Ecological Validity of the Neuropsychological Assessment Battery-Screening Module and Texas Functional Living Scale in a Post-Acute Acquired Brain Injury Population

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Introduction

Neuropsychological assessment performs an essential function for post-acute rehabilitation following acquired brain injury (ABI). Neuropsychologists are called upon for diagnostic purposes, treatment planning, and monitoring functioning over time. Their recommendations can play a valuable role in client outcomes.

Given the widespread use of neuropsychological measures and the importance of their findings, the question of whether they predict the functional and real-world abilities of clients is essential. Establishing ecological validity requires evidence that measures can predict impairment and functional abilities in everyday life. Some have argued that this is an accurate assumption, with moderate correlations between cognitive functioning and functional abilities. Nonetheless, continued work is necessary to extrapolate these findings across populations.

Objectives

The current study seeks to extend support for the ecological validity of the Neuropsychological Assessment Battery-Screening Module (NAB-SM) and a measure of functional abilities that clients encounter in their daily lives the Texas Functional Living Scales (TFLS) in a population with ABI. The researchers examined the ability of cognitive performance on the NAB-SM and functional skills on the TFLS to predict clinical outcomes on a measure of clinician-completed impairment (MPAI-4)

Method and Materials

Participants: Participants were 64 adults (65.6% male) from a post-acute facility for individuals with severe ABIs. All participants were two years or greater post-injury. Mean participant age was 44.94[11.29]. Median years of education was 12[1.93].

Materials: Cognitive functioning was measured by the NAB-SM. Functional abilities were measured by performance on the TFLS. Clinical outcomes were determined using the Mayo-Portland Adaptability Inventory, 4th Edition (MPAI-4), an interdisciplinary clinician-reported measure of physical, emotional, cognitive, behavioral, and social functioning of clients. The MPAI-4 provides an overall impairment score (Total), a measure of motor, sensory, and cognitive functioning (Ability), a measure of psychosocial issues (Adjustment), and a measure of social, vocational, educational, and other functional abilities (Participation).

Procedures: Archival data was collected from a database of annual neuropsychological screenings from 2012–2015. Participants were included from the most recent year with data on all three measures. Regression analyses were conducted using SPSS V. 22 to examine if functional performance (TFLS) mediated the relation between cognitive abilities (NAB-SM) and clinical outcomes (MPAI-4).

Results

Descriptive statistics for participants and measures are listed in Table 1 and Table 2. The following significant associations were found between variables:

- Age was positively correlated with NAB-SM Memory Index scores, r=.26, p<.05, F(1,62)=4.39, p<.05.
- Education was positively correlated with TFLS Communication scores, r=.25, p<.05.
  - Education was also found to significantly predict TFLS Communication raw scores, F(1,62)=4.22, p<.05.
- Gender was more positively correlated with higher NAB-SM Language Index scores for women, r=.31, p<.05, F(1,62)=46.57, p<.05, (M=94.3[19.6]), compared with men (M=80.1[21.7]).
- All other demographic variables were not associated with test performances.

Demographic Variable	Mean	SD	Min	Max
Age	44.94	11.29	23	67
Education (years)	12.77	1.93	8	18
Gender	**Male: 42**		**Female: 22**	

Table 1. Demographic descriptive statistics

Measure	Mean	SD	Minimum	Maximum
NAB-SM Total SS	68.69	15.31	49	115
NAB-SM Attention SS	62.97	12.18	47	97
NAB-SM Language SS	84.97	21.93	45	127
NAB-SM Memory SS	81.11	15.39	53	118
NAB-SM Spatial SS	81.30	15.16	47	127
NAB-SM Executive SS	77.3	19.12	47	141
TFLS Total T-score	36.09	11.11	15	60
TFLS Time raw	7.42/9	1.17	2	9
TFLS Money & Calculation raw	5.38/8	2.171	0	8
TFLS Communication raw	19.44/28	6.82	4	28
TFLS Memory raw	2.84/5	1.98	0	5
MPAI Total	53.86	13.76	24	20
MPAI Ability	19.95	7.59	6	40
MPAI Adjustment	21.02	7.10	4	36
MPAI Participation	19.06	5.86	6	29

Table 2. Measure variable descriptive statistics

Results Continued

A regression analysis was conducted using SPSS to examine the degree to which functional performance (TFLS) and cognitive abilities (NAB-SM) predicted impairment and functional outcomes (MPAI-4).

