

Relationship Between the Neuropsychological Assessment Battery Screening Module (NAB-SM) and Functional Independence in Post-Acute Brain Injury Rehabilitation



Richard O. Temple
CORE Health Care
Dripping Springs, TX



Dennis J Zgaljardic
Transitional Learning Center
University of Texas Medical Branch
Galveston, TX



ABSTRACT

Primary Objective: To assess the relationship (i.e., ecological validity) of the Screening Module of the Neuropsychological Assessment Battery (NAB-SM) using the Functional Independence Measure (FIM).

Method: Seventy individuals (57 males) with moderate to severe traumatic brain injury at a residential post-acute rehabilitation facility were administered the FIM instrument and the NAB-SM upon admission. Hierarchical regression analysis was used to examine the relationship between the variables from these two assessment measures.

Results: Hierarchical models revealed that (1) the NAB-SM Total score was significantly associated with the FIM instrument Total score as well as the Motor and Cognition subscale scores, above and beyond the contribution of demographic variables, (2) the NAB-SM Language, Memory, and Spatial domain scores were significantly predictive of the FIM instrument Cognition subscale score, and (3) the NAB-SM Spatial domain score was significantly predictive of the FIM instrument Total and Motor subscale scores.

Conclusions: The current findings support previous research and provide evidence for the ecological validity of the NAB-SM with regard to functional abilities as assessed by the FIM instrument.

INTRODUCTION

> Cognitive impairment secondary to traumatic brain injury (TBI) can greatly limit an individual's functional independence. The assessment of cognitive impairment is paramount in the rehabilitation setting as a means to aid in treatment planning.

> It is crucial for measures of cognitive functioning to maintain some degree of ecological validity in order to provide consistent and reliable information about a patient's cognitive abilities to the interdisciplinary treatment team.

The Screening Module from the Neuropsychological Assessment Battery (NAB-SM) allows for the brief (i.e., ~30 min.) assessment of Attention, Language, Memory, Spatial, and Executive Functioning.

> The Functional Independence Measure (FIM) is widely used to assess the functional status of individuals with disabilities. The FIM consists of 18 items, 13 of which assess basic ADLs, with the remaining five based on cognitive skills.

> In the current study we assessed the relationship between all portions of the FIM instrument with the screening module from the Neuropsychological Assessment Battery (NAB; Stern & White, 2003) in a sample of patients with traumatic brain injury in a residential post-acute rehabilitation setting.

METHOD

Participants

> Seventy individuals (53 males) with a history of moderate to severe traumatic brain injury (GCS 3-12, loss of consciousness greater than 30 minutes, and/or positive neuroimaging findings) consecutively admitted to a post-acute rehabilitation facility participated in the study.

> Mean age of the sample was 36.0 (SD=13.6) and mean educational attainment was 12.1 years (SD=2.2).

> Mean length of time between injury and assessment was 1.7 years (SD=4.0).

> Participants were excluded if they presented with a severe communication or motor condition that prevented them from completing the NAB screening module.

Procedure

> The NAB Screening Module and FIM Instrument were administered to all participants according to standardized procedures.

Data Analysis

> Hierarchical regression analyses were used to examine the relationships between the NAB-SM and the FIM Instrument.

> Age and sex were added to the first block based on preliminary linear regression analysis, and either the NAB Total Screening Score or the five cognitive domain scores were entered in the second block.

Mean scores for NAB-SM and FIM Instrument

	Variable	Mean	SD	Minimum	Maximum
FIM	Total Score	103.0	15.9	40	124
	Motor Skills Subtotal	79.6	13.9	28	91
	Cognitive Skills Subtotal	23.4	4.7	12	34
NAB-SM	Total Screening Standard Score	74.2	16.6	49	116
	Attention	70.9	17.3	48	111
	Language				
	Memory	84.7	23.6	45	130
	Spatial	85.9	16.3	53	122
	Executive	81.8	16.9	45	114

RESULTS

> The NAB Total Screening Standard Score significantly incremented the R^2 above the influence of age and sex, $F(1, 66) = 27.8, p < .0001$, adjusted $R^2\Delta = .26$.

