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Acceptance and Commitment Therapy delivered in a dyad after a severe traumatic brain injury: A feasibility study

Diane L. WHITING,[1,2] Frank P. DEANE,[2] Grahame K. SIMPSON,[1,3] Joseph CIARROCHI[4] and Hamish J. MCLEOD[5]

[1]Brain Injury Rehabilitation Research Group, Ingham Institute of Applied Medical Research, Liverpool, New South Wales, [2]School of Psychology, University of Wollongong, Wollongong, New South Wales, [3]John Walsh Centre for Rehabilitation Research, University of Sydney, Sydney, New South Wales, [4]Institute of Positive Psychology & Education, Australian Catholic University, Strathfield, New South Wales, Australia and [5]Institute of Health and Wellbeing, University of Glasgow, Glasgow, Scotland

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Correspondence
Diane Whiting, Brain Injury Rehabilitation Unit, Liverpool Hospital, Locked Bag 7103, Liverpool BC NSW 1871, Australia.
Email: diane.whiting@health.nsw.gov.au

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Abstract

Objective: There is a high prevalence of complex psychological distress after a traumatic brain injury but limited evidence of effective interventions. We examined the feasibility of Acceptance and Commitment Therapy after a severe traumatic brain injury using the criteria, investigating a therapeutic effect, and reviewing the acceptability of measures, treatment protocol, and delivery method (in a dyad of two clients and a therapist).
Method: Two male outpatients with severe traumatic brain injury and associated psychological distress jointly engaged in a seven session treatment program based on Acceptance and Commitment Therapy principles. Pre- and post-treatment measures of mood, psychological flexibility, and participation were taken in addition to weekly measures.
Results: The intervention showed a therapeutic effect with one participant, and appeared to be acceptable for both participants with regard to program content, measures, and delivery mode by in a dyad. One participant showed both significant clinical and reliable change across several outcome measures including measures of mood and psychological flexibility. The second participant did not show a reduction in psychological inflexibility, but did show a significant drop in negative affect. Significant changes pre- to post-treatment for measures of participation were not indicated. Qualitatively, both participants engaged in committed action set in accordance with their values.
Conclusions: This study suggests that Acceptance and Commitment Therapy may be feasible to be delivered in a dyad with individuals who have a severe traumatic brain injury. A further test of its potential efficacy in a phase II clinical trial is recommended.

Key Points

1 Psychological distress is common after a severe traumatic brain injury (TBI) and there is limited evidence of effectiveness of therapies.
2 Acceptance and commitment therapy (ACT) appeared to be acceptable to two individuals with severe TBI with improvements to psychological flexibility and reductions in psychological distress.
3 This initial study indicates ACT is feasible to provide a therapeutic effect when delivered in a dyad after a TBI but further research is required.

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Introduction

The damage which occurs to the brain after a traumatic injury is complex and results in temporary or permanent impairments across a number of domains including

physical, cognitive, behavioural, emotional, and psychosocial. These changes result in psychological distress with symptoms spanning depression (Bombardier et al., 2010), anxiety (Anson & Ponsford, 2006a), and traumatic stress (Bryant et al., 2010). Cognitive impairment (Spitz, Schönberger, & Ponsford, 2013) and challenging behaviours (Sabaz et al., 2014) also contribute to distress and post injury adjustment difficulties.

There is limited evidence of the effectiveness of non-pharmacological therapies to address the complex needs of this population (Fann, Hart, & Schomer, 2009; Gertler, Tate, & Cameron, 2015), although some support has been found for cognitive behavioural therapy (CBT). CBT has a focus on symptom reduction as the treatment outcome and generally tends to be disorder specific (e.g., Hsieh et al., 2012; Medd & Tate, 2000) though a recent study has demonstrated the efficacy of CBT in treating comorbid anxiety and depression (Ponsford et al., 2016). This may provide challenges in the provision of treatment for the complex psychological distress that accompanies TBI because it is often unclear which of the multiple issues should be addressed first. Treatments are needed that provide the client with skills they can utilise across a range of presenting problems.

Acceptance and Commitment Therapy (ACT) is a "third wave" behaviour therapy that aims to improve participation and engagement in meaningful life activities while accepting that this might involve a level of emotional pain. As opposed to focussing on symptom reduction, ACT seeks to promote psychological flexibility, or persisting in behaviour in the service of valued ends (Hayes, Strosahl, & Wilson, 2003). The primary therapeutic target of ACT is to assist the individual to engage in valued behaviour in the context of that content, with therapy outcomes focussed on these behavioural changes. For example, in a non-brain-damaged chronic pain sample, Dahl, Wilson, and Nilsson (2004) found ACT was associated with a reduction in sick leave, even though participants continued to experience chronic pain. Research into ACT has found that as result of these behavioural changes, there is often a corresponding reduction in psychological distress as a secondary outcome (Hann & McCracken, 2014).

Initial studies have indicated the effectiveness of ACT in reducing inflexible behavioural responses across a number of chronic health conditions, including pain (Dahl et al., 2004; McCracken, Sato, & Taylor, 2013), tinnitus (Westin, Hayes, & Andersson, 2008), and general psychological distress (Fledderus, Bohlmeijer, Pieterse, & Schreurs, 2012). The evidence for efficacy of ACT with individuals experiencing chronic pain is quite robust (Hann & McCracken, 2014; Veehof, Oskam, Schreurs, & Bohlmeijer, 2011) but a recent systematic review recommended that further research is required before efficacy is established in other chronic diseases including cancer, diabetes, and HIV (Graham, Gouick, Krahé, & Gillanders, 2016). Recently, researchers have argued that ACT can be useful after a TBI, if modified to account for cognitive impairment (Whiting, Deane, Simpson, McLeod, & Ciarrochi, 2017).

