

Laymen's Summary Major Project Sofía Gutiérrez Santamaría

Background: Dementia is a growing syndrome that requires many resources. Traditionally, its effects have been mitigated by pharmacological measures; however, new treatments such as music therapy are on the rise. In this study, underlying changes in brain microstructure associated to memory impairment and music therapy by means of diffusion are evaluated.

Methods: A cross-sectional and a longitudinal study were performed, in each of which a region of interest (ROI) analysis and a network analysis were carried out. 101 participants were selected for the short-term study (54 memory impaired participants and 47 healthy controls) and 31 for the long-term study (15 memory impaired participants in the music group and 16 memory impaired participants in the control group). All memory impaired subjects were recruited from the Alzheimer's and Music Therapy (ALMUTH) study. They underwent diffusion-weighted (DW) and T1 scans in the same way as healthy controls. Diffusion and connectomics metrics were computed in 16 regions of the brain and in the whole-brain, respectively. These metrics were compared between groups and related to active musical engagement, musical training and number of active singing lessons.

Results: A significant increase in fractional anisotropy (FA) in the right superior-temporal cortex, left medial-orbito-frontal cortex and right parahippocampal cortex regions was found when comparing pre and post scans in the ALMUTH music group. Also, FA and active musical engagement were found to be significantly correlated for healthy controls in three other regions: right insula cortex, left postcentral cortex and right postcentral cortex. Regarding mean diffusivity (MD), significant higher MD was encountered in ALMUTH participants than in healthy controls for the hippocampus and the parahippocampal regions. Likewise, a significant increase in MD in the entire hippocampus and in the left hippocampus was noticed when comparing pre and post scans in both the ALMUTH control and music groups, respectively. In relation to network metrics, significant higher local efficiency was obtained for healthy controls in comparison with ALMUTH participants.

Conclusion: The hippocampus and the parahippocampal regions are highly affected in dementia, but active musical engagement might prevent memory impairment in some regions. Also, the results suggest that a reduction in local efficiency can be a useful indicator for whole-brain memory decline. The findings regarding music therapy suggest it could have a positive effect on underlying microstructural changes, reversing the effects of memory loss in some regions.