Selective changes of resting-state networks in individuals at risk for Alzheimer's disease.

Abstract:
Alzheimer's disease (AD) is a neurodegenerative disorder that prominently affects cerebral connectivity. Assessing the functional connectivity at rest, recent functional MRI (fMRI) studies reported on the existence of resting-state networks (RSNs). RSNs are characterized by spatially coherent, spontaneous fluctuations in the blood oxygen level-dependent signal and are made up of regional patterns commonly involved in functions such as sensory, attention, or default mode processing. In AD, the default mode network (DMN) is affected by reduced functional connectivity and atrophy. In this work, we analyzed functional and structural MRI data from healthy elderly (n = 16) and patients with amnestic mild cognitive impairment (aMCI) (n = 24), a syndrome of high risk for developing AD. Two questions were addressed: (i) Are any RSNs altered in aMCI? (ii) Do changes in functional connectivity relate to possible structural changes? Independent component analysis of resting-state fMRI data identified eight spatially consistent RSNs. Only selected areas of the DMN and the executive attention network demonstrated reduced network-related activity in the patient group. Voxel-based morphometry revealed atrophy in both medial temporal lobes (MTL) of the patients. The functional connectivity between both hippocampi in the MTLs and the
posterior cingulate of the DMN was present in healthy controls but absent in patients. We conclude that in individuals at risk for AD, a specific subset of RSNs is altered, likely representing effects of ongoing early neurodegeneration. We interpret our finding as a proof of principle, demonstrating that functional brain disorders can be characterized by functional-disconnectivity profiles of RSNs.