Return to work following traumatic brain injury: An exploration of using the Brannagan Executive Functions Assessment to increase self-awareness in practice

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Abstract

Aim and Background: The Brannagan Executive Functions Assessment is an occupation-based approach for increasing self-awareness. This study explores the application of the Brannagan Executive Functions Assessment in traumatic brain injury return to work intervention. It describes changes in self-awareness, goal achievement and perspectives of occupational therapy and people with brain injury. **Methods:** Case study design using a mixed-methods approach: with pre-post evaluation of outcomes and semi-structured interviews. Participants with traumatic brain injury completed the assessment with two occupational tasks related to return to work. Primary outcomes were self-awareness (Self-awareness Deficits Interview and Awareness Questionnaire) and Goal performance/satisfaction using the Canadian Occupational Performance Measure. Mood was a secondary outcome. Analysis was descriptive for quantitative data, thematic for qualitative data. **Results:** Two participants with brain injury, two support people and one occupational therapist were recruited. One participant with brain injury had an increase in self-awareness scores. Brain injury participants and the occupational therapist identified benefits including an increased awareness of needing to incorporate planning to meet goals. **Conclusion:** The Brannagan Executive Functions Assessment offers benefits to practice in brain injury rehabilitation, facilitating a structured occupational approach to self-awareness and participation in meaningful return to work tasks.

Keywords: Awareness, cognition, occupational therapy, rehabilitation, return to work, traumatic brain injury.

Introduction

Approximately 30-55% of individuals with moderate to severe traumatic brain injury (TBI) return to work after one year (Andelic et al., 2012; Sigurdardottir et al., 2018). However, many of these individuals cannot sustain employment, with research indicating at 3 follow up periods over 3 years: 34% were stably employed, 27% unstably employed, and 39% were unemployed (Kreutzer et al., 2003). Failure to return to work has been associated with negative outcomes including a higher degree of financial dependence, poorer psychosocial outcomes, mood disorders and a lower functioning status (Andelic et al., 2012; Frostad Liaset & Loras, 2016; Libeson et al., 2020). Conversely, successfully returning to work is associated with positive outcomes, including improved quality of life (Frostad et al., 2016; Libeson et al., 2020). Evidence suggests factors influencing return to work after TBI include severity of injury, pre-injury employment, age at injury, level of education, relationship status and ethnic background (Sigurdardottir et al., 2018). Yet the most significant predictors reported in determining return to work outcomes are behavioural changes and cognitive functioning, especially in processing speed and self-awareness (Ownsworth & McKenna, 2004; Schonberger et al., 2011; Shames et al., 2007).

Self-awareness deficits occur commonly, up to 97%, after moderate to severe TBI (Doig et al., 2017; Sherer & Fleming, 2014). This results in individuals underestimating their cognitive and behavioural deficits, often declining to participate in interventions to optimise their functional recovery (Doig et al., 2009; Sherer et al., 1998). Furthermore, individuals with TBI have a reduced understanding of how these deficits impact on occupational performance, especially in more cognitively demanding tasks, posing a major barrier to return to work, reduced motivation and willingness to receive feedback during rehabilitation, and

unrealistic goal setting (Doig et al., 2017; Doig et al., 2014; Fischer et al., 2004; Robertson & Schmitter-Edgecombe, 2015).

Occupational therapists use rehabilitation approaches to provide intervention related to changes in awareness focusing on: 1) metacognitive knowledge and beliefs (knowledge of cognitive processes, characteristics of tasks, strategies and understanding of ones' own capabilities and limitations); and 2) on-line awareness which relates to the understanding of one's own capabilities and limitations within the context of specific task performance (Toglia & Kirk, 2000). On-line awareness is further divided into emergent - awareness of difficulties as happening; and anticipatory- predicting when difficulties will arise because of deficits (Toglia & Kirk, 2000). Treatment approaches within occupational performance include pre-task prediction, post-task evaluation, video or verbal feedback, and role reversal (Fleming & Schmidt, 2015). Use of these approaches has been demonstrated to be beneficial in developing awareness of personal limitations, realistic goal setting and improved agreeability to participate in an occupation aligned with an individual's functional capacity following TBI (Doig et al., 2014; Wise et al., 2005). In conjunction with self-awareness assessment and treatment, depression and anxiety are indicated for monitoring. As through the targeting of self-awareness, individuals with TBI may be placed at an increased risk of emotional distress, secondary to being confronted by and educated about their deficits (Fleming et al., 2006; Ownsworth et al., 2006).

