43 Transcutaneous Vagus Nerve Stimulation Effects on Functional Connectivity of the Hippocampus in Mild Cognitive Impairment

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Objective: Transcutaneous vagus nerve stimulation (tVNS) is a promising potential intervention for Alzheimer's disease (AD) due to its influence on brain functions and mechanisms important in disease progression. Regions of interest include projection to the nucleus of the solitary tract, locus coeruleus, and hippocampus. Deterioration of the hippocampus is one of the most prominent early characteristics of AD, particularly during the mild cognitive impairment (MCI) stage. tVNS could modify function of the hippocampus. We examined resting state functional connectivity from the bilateral hippocampus in response to tVNS in patients with MCI.
Participants and Methods: Fifty older adults (28 women, 60-89 years of age) diagnosed with MCI were assessed. MCI was confirmed via diagnostic consensus conference with a neurologist and neuropsychologist (sources of information: Montreal Cognitive Assessment Test [MoCA], Clinical Dementia Rating scale [CDR], Functional Activities Questionnaire (FAQ), Hopkins Verbal Learning Test – Revised [HVLT-R] and medical record review). Resting state functional magnetic resonance imaging (fMRI) was collected on a 3T Siemens Prisma scanner while participants received either unilateral tVNS (left tragus, n = 25) or sham stimulation (left ear lobe, n = 25). fMRI data were processed using CONN toolbox v18b and hippocampal seed to voxel (whole brain) analyses were conducted with voxel and cluster level multiple comparison correction.
Results: Contrasting tVNS and sham stimulation, whole-brain seed-to-voxel analysis demonstrated significant changes in connectivity from the left hippocampus to several cortical and subcortical regions bilaterally. Specifically, there was increased connectivity to prefrontal regions and cingulate gyri, and decreased connectivity to anterior and medial temporal lobes. A seed-to-voxel analysis from the right hippocampus indicated significant decrease in connectivity to a single cluster of regions in the left anterior temporal lobe in response to tVNS.
Conclusions: In conclusion, tVNS modified connectivity from the hippocampus to multiple brain regions implicated in semantic and salience functions, in which disruption correlates with deterioration in AD. These findings indicate afferent target engagement of tVNS. Future work is needed to investigate the long-term effects of tVNS in patients with MCI and whether it could contribute to meaningful cognitive change and subsequent improvements in quality of life.

Categories: Neuroimaging
Keyword 1: mild cognitive impairment
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44 Functional Connectivity In The Default Mode Network Of ASD and ADHD

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Objective: Autism Spectrum Disorders (ASD) and Attention Deficit Hyperactivity Disorder (ADHD) are neurodevelopmental disorders with overlapping symptomatology and shared genetic makeup. Numerous previous studies have investigated ASD and ADHD using resting state functional networks. One functional network of particular interest is the Default Mode Network (DMN), as it has been shown to be abnormal in several mental disorders. Previous studies have investigated the DMN in ASD and ADHD separately but reported mixed trends of

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increased and decreased functional connectivity (FC) in the DMN in ASD and increased FC in ADHD. Additionally, little studies have investigated executive and attentional network dysfunction in the DMN for ASD and ADHD populations. To better understand the shared characteristics between ASD and ADHD, this study analyzed the DMN FC in children with ASD and ADHD.
Participants and Methods: Archival datasets from Autism Brain Imaging Data Exchange (ABIDE)-I and ADHD-200 datasets were used, with 33 ADHD, 35 ASD, and 32 typically developing (TD) males (ages = 7–17 years). After applying a standard pre-processing pipeline, 11 regions of interest (ROIs) from the Dosenbach-160 atlas were examined with 55 ROI pairs generated for the 100 subjects.
Results: Significant differences were noted between ASD–ADHD groups in attentional networks and executive functioning networks. Specifically, significant Group x VIQ interactions were noted for FC between the following pairs of regions: medial prefrontal cortex – ventromedial prefrontal cortex, anterior cingulate cortex – ventromedial prefrontal cortex, inferior temporal lobe – ventromedial prefrontal cortex , angular – ventromedial prefrontal cortex, angular – anterior cingulate cortex, inferior temporal lobe – ventrolateral prefrontal cortex, angular – superior frontal lobe, and intraparietal sulcus – superior frontal lobe. In the above FC pairs, FC in ADHD was negatively correlated with VIQ, with no correlation for ASD and positive correlation for TD. Previous literature has indicated that ADHD individuals demonstrate increased executive functioning deficits compared to ASD individuals. This study provides evidence at a neural level for these findings by demonstrating decreased FC trends in ADHD in attentional and executive functioning networks compared to ASD individuals. Group and VIQ main effects demonstrated mixed patterns across the three groups, as well as shared decreased FC in attention/executive networks for both ASD and ADHD groups.
Conclusions: In summary, this study found similar findings from previous studies regarding mixed connectivity patterns, as well as shared dysfunction between ASD and ADHD groups. These results help in solidifying the theory that ASD and ADHD share clinical and neural patterns which need to be examined further. Future directions include utilizing more ASD+ADHD comorbid individuals in studies comparing ASD and ADHD FC trends as well as seeking to further understand the neuropsychological and neuroimaging profiles in ASD and ADHD.

Categories: Neuroimaging
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45 The Impact of Loneliness on Amyloid Burden, Cerebrovascular Disease, Neurodegeneration, and Memory Performance in a Community-Based Sample of Older Adults

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Objective: The current research framework recommends using biomarkers to further understand Alzheimer's disease (AD) pathogenesis, including other contributing factors like cerebrovascular disease. In longitudinal studies of people with neuropathological examination after death, baseline loneliness was associated with lower cognition, faster cognitive decline, and future AD risk, independent of AD pathology. Examination of memory impairment along with AD and cerebrovascular biomarkers, could aid risk reduction efforts earlier in the lifecourse and among populations with more exposure to loneliness. We hypothesized that loneliness is associated with amyloid, vascular, and neurodegeneration biomarkers; with worse memory; and that loneliness increases the susceptibility to biomarker-related memory impairment.
Participants and Methods: A subset of cognitively unimpaired older adults with available amyloid PET, vascular MRI (white matter hyperintensity volume, WMH), structural

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