

inclusion/exclusion criteria, age, sex/gender, education, race and ethnicity, socioeconomic status, and region. This paper examines the standardization studies of the most widely used NP tests, identifies their strengths and weaknesses, and makes recommendations for interpretive caveats based on these analyses.

Participants and Methods: We reviewed the standardization strategies and coded information about the sampling frames, inclusion/exclusion criteria, stratification methods, demographic characteristics, and sample sizes overall and within each stratum where relevant. These methods were applied to the WAIS-IV, WMS-IV, CVLT3, D-KEFS, Pearson Advanced Clinical Solutions (ACS), Rey Complex Figure Test, WCST, Symbol Digit Modalities Test, RBANS, BVMT-R, HVL, Halstead-Reitan (“Heaton et al”) Norms for Boston Naming, Finger Tapping, Grooved Pegboard), MOANS, and MOAANS (Boston Naming, Trail Making Test, Judgement of Line Orientation). We calculated multiple indexes for each test, including standard errors and confidence intervals for scaled scores.

Results: Most tests used age only as a stratification factor, providing “age corrected” scores for selected age bands. The sample sizes for the age strata range from 1 to ~200 but were usually less than 100 participants/stratum. Sex differences were rarely reported and some studies had markedly uneven distributions of sex. Education was not used as a stratification factor in any study, and few norms attempted corrections for education. The possible interactions of age and education on test scores are seldom reported and cell sizes for combinations of age and education may be too small to enable robust estimates of scores, especially at lower levels of education and older ages. The possible impact of race and ethnicity are rarely interrogated except in ACS, Heaton and MOAANS norms, which all focus on “African American” participants. Discrepancies in scores across ACS, Heaton and MOAANS suggest marked sampling differences.

Conclusions: Existing norms have major limitations which may impact the clinical assessment of individuals and result in inappropriate treatment recommendations as well as lead to inappropriate classification in clinical trials, which may include score “cutoffs” based on widely used normative standards. Most norms use only age as a stratification factor, despite robust impacts of education on scores. Race and ethnicity are poorly represented, fail to reflect current demographic

characteristics of the United States, and existing norms present major conflicts for African American groups, with the same raw scores differing by a full standard deviation depending only on the source of normative data. Sex differences are examined infrequently and it remains unclear to what extent sex or gender differences may affect some scores. There is an urgent need for new, preferably “dynamic” normative standards, that include sampling by socially and demographically meaningful metrics, to provide greater precision in assessment of neuropsychological scores and score discrepancies, and for evaluating the inclusion/exclusion criteria, and criteria for efficacy in clinical trials that use neurocognitive endpoints.

Categories:

Assessment/Psychometrics/Methods (Adult)

Keyword 1: normative data

Keyword 2: test reliability

Correspondence: Phoebe Katims, Semel Institute at UCLA, pak2143@barnard.edu

2 Clinical Validity and Cut-Off Scores of a Brief Neuropsychological Battery for a Large Rural Population in Community Setting

Vikas Dhiman^{1,2}, Tanwi Trushna², Dharma Raj³, Yogesh Sharma², Swapna Azhar², Subroto Shambhu Nandi⁴, Rajnarayan Ramshankar Tiwari⁵

¹Environmental Neuro-Behavioral Laboratory (ENBL), ICMR-National Institute for Research in Environmental Health (NIREH), Bhopal, Madhya Pradesh, India. ²Department of Environmental Health and Epidemiology, ICMR-National Institute for Research in Environmental Health (NIREH), Bhopal, Madhya Pradesh, India. ³Department of Biostatistics and Bioinformatics, ICMR-National Institute for Research in Environmental Health (NIREH), Bhopal, Madhya Pradesh, India. ⁴Department of Environmental Monitoring and Exposure Assessment (Air), ICMR-National Institute for Research in Environmental Health (NIREH), Bhopal, Madhya Pradesh, India. ⁵ICMR-National Institute for Research in Environmental Health (NIREH), Bhopal, Madhya Pradesh, India