A high percentage of individuals of working age with TBI have reduced self-awareness (Doig et al., 2017). With return to work being a priority focus of rehabilitation following TBI (Scaratti et al., 2017), there is a need to explore occupation-based treatment approaches that

target self-awareness in relation to return to work for occupational therapists to use in practice.

An occupation-based approach currently used in practice, the Brannagan Executive Functions Assessment (BEFA), can be used as an intervention targeting self-awareness when applied to multiple tasks (Brannagan, 1998). It is designed for use with individuals experiencing dysexecutive function post-TBI and can be applied to any occupational task (Brannagan, 1998). Initially, the occupational therapist and person with TBI discuss executive function and define eight sub-components. A task to be undertaken is then chosen by the therapist in consultation with the person with TBI, facilitating client engagement and client-centred practice. Prior to performance the person with TBI predicts, on a 10-point Likert scale, how well the task will be completed and how long it will take. The task is completed with the therapist monitoring performance (Brannagan, 1998). Post-task evaluation is then completed, recording the time taken for task completion and the person with TBI's assessment of how well they performed on a 10-point Likert scale. The occupational therapist also assesses the person's performance on 8 different components of executive function on a 5-point Likert scale, with feedback provided. As the BEFA has been specifically designed for the TBI population, it is used in clinical practice as an intervention to increase self-awareness in relation to return to work and other client-centred goals using real life scenarios. Despite being developed in 1998, to date no literature has examined its utility by occupational therapists working with people with TBI, nor its application to return to work.

Aims

The primary aim of this study was to describe people with TBI's self-awareness and goal performance and satisfaction in relation to return to work, before and after use of the BEFA as an intervention in occupational therapy practice in TBI community rehabilitation. The secondary aims include an exploration of the influence of the use of the BEFA in practice on emotional distress, perspectives of its utility of individuals with TBI, the treating occupational therapist and significant others.

Ethical approval

Ethics approval was granted by the Northern Sydney Local Health District Human Research Ethics Committee (RESP/18/168) and the clinical facility where the research was conducted (18SSA04). All participants provided informed written consent to participate.

Method

Study design

A case study design with a mixed methods approach was used for this study, including a pre and post-test evaluation of outcomes and semi-structured interviews discussing the utility of the BEFA.

Setting

The study was conducted in a public community-based brain injury rehabilitation service in Sydney New South Wales, Australia.

Recruitment

There were three groups of participants. a) *People with TBI* were assessed for suitability in the study when referred to occupational therapy within the brain injury service. Inclusion criteria were: (1) have a return to work goal post-TBI; (2) be over the age of 16 years; (3) be out of post traumatic amnesia (PTA) as assessed by the Westmead PTA Scale (Marosszeky et

al., 1997); (4) have functional English; (5) display reduced self-awareness as per the Awareness Questionnaire (AQ) (Sherer & Fleming, 2014), and (6) be able to give informed consent. Participants were excluded if they presented with a significant communication deficit that impeded their ability to participate in completion of the BEFA. b) *Significant other of each participant with TBI* were eligible if they were: (1) residing with or in regular contact with the individual with TBI participating in the study; and (2) able to provide informed consent. Participants were excluded if they did not have functional English. c) *Therapists* were eligible if they were occupational therapists using the BEFA when working with an individual with TBI participating in the study.

