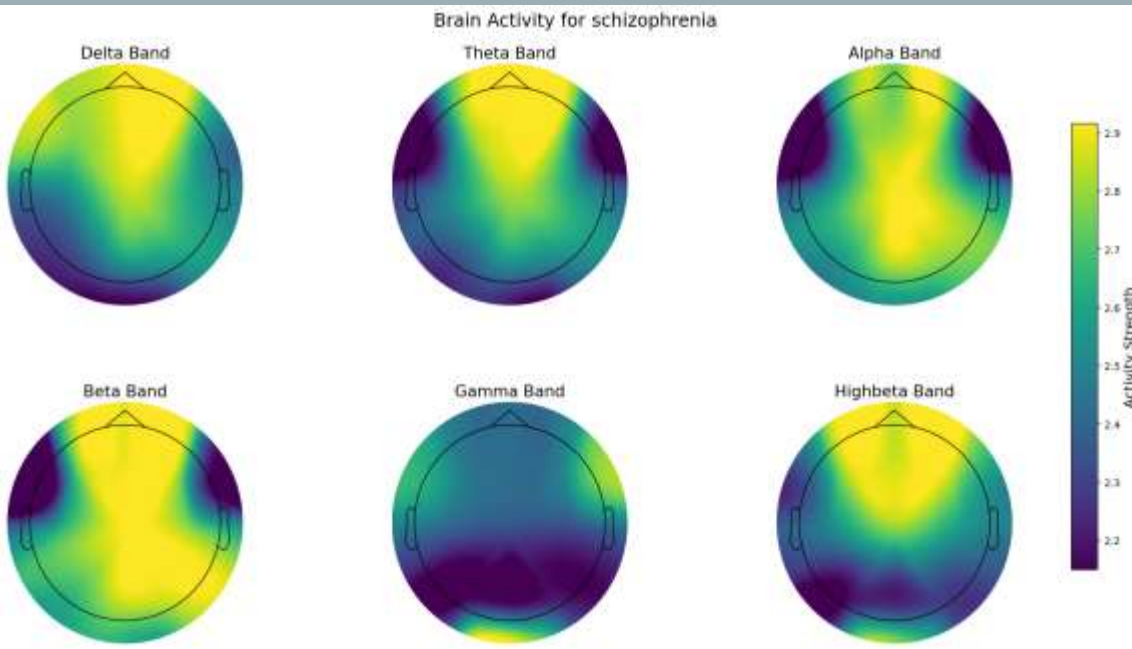


Our data set:

