

Non-invasive biophysical neuromodulation to reduce biological brain aging

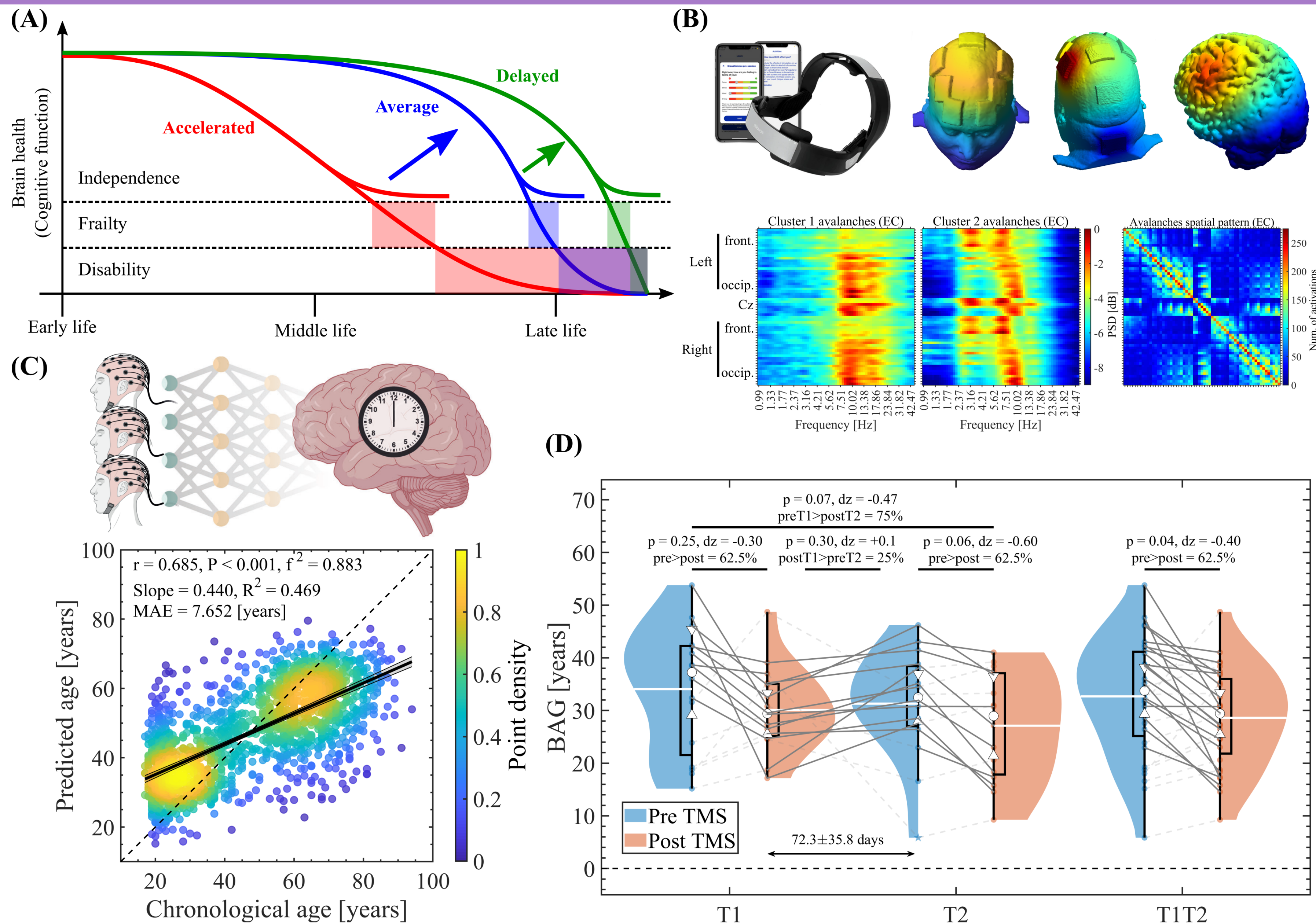
Sunday-1137



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We advanced transcranial neuromodulation in brain aging research by integrating tES/TMS, 3D electromagnetic head models and normative brain clock models to quantify BAGs and characterize neural network dynamics. Our results offer preliminary evidence that TMS is associated with BAG reduction, warranting further research to assess putative therapeutic potential of transcranial neuromodulation to delay accelerated brain aging trajectories.



CAPTION

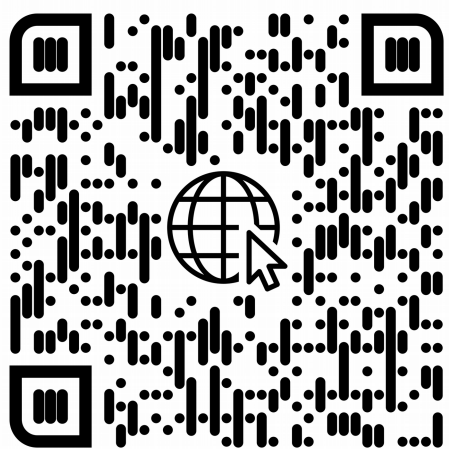
(A) Brain health trajectories. (B) We aim to investigate transcranial neuromodulation effects on brain age and neural network dynamics using normative brain clock and generative whole-brain models. (C) Brain clock model were used to assess the effect of TMS on the Brain Age Gap (BAG). The model was trained using EEG recordings of 1677 healthy controls (50% females), median age: 49 [26 - 65] years. (D) We analyzed EEG recordings from 16 healthy participants (age 24.5 ± 2.8 years, 7 females). EEG traces were acquired before and after Transcranial Magnetic Stimulation (TMS) targeting the dorsolateral prefrontal cortex and the inferior parietal lobule (120 biphasic TMS pulses, 2-10 sec inter-stimulus interval, 100% of the resting motor threshold). The reported p values correspond to two-tailed Wilcoxon signed-rank test for the paired samples. T1, test session; T2, retest session; T1T2, pooled test and retest sessions.

REFERENCES

Moguilner S & Ibanez A et al. (2024), Brain clocks capture diversity and disparities in aging and dementia across geographically diverse populations, Nature Medicine 30(12):3646-3657. DOI: 10.1038/s41591-024-03209-x

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