Data collection

Quantitative measurement

Each participant with TBI completed the Mayo-Portland Adaptability Inventory (MPAI-4), as a baseline level of function measure (Malec & Lezak, 2008). The MPAI-4 is a 35-item instrument that assesses disability after brain injury. A 5-point Likert scale is used to measure physical, cognitive, emotional, behavioural and social challenges; and obstacles to community integration; resulting from a TBI. Overall scores range from 0-111 with lower scores indicating greater community integration. All primary and secondary measures were used prior to and after using the BEFA as an intervention.

The primary outcome measures used were:

1. Awareness Questionnaire (AQ) is a self-awareness discrepancy method, comparing the TBI participant's perceived function in comparison to pre-injury to a rating made by a significant other (Sherer & Fleming, 2014). Seventeen items of everyday activities are rated compared to pre-injury ability using a 5-point Likert scale from 1 (much worse) to 5 (much better) (Sherer & Fleming, 2014). A positive discrepancy of two points indicates reduced self-awareness, with a greater discrepancy in scores correlating with a lower level of self-

awareness (Schmidt et al., 2012). The AQ has demonstrated high test-retest reliability, internal consistency and adequate to excellent construct validity in the TBI population (Hellebrekers et al., 2017).

2. Self-Awareness Deficit Interview (SADI) is a quantitative measure using a semi-structured interview to assess an individual's intellectual self-awareness of their deficits using three domains: self-awareness deficits, self-awareness of functional impact, and ability to set realistic goals (Sherer & Fleming, 2014). A maximum of three can be scored on each domain, with zero indicating good level of self-awareness (cognitive/psychological problems reported by patient/client in response to general questioning, or readily acknowledged in response to specific questioning) and three indicating a poor level of self-awareness (No acknowledgement of deficits can be obtained or patient/client acknowledges problems that have been imposed) (Sherer & Fleming, 2014). The SADI has demonstrated high test re-test reliability, inter-rater reliability and convergent validity in the TBI population (Simmond & Fleming, 2003; Wise et al., 2005).

3. Canadian Occupational Performance Measure (COPM) is used to identify occupational performance issues, set goals in relation to these areas and detect changes in the TBI individual's perception of occupational performance issues (Law et al., 1994). Participants score each occupational performance issue on level of importance, performance and satisfaction on a scale of one to 10 (Law et al., 1994). The COPM has displayed good test-retest reliability, adequate internal consistency and validity in the TBI population (Phipps & Richardson, 2007).

The secondary outcome measure used was the Depression Anxiety Stress Scale (DASS-21) to ascertain whether increased self-awareness led to a change in emotional distress (Dahm et al., 2013). This measure assesses depression, anxiety and stress separately with

three 7-item scales (Dahm et al., 2013). A maximum of three can be scored on each domain, with zero indicating never, and three indicating almost always. Each domain is scored separately with end scores ranging from normal to extremely severe. This measure has displayed good validity, internal consistency and test-retest reliability in the TBI population (Wong et al., 2013).

Intervention

The treating occupational therapist conducted the BEFA as an intervention with two different tasks. Each participant completed one task nominated in the BEFA, such as '*planning a holiday*', and one task developed in conjunction with their therapist (Brannagan, 1998). Error performance was monitored, with the therapist only intervening for safety (Brannagan, 1998). Pre-task prediction and post-task evaluation were scored by the therapist and TBI participant on the BEFA. Scoring ranges from one (unable/no evidence of behaviour) to five (completely independent). Post scoring, they discussed task performance and scoring discrepancies. Direct verbal feedback was provided by the therapist. Length of time to complete the BEFA was dependent on complexity of the tasks selected and degree of cognitive deficit, ranging from four to seven weekly sessions.

Qualitative data collection

Semi-structured interviews post BEFA were conducted with participants with TBI and occupational therapist participants to explore their perspectives of using the BEFA in practice. An interview guide was used (Appendix 1).