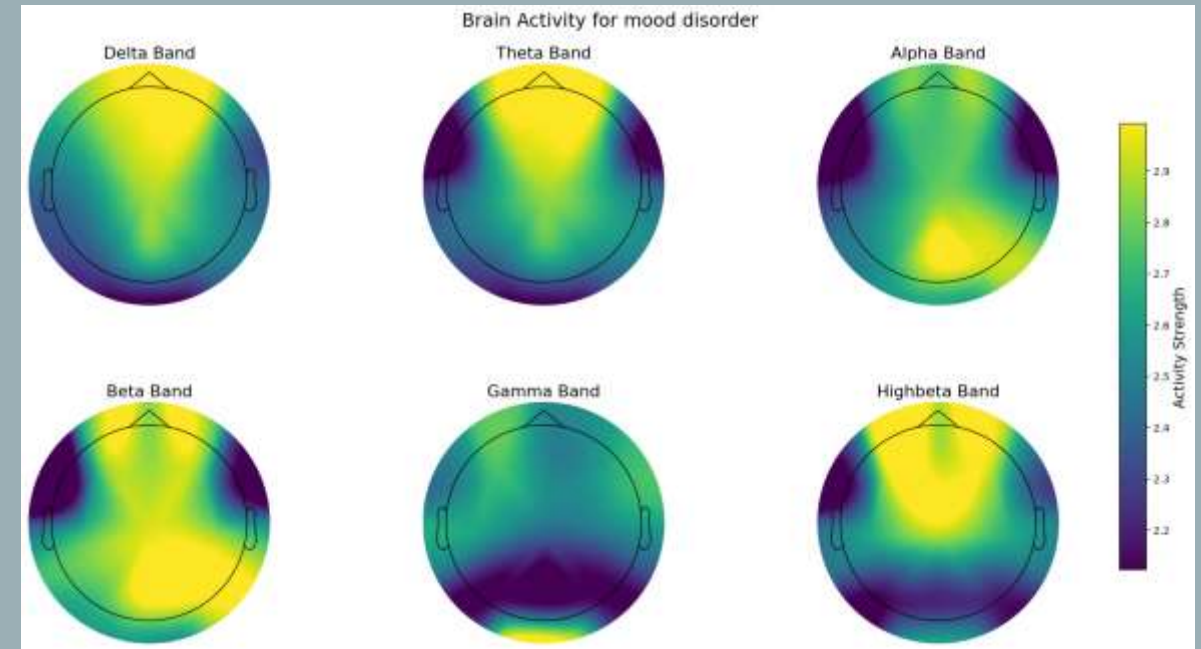
- Contained EEG data from 945 subjects with various different psychiatric disorders. (850 sick & 95 h.c.)
- The EEG data included information from 5 minutes resting state of each subject.
- The 6 main psychiatric categories were: schizophrenia, mood disorders, anxiety disorders, obsessive—compulsive disorders, addictive disorders, and trauma and stress-related disorders.
- Each subject also had a specific disorder (i.e., in addiction disorder, alcohol use disorder or behavioral addiction disorder)
