Assessing neuroplasticity and cognition with a portable platform throughout esketamine treatment for therapy-resistant depression.

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SUBMISSION DETAILS

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What is the Methodological Issue Being Addressed? Major depressive disorder (MDD) is associated with impairments in executive function, working memory, and processing speed, as well as deficit in neuroplasticity [1,2]. However, most MDD studies rely on clinic-based measures, limiting insight into day-to-day fluctuations in real-world settings.

This study deploys a mobile technology [3] for in-clinic and at-home monitoring of cognitive and neurophysiological markers of response to esketamine in patients with therapy-resistant MDD. Despite prior demonstrations of feasibility in other clinical populations, evidence for the utility of this technology in patients with MDD undergoing clinical care remains limited, so this study aims to assess feasibility of in-clinic and at-home use.

Introduction The ongoing PlastiCogMDD study aims to evaluate the feasibility, adherence, and data quality of a multimodal platform (NeuLogiq [3]) for repeated cognitive and neurophysiological assessment in patients with therapy-resistant MDD and capture the effects of esketamine on neuroplasticity and cognitive performance markers across both home-based and in-clinic settings. As esketamine is known to enhance synaptic plasticity, an effect robustly demonstrated in preclinical models, this study additionally provides an opportunity to investigate whether neurophysiological plasticity markers relate to functional cognitive improvement in this patient cohort. The change in visually evoked potential (VEP)-measured plasticity (see [2,3,4] for details of methodological validation and grounding in preclinical studies) before and after esketamine treatment compared to a treatment-as-usual (TAU) control group serves as the primary clinical outcome, measured using portable dry electroencephalography (EEG).

Methods PlastiCogMDD is a single-centre, unblinded, parallel-group study conducted at the University Medical Center Freiburg (N=54). Patients with therapy-resistant MDD are randomised with respect to the observation timeframe, not to treatment itself. Group 1 (MDD TAU + esketamine, n=27) is observed during esketamine initiation; Group 2 (MDD TAU, n=27) is assessed during the clinically indicated waiting period prior to esketamine. All patients continue standard antidepressant treatment throughout. The 22-day observation window combines four structured in-clinic visits, including EEG-based assessments (VEP modulation, auditory steady-state response (ASSR), resting-state EEG), a visual associative memory task and clinical ratings (Montgomery-Åsberg Depression Rating Scale, Beck Depression Inventory) with continuous at-home assessments via a dedicated tablet twice daily. At-home tasks include cognitive tests (Digit Symbol

Substitution Test, N-Back Task) and mood ratings (Visual Analogue Scale). Patient-reported platform usability is assessed at end-of-study via System Usability Scale (SUS). This design allows longitudinal tracking of cognitive and neurophysiological parameters across both settings simultaneously.

Results Recruitment is progressing above the expected rate; final results are anticipated by Q3 2027. Interim analyses (of 15 participants who are data complete) demonstrate excellent feasibility: 98.7% of all in-clinic sessions, and 90.5% of all scheduled at-home behavioural sessions were completed and yielded analysable data, including accounting for technical issues and patient non-compliance. Patient-reported burden for at-home assessments is minimal, supporting tolerability of the platform in this clinical population. Mean System Usability Score (SUS) is 88.5, indicating good usability. EEG and behavioural data examples and interim means from both at-home and in-clinic sessions will be presented.

Conclusion These interim results suggest that repeated cognitive and neurophysiological assessment using a portable platform is highly feasible and well tolerated in patients with therapy-resistant MDD. The randomisation approach, assigning patients to different observation timeframes rather than to treatment, enables the effects of esketamine on neuroplasticity and cognitive markers to be captured within a naturalistic clinical context. These findings also support the broader utility of wearable EEG technology for longitudinal monitoring in depression research and clinical practice.

References
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Keywords

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Guidelines I have read and understand the Poster Guidelines

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