

Statistical Analysis Plan (SAP)

Sample size: 120 subjects (WP1: 60 MCI, 60 controls; WP2: 30 active, 30 sham tACS), including 10% dropout allowance. Power: $1-\beta = 0.90$, $\alpha = 0.05$.

Behavioural data (MoCA, V-PALT, S-PALT, TLT, DS): Repeated-measures ANOVA with factors GROUP (MCI vs. controls / active vs. sham) and TIME (baseline, post-stimulation). Greenhouse–Geisser correction applied. Post hoc: paired t-tests if F significant.

MRI: Between-group (MCI vs. controls) differences in MTL and WMH volumes analysed using FreeSurfer (T1) and BIANCA (T2-FLAIR). Brain age estimation from T1 scans. Electric field distribution modelled via SimNIBS; correlated with behavioural outcomes.

TMS (SICI, ICF, LICI, recruitment curves): Repeated-measures ANOVA with factors GROUP, TIME, and ISI (2, 4, 7, 9, 12 ms) or INTENSITY (110–140% RMT) as within-subject factors. Greenhouse–Geisser correction. Post hoc: paired t-tests if F significant.

EEG: Resting-state data pre-processed independently at each site (filters, ICA), then merged for analysis. Spectral power and coherence compared MCI vs. controls (WP1) and pre- vs. post-tACS (WP2). Statistics: cluster-based non-parametric permutation testing.

Biomarkers (NF-L, tau): Plasma/serum analysed via Simoa. Between-group comparison (MCI vs. controls) at baseline and pre- vs. post-tACS in MCI. Statistics: cluster-based non-parametric permutation testing.