- The data from each electrode for each subject was filtered according to the different frequency bands.
- The EEG parameters were the Power Spectral Densities, measured in $\mu\text{V}^2/\text{Hz}$.

What is the characteristic EEG activity of different main psychiatric disorders?



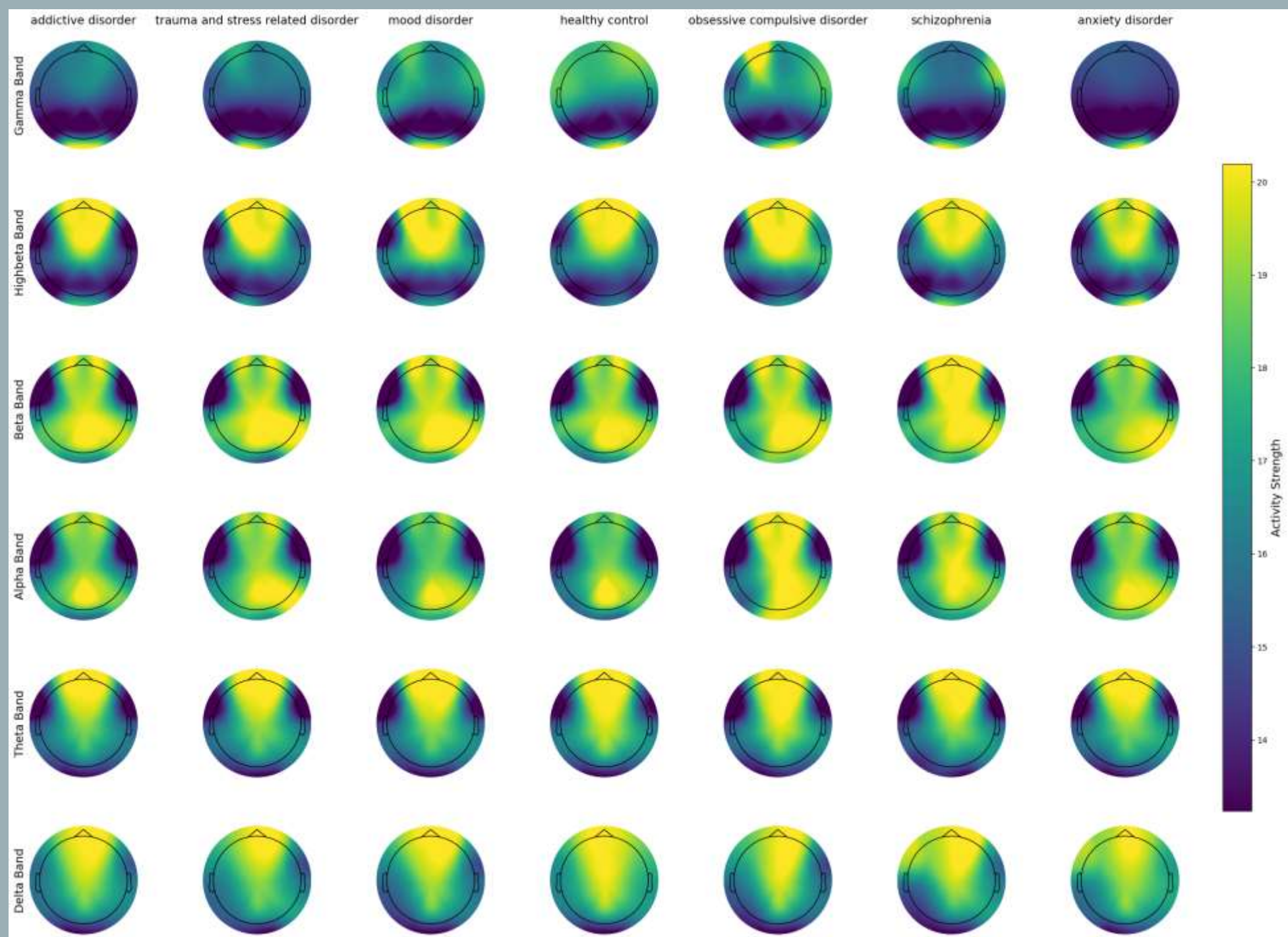
For schizophrenia, we've found excessive occipital activity, especially in the delta band (0.5 – 4 Hz), compared to healthy controls.

