

Single Word Reading as a Test of Premorbid Functioning in Chronic Severe Acquired Brain Injury

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Background

Estimation of premorbid functioning is a necessary component of neuropsychological assessment, as premorbid cognitive ability is a baseline upon which post-injury neurocognitive abilities can be compared. Tests of word reading are often used to estimate premorbid intellectual abilities, as this ability correlates highly with intelligence, is thought to be resistant to impact from most neurologic impairment, and is considered stable over time. However, reading ability may be impacted by language deficits and some research has found that reading ability may be compromised with more severe cognitive impairment. In addition, cognition may decline among those with chronic, severe brain injury, which could affect reliability of word reading scores in this population.

Objective: This study examined test-retest reliability of the Wide Range Achievement Test-4 Word Reading (WRAT-4) in a sample of adults with chronic, severe, acquired brain injuries (ABI).

Methodology

Participants:

Participants were 58 adults with chronic, severe ABI (71% male, M age = 49.05 [10.84], M years post injury = 23.49 [9.99]) who attend a post-acute community neurorehabilitation program.

Measures:

Cognition: Neuropsychological Assessment Battery-Screening Module (NAB-SM); Dementia Rating Scale-2 (DRS-2)
 Mood: Patient Health Questionnaire; Brief Mood Survey (BMS)
 Word Reading: WRAT-4 Word Reading

Procedure:

Archival data was collected from a database of annual neuropsychological screenings completed between 2012 – 2015. Test-retest reliability of Word Reading was analyzed using SPSS V.23 to compute intraclass correlation coefficients (ICC's) between baseline and testing 1–2 years later. Additional ICC's were computed to assess if consistency remained across conditions that may impact testing, such as impaired mood, language, attention, or overall impairment.

Results

Word Reading raw scores at baseline ranged from 23–70 ($M = 52.02$ [11.94]). Raw scores one to two years following the initial data point ranged from 19–69 ($M = 49.78$ [12.31]). One year later, raw scores ranged from 24–68 ($M = 49.72$ [11.60]). In general, there was low variability between time points with a mean standard deviation of 3.00 [2.95] between baseline and time point two, and a mean standard deviation of 3.59 [2.44] across the three time points. See Table 1.

Single measure ICC scores between Word Reading baseline and testing 1–2 years later was 0.88, 95% CI (0.79, 0.93), and was 0.88, 95% CI (0.80, 0.94) across the three time points. ICC scores grouped by cognitive impairment, language, and mood ranged from 0.84, 95% CI (0.63, 0.93) to 0.91, 95% CI (0.82, 0.96). See Table 2.

Table 1. Descriptive Statistics (raw scores)

	Measures	M	SD
Word Reading	WRAT4 WR Baseline	52.02	11.94
	WRAT4 WR Time Point 2	49.78	12.31
	WRAT4 WR Time Point 3	49.72	11.60
	Mean SD Baseline – Time Point 2	3.00	2.95
	Mean SD Baseline – Time Point 3	3.59	2.44
Cognition	NAB-SM Total Screening	68.88	15.23
	NAB-SM Attention	62.21	12.51
	NAB-SM Language	86.80	20.05
	DRS-2 Total	99.54	17.33
	DRS-2 Attention	32.46	2.70
Mood	DRS-2 Initiation/Perseveration	20.00	8.04
	Patient Health Questionnaire	5.92	5.65
	BMS – Anxiety	3.98	5.06
	BMS – Depression	3.13	4.53
	BMS – Anger	5.00	5.57

Table 2. ICC's (ICC model 2-way mixed type, absolute agreement)

Word Reading ICC	CI	N	
$T_1 - T_2$.883	.788 – .933	58
$T_1 - T_2 - T_3$.880	.799 – .935	32
Overall Impairment	.865	.737 – .931	37
Impaired Attention	.913	.819 – .957	38
Impaired Language	.837	.631 – .933	19
Mood Disturbance	.873	.675 – .950	20

Discussion

Tests of single word reading ability are frequently used by neuropsychologists to estimate premorbid functioning due to the relationship to general intelligence and relative preservation from cognitive dysfunction, as well as practical considerations, such as ease and brevity of administration. Establishing consistency across time and severity of impairment is necessary for such tests to be considered a reliable method of estimating premorbid functioning.

This study found high test-retest reliability of WRAT-4 Word Reading across one to three year intervals in a sample of individuals with chronic, severe ABI. Consistency remained even for subgroups with high levels of overall impairment or impairment in mood, language abilities, or attention. These findings support the use of the WRAT-4 Word Reading as a stable measure of pre-morbid functioning in a population of adults with severe, chronic brain injuries.

Limitations and Future Directions

Limitations:

Limitations included the small sample size, particularly within subgroup analyses, which lower the power of this study. In addition, data was collected retrospectively, so information regarding external factors that may have influenced testing was unavailable.

Future Directions:

While the WRAT-4 Word Reading was found to be reliable over a 1 – 2 year time period, future studies should assess reliability over longer timeframes to identify possible effects of cognitive decline in a population with chronic ABI. In addition, there were a small number of participants who showed considerable variability in Word Reading scores. Future research should examine factors that contribute to individual variability, which could provide guidance on when to supplement the use of Word Reading with other methods for assessing premorbid functioning. Finally, while this study supported the reliability of the WRAT-4 Word Reading test, additional research is needed to verify it's validity as an estimate of pre-morbid functioning, particularly for individuals with chronic, severe ABI.

See presenter for list of references