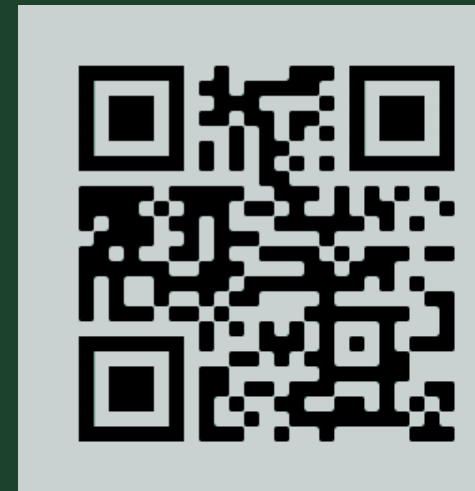


Effect of Psilocybin on neural oscillations and signal diversity in EEG and their psychological correlates

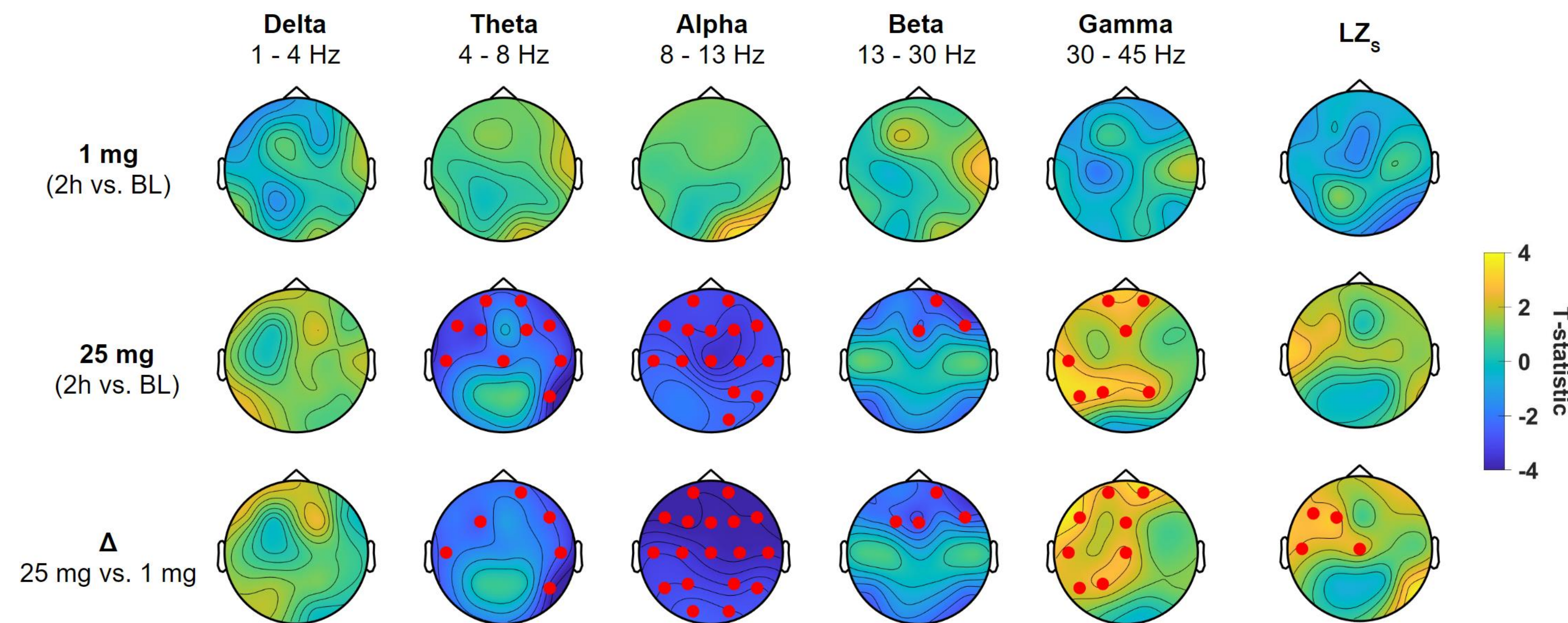
Faissal Sharif^{1*}, David Erritzoe¹, Laura Kärtner¹, Christopher Timmermann¹