Given that delta waves are typically associated with deep sleep and unconscious states, their increased presence in the visual cortex suggests a dream-like neural state while awake, potentially contributing to visual hallucinations.

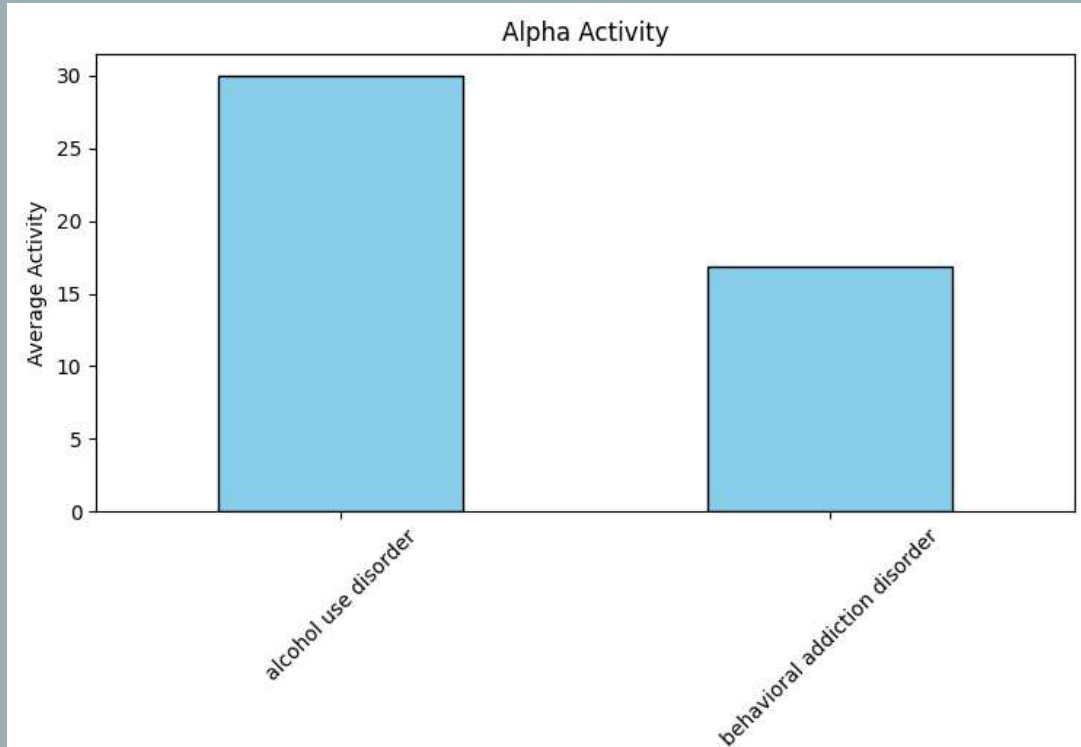


Subjects with mood disorder exhibit significantly increased beta (12–30 Hz) and high-beta (25-30 Hz) activity across multiple brain regions compared to healthy controls.

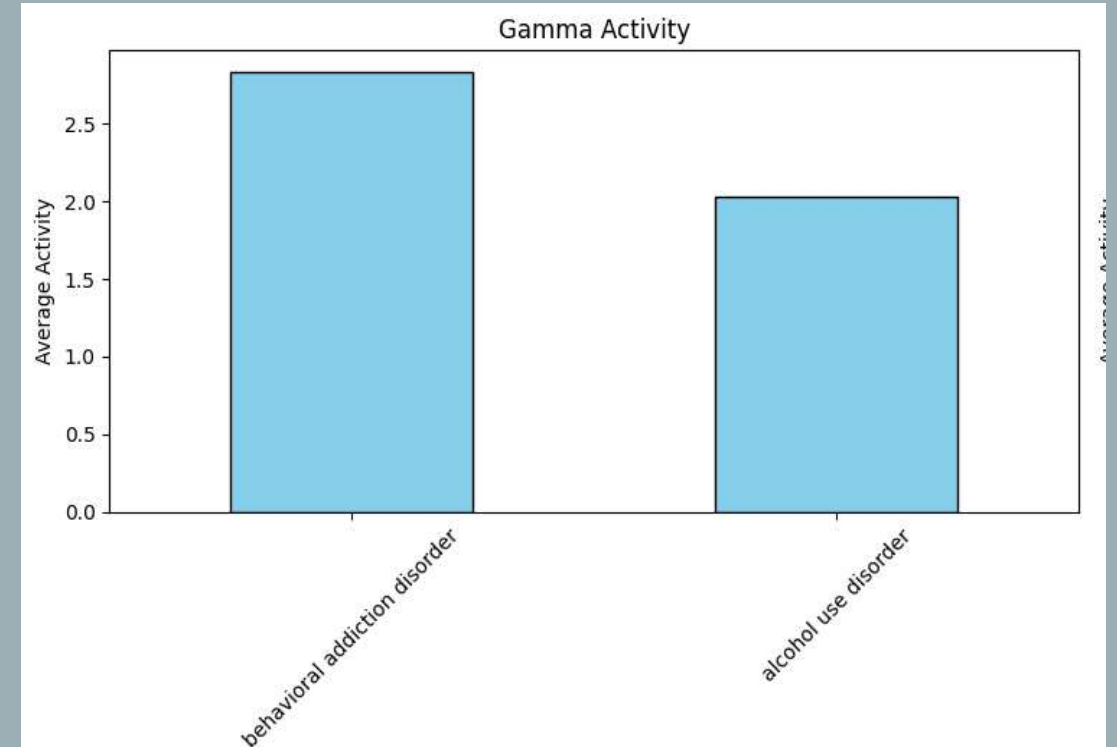
Beta Waves and High-Beta waves are typically associated with active thinking, problem-solving, and alertness. Excessive beta activity can correlate with anxiety, stress, and hyperarousal, which are often observed in mood disorders like major depressive disorder and bipolar disorder.



