

COGNITIVE CORRELATES OF FRONTAL LOBE AND HIPPOCAMPAL VOLUMES IN MCI

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Background: Mild cognitive impairment (MCI) has been proposed as a transitional state between healthy aging and dementia. The correlation between hippocampal volumes and memory performance is well established in Alzheimer disease. Recent studies have extended this correlation to amnesic MCI as well. However, the relationship between cognition and brain structures in MCI has not yet been explored.

Objective(s): To better understand the relationship between cognition and frontal lobe and hippocampal volumes in MCI.

Methods: Subjects were 24 patients diagnosed with MCI of a single domain, affecting either memory (amnesic MCI; n=9) or executive function (executive MCI; n=15). Amnesic MCI patients met Petersen criteria for memory impairment but exhibited intact executive functioning. Executive MCI patients were selected based on either complaints of executive dysfunction (e.g., attention, multi-tasking, behavior) or demonstrated impairment on tests of executive, but not memory, function. All subjects completed a 1.5T structural MRI that was segmented into gray and white matter based on high-resolution T1-weighted images. Regions of interest were hippocampus and frontal cortex. Subjects were also administered cognitive tests measuring memory, executive, visuospatial, and language function. Partial correlations were obtained between frontal cortex and hippocampal volumes and cognitive measures controlling for age and white matter lesions (WML).

Results: Mean age was 66.7 (sd=7.4) and MMSE was 29.0 (sd=1.2). There were no significant correlations between frontal cortex and hippocampal volumes. Controlling for age and WML, frontal lobe volume was significantly correlated with several measures of executive functioning, including DKEFS Trailmaking Number-Letter ($r=0.47$, $p=0.03$), Design Fluency Filled ($r=0.40$, $p=0.03$) and Empty ($r=0.41$, $p=0.03$) conditions. Smaller frontal lobe volumes predicted lower performance on executive measures. Frontal lobe volumes, however, did not correlate with MMSE, memory, language, or visuospatial scores. In contrast, hippocampal volumes correlated with the List B trial of the California Verbal Learning Test ($r=-0.48$, $p=0.01$) but not MMSE or any measures of executive, language, or visuospatial function.

Conclusions: These results indicate that there are discernable patterns of brain-behavior relationships in patients with single-domain MCI, with frontal contributions to executive functioning and hippocampal contributions to episodic memory. They also highlight the importance of identifying different subtypes of MCI.