> The NAB Total Screening Standard Score was significantly associated with motor skills above the influence of age and sex, $F(1, 66) = 9.9, p < .003$, adjusted $R^2\Delta = .11$.

> The NAB Total Screening Standard Score was significantly associated with the FIM instrument Cognitive Subtotal score, $F(1, 66) = 77.0, p < .0001$, adjusted $R^2\Delta = .53$.

> NAB-SM domain scores significantly incremented the association between the FIM instrument Total Score, the FIM instrument Motor, and the FIM instrument Cognitive Subtotal Scores ($F_s > 4.6, p_s < .002$).

> The NAB-SM Spatial Domain score was independently associated with the FIM instrument Total Score, $t(1, 62) = 3.3, p < .002$ and the FIM instrument Motor Subtotal score, $t(1, 62) = 2.7, p < .009$.

> The NAB-SM Language, Memory, and Spatial Domain Scores were all significantly and independently associated with the FIM instrument Cognitive Subtotal Score (all $F_s > 2.5, p_s < .02$).

Hierarchical Regression Models

FIM Outcome Variable	Model	Adjusted R^2	$R^2\Delta$	$F\Delta$	Sig. $F\Delta$
Total Score	1	.08	.10	3.9	.03
	2	.41	.37	7.9	<.0001
Motor Subscale	1	.08	.10	3.9	.02
	2	.28	.25	4.8	.0002
Cognitive Subscale	1	-.01	.02	0.6	n.s.
	2	.51	.55	11.5	<.0001

Notes: Model 1 ($df = 2, 67$) predictors = age and sex; Model 2 ($df = 7, 62$) predictors = NAB Screening Attention, Language, Memory, Spatial, and Executive index scores.

DISCUSSION

> The purpose of the current study was to explore the ecological validity of the NAB-SM with an established measure of functional independence (FIM instrument) in a sample of individuals with moderate to severe traumatic brain injury.

> The results of this study provide strong evidence for the ecological validity of the NAB-SM with regard to functional abilities.

> The NAB Total Screening score accounted for 26% of the variance in the FIM instrument Total Score, 11% of the variance in the FIM instrument Motor Subtotal score, and 53% of the variance in the FIM instrument Cognitive Subtotal score, above and beyond the variability accounted for by demographic variables (i.e., age and sex).

> Analysis of the independent contributions of the NAB-SM Cognitive Domain scores revealed that the NAB-SM Spatial domain was independently associated with both the FIM instrument Total Score and the Motor Subtotal. Given the obvious role of spatial analysis in many tasks assessed by certain FIM instrument Motor domains (e.g., locomotion, transfers, and self care tasks), these findings provide evidence for the ecological validity of the NAB-SM with regard to motoric functional activities.

> Significant relationships were also observed between the NAB-SM and FIM instrument cognitive domains. NAB-SM Language, Memory, and Spatial Domain scores were all independently associated with the FIM instrument Cognitive Subtotal score. These findings are consistent with other studies demonstrating a relationship between neuropsychological test performance and the FIM instrument (Hajek et al., 1997; Smith-Knapp et al., 1996).

Cognitive Domains and Subtests in NAB Screening Module

Screening Domain	Subtest	Construct Assessed
Screening Attention Domain (S-ATT)	Digits Forward	Auditory Attentional Capacity
	Digits Backward	Working Memory
	Letter Cancellation	Selective and Divided Attention
Screening Language Domain (S-LAN)	Auditory Comprehension	Comprehension of brief commands
	Naming	Confrontation naming
Screening Memory Domain (S-MEM)	Immediate and Delayed Story Recall	Verbal memory
	Immediate and Delayed Shape Recognition	Visual Memory
Screening Spatial Domain (S-SPT)	Visual Discrimination	Visual analysis
	Design Construction	Visual construction
Screening Executive Functions Domain (S-EXE)	Word Generation	Organization of verbal output
	Mazes	Visual Planning

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