- Results indicated that the NAB-SM Total score was a significant predictor of TFLS Total Score, b=.539, SE=.062, p<.01.
- The NAB-SM Total score significantly predicted impairment on the MPAI-4, b=-.428, SE=.100, p<.01.
- The TFLS Total Score was also a significant predictor of overall impairment, b=-.694, SE=.130, p<.01.

Subsequent analyses evaluated the predictive ability of total and subscale scores. Results are presented in Table 3.

- MPAI-4 Total and Ability subscale scores were predicted by all measures (ps<.05).
- Select scores reflected MPAI-4 Participation scores (ps<.05).
- Measures did not predict MPAI-4 Adjustment scores (ps>.05).

Measure	MPAI-4 Total	MPAI-4 Ability	MPAI-4 Adjustment	MPAI-4 Participation
NAB-SM Total SS	18.236***	28.654***	0.022	13.811***
NAB-SM Attention SS	13.166**	17.597***	0.381	10.590**
NAB-SM Language SS	8.585**	13.917***	0.003	5.635*
NAB-SM Memory SS	4.958*	6.865*	0.028	2.553
NAB-SM Spatial SS	5.892*	7.767**	0.003	6.079*
NAB-SM Executive SS	8.833**	17.669***	0.019	6.145*
TFLS Total T-score	28.416***	38.336***	0.853	24.193***
TFLS Time raw	5.842*	10.654**	0.011	3.093
TFLS Money & Calculation raw	4.825*	12.186**	0.04	2.201
TFLS Communication raw	16.338***	22.693***	0.22	12.249**
TFLS Memory raw	12.599**	19.586***	0.046	18.521***

Table 3. F-Values for Regression Equations of Measures on MPAI-4
*p<.05; **p<.01, ***p<.001

Discussion

Significant effects were found regarding certain demographic variables and performance. Some of the findings may have been artifacts of characteristics of the sample and their respective injuries, such as gender and language ability. Others, such as education and functional communication, may be indicative of genuine population trends. Further research is warranted to examine these findings.

Regression findings supported the ecological validity of the NAB-SM and the TFLS as predictors of overall impairment in an ABI population.

- All subtests and total scores predicted some degree of functional abilities, as assessed by the MPAI-4 Ability scale.
- NAB-SM Total score, as well as scores on tasks utilizing attention, language, visuospatial, and executive skills, predicted participation in social, vocational, educational and other activities (MPAI-4 Participation). This was also predicted by the TFLS Total score as well as TFLS Communication and Memory subtest scores.
- No scores were associated with psychological adjustment (MPAI-4 Adjustment).

These findings revealed that both the NAB-SM and TFLS were useful in predicting overall impairment and impairment in specific domains on the MPAI-4. All measures predicted Ability scale performance, as this domain relies heavily on cognitive skills. Participation was predicted by certain scores on both the NAB-SM and TFLS, presumably because they measured tasks which were more essential to social, vocational, and educational participation. No scores predicted psychosocial adjustment, which is unsurprising as the NAB-SM and TFLS assess cognitive and functional ability rather than psychological issues.

In conclusion, both the NAB-SM and TFLS were found to be strong predictors of functional impairment on many domains of the MPAI-4, lending ecological validity to the measures. This data supports the use of these tests in rehabilitation populations to assess functional impairment and may lend useful information regarding treatment recommendations.

Limitations of this study include a small sample size and questionable representativeness. Future studies should also examine more robust measures of cognitive ability, such as the full NAB, in addition to the screening measure.

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