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Neuropsychology/computerized neuropsychological assessment

Diagnostic differentiation by NIH Toolbox-Cognition (iPAD) for Alzheimer's disease, mild cognitive impairment (MCI), and healthy control participants

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Abstract

Background: Age-associated impairment among older adults is a significant public health concern. The NIH Toolbox for Assessment of Neurological and Behavioral Function® (NIHTB) was developed for use in studies for which standardized, computer-based measurement of cognitive, motor, sensory, and behavioral processes is of importance. The NIH Toolbox–Cognition battery measures both crystallized and fluid cognitive functions. The goal of this study was to compare performance of the newly available tablet-version of the Cognition battery across healthy and impaired older adults and to analyze if race and gender effects would be evident even when using NIHTB fully-adjusted T-scores.

Method: A total of 104 individuals (28 men, 56 women; 45% African American) completed the NIH Toolbox–Cognition as part of a National Alzheimer's Disease Coordinating Center (NACC) longitudinal study of memory and aging through the Michigan Alzheimer's Disease Research Center (Michigan ADRC). All participants received the Unified Data Set (UDS) and consensus diagnosis of normal cognition (NL), amnestic mild cognitive impairment (aMCI), or Alzheimer's dementia (AD). Univariate analyses of variance with post-hoc comparisons were used to compare fully adjusted (age, gender, race/ethnicity, education) Toolbox T-Score performance across the groups.

Results: Univariate ANOVAs revealed significant findings for the Total and Fluid composites (both $p<0.001$) and Crystallized Composite ($p<0.05$). For Crystallized subtests, only Oral Reading demonstrated group differences, with NL>AD. Though NL and aMCI groups performed similarly, both groups outperformed AD on Dimensional Card Sort, Flanker, and Pattern Comparison Fluid subtests. NL>aMCI>AD on List Sorting Working Memory and Picture Sequence Memory. Main effects for race or gender were not seen for comparisons of NL to aMCI, but some group sizes were too small for adequate testing in the AD participants.

Conclusions: As expected, NL, aMCI, and AD demonstrated significant performance differences on NIH Toolbox—Cognition composite and scale scores. As expected, Crystallized tasks were least effective, traditionally representing cognitive areas least sensitive to neurologic dysfunction. Fluid tasks were noticeably more effective, with the working memory and learning measures showing a significant tiered difference, with NL highest and AD lowest. The fully adjusted scores were successful in accounting for demographic variables.