INTERNATIONAL INSTITUTE OF INFORMATION TECHNOLOGY HYDERABAD

R&D SHOWCASE 2021

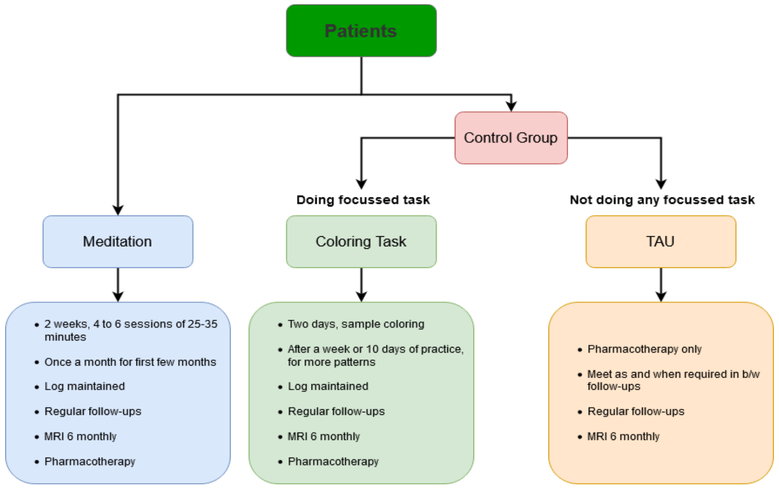
Technology, Social Impact

Does meditation improve brain structure and function in Early MCI and AD patients?

Motivation and objective

- The effect of meditation in neurodegenerative diseases like mild cognitive impairment (MCI), Alzheimer's dementia (AD) and Dementia have been investigated cross-sectionally.
- Past cross-sectional studies reported positive effects of meditation in the brain areas related to attention and executive functions in healthy elderly population.
- **The main aim of this project** *is to explore changes in structural, biological and neuropsychological parameters in patients with early dementia or MCI after long term meditation intervention.*

Data acquisition and intervention



Methods

To investigate the longitudinal functional and structural changes, Neuroimaging data from 3 modalities (T1-w structural image, diffusion tensor images – DTI, and resting state functional MRI) are collected every 6 months over a two-year period (2019-ongoing).

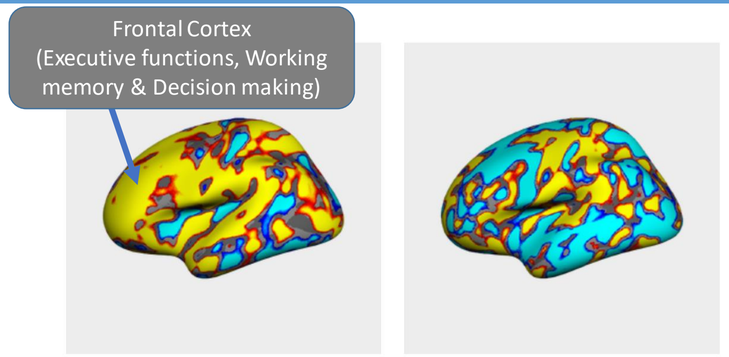
Structural Analysis

- We performed surface-based morphometry (SBM) analysis. All the T1-w structural images were preprocessed and statistically analyzed using publicly available *Freesurfer* software.
- Our preliminary analysis showed that there are positive and diverse effects of meditation selectively in the MCI and AD population.
- Specifically, we observed increase in cortical thickness and gray matter volume mainly in the frontal and parietal regions which are responsible for attention and executive functions.

Future Directions

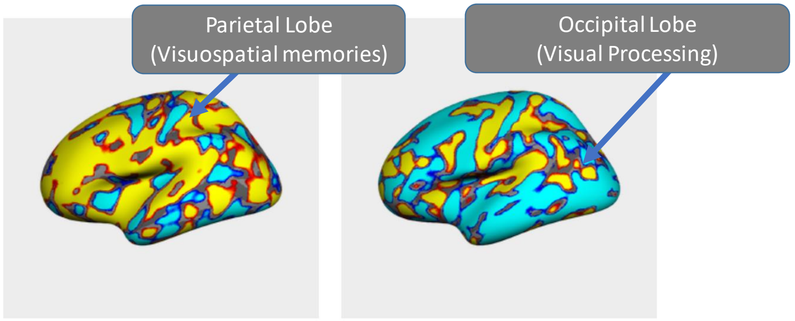
- A similar trend has been observed in the resting state fMRI data. Further analysis using graph theoretical methods is under way.
- Preprocessing, including probabilistic tractography has been completed for the DTI data. Trends corroborating cortical volume, thickness and functional changes will be assessed in the structural connectome as well.
- We would eventually aim to correlate the neuroimaging findings with the results of analysis of neuropsychological battery and survey reports of the efficacy and perceived benefits as seen by the caregivers.

Rate of Change in Cortical Thickness across two time points (>5% : Yellow ; <-5% : Blue)



Meditation Non-Meditation

Rate of Change in Gray Matter Volume across two time points (>5% : Yellow ; <-5% : Blue)



Meditation Non-Meditation

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