

Free Range Factors in Clinical Neuropsychology: Do Real World Assessments Follow the Norms?

Robert M. Bilder¹, Keith F. Widaman², Russell M. Bauer³, Daniel Drane⁴, David W. Loring⁴, Laura Glass Umfleet⁵, Louis Charles Vannier⁶, Dustin Wahlstrom⁶, Jessica L. Fossum⁷, Emily Wong⁷, Kristen Enriquez¹, Fiona Whelan¹, Stone Shih¹

¹Jane & Terry Semel Institute for Neuroscience & Human Behavior at UCLA, ²UC Riverside, ³University of Florida, ⁴Emory University, ⁵Medical College of Wisconsin, ⁶Pearson Clinical Assessment, ⁷UCLA

Background

Neuropsychological research and clinical practice frequently depend on the assumption that the factor structures of measurement are the same in cases with pathology as they are documented in healthy "normative" standardization samples. We examined the validity of this assumption using data from the National Neuropsychology Network.

Methods

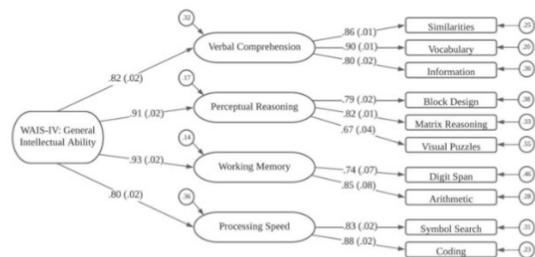
We examined results from 5,000 patients seen at four clinics where patients received subtests from the Wechsler Adult Intelligence Scale, 4th Edition, Wechsler Memory Scale, 4th Edition (WMS-IV), California Verbal Learning Test, 3rd Edition; and Delis-Kaplan Executive Function System (D-KEFS). We used confirmatory factor analysis to evaluate models derived in the original standardization samples. Model fit statistics were evaluated and compared to models using the same variables in the standardization samples. We examined relations of factor scores to demographic and clinical characteristics.

Table 1

Patient Characteristics		
Characteristic	N	Mean (SD)
Age ¹	5000	57.04 (18.57)
Education ²	685	14.82 (2.65)
Characteristic		
	N	Percent
Sex		
Male	2376	47.5%
Female	2615	52.3%
Intersex	3	0.1%
None of these describe me	6	0.1%
Race		
White	4014	80.3%
Black	597	11.9%
Asian	103	2.1%
Native Hawaiian/Other Pacific Islander	3	0.1%
Native American/Alaskan Native	16	0.3%
Other	95	1.9%
Unknown	145	2.9%
Prefer Not to Answer/Declined to Specify	27	0.5%
Ethnicity		
Hispanic or Latino	176	3.5%
Not Hispanic or Latino	4648	93.0%
Unknown/Missing	176	3.5%

Notes. ¹Age was recoded as 90 for those with age > 89. ²Education was coded using an adaptation of the PhenX Toolkit; a score of 14 indicates an Associate's Degree and 15 indicates completion of 3 years but not graduating from college (full code available at www.nnn.ucla.edu).

Figure 1
WAIS-IV Structural Model
a) NNN Sample



b) Standardization Sample (reproduced with permission from Pearson)

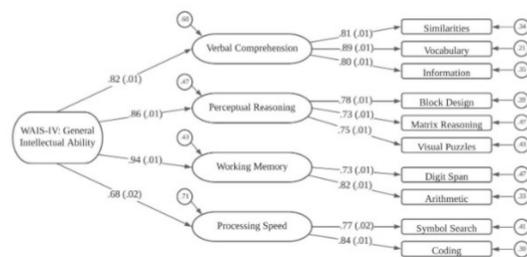
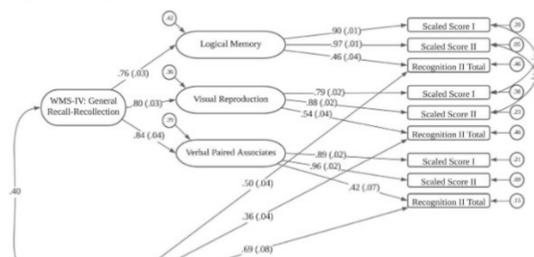