¹ Department of Brain Sciences, Faculty of Medicine, Imperial College London

Imperial College London



Correspondence: fs419@ic.ac.uk



Topographic Spectral Power and Lempel-Ziv Complexity changes in LD and HD conditions. EEG Spectral Power decreased in the Theta, Alpha and Beta band and increased in the Gamma band in the HD vs. LD. Further, EEG Lempel-Ziv Complexity increased in the HD vs. LD. Comparisons of peak (2h post-dosing) vs. baseline spectral power and LZs activity in 1 mg, 25 mg, as well as comparisons between conditions (Δ) are shown. Significance is indicated as $< .05$ (red dot). Abbreviations: BL, baseline; LZs, Lempel-Ziv Complexity; LD, low dose; HD, high dose.

Background

Psychedelics

From greek *psyche* “mind” and *deos* “revealing”; bind to 5-HT_{2A} receptor

Psilocybin

Tryptamine alkaloid found in 200+ mushroom species (“magic mushrooms”)

- Psychedelics can induce acute drastic effects on **consciousness** and **emotion** which can translate to long-term changes in **personality**
- Downregulation of the Default Mode Network (DMN) underlies acute experiences of **ego dissolution** (“losing sense of self”)
- Investigation of **EEG spectral power** and **signal diversity (entropy)** may yield important insights into the neuronal underpinnings of the psychedelic experience

What are psychological and EEG markers of the acute psilocybin experience? Do these translate into long-term changes in personality, e.g. psychological insight?



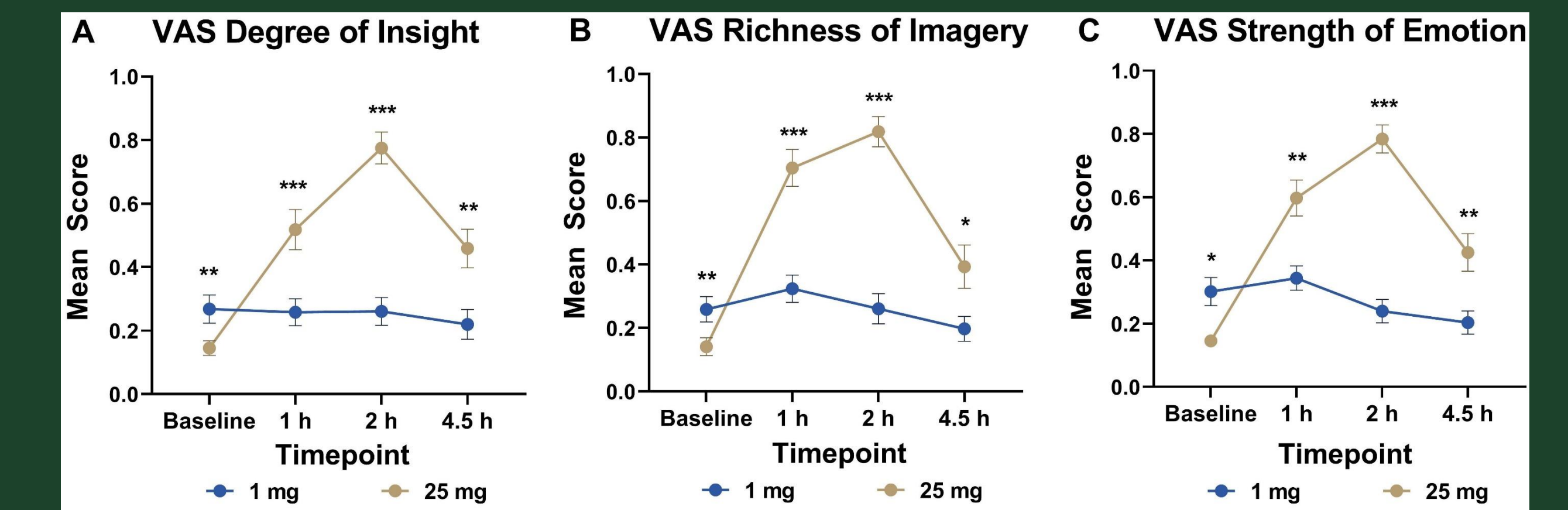
Methods

- Within-subject study, **28 psychedelic-naive subjects** received **1 mg** (low dose, LD) and **25 mg** (high dose, HD) of psilocybin, during two dosing days, four weeks apart
- During each dosing day, four repeated **acute measures** of emotional insight, richness of imagery and strength of emotion were accompanied by resting-state EEG (RS-EEG) measures
- **Acute ego dissolution ratings** and **long-term changes** in psychological insight at 2- and 4-weeks post-dosing were assessed. RS-EEG data was analysed for changes in **power** and **entropy** through Lempel-Ziv Complexity (LZs)

