



ABI JOURNAL CLUB

Do People With Severe Traumatic Brain Injury Benefit From Making Errors? A Randomized Controlled Trial of Error-Based and Errorless Learning

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LAND ACKNOWLEDGEMENT

The Nova Scotia Rehabilitation & Arthritis Center (NSRAC) is located in Mi'kma'ki, the ancestral and unceded territory of the Mi'kmaq People, and we acknowledge them as the past, present, and future caretakers of this land.

This territory is covered by the “Treaties of Peace and Friendship” which Mi'kmaq Wəlastəkwiyik (Maliseet), and Passamaquoddy Peoples first signed with the British Crown in 1725. The treaties did not deal with surrender of lands and resources but in fact recognized Mi'kmaq and Wəlastəkwiyik (Maliseet) title and established the rules for what was to be an ongoing relationship between nations. We are all Treaty people.

Mi'kma'ki includes all of Nova Scotia, Prince Edward Island, part of New Brunswick, the Gaspé region of Quebec, part of Maine, and southwestern Newfoundland.



Disclaimer

The goal of the ABI Journal club is to foster skills of research critique, promote interprofessional interaction and encourage the inclusion of evidence-based practice.

Please join us in creating a safe and approachable learning environment.

Please note that although presenters may have an interest in the article that is presented, they may not necessarily be an expert in that field.

This event is for your learning only. Please do not distribute slides or recordings. Recordings can be distributed by Journal Club organizers only.

Do People With Severe Traumatic Brain Injury Benefit From Making Errors? A Randomized Controlled Trial of Error-Based and Errorless Learning

- **Why is this a good paper to read for journal club?**
 - Errorless learning is a common approach that is well supported in our area of practice and amongst colleagues
 - The research shows contrasting views on whether error based learning or errorless learning is more beneficial
- **Why did we pick it?**
 - Our own experience with using these approaches as well as relevancy to different team members



THE PRIMARY ISSUE DISCUSSED IN THE ARTICLE

Historically, errorless learning has been widely accepted for skills teaching post-ABI. There is strong efficacy for its use in cognitive rehabilitation.

However, errorless-learning is hyper-specific and skills may not generalize to novel situations. It also requires a high level of support from therapists.



BACKGROUND INFORMATION

Errorless learning (ELL) – task-specific approach for error-free performance by practicing correct steps only. Individuals are not exposed to opportunities where errors are possible.

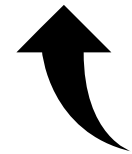
Ex: modelling correct actions, providing individuals with all the correct information or steps

Bottom-Up approach

Error-based learning (EBL) – Metacognitive approach using structured opportunities for individuals to make errors and learn how to recognize, anticipate, and self-correct errors.

Ex: video feedback, graded prompts, pre-post task reflections

Top-down approach



THE INTENDED OUTCOMES OF THIS RESEARCH?

- EBL would demonstrate significantly greater skills generalization than ELL
- EBL would generate greater self-awareness and behavioural competency than ELL
- Compare effects of EBL and ELL on psychosocial functioning at follow-up



Participants

Participants were recruited from:

Outpatient and community brain injury rehabilitation services in Brisbane (2013-2016)

Community rehabilitation at a brain injury unit in Sydney (2014-2015)

81 individuals were referred: 16 did not meet criteria, 5 were too impaired, 2 had psychiatric, 7 declined, and 4 could not be contacted

Demographic information:

No significant demographic differences between groups

Only clinical variable between groups: EBL had higher global psychosocial functioning than ELL group

Mean age for both groups: 37 years old

Majority male participants

Sample characteristics:

Sample size of 123 participants was determined to be required

Final study sample size was 42 at 6-month follow-up; started with 54 at randomization



METHODS

- **Trial Design**
 - The study was an **assessor-blinded RCT** with 2 intervention groups and 3 phases
- **Screening Measures**
 - Neuropsychological test battery to confirm dysexecutive impairments
 - Participants were classified as having 'mild to moderate' or 'severe' deficits
- **Primary Outcome**
 - Skills generalization (near transfer) – Cooking Task
- **Secondary Outcomes**
 - Skills generalization (far transfer) – Zoo Map Test,
 - The Awareness Questionnaire, The Patient Competency Rating Scale, The Sydney Psychosocial Reintegration Scale, The Care Needs Scale, The Depression Anxiety and Stress Scales

METHODS

Assessment

- Review of hospital records, & in home baseline assessment
- Post-intervention assessment (Approx. 1 week after final intervention session)
- 6 month follow up – for the secondary aim of the study which was to compare the intervention effects (EBL VS. ELL) on psychosocial functioning (e.g. work, relationships, independence and mood).