Objective: There is a dearth of an appropriate standardized tool to assess neuropsychological functions in rural population, which has low literacy rates, are culturally diverse, and have limited access to healthcare resources. The NIREH Neuropsychological Battery for Rural Population (NINB-RP) is a relatively brief and easy-to-administer battery comprising multiple tests that are modified or adopted as per rural community settings to evaluate verbal learning, fine coordination, attention efficiency, executive task, concentration, and visual attention, mental flexibility, and motor coordination in rural populations. The present study aimed to examine the clinical validity and establish cut-off scores for impairment of neuropsychological functions for different age, gender, and education levels of NINB-RP in a rural community in central India.

Participants and Methods: This was a prospective cross-sectional study conducted in participants aged ≥ 18 years ($n=2952$, M: F=1407:1545) recruited through a stratified sampling technique from 23 randomly selected villages from central India. The data of nine neuropsychological tests [(Finger and Tweezer dexterity test (FDT, TDT); Digit Forward and Backward test (DFT, DBT); Serial subtraction test (SST); Trail Making-A and B; Finger Tapping test (FTT); and Letter Digit Substitution test, LDST)] from 215 cognitively impaired and 2737 healthy control subjects were analyzed. The tests were performed in a village school/community hall or an outdoor camp. Independent sample t-test, Chi-square test, and Receiver Operating Characteristic (ROC) curve were used to calculate the area under the curve (AUC), cut-off scores, and sensitivity (ST)/specificity (SP) values for seven conditions, i.e., gender (male vs. female), age groups (up to 49 years and above 50 years); and educational levels (illiterate, intermediate and college). For those variables where ST/SP values were lower than 0.70, a unique cut-off score was calculated for the entire sample, adjusting by age and educational levels.

Results: A significant difference in mean (median) scores between the healthy control and cognitively impaired groups were observed in all tests except Trail Making A and B and LDST. The AUC for most of the tests ranged from 0.70 to 0.81, and the ST/SP values ranged from 69-73% and 65-75%, respectively. The results showed that most tests of NINB-RP reached moderate to good sensitivity and specificity for gender, age and education levels,

except for DBT for females, above 50 years, and illiterate and intermediate education groups. FDT for males [AUC: 0.85 (95%CI 0.80-0.91), ST/SP=76/82%] and females [(AUC=0.78 (95%CI 0.74-0.82), ST/SP=71/70%), TDT for intermediate education group [AUC=0.82 (95%CI 0.60-1.00), ST/SP=86/83%] and FTT for less than 49 years age group [AUC=0.75 (95%CI 0.67-0.84), ST/SP=71/76%] were the most useful tests to discriminate among healthy control and cognitively impaired rural population.

Conclusions: The present study is an attempt to establish the cut-off scores of a neuropsychological battery for a large rural population in the community setting. The proposed cut-off values might be helpful in clinical assessment in rural areas where clinical neuropsychology services are not readily available. NINB-RP can be a valuable tool for clinical research studies in rural communities. Further studies on similar samples in other countries need to be undertaken.

Categories:

Assessment/Psychometrics/Methods (Adult)

Keyword 1: neuropsychological assessment

Keyword 2: validity (performance or symptom)

Keyword 3: demographic effects on test performance

Correspondence: Dr. Vikas Dhiman, ICMR-National Institute for Research in Environmental Health (NIREH), Bhopal-462030, Madhya Pradesh, India. Email: dhiman.vikas@icmr.gov.in

3 Rey Complex Figure Scoring Made Simple: Data from the Emory Healthy Brain Study

David W. Loring, Jessica L. Saurman, Najé Simama, Katherine Sanders, James J. Lah, Felicia C. Goldstein
Emory University, Atlanta, GA, USA

Objective: The Rey Complex Figure (CF) is a popular test to assess visuospatial construction and visual memory, but its broader use in clinical research is limited by scoring complexity. To widen its application, we developed a new CF scoring system similar to the Benson Figure in which 10 primary CF elements are scored according to presence and location. A novel