Intensive cognitive-communication rehabilitation for college-bound young adults with brain injury

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BACKGROUND

- Young adults (YA) are frequently affected and growing groups to suffer traumatic brain injury (TBI) and stroke.1,2
- Acquired brain injury (ABI) often negatively impacts cognitive-linguistic function (e.g., reading), activity participation (e.g., following a class syllabus), and overall well-being (e.g., satisfaction with life as unremarked/unemployed).3,4
- Not surprisingly, YAs with ABI often struggle in an academic setting (e.g., ~80% of individuals with TBI).5
- Comprehensive, contextualized cognitive rehabilitation (CR) programs target cognitive-linguistic constructs, teach compensatory strategies, and provide contexts for learning implementation. Such programs have resulted in significant gains in cognition, community integration and independence for individuals with ABI.6
- Yet, to date, none of these programs have focused directly on supporting YAs with ABI who wish to pursue college, while also incorporating all relevant principles of experience-dependent neural plasticity to maximize rehabilitation progress (i.e., repetition, salience, specificity of training, enriched environment, intensity, age).7

RESEARCH QUESTIONS

After an Intensive Cognitive-Communication Rehabilitation (ICCR) program, do ICCR students...

- Show gains in cognitive-linguistic functioning?
- Exhibit progress in individual speech therapy?
- Show improved classroom performance?
- Demonstrate increased participation and quality of life?

METHODS

Assessment

Formal Assessments:

- Cognitive-Linguistic Function
  - Western Aphasia Battery - Revised (WAB-R)10
  - Scales of Cognitive and Communicative Ability for Neurorehabilitation (SCCAN)9
  - Repeatable Battery for the Assessment of Neuropsychological Status (RBANS)10
  - Discourse Comprehension Test (DCT)11
  - Participation and Quality of Life
    - Child and Adolescent Scale of Participation (CASP)12
    - TBI-QOL13 and Neuro-QOL14

Informal Assessments:

- Daily classroom performance (e.g., answering questions)
- Performance on individual speech therapy goals (e.g., accurately spelling words)

Sample Weekly Treatment Schedule

Other Activities

<table>
<thead>
<tr>
<th>Monday</th>
<th>Tuesday</th>
<th>Thursday</th>
<th>Friday</th>
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<tbody>
<tr>
<td>10:00</td>
<td>Economics Lecture</td>
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<tr>
<td>11:00</td>
<td>Review</td>
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<tr>
<td>12:00</td>
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<td>Practice Quiz 7’s</td>
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<td>2:00</td>
<td>Statistics</td>
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<tr>
<td>3:00</td>
<td>Tech</td>
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Note: ~288 hours/semester; ICCR students may attend multiple semesters of the program until they are ready to transition to post-secondary education.

RESULTS

RQ 1: Show gains in cognitive-linguistic functioning?

- Timepoint significantly predicted score over time on the WAB and SCCAN (see figure).
- Controls showed no significant change in measures, compared to ICCR students who demonstrated significant gains over time with the 12-week period.

Summary: Yes. As the number of semesters in ICCR increased, participants’ scores on 2/4 tests of cognitive-linguistic function significantly improved. The lack of significant change on controls scores suggests the intervention resulted in the ICCR students’ gains.

RQ 2: Exhibit progress in individual speech therapy?

- Time/behavior interaction: 6 < -0.06, SE = 0.05, t-value = -1.07, p < 0.29

Summary: Not significantly over time. Positive behaviors (e.g., answering questions, asking questions, making comments accurately/appropriately) were significantly impacted. However, negative behaviors did not increase significantly more than negative behaviors across the semester.

RQ 3: Show improved classroom performance?

- Classroom Participation
  - As post-treatment changes did not exceed the standard deviation. Yet, after ICCR, students demonstrated trends consistent with increased positive affect and communication, in addition to lower depression.

RQ 4: Demonstrate increased participation and quality of life?

- CASP (n = 167)
  - 100 = full participation
  - Neuro-QOL T-scores (n = 3)
  - 100 = full participation

Summary: Yes. ICCR students improved in the majority of participation metrics and significantly in the School domain. In terms of the QOL measures, pre- to post-treatment changes did not exceed the standard deviation. Yet, after ICCR, students demonstrated trends consistent with increased positive affect and communication, in addition to lower depression.

DISCUSSION & FUTURE DIRECTIONS

- Consistent with current principles of neuroplasticity, ICCR provided intensive, repetitive, specific and salient training on cognitive-linguistic function within an academic context.
- ICCR students’ standardized cognitive-linguistic assessment scores significantly improved as the number of semesters in ICCR increased, suggesting a cumulative benefit of ICCR.
- In terms of the classroom, ICCR students significantly improved in their participation at school (e.g., academic activities with other students). Furthermore, they contributed successfully in the classroom (e.g., answering questions accurately > inappropriately). Overall, the classroom environment was positive with limited inappropriate behaviors.
- ICCR students also showed gains in individual speech therapy (i.e., complexity of goals increased by the end of semester) and quality of life (e.g., higher positive affect).
- Corroborating our previous work,8 these findings support ICCR’s efficacy. Future work will investigate the specific cognitive-linguistic domains important for academic success that improve over time after ICCR and the neuroplasticity supporting such gains.

SELECTED REFERENCES

- ICCR students, families, and caregivers
- BU Aphasia Research Laboratory members and staff
- Duan’s Funding from Sargent College of Health and Rehabilitation Sciences
- NH/NIHDCD 130013/13017: Advanced Research Training In Communication Sciences & Disorders

ACKNOWLEDGEMENTS