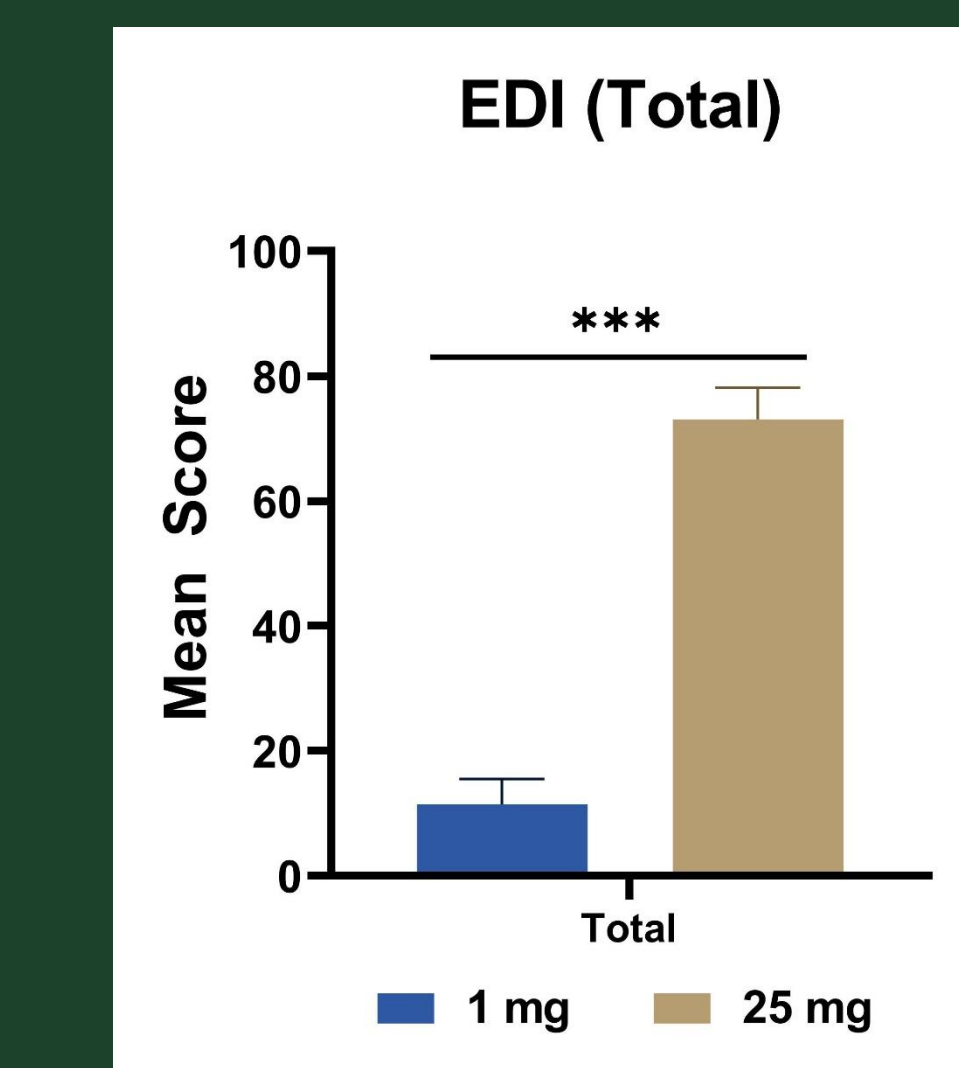
Conclusion

- As psilocybin moves further into **therapeutic settings**, findings like these, showing universal increase in **psychological measures**, become increasingly relevant
- **Changes in spectral power and entropy** reflect a change in consciousness as described under the **Entropic Brain Hypothesis**
- In line with the **Free Energy Principle** and **predictive processing**, a shift occurs from top-down to bottom-up processing

