Abstract

DEVELOPMENTS IN AGING AND DEMENTIA-4

Validating the Reliable Change Index with Tensor-Based Morphometry: the ADNI-MEM and the ADNI-EF

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Objective: The Reliable Change Index (RCI) is a commonly used method for interpreting change in neuropsychological test scores over time. However, the RCI is a psychometric phenomenon that, to date, has not been validated by neuroanatomical evidence. Method: Longitudinal neuroimaging and neuropsychological data from baseline and one-year follow-up visits were retrieved from the Alzheimer’s Disease Neuroimaging Initiative (ADNI) database. The RCI was used to identify participants showing reliable decline on ADNI-MEM and ADNI-EF factor scores, which provide composite measures of memory and executive functioning, respectively. For each cognitive test score, two groups (reliable change vs. no reliable change) were matched on potential confounding variables using a genetic algorithm. Longitudinal neuroanatomical data were analyzed using tensor-based morphometry. Results: Whole brain analysis revealed that reliable change on ADNI-MEM was associated with extended atrophy of the temporal lobe, the parahippocampal gyrus, the entorhinal cortex, and the posterior cingulate gyrus (Left Figure). Similar extended atrophy patterns were found for reliable change on ADNI-EF, except that the atrophy was more extensive and of higher magnitude (Right Figure). Regional analysis further confirmed that in such brain regions, the reliable change group manifested higher grey matter loss than the no change group. Conclusion: The current study not only validated clinical usage of the RCI with neuroanatomical evidence but also practically suggested patterns of likely brain atrophy when reliable cognitive decline is detected.