Electrophysiological (EEG) indices of Mild Cognitive Impairment & Dementia in Parkinson's Disease: A Systematic Review

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Background

Parkinson's Disease (PD)

Progressive neurodegenerative disorder resulting from dopaminergic neuron death (1).

Both motor (eg. tremor) & non-motor symptoms (eg. cognitive impairment) can present (1).

Spectrum of cognition exists, ranging from Normal Cognition (PDNC), to Mild Cognitive Impairment (PD-MCI), to Dementia (PDD) (2).

60% PDMCI patients develop PDD 4 years post diagnosis (3).

Accurate prognostic indicators of cognitive decline (eg. EEG) in PD patients are needed

Electroencephalography (EEG)

- Low cost, non-invasive diagnostic tool (4).
- Scalp electrodes measure the dynamic electrical activity of the brain (4).
- EEG Band Power (a), Event Related Potentials (b) and Functional Connectivity (c) can be investigated

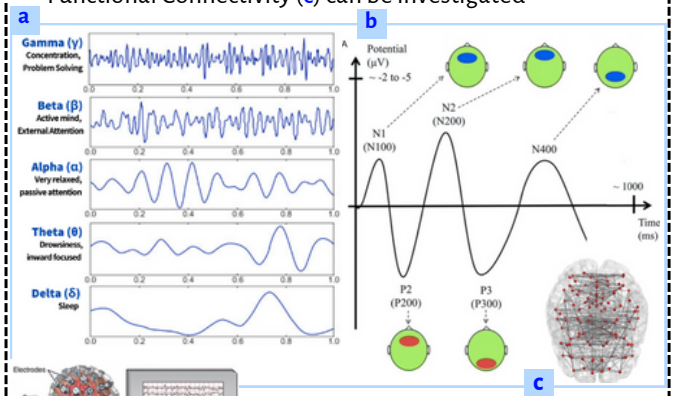


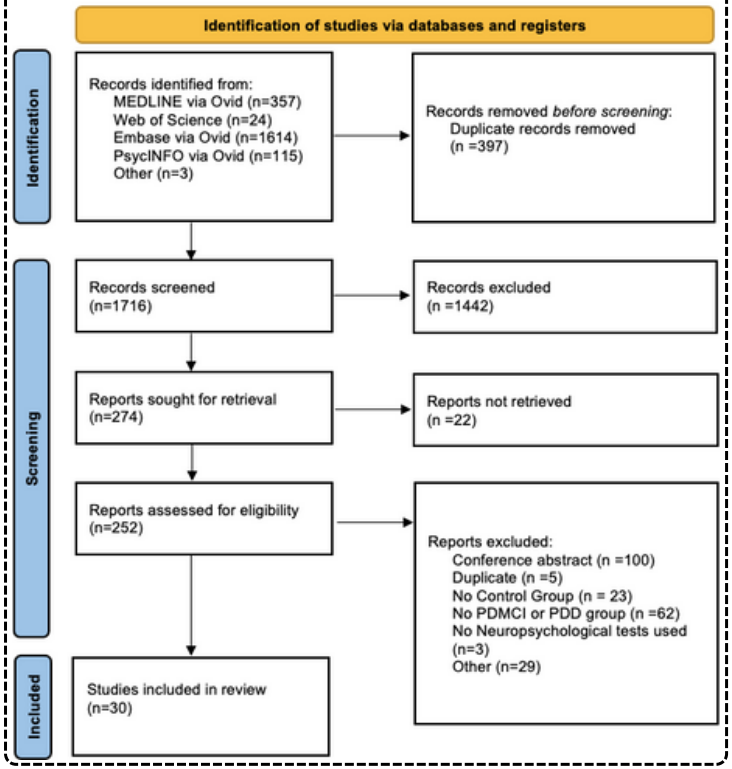
Figure 1: *Diagram showing EEG cap, a) Brain frequency bands measured by EEG b) Main ERP components c) Functional connectivity networks (Adapted from (5-8))*

Aim

Systematically review which EEG indices are associated with mild cognitive impairment (PD-MCI) and dementia in PD (PDD).

Methods

- Systematic review registered in PROSPERO (CRD42022298956) & carried out in line with PRISMA checklist.
- Database searches conducted in Embase,MEDLINE, PsycINFO & Web of Science (November 2022) to identify studies using EEG to assess cognition in PD-MCI and PDD



Results

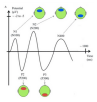
EEG Band Power: 13 studies

Event Related Potentials: 6 studies

Functional Connectivity: 9 studies

Overall slowing of spectral power in PD-MCI and PDD (n=11).

Reduced functional connectivity between anterior & posterior regions in PD (n=2), decreased functional connectivity in alpha band (n=9) in PD-MCI and PDD



ERP studies: deficits in attention & semantic processing associated with PD-MCI/PDD.

Conclusions

Slowing of EEG activity, reduced functional connectivity & aberrant ERPs are associated with PD-MCI and PDD.
This highlights the potential application of EEG to predict & monitor cognition in PD.

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