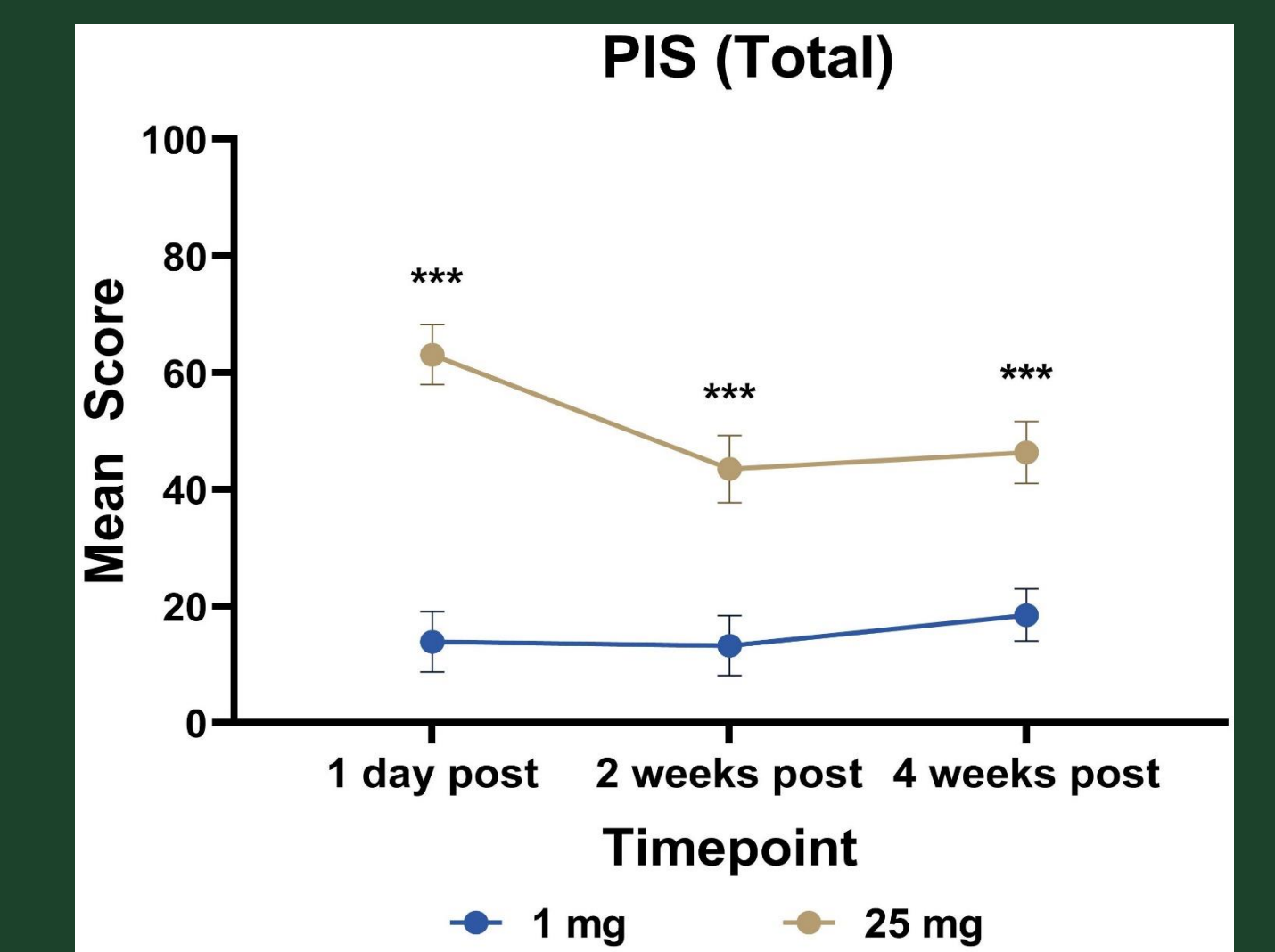
Results



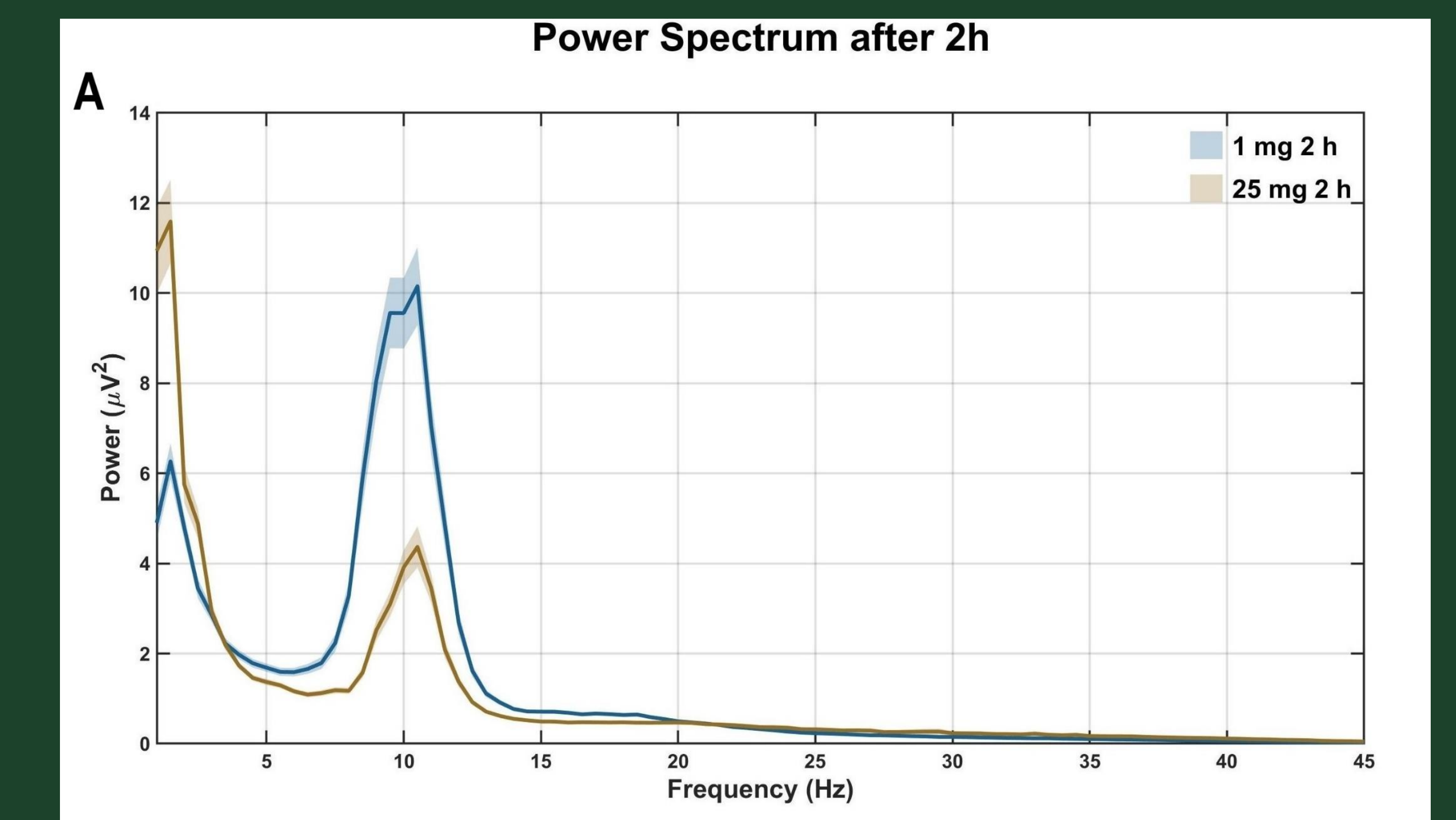
Acute VAS scores. Acute measures of degree of insight, richness of imagery and strength of emotion increased in the HD vs. LD and peaked 2 hours post-dosing. Abbreviations: VAS, Visual Analogue Scale; LD, low dose; HD, high dose.



Acute EDI scores. Acute measures of the EDI increased dramatically in the HD vs. LD. Abbreviations: EDI, Ego Dissolution Inventory; LD, low dose; HD, high dose.



Long-term PIS scores. Long-term measures of the PIS increased in the HD vs. LD. Abbreviations: PIS, Psychological Insight Scale; LD, low dose; HD, high dose.



Spectral Power at peak. EEG Spectral Power decreased in the Theta, Alpha and Beta band and increased in the Gamma band in the HD vs. LD.