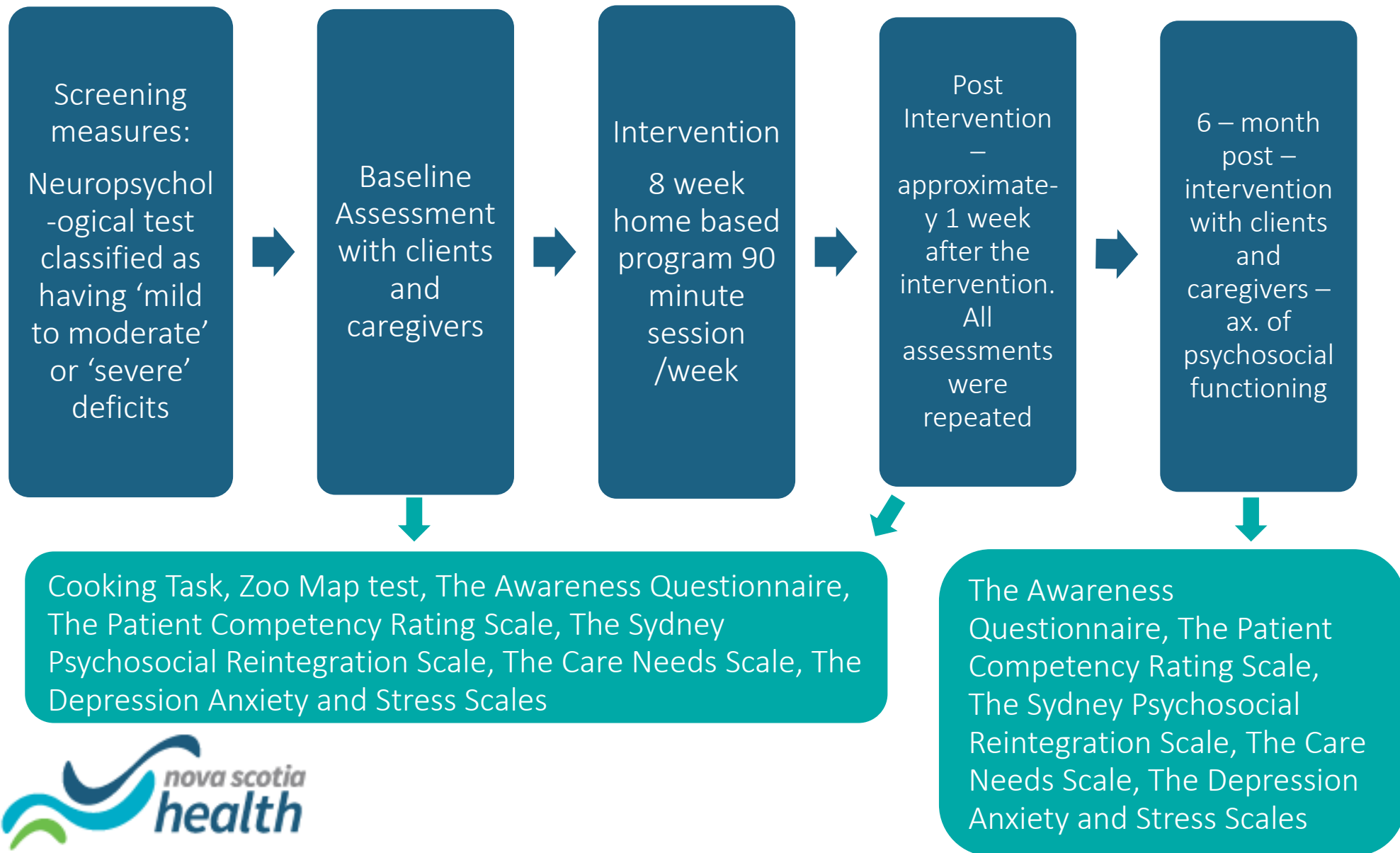
Interventions

- OTs were involved in delivering each intervention
- Both interventions included an 8 week home based program (90-minute session /week)
- Focus of the first 4 sessions was learning to prepare a hot meal (a stir fry). The last 4 sessions were focused on a set of multiple tasks or a complex multistep activity that was related to participant's goals and interests

Data Analysis

- Analysis of covariance

METHODS - Summary



RESULTS at Post Intervention Phase (1 week after)

- The **Error Based Learning** participants made significantly fewer errors postintervention (about 1 week after) than the **Errorless Learning** participants
- The **Error Based Learning** group also demonstrated significantly better “behavioural competency” on The Patient Competency Rating Scale than **the Errorless Learning group**
- **Errorless Learning** group revealed that mood symptoms were significantly lower postintervention

RESULTS at 6-Month Follow- up

- There were no differences in self-awareness, behavioural competency, or psychosocial outcomes between the Error Based Learning and Errorless Learning groups at the 6-month follow up

COMPARISON/EVALUATION OF METHODS

How did they evaluate their method?

- Therapists were supervised by lead investigators
- Therapist adherence to the treatment protocol was examined for a random sample (15%) of audiotaped sessions 1 – 8 for each intervention using a checklist based on Borelli's framework
- Therapists showed “**good adherence**” to the EBL intervention, and “**generally good**” for the ELL intervention

AUTHOR'S CONCLUSIONS

- EBL is more effective for training skills with varying demands within same functional context than ELL
- EBL is more effective in improving self-awareness and behavioral competencies than ELL
- However more research needed to determine benefits of making errors during training compared to retrieval practice

Discussion Questions

1. What did you see as some of the study limitations?
2. Are the methods described in sufficient detail?
3. Could you figure out how to implement the intervention from what they wrote?
4. Did they evaluate the method appropriately?
5. Was there any issues with sampling? Do the participants adequately reflect that the group that they represent?
6. What do you like about the method, implementation, and evaluation, especially with reference to the Acquired Brain Injury content?
7. Did the authors make unrealistic simplifying assumptions?
8. Can the results be used to solve other problems? How generalizable are the results?



SUMMARY

These findings suggest that gains in self-awareness are more likely to occur in rehabilitation when individuals have structured opportunities to make errors, reflect on their functional significance, and engage in problem solving to recognize and correct their own errors.

The findings broadly support the important role that errors play in learning in rehabilitation



REFERENCES & RECOMMENDED READING

Altman, R. & Bagley, S. (2012). BMI Journal Club Template.

Owensworth, T., Fleming, J., Tate, R., Beadle, E., Griffin, J., Kendall, M., Schmidt, J., Lane-Brown, A., Chevignard, M., & Shum, D. (2017). Do People With Severe Traumatic Brain Injury Benefit From Making Errors? A Randomized Controlled Trial of Error-Based and Errorless Learning. *Neurorehabilitation and neural repair*, 31(12), 1072–1082. <https://doi.org/10.1177/1545968317740635>



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