TMS-EEG as a measure of cortical hyperexcitability in motor and parietal cortex in Alzheimer’s disease: a pilot study

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Introduction
- Alzheimer’s disease (AD) patients show cortical hyperexcitability, with an increased risk of clinical seizures and epileptiform discharges.1 2
- However, there is currently no established, objective tool that can quantify hyperexcitability in vivo.
- Transcranial magnetic stimulation with electroencephalography (TMS-EEG) may be a useful metric of cortical excitability in AD.

Study Design
Participants
Healthy controls (HC)
Ab+ MCI or mild AD (Early AD)

Parietal Neuropsychological Tests
Benton Line orientation, ADAS Maze

TMS-EEG Evoked Potentials (TEPs): - 120 single pulses to primary motor cortex (M1) at 120% RMT & 135% RMT - 120 single pulses to the inferior parietal lobe (IPL) at 120% RMT & 135% RMT

Dynamic Excitability : TEP Gain
= % Increase in cortical activity with increasing stimulation intensity
120% RMT stimulation
135% RMT stimulation
msec after the TMS pulse

Prolonged Excitability : TEP Ratio
= Ratio of Late (time 225–400 msec) to Early (20–225 msec) brain activity

Group level TEPs

Conclusions
- While preliminary data is suggestive of increased cortical excitability on TMS-EEG in AD, a larger sample size is needed to test for between-group differences in excitability (est. 38 in each group)
- Parietal lobe excitability is related to visuospatial function tests in AD
- TMS-EEG is a feasible & promising technique to assay cortical excitability in local brain regions in AD

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References

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