

Practice Effects on Repeat Neuropsychological Assessment in Chronic Severe TBI

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Background

- Practice effects (PE) are factors inherent to repeat assessment that result in improved performance, such as familiarity with test procedures, repeated exposure to test materials, and development of test-taking strategies (Bartels et al., 2010; Calamia et al., 2012)
 - Failure to account for PE can cause clinicians to make inaccurate conclusions and can compromise the validity of findings (Calamia et al., 2012)
 - Substantial PE have been found for tasks that are novel, rely on motor speed, involve fluid abilities, force the examinee to provide the answer during the test, and involve responses that have not been previously encountered (Duff et al., 2012; Lezak et al., 2012)
 - Tests that involve unique features and objects or have a single solution increase the risk for PE (Lezak et al., 2012)
 - The magnitude of PE and domains affected are moderated by clinical diagnosis and severity, as supported by research for individuals with mild cognitive impairment, preclinical Alzheimer's disease, and Alzheimer's disease (Gavett et al., 2016)
 - The differential impact of PE based on disorder severity in Alzheimer's disease raises concerns that severity of neurologic injury may impact the pattern of PE in other clinical populations.
 - Given the diverse pathophysiology and etiology of deficits associated with TBI, it is likely that the pattern of PE across the spectrum of TBI severity widely differs.
 - As there is no known research on PE for individuals with chronic severe traumatic brain injury (sTBI), this study aims to identify the pattern of practice effects for this population
- Hypothesis: In contrast to the expected pattern of PE, the pervasive cognitive deficits seen in individuals with chronic sTBI will result in a diminished pattern of PE on repeat assessment.**



Methodology

- All participants were enrolled in post-acute rehabilitation services at a multi-site day treatment program in New Jersey
- Archival data collected between 2012 and 2018 from annual neuropsychological evaluations of residential TBI patients
- Exclusion criteria included history of a non-traumatic ABI, unknown etiology, and incomplete or discontinued testing
- Average time between test administrations was 13.34 months

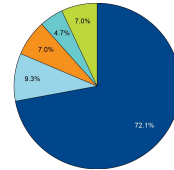
Sample Characteristics

- 38 Participants (13 Females, 25 Males)
- Ages 23 to 63 years old ($M = 44.13$, $SD = 10.51$)
- 90.7% White, 7% Black/African American, 2.3% Asian
- Mean years of education = 12.61 ($SD = 1.95$)
- Mean age of TBI onset = 25.95 years ($SD = 11.31$)
- Patients were first tested ~2 decades post-injury ($M = 18.88$, $SD = 10.37$)

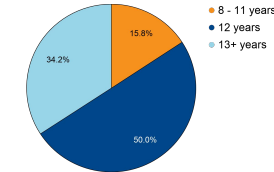
Assessment Battery

- Neuropsychological Assessment Battery (NAB), Screening Module, Judgment subtest
- Wide Range Achievement Test, 4th Ed. (WRAT-4), Word Reading
- Texas Functional Living Scale (TFLS)

TBI Etiology



Education



Results

Paired Samples t-test and Effect Sizes for Neuropsychological Tests

Test Name	n	Time		t	p	d
		Mean (SD)	Mean (SD)			
NAB Attention	38	61.05 (11.08)	63.79 (11.78)	2.35*	0.024	0.38
NAB Language	38	91.71 (20.15)	91.76 (16.10)	0.17	0.986	0.00
NAB Memory	38	81.95 (11.92)	82.68 (14.37)	0.34	0.737	0.05
NAB Spatial Reasoning	38	84.53 (17.28)	85.45 (13.51)	0.38	0.708	0.06
NAB Executive Functioning	38	75.32 (16.67)	78.24 (17.13)	1.39	0.172	0.23
NAB Total Score	37	69.97 (12.99)	71.08 (13.45)	0.82	0.418	0.11
NAB Judgment (T-Score)	34	45.85 (13.10)	50.35 (13.20)	1.82	0.078	0.29
WRAT-4 Word Reading	37	89.65 (17.59)	88.43 (16.25)	-1.09	0.105	0.19
TFLS Total score (T-Score)	37	36.30 (8.64)	40.08 (10.00)	2.93**	0.006	0.42

Note: All values are Standard Scores unless noted; ** $p < .01$, * $p < .05$; t = paired samples statistic; d = Cohen's d

- A paired-samples t-test was conducted to compare the difference in test scores from Time 1 to Time 2. There was a significant and reliable increase in scores for the second administration of NAB Attention and TFLS Total Score. NAB Judgment subtest approached significance. No practice effects observed for NAB Language, NAB Memory, NAB Spatial Reasoning, or WRAT-4 Word Reading.
- Effect sizes (Cohen's d) for NAB Language, NAB Memory, NAB Spatial Reasoning, NAB Total Score, and WRAT-4 Word Reading were negligible. Effect size for NAB Judgment was small, NAB Attention was small to moderate, and TFLS Total Score was moderate.

Discussion

- Consistent with prior research, NAB attention tasks rely heavily on motor speed and were significantly impacted by PE
- Task characteristics differentially affected risk of PE
 - TFLS contains functional tasks with prospective memory cue
 - Largest effect size contribution ($d=0.39$) from communication domain, that contains items forcing patients to use test information to deduce future answers
- No changes on tasks that rely on crystallized knowledge, such as WRAT-4 Word Reading and NAB Language
- Unlike prior research, no PE were observed on novel tasks or those that require cognitive strategies, such as NAB Executive Functioning
 - Incidental learning of cognitive strategies is a skill this population may not have had given severe cognitive impairment
- No gains were found on NAB Memory tasks, likely related to the significant cognitive deficits associated with sTBI
- Largest PE on NAB Judgment, which evaluates reasoning skills related to real world decision-making
 - After accounting for PE with statistical models (RCI-PE) almost 30% of the sample still improved (Iverson et al., 2001)
 - Rehabilitation and cognitive therapies may contribute to improved test performances, or absence of cognitive decline (Forslund et al., 2019)
- NAB Screening Battery is not normally distributed and is limited in its range of scores

This study indicates that adults with chronic sTBI demonstrate significant practice effects primarily on measures associated with functional living skills. These findings suggest that repeat testing in this population may be less susceptible to the influence of practice effects

References

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