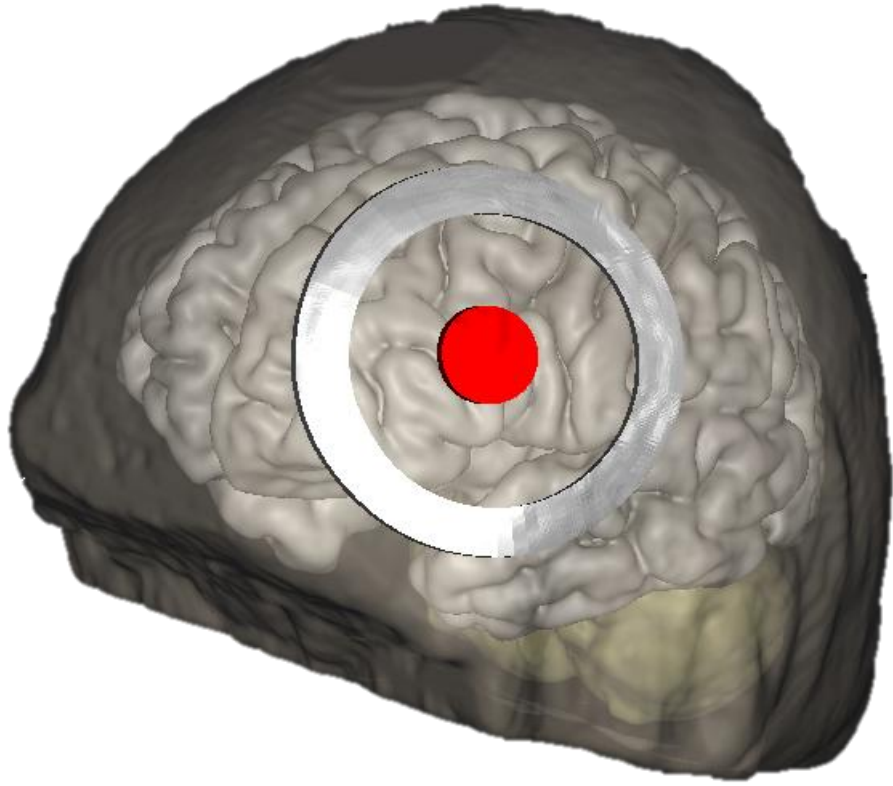


Resilience to Alzheimer’s disease by enhancing sleep quality through 40 Hz high-definition transcranial alternating current stimulation

2026.
2a30483

Hanna Lu*, Natalie Shu Yang, Xi Ni, Yuk Shan Yuen, Linda Chiu Wa Lam, Suk Ling Ma, Xiaoqing Hu, Li Zhang

In this three-arm randomized controlled trial, mild NCD-AD patients with sleep disturbances who received repeated 40 Hz HD-tACS showed significant improvement than HD-tDCS and sham HD-tCS in sleep quality and cognitive performance over 24 weeks.

INTRODUCTION	METHODS	RESULTS	CONCLUSIONS	REFERENCES
▪ Poor sleep quality is a prevalent and distressing comorbidity of very early-stage Alzheimer’s disease. ▪ Untreated sleep disturbances could increase the level of β-amyloid and lead to accelerated cognitive decline. Transcranial current stimulation has shown promise but is limited by lack of specific frequency and sham control.	▪ Ninety-nine patients with mild NCD-AD were randomized to receive either 40 Hz high-definition transcranial alternating current stimulation (HD-tACS), HD transcranial direct current stimulation (HD-tDCS) or sham stimulation for 4 weeks. ▪ Primary outcomes included the changes from baseline to 4th and 24th week in sleep quality (Pittsburgh Sleep Quality Index [PSQI]) and working memory (Delayed recall of the words).	A total of 238 individuals were screened, and 99 were randomly assigned to three intervention groups: 33 in the 40 Hz HD-tACS group, 33 in the HD-tDCS group and 33 in the placebo group. 40 Hz HD-tACS group had the lowest PSQI total score than the HD-tDCS and sham HD-tCS groups at the 4th week, 8th week, 12th week and 24th week, with an average eta-squared (η^2) effect size of 0.24. At week 4, the 40 Hz HD-tACS group had the highest HK-MoCA total score than the sham HD-tCS group ($p=0.031$). At week 24, both 40 Hz HD-tACS and HD-tDCS groups showed significant higher HK-MoCA total scores than sham HD-tCS group. At week 4, the 40 Hz HD-tACS group showed significant lower saliva Aβ42 (and higher Aβ 42/40 ratio than sham HD-tCS group.	➤ In this study, mild NCD-AD patients with sleep disturbances who received repeated 40 Hz HD-tACS showed significant improvement than HD-tDCS and sham HD-tCS in subjective sleep quality and cognitive performance over 24 weeks. ▪ Trial Registration ClinicalTrials.gov Identifier: NCT05544201 ➤ Funding support: Hong Kong Research Grant Council (RGC)-General Research Fund (GRF) (Grant No. 14111021).	 CONTACT  Please contact: Dr. LU Hanna Email: hannalu@cuhk.edu.hk  ALZHEIMER'S ASSOCIATION AAIC>26