How do different specific disorders vary in brain activity across various frequency bands within the same main disorder?



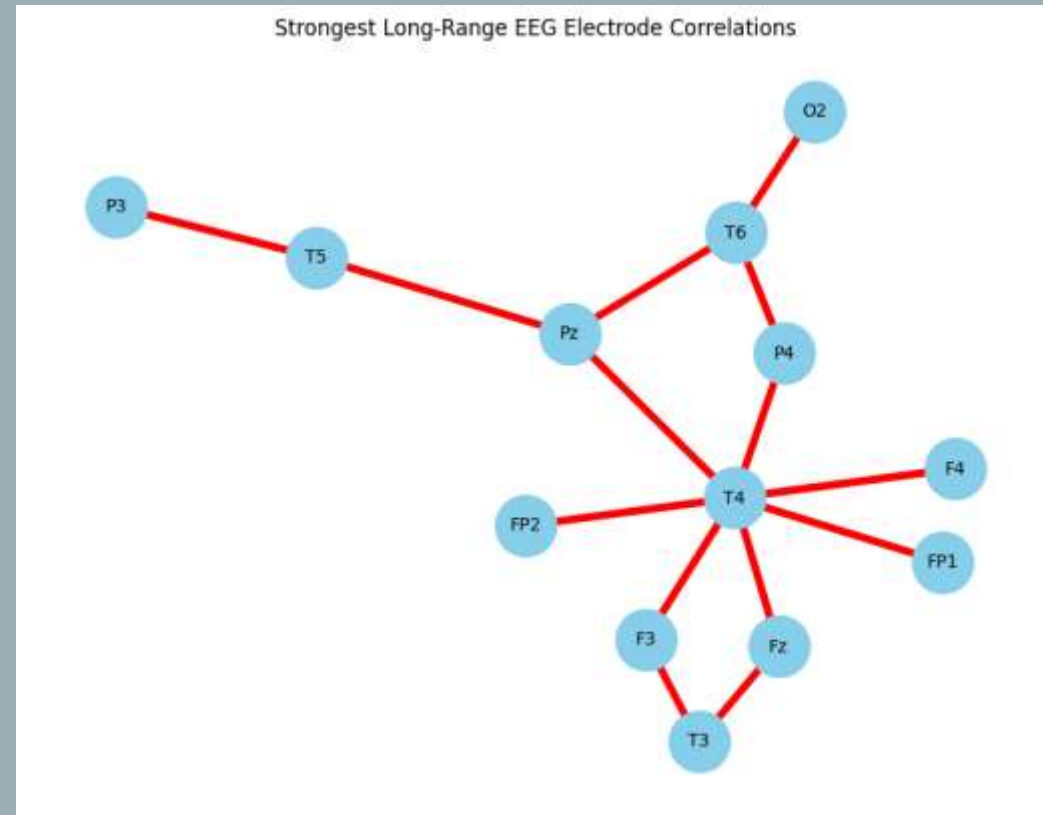
One example we've found is that within the addictive disorders category, alcohol use disorder shows higher alpha (8-12 Hz) activity compared to behavioral addiction disorder, indicating a greater tendency for relaxation or mental disengagement.



