

Improved mPFC–MTL connectivity after a psycho-physical intervention in the elderly

With the support by the National Natural Science Foundation of China, Prof. Li Juan’s laboratory at the Center on Aging Psychology, Key Laboratory of Mental Health, Institute of Psychology, Chinese Academy of Sciences, reported plasticity of the functional connectivity between the medial prefrontal cortex (mPFC) and the medial temporal lobe (MTL) in older adults, which was published in *Frontiers in Aging Neuroscience* (2014, 6: 39).

The prefrontal cortex and MTL are particularly vulnerable to the effects of aging. The disconnection between them is suggested to be an important cause of cognitive decline in normal aging. In the present study, a psycho-physical intervention trail was performed to investigate the brain plasticity in older adults. The older adults from two similar communities were randomly allocated to two groups: the intervention group receiving a 6-week multimodal intervention that included cognitive training, Tai Chi exercise, and group counseling, and a control group which attended two 120-minute lectures on health and aging. By specifically using resting-state fMRI to explore the regional connectivity changes in the default-mode network as well as changes in prefrontal-based voxel-wise connectivity in the whole brain, we were able to show that the intervention selectively affected functional brain connectivity between the medial prefrontal cortex (mPFC) and the MTL. Furthermore, the strength of the functional connectivity between these regions correlated with individual cognitive performance. Our results provide evidence that brain regions greatly affected by aging may retain remarkable plasticity, and that this plasticity may be a crucial factor for helping older individuals maintain a healthy brain during old age.

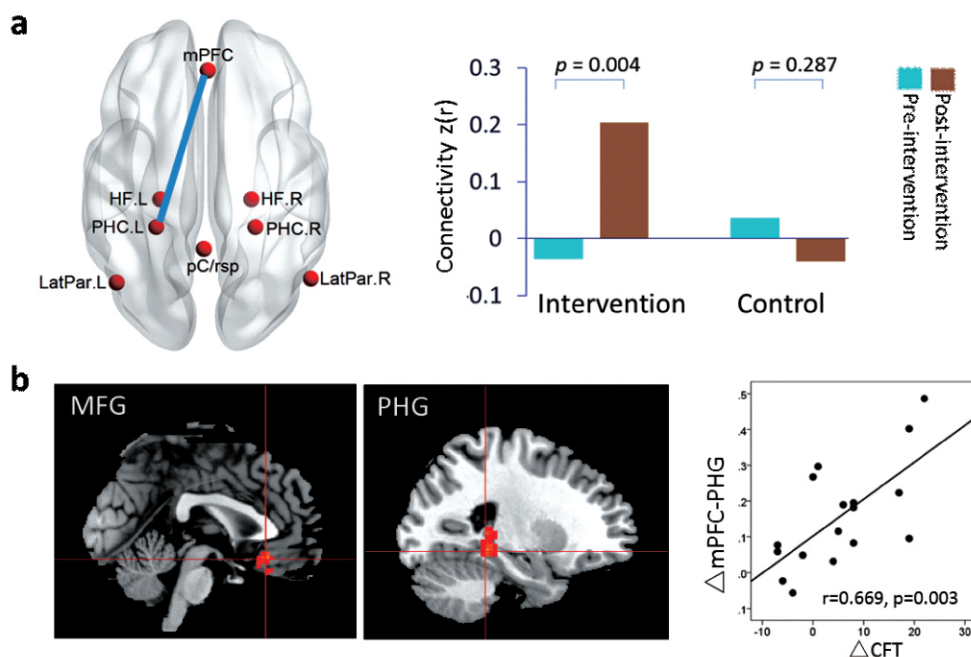


Figure Plasticity of mPFC–MTL connectivity. **a**, Intervention positively affected the connectivity between the mPFC and the left parahippocampal cortex (PHC) in the DMN. **b**, Whole brain connectivity of the mPFC revealed increased connectivity in the medial frontal gyrus (MFG) and parahippocampal gyrus (PHG), and the increased mPFC–PHG connectivity is correlated with improved cognition (CFT: Category Fluency Test, a typical neuropsychological test used to assess language and executive functions, search strategies, and long-term memory).