

Uncoupling Of Sleep Oscillatory Events Impairs Cognitive Function In Alzheimer's Disease

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★ Study design

Alzheimer's disease (AD) dementia

Mild cognitive impairment (MCI)

Cognitively normal (CN)

Polysomnography

Time-frequency analysis

Theta burst

SO-theta burst coupling

Spindle

SO-spindle coupling

EEG metrics for analysis

- Frequency of coupled sleep rhythm
- SO-coupled theta burst and spindle power
- Misalignment of coupled sleep rhythm

Follow up over 2 years

79.5% participants completed follow-up neuropsychological test

01 Dynamics of NREM-coupled sleep rhythm during AD progression

CN

MCI

AD dementia

SO-theta burst coupling

- Frequency ↓
- Misalignment

SO-spindle coupling

- Frequency ↓
- Misalignment

02 Neuroanatomical basis

Cognitively impaired population

Hippocampal atrophy is associated with impairment in the SO-theta burst coupling

mPFC atrophy is associated with impairment in the SO-spindle coupling

03 Accelerate cognitive decline in AD

Intact coupled sleep rhythm

Coupled sleep rhythm disruption

Cognitive function

CN MCI AD dementia

04 Enhance the prognostic value for AD progression

Worsening of the CDR-SB score

Worsening of the CDR-global score

Worsening of the CDR-global score

All population

MCI

AD dementia

Standardized $\beta = 0$ OR = 1

- SO-coupled theta burst power
- Misalignment of SO-spindle coupling

Sensitivity 1 - Specificity

- CSF: AUC 0.753
- MRI: AUC 0.714
- EEG: AUC 0.736
- CSF+MRI: AUC 0.837
- CSF+EEG: AUC 0.852
- MRI+EEG: AUC 0.804
- CSF+MRI+EEG: AUC 0.903