Data analysis

Changes in TBI participant's self-awareness pre and post BEFA on the AQ and SADI as well as changes in goals, satisfaction and performance on the COPM, and changes in emotional distress measured on the DASS-21 were compared descriptively. Interviews were recorded, transcribed verbatim then thematically analysed using the six phases as described

by Terry et al. (2017) of 1) familiarising with the data, 2) generating codes, 3) constructing themes, 4) reviewing potential themes, 5) defining and naming themes, and 6) producing the report, to explore the utility of the BEFA in increasing self-awareness and modifying return to work goals from both the TBI participant and therapist perspectives. In all phases of analysis two researchers engaged in reflexive discussions to ensure final themes were agreed upon. Participants' names have been changed and general descriptors are used for the previous area of employment to ensure anonymity.

Results

   Two individuals with TBI met the inclusion criteria and consented to participate, two significant others and one occupational therapist also participated in this study. Pseudonyms of Greg and Simon are used for the TBI participants.

Baseline characteristics and MPAI-4 results are reported in Table 1. A lower number on the MPAI-4 indicates a higher level of function.

Table 1: Summary of TBI participant characteristics

Characteristics	Greg	Simon
Age	51	29
TBI severity	Mild – 6 months post	Severe – 5½ years post
Previous area of employment	Office based	Manual outdoors
MPAI-4 abilities	7	14
MPAI-4 adjustment	10	12
MPAI-4 participation	6	12
MPAI-4 total	19	44

TBI: Traumatic brain injury

MPAI: Mayo-Portland Adaptability Inventory

Quantitative data

Self-awareness: There was no change in Greg's discrepancy rating with his significant other pre/post BEFA on the AQ, despite Greg reporting a higher level of self-perceived function. Also, there were no self-awareness deficits detected on the SADI baseline assessment (see Table 2). In comparison, Simon scored 54 on the initial AQ, indicating a perceived level of function similar to pre-injury. A reduction in self-awareness was noted (25-point discrepancy) with his significant other. Post BEFA Simon displayed a nine-point increase in self-assessment of function on the AQ, as well as a 20-point reduction in discrepancy with his family member perceived assessment of function (Table 2). On the SADI Simon displayed a three-point improvement in self-awareness post BEFA.

Table 2: Baseline and post BEFA TBI participant outcome measure results

	Greg – Baseline	Greg – Post tool use	Simon – Baseline	Simon – Post tool use
AQ – Client	40	42	54	63
AQ – Significant Other	43	45	29	68
SADI	0	0	6	3
DASS-21: Depression	8 (moderate)	6 (mild)	*Missing data	1
DASS-21: Anxiety	1	0	*Missing data	1
DASS-21: Stress	6	5	*Missing data	5

AQ: Awareness Questionnaire

SADI: Self-Awareness Deficit Interview (SADI)

DASS-21: Depression Anxiety Stress Scale

*Baseline Data was not collected

COPM: Greg identified two occupational performance problems on the COPM as highly important, and the lowest level of satisfaction at baseline, see Table 3. Post BEFA Greg displayed a 0.5-point average improvement on self-rating of performance and a 4.5-point average improvement on satisfaction. Minimal improvement on performance was noted due to focusing on one occupational problem during the BEFA (Table 4). A change of two or more points on the COPM is considered to be a clinically important change (Law et al., 2019).

Table 3: Baseline and post BEFA COPM Performance Problems: Importance, Performance and Satisfaction

Participant	Occupational performance problem	Importance	Performance: Baseline	Performance: Post tool use	Satisfaction: Baseline	Satisfaction: Post tool use
Greg	Managing volume of work	10	1	1	1	1
Greg	Complexity of itinerary	10	3	4	1	10
Simon	Wasted time due to limited planning	10	1	6	5	8
Simon	Delays in payments & non-payments	10	4	4	5	1
Simon	Not progressing through course as wanted	9	7	10	6	8

Table 4: Baseline and post BEFA COPM – Performance and Satisfaction rating

	Greg – Baseline	Greg – Post tool use	Simon – Baseline	Simon – Post tool use
COPM - Performance average*	2	2.5	4	6.7
COPM - Satisfaction Average*	1	5.5	5.3	5.7

*Total of performance or satisfaction scores/number of occupational performance problems

Simon listed 3 occupational performance problems on the COPM, rated as highly important, with varied results for performance and satisfaction at baseline (Table 3). Simon did display a 2.7-point average increase in performance and 0.4 point average increase in satisfaction (Table 4). Minimal improvement in satisfaction average was noted due to a reduction in satisfaction on one problem, which was not a task focused on for Simon's BEFA. There was, however, a 3-point and 2-point increase for satisfaction on the other reported problems.