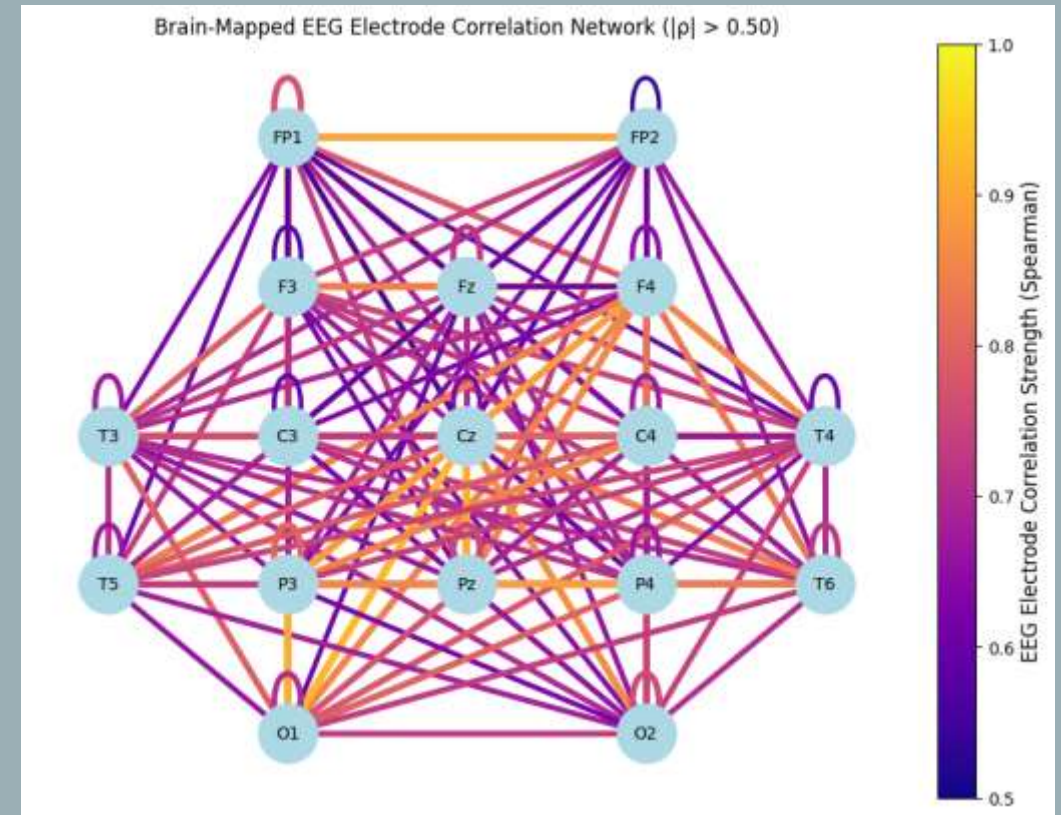
Behavioral addiction, on the other hand, exhibits higher gamma (30-40 Hz) activity, suggesting greater cognitive engagement than alcohol use disorder.

Are there any strong correlations between distant (not adjacent) electrodes in healthy controls?

- First, we mapped the long-range correlations within the healthy control group.

