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Convergent and Discriminant Validity of NIH Toolbox Cognition Measures of Premorbid Intellectual Functioning in Older African American Adults With and Without Mild Cognitive Impairment

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Abstract

Background: Estimation of premorbid IQ (PMIQ) among older adults is crucial to characterize cognitive decline properly, particularly among older adults at risk for Alzheimer's disease. Three scores from the NIH Toolbox-Cognition Battery (NIHTB-C) ostensibly may estimate premorbid functioning: Crystallized Cognition (CC) and its component subtests, Picture Vocabulary (PV) and Oral Reading Recognition (ORR). However, they have not yet been validated in a sample of older African American adults at risk for cognitive impairment. We investigated whether performance on the Crystallized NIHTB-C measures was related to the WTAR, a gold standard word recognition test associated with PMIQ, in older African Americans with and without mild cognitive impairment (MCI). We also compared WTAR scores to the summary score from the NIHTB-C Fluid Cognition (FC) battery, where no relationship was expected.

Methods: The WTAR and NIHTB-C were administered to 36 cognitively normal and 18 MCI participants (diagnoses determined by consensus conference following NACC UDS guidelines) who were community-dwelling, older African Americans aged 65–86 years. Data analysis used Bayesian bivariate correlations and hierarchical multiple regression to adjust for education effects.

Results: In the full sample, Bayesian bivariate correlations showed that WTAR performance was positively associated with performance on ORR ($r = .86$, $BF_{10} > 100$, 95%CI[.76, .92]), PV ($r = .66$, $BF_{10} > 100$, 95%CI[.47, .78]), and CC ($r = .84$, $BF_{10} > 100$, 95%CI[.72, .90]), and not associated with FC performance ($r = .08$, $BF_{10} = 0.196$, 95%CI[-.19, .33]). This pattern held in analyses restricted to the cognitively normal ($r = .84$, $BF_{10} > 100$, 95%CI[.68, .91]; $r = .58$, $BF_{10} > 100$, 95%CI[.29, .75]; $r = .81$, $BF_{10} > 100$, 95%CI[.64, .90]; $r = .12$, $BF_{10} = 0.22$, 95%CI[-.23, .37], respectively) and the MCI

groups ($r = .88$, $BF_{10} > 100$, 95%CI[.64, .95]; $r = .71$, $BF_{10} = 41.6$, 95%CI[.31, .87]; $r = .84$, $BF_{10} > 100$, 95%CI[.55, .93]; $r = -.33$, $BF_{10} = 0.70$, 95%CI[-.66, .15], respectively). Although education was positively related to the four measures ($p < .05$), hierarchical multiple regression revealed that education did not predict NIHTB-C performance and did not improve model fit beyond WTAR performance alone.

Conclusion: WTAR scores are strongly positively associated with NIHTB-C CC scores and unrelated to FC scores, suggesting appropriate convergent and discriminant validity. Our findings support our hypothesis that NIHTB-C Crystalized Cognition scores represent reasonable, valid estimates of PMIQ in older African Americans with and without MCI.