Figure 2
WMS-IV Structural Model
a) NNN Sample



b) Standardization sample

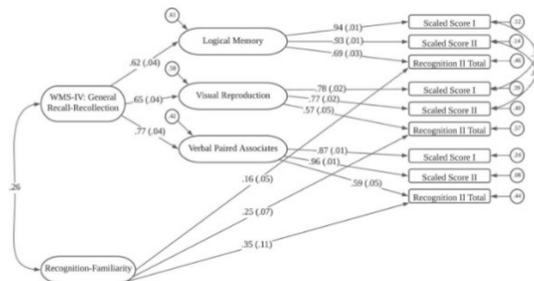
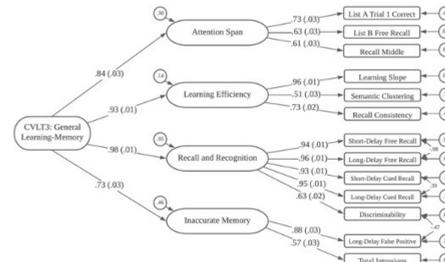


Figure 3
CVLT3 Structural Model
a) NNN Sample



b) Standardization Sample

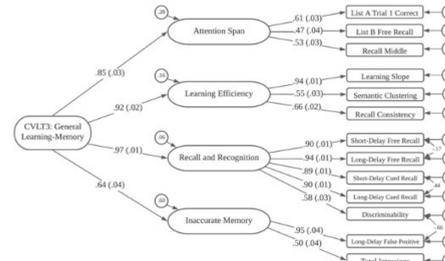
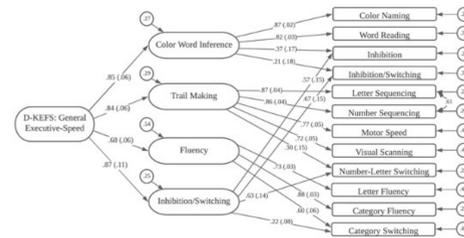
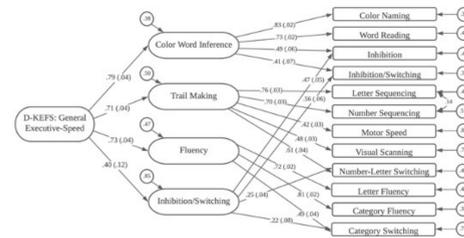


Figure 4
D-KEFS Structural Model
a) NNN Sample



b) Standardization Sample



Results

For each set of variables, we identified four first-order and one second-order factor. Optimal models in patients generally paralleled the best-fitting models in the standardization sample, but on the WMS-IV we identified a recognition memory factor, and on the D-KEFS we found an inhibition/switching factor that did not fit well in the standardization sample. The memory recognition factor correlated with age more strongly than in the standardization sample.

Conclusions

NP constructs identified in "free range" patients overlap with but show important differences from people in standardization samples. Recognition memory and inhibition/switching factors are particularly salient in clinical groups and provide unique, clinically relevant information. It is important that these measure not be removed from clinical research studies simply because they have limited psychometric value in healthy people.

Next Steps

Analyses are planned to examine effects of different diagnostic groups and groups defined by racial, ethnic, and linguistic differences, to identify factors across instruments including measures from other publishers, and to examine factor definitions using item-response theory, which can generate proposals for more efficient adaptive tests.

Formal tests of measurement invariance revealed generally strong to strict invariance across the NNN and Pearson standardization samples. But by identifying the best-fitting models in the NNN clinical sample, we specified a recognition memory or "familiarity" factor, and an "inhibition/switching" factor that were not originally reported.