Young Adults with Acquired Brain Injury Show Significant Gains in Cognitive Function Following Intensive Rehabilitation

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BACKGROUND

- Acquired brain injury (ABI) is on the rise in young adults.[1,2]
- ABI impacts cognitive processes[3,4] important for academic success.[5-7]
- Young adults with ABI struggle with academics in college.[8,9]
- Current cognitive rehabilitation approaches are not sufficiently repetitive, intensive, salient, and contextualized to advance young adults with ABI to college.[10]
- The Intensive Cognitive and Communication Rehabilitation (ICCR) program serves as a first step in filling this gap.
- While an initial efficacy study[11] (n = 4) showed promising results, it remains to be seen 1) whether these findings extend to a larger participant sample, and 2) what cognitive domains important for academic success improve as a function of this intensive program.

RESEARCH QUESTIONS

1. Does item accuracy on standardized assessments of cognitive function significantly increase over time (i.e., effect of treatment)?
2. In what broad cognitive domains, does item accuracy on standardized assessments of cognitive function significantly increase over time (i.e., effect of treatment on cognitive-linguistic domains vs. other cognitive domains)?
3. In what specific cognitive domains, does item accuracy on standardized assessments of cognitive function significantly increase over time (e.g., effect of treatment on memory, verbal expression, etc.)?

METHODS

N	Etiology	Age Mean (SD)	Sex	MPO Mean (SD)	Edu. Level Mean (SD)
17	TBI = 8 Non-TBI = 9	24.60 (4.04)	M = 14 F = 3	56.47 (38.68)	14.71 (1.40)

Note: MPO = months post onset; TBI = traumatic brain injury; non-TBI = stroke, tumor, encephalitis

Study Timeline

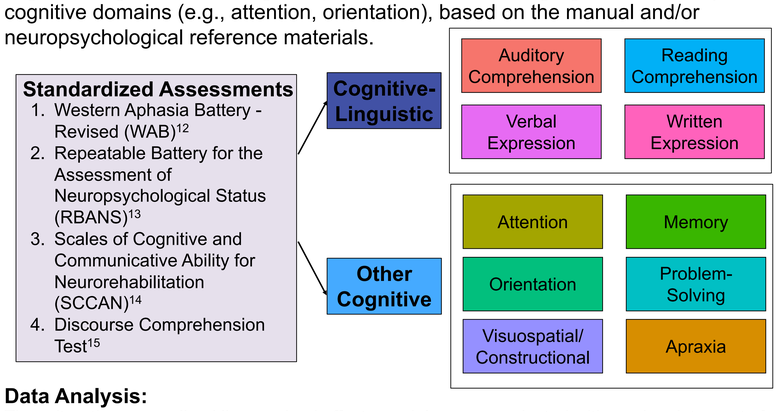
Pre-tx		Post-tx 1		Post-tx 2		Post-tx 3
Timepoint 0	12-week therapy	Timepoint 1	12-week therapy	Timepoint 2	12-week therapy	Timepoint 3
Standardized Assessment Battery		Standardized Assessment Battery		Standardized Assessment Battery		Standardized Assessment Battery

Key components of 12-week intensive therapy:
1) 6 hours/day, 4 days/week
2) Classroom-style lectures
3) Individual therapy
4) Computer- and app-based training

Note: Participants may attend multiple semesters (timepoints) of the program until ready to transition to college. Post-treatment (tx) assessment data serves as pre-tx data for the upcoming semester (timepoint).

METHODS (cont'd)

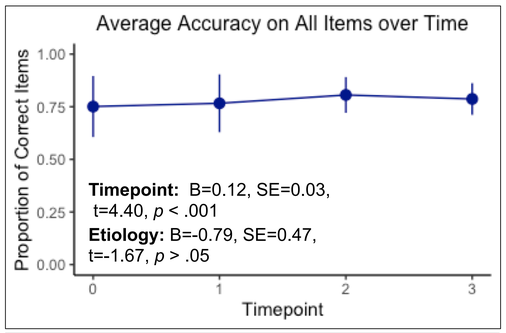
Items from standardized assessments fell into two broad cognitive domains (i.e., cognitive-linguistic, other cognitive), which were further segregated into ten specific cognitive domains (e.g., attention, orientation), based on the manual and/or neuropsychological reference materials.