The goals developed at baseline on the COPM were as follows. Greg's one goal was to return to work under guidance from the vocational provider. Simon developed two goals: 1) To condense current eight days of work per fortnight into six days of work per fortnight [i.e. increase capacity of hours of work per day], and 2) To prepare a monthly plan to complete all eight modules of consulting accelerator course in three months.

Emotional distress: On the DASS-21 Greg displayed a reduction in depressive, anxiety and stress symptoms post BEFA with scores indicating no signs of emotional distress (Table 2). Initial DASS-21 for Simon had missing data, no signs of depression, anxiety or stress symptoms post BEFA.

Qualitative data

Two themes were identified from the analysis of interview data from the TBI participants and occupational therapist: 1) TBI participants thinking about return to work, and 2) perceived benefits of the BEFA.

TBI participants thinking about return to work

At the time of the interview (post BEFA), both TBI participants were thinking about their goal of returning to work. Greg identified the importance of '*getting back to…what was normal*' and what this would look like, displaying awareness regarding '*not jumping in too quick*'. He also identified concerns about the demanding and draining nature of the work, as well as a lack of control over service demand. Simon reported being '*excited to return to work'* and '*ready to move further towards (his) study goals*' to assist with return to work. Both participants reflected on their capacity to return to work, with Greg reporting '*planning probably wasn't anywhere near as good as it needed to be prior*' to injury. Simon reported to not have any focus, '*dropping out of the (health) system*' initially post TBI then '*floating around…for a long time.*'

Perceived benefits of the BEFA

TBI Participants: Both described an increased awareness of needing to plan to move forward. One participant reported '*now more than ever planning needs to be front and centre*', and the other noted that '*if I didn't do planning I might not have been focused*' on the BEFA task. Both identified the benefits of planning: '*I can now see where planning's going to play a pretty important role in assisting me to…hopefully the level I was prior*'. TBI Participants described that the BEFA assisted them in identifying when they were not performing well in specific areas within the task set and '*ensure that that doesn't happen quite to the degree it may have in the future*' and the BEFA assisting in getting him '*focused…and directed.*'

Therapist Participant: Described that the ability to tailor the assessment to ensure tasks were meaningful, being '*able to break tasks down*' and '*upgrade the complexity of future tasks to make it more relevant*' which assists with '*buy-in of the client'*. It also 'g*ives you that ability to adapt it to multiple vocations*' including '*more cognitively demanding type jobs.'* Other benefits included '*the template [] scoring approach (which) [] build(s) client's awareness of their performance*' regarding executive function on the task chosen and identified areas that they could '*then focus on*' moving forward. The BEFA provided therapists with a '*systematic approach'* to providing feedback. Flexibility of the tool was described as '*a real strength'* with clients being able to work on the task within the session and/or take it home, dependent on the demands of the work role. The therapist reported its application with those '*who are struggling with self-awareness'*, reporting that using the BEFA benefited both TBI participants despite '*differences in their level of self-awareness which…reflects (the BEFA's) utility.'*

Discussion

This study specifically focused on occupation-based tasks related to return to work, exploring the utility of the BEFA in increasing self-awareness in individuals with TBI and whether an increase in self-awareness post BEFA influences goal setting. Findings from this study indicate variable results. Measures pre and post BEFA in Simon's case indicated an increase in self-awareness, regarding functional capacity and TBI consequences. Despite the BEFA not impacting on Greg's objective self-awareness measures he did report an increased awareness of his limitations during interview, reduced planning prior to injury, and capacity to use compensatory strategies in relation to return to work (online awareness). An improvement in online awareness with no change in intellectual awareness is reported in

other studies due to the AQ not being directly related to the intervention (Doig et al., 2014; Toglia et al., 2010).

