

Vagus nerve stimulation effects on functional connectivity in mild cognitive impairment: The role of cerebral metabolites

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State of the Art: Transcutaneous vagus nerve stimulation (tVNS) is a promising potential treatment for Alzheimer's disease (AD) due to its influence on brain functions and mechanisms important in disease progression. This project aims to determine the influence of cerebral metabolite indicators of neuronal integrity, immune response, and inflammation, to relevant brain function response to tVNS in patients with mild cognitive impairment (MCI).

Methodology: Forty-four older adults (60-89 years of age) with MCI were assessed before and while receiving either active, unilateral left tVNS or sham stimulation. Magnetic resonance spectroscopy (MRS) and functional magnetic resonance imaging (fMRI) were collected on a 3T Siemens Prisma scanner and used to determine metabolite concentrations and resting-state functional connectivity (FC). MRS data were processed in Osprey, and fMRI data were processed using CONN toolbox v18b.

Results: Whole-brain seed to voxel analyses, in tVNS and sham groups, demonstrate group differences as a function of cerebral metabolites, within brain regions important in performing semantic and salience functions. Within the active stimulation group, contrasts reveal associations between FC response in semantic and salience networks and N-acetylaspartate (NAA), myo-inositol (MI), choline-containing compounds (Cho), and creatine and phosphocreatine (Cr).

Conclusion: In adults with MCI, cerebral metabolites indicative of different aspects of brain physiology are associated with differences in functional connectivity in response to tVNS, in brain regions associated with lexical-semantic processes that decline in MCI and AD. These findings suggest that MRS-derived indices of brain metabolic status may be a sensitive and useful tool in predicting tVNS response.

Conflicts of interest

N/A