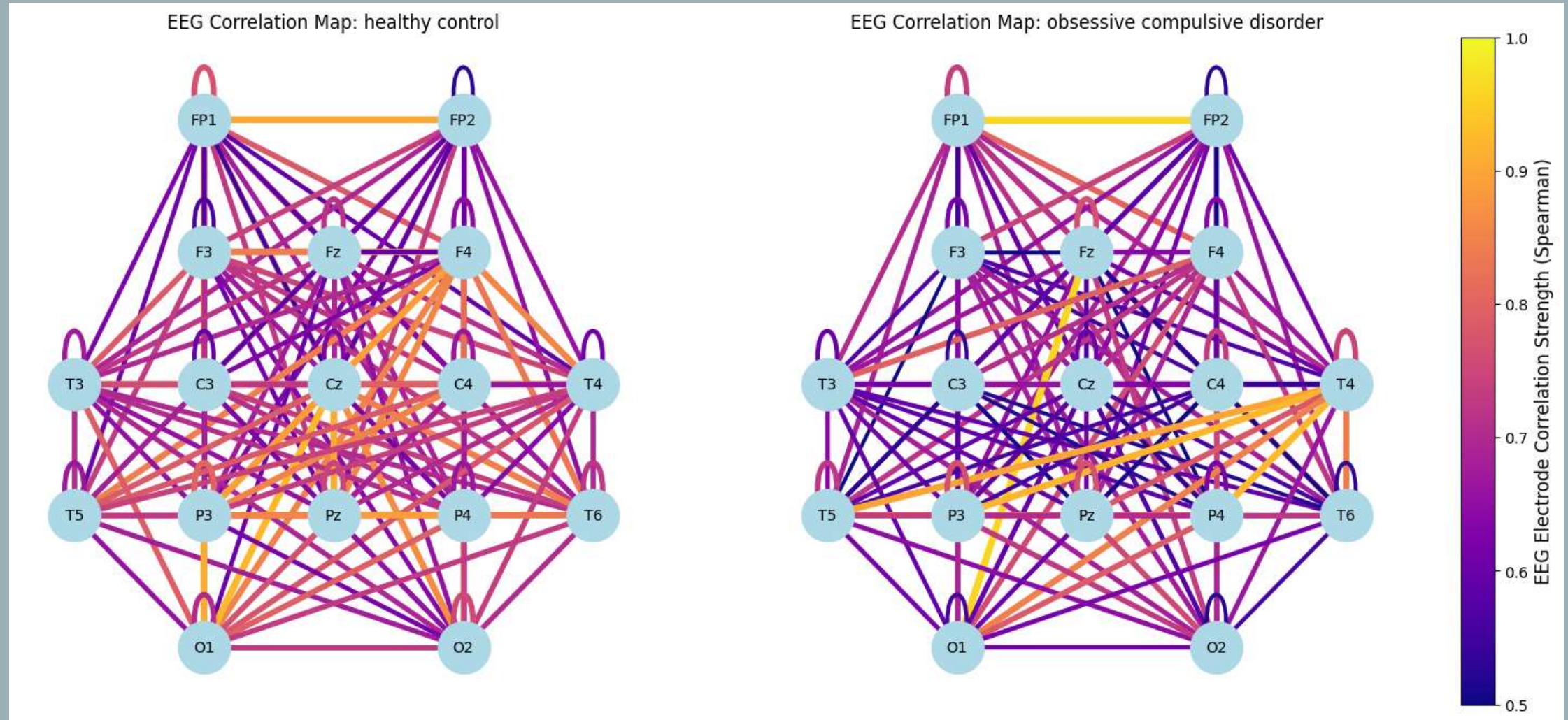


- And then mapped the strongest correlations (> 0.5) onto a correlation-gradient map of the brain.



we considered electrodes distant if they belong to one of the following region pairs:
Frontal–Occipital, Frontal–Temporal, Central–Occipital, Temporal–Parietal, or Temporal–Occipital.

We could then use our maps to compare correlativity of distant electrodes between healthy controls and subjects with disorders!



In contrast to the HC network, the OCD network shows increased local connectivity, particularly in posterior-temporal regions (Pz, T5, T6, O1, O2), and weaker uniform frontal-central integration, suggesting hyperactive sensory processing and altered executive control.

Finally, we asked whether we could predict the subject's main psychiatric disorder based on the EEG data.

We've tried to train a model to do that, using sklearn and RandomForest, but unfortunately it wasn't so successful.

- High recall means fewer false negatives.
- High precision means fewer total misclassifications (fewer false positives).

```
Model Accuracy: 0.34
```

```
Classification Report:
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	precision	recall	f1-score	support
addictive disorder	0.382353	0.382353	0.382353	34.000000
anxiety disorder	0.666667	0.125000	0.210526	16.000000
healthy control	0.750000	0.157895	0.260870	19.000000
mood disorder	0.325758	0.767857	0.457447	56.000000
obsessive compulsive disorder	0.000000	0.000000	0.000000	9.000000
schizophrenia	0.125000	0.050000	0.071429	20.000000
trauma and stress related disorder	0.428571	0.085714	0.142857	35.000000
accuracy	0.343915	0.343915	0.343915	0.343915
macro avg	0.382621	0.224117	0.217926	189.000000
weighted avg	0.389731	0.343915	0.282384	189.000000

Questions?