Using MRI measures of entorhinal cortex and hippocampal subfields to assess differences between healthy controls and mild cognitively impaired subjects

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Introduction

Alzheimer’s disease (AD) is the most prevalent form of dementia and is marked by an insidious onset of cognitive deficits. Mild Cognitive Impairment (MCI) has been described as the intermediate stage between the expected, mild declines in cognition associated with normal aging and the more serious and pronounced decline in cognition seen in dementia. Neuropathological studies in the literature and imaging studies have established the involvement of the medial temporal regions in MCI and AD, particularly the entorhinal cortex and hippocampal formation. We have found that in AD both the hippocampal formation and the entorhinal cortex are consistently atrophic on MRI. However, in MCI only the entorhinal cortex displayed consistent atrophy. It is feasible that this differential finding is the result of a global measure of hippocampal volume that is insensitive to the isolated changes in specific hippocampal subfields. The goal of the study was to compare measures of entorhinal cortex thickness, hippocampal formation volume, and hippocampal subfield volumes between a set of healthy controls and subjects with MCI.

Objective

Statistical differences exist in hippocampal subfields and the entorhinal cortex between healthy controls and MCI subjects.

Only selected left hippocampal subfields contributed independent variance to the prediction model.

Methods

Participants were scanned at the Center for Biomedical Imaging (CBI) at the BU School of Medicine on a 3T Philips Achieva System with a 32-channel head coil. Brain morphometric measures were generated using FreeSurfer version 6.0. Classical between group analyses were conducted using independent samples t-tests. Predictive models were generated using nominal logistic regression in order to identify the measures that contribute independent variance to the predictor of group membership.

Participant Information

Participants were part of the Health Outreach Program for the Elderly (HOPE) study run through the Boston University Alzheimer’s Disease Center (BU-ADC). For the purposes of this study, there were 19 control subjects and 23 MCI subjects.

Results

Graphs above showing comparison between controls subjects and MCI subjects for the indicated measures. Regions that reached significance (p < 0.01) are indicated with an asterisk (*)

Logistic Models

<table>
<thead>
<tr>
<th>Source</th>
<th>FDR LogWorth</th>
<th>FDR PValue</th>
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<tr>
<td>left_entorhinal</td>
<td>0.109</td>
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</tbody>
</table>

Summary

- Statistical differences exist in hippocampal subfields and the entorhinal cortex between healthy controls and MCI subjects.
- Only selected left hippocampal subfields contributed independent variance to the prediction model.