Data Analysis:
Three iterative generalized linear mixed effects models were conducted with random intercepts for participants and items and by-participant random slopes for timepoint. Timepoint was coded as a numeric predictor: Pre-tx=0, Post1=1, Post2=2, Post3=3. Domain (ref. level: cognitive-linguistic), sub_domain (ref. level: aud. comp.) & etiology (ref. level: non-TBI) were dummy-coded.

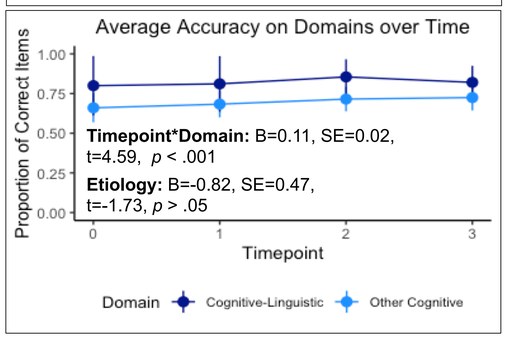
- RQ1 model: Item score ~ timepoint + etiology + (1 | Item) + (timepoint | participant)
  - , Etiology: 2 levels (i.e., non-TBI, TBI)
- RQ2 model: Item score ~ timepoint * domain + etiology (1 | Item) + (timepoint | participant)
  - Domain: 2 levels (i.e., cognitive-linguistic, other cognitive), Etiology: 2 levels (i.e., non-TBI, TBI)
- RQ3 model: Item score ~ timepoint * sub_domain + etiology + (1 | Item) + (timepoint | participant)
  - Sub-Domain: 10 levels (e.g., attention, memory, auditory comprehension), Etiology: 2 levels (i.e., non-TBI, TBI)
  - Post-hoc pairwise comparisons to obtain intercept and slope estimates for each domain
  - P-values were Bonferroni-adjusted to manage multiple comparisons

RESULTS/DISCUSSION



RQ1. Effect Of Treatment?

- Overall effect of treatment
- Similar benefit of treatment for participants with TBI and non-TBI

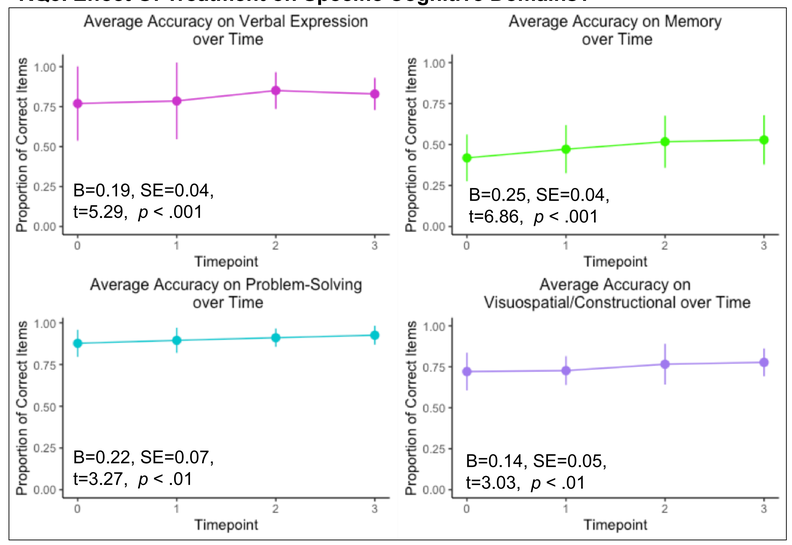


RQ2. Effect Of Treatment on Broad Cognitive Domains?

- Effect of treatment was greater for items in the "other cognitive domain" category than for items in the "cognitive-linguistic domain" category over time
- No significant difference in item accuracy for etiology

RESULTS/DISCUSSION (cont'd)

RQ3. Effect Of Treatment on Specific Cognitive Domains?



Item accuracy in the verbal expression, memory, problem-solving, and visuospatial/constructional domains increased significantly over time, indicating a positive effect of treatment on these specific cognitive domains.

CONCLUSIONS

- Young adults with ABI demonstrated significant gains in standardized assessment items over time, supporting a cumulative benefit of ICCR on cognitive function and extending initial findings to a larger participant sample.
- The treatment appeared to have a greater benefit for "other cognitive domain" processing (e.g., memory) than "cognitive-linguistic" processing (e.g., auditory comprehension).
- Participants demonstrated longitudinal gains in cognitive domains important for academic success — memory, problem-solving, verbal expression, and visuospatial/constructional skills.

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