

DEMENTIA CARE RESEARCH (RESEARCH PROJECTS; NONPHARMACOLOGICAL)

Neuromodulation for Mild Cognitive Impairment: Improvements in Spatial Navigation and Associative Memory with Acute Transcutaneous Vagus Nerve Stimulation: VINCI-AD

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Abstract

Background: New therapeutic strategies to treat Mild Cognitive Impairment (MCI) are urgently needed. Transcutaneous Vagus Nerve Stimulation (tVNS) is a neuromodulation technique which uses a handheld device to peripherally stimulate the afferent vagus nerve. tVNS has shown promise in augmenting memory in cognitively healthy populations but data in cognitively impaired populations is sparse.

Method: VINCI-AD is an investigator-led, single-blind, sham-controlled crossover pilot study assessing the effects of tVNS in amnesic MCI. All participants have MCI (CDR global 0.5) with amnesic neuropsychological profile (RBANS delayed memory index <85). Participants are randomised over 3 study visits to baseline (no stimulation) active stimulation (at the CC of left ear) or sham stimulation (earlobe). Cognitive tests include Face-Name Association Task (FNAT), Sustained Attention Response Test (SART) and Sea Hero Quest Navigation Test (SHQ) among others.

Result: Interim data analysis of 28 participants is presented (mean age 71.5 (range 55-85), 17 male, RBANS DMI 73.3 ± 11.1). CSF AD biomarkers were positive for 75% (21/28) (AB-42 460.4pg/ml ($\pm 83.3\text{pg/ml}$) and p-tau181 82.5pg/ml ($\pm 53.2\text{pg/ml}$)) and 78% (22/28) of participants had a Charleston Comorbidity Index of ≥ 3 . Mean tVNS stimulation time pre-cognitive assessments was 21.2 minutes, with mean amplitude setting during active stimulation of 2.5mA (1.8-4.5) and sham of 2.0mA (0.9-3.1). During FNAT, active tVNS had no effect on facial recognition or reaction times, however recall accuracy was significantly improved ($69.2\% \pm 3.13$) compared to baseline ($44.7\% \pm 3.51$ $p = 0.016$) and sham ($50.1\% \pm 3.28$ $p = 0.021$) and during active tVNS spatial navigation (38.94sec (± 1.68)) was quicker than baseline (51.49sec (± 3.2) $p = 0.0164$) and sham (51.9sec (± 3.15) $p = 0.0038$). We noted no significant improvements in SART or other cognitive tests performance during tVNS.

Conclusion: tVNS may be a useful complementary tool to augment spatial and associative memory in MCI. Further larger studies are needed to delineate precise settings in this population.