These study findings have also shown use of the BEFA with varied levels of self-awareness within the TBI population, its ability to be tailored to the client and its applications to a variety of work roles. Both the occupation-based approach and feedback tools were also used in studies by Ownsworth (2010), Ownsworth et al. (2006) and Doig et al. (2017), with feedback provision more likely to improve both intellectual and online awareness. Using the BEFA did not appear to increase emotional distress on the DASS-21 post BEFA as per Schmidt et al. (2012), who suggests that the provision of a supportive therapeutic environment may assist in counteracting the distress associated with post injury impairment education.

Study results suggest the BEFA has an influence on goal setting with Simon displaying improvement in COPM-performance and Greg displaying an increase in COPM-satisfaction. Due to completing goal related tasks, the BEFA is more likely to be ecologically valid due to the tasks being contextual, having capacity to guide specific individual rehabilitation programs and being sensitive to change (Doig et al., 2017).

Although there was a substantial improvement in Simon's self-awareness on the AQ/ SADI, this did not translate to a modification in goals post BEFA. A similar finding was found by Doig et al. (2014), where a large reduction in discrepancy ratings did not generalise to goals related to return to work. The length of time between baseline and post BEFA may also impact on an individual's capacity to modify their goals (Fischer et al., 2004).

Limitations and implications for future research

Due to the small sample size, it is difficult to determine whether changes in self-awareness influence individual goals. Larger studies would be required to determine this. It is unclear whether reduced discrepancy on the AQ, as in Simon's case, is due to increased awareness, improvement in functional capacity and/or related to his significant other's reliability of reporting pre-injury function (Wise et al., 2005). Both Toglia et al. (2010) and Fleming et al., (2020) reported reduced discrepancy ratings between the therapist and participants, however there was minimal or no improvement in participants' pre-post intervention ratings. This highlights the importance of including the SADI and the AQ as outcome measures for self-awareness in practice. Despite these limitations, this is the first study we are aware of to examine the utility of the BEFA in increasing self-awareness in relation to the goal of return to work in individuals post TBI, from which future work can build.

The BEFA would benefit from further research with a larger sample size of TBI participants with varied levels of self-awareness and clinicians, to more conclusively determine whether it increases self-awareness in relation to return to work and then in turn influences goal setting. Notwithstanding this study targeting TBI individuals in the community, the BEFA can be used in the inpatient setting so further research including this cohort is also warranted. Furthermore, future consideration to the measurement of error behaviour during occupational performance, as suggested by Doig et al. (2017), to assess the level of online awareness within the BEFA, is required as online awareness is considered critical for increasing functional independence. This approach would be dependent on the type of task chosen by the TBI individual and therapists would require extensive training.

Conclusion

This study indicates promise in relation to the utility of the BEFA used by occupational therapists in increasing self-awareness in TBI individuals with a goal related to return to work. Therefore, further research with a larger sample size is warranted with TBI individuals with varying levels of self-awareness. Inclusion of error behaviour monitoring may be necessary.

Key messages

- Brannagan Executive Functions Assessment increased awareness of limitations and identified compensatory strategies.

- TBI participants' satisfaction with goals improved.

- Using BEFA in relation to return to work following TBI can inform occupational therapy practice.

- Further research with a larger sample size of TBI participants with varied levels of self-awareness and clinicians is required.

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Appendix 1

Interview Guide: Participant

1. Can you tell me about your return to work goals/plans?

2. How do you feel about returning to work?

3. Has that changed since participating in the Brannagan Executive Functions assessment with (therapist's name)? Can you tell me about those changes?

4. What was it about the Brannagan Executive Functions Assessment that brought about (ask about one change at a time)?

Use prompts (such as, can you tell me more about that) to gather more details when needed.

Interview Guide: Therapist

1. What's your experience of working with the Brannagan Executive Functions Assessment?

2. What's your reasoning for using it?

3. What type of clients does it usually work effectively for?

4. What type of clients does it not work with?

5. How do you go in developing a task?

6. How many tasks do you typically do with any individual client?