To the best of our knowledge, there has been one intervention study evaluating the effectiveness of ACT for people with cognitive impairments. Sylvester (2011) reported on outcomes from a manualised program delivered to a group of adults with ABI of mixed aetiologies who incurred their injury as a child. The intervention resulted in improved participation and decreased psychological distress, providing the first indication ACT is feasible for individuals with cognitive impairment. Three case reports have also suggested the feasibility of employing ACT to treat people with cognitive impairments, including the treatment of post stroke anxiety (Graham, Gillanders, Stuart, & Gouick, 2015), to promote the reduction of anxious and obsessive thoughts for an individual with a developmental disorder (Brown & Hooper, 2009), and to reduce challenging behaviour in a person with developmental delay and psychosis (Pankey & Hayes, 2003). The results from these four studies suggest that individuals with cognitive impairment can engage in ACT and achieve the desired treatment outcomes.

Before moving into a clinical trial of ACT, phase I of clinical outcome research proposes researchers investigate whether a therapeutic effect can be detected which can be undertaken by case studies (Robey, 2004). It is also proposed that the single case experimental design approach provides a useful design to assess the feasibility requirements and such designs are commonly utilised in neuro-rehabilitation studies (Evans, Gast, Perdices, & Manolov, 2014; Perdices & Tate, 2009). Furthermore, the initial phase can include decisions around the selection of appropriate and relevant outcome measures (Craig et al., 2008) and a review of both the content and delivery of a treatment program (Arain, Campbell, Cooper, & Lancaster, 2010).

In considering the delivery of the treatment, previous interventions after a TBI have been provided in a small group format (e.g., Anson & Ponsford, 2006b). It has been proposed though, that ACT is best delivered individually after a TBI due to the need to compensate for differing cognitive impairments (Kangas & McDonald, 2011). One delivery mode, which may incorporate some elements of group process but still allow for individualisation of therapy, is the use of a dyad (two participants and one therapist). A dyad had been used as an effective

delivery mode for psychological treatment post severe TBI (Simpson, Tate, Whiting, & Cotter, 2011). Dyads are simpler than larger groups, they allow for stronger emotional expression and greater interaction (Moreland, 2010) but still allow for a number of group phenomena such as social facilitation (Williams, 2010). An additional benefit in implementing a small group format is the interactions with other group members may allow group members to better define their self (Tindale, Meisenhelder, Dykema-Engblade, & Hogg, 2001) which is often a challenging process after a TBI (Myles, 2004).

The main objective of this study is to explore the use of ACT with individuals with a severe TBI who are evidencing psychological distress. The key goals are to determine: (1) whether ACT produces a therapeutic effect for individuals with a TBI; and (2) to evaluate the acceptability of the program content, mode of delivery (by dyad), and outcome measures.

Methods

Design

The intervention was evaluated using case study design with two participants engaging in a group treatment program (a dyad). The design involved two main assessment points (pre- and post-intervention) with a subset of the measures administered weekly at the beginning of each intervention session (sessions 1–7).

Participants

Two participants (P1 and P2) with a severe TBI (post-traumatic amnesia [PTA] >24 hr) were recruited from the outpatient service of Liverpool Brain Injury Rehabilitation Unit, Australia. Inclusion criteria were having: a clinical level of psychological distress, moderate level or above on any subscale of the Depression Anxiety and Stress Scale-21 (DASS-21: Lovibond & Lovibond, 1995), incurred a severe TBI between the ages of 18 and 65 years, adequate English skills to complete the scales, and sufficient cognitive capacity to meaningfully engage in the treatment program. Exclusion criteria included current drug or alcohol dependence or a premorbid psychiatric diagnosis.

Participant 1

P1 was a 19-year-old man, who had sustained a severe closed head injury 20 months previously. His PTA was between three and five days. A neuropsychological assessment (Table 1) undertaken 15-months post injury indicated deficits in attention, working memory, speed of information processing, and memory deficits. At the time of the intervention, P1 was engaged in a graded return to work program as an apprentice electrician, which was supervised by an occupational therapist. His return to work was hampered by symptoms of depression and high levels of anxiety resulting in avoidance behaviour both socially and in the work place.

Participant 2

P2 was a 29-year-old man who sustained his severe head injury when he fell from a moving car. Duration of PTA was 17 days and P2 was 17 months post injury at the commencement of treatment. A neuropsychological assessment undertaken 16 months post injury indicated he had impairments in processing speed, planning and organisational skills, poor attention and working memory and deficits in verbal learning and memory and verbal generativity. Test results for his neuropsychological profile are reported in Table 1. At the time of the injury, P2 was unemployed and prior to the injury had experienced difficulty in maintaining employment. On commencement of the ACT program, he had not yet returned to job seeking or any other occupational activities.

Measures

To assess the therapeutic effect of the intervention, a battery of eight standardised self-report instruments measuring primary and secondary outcomes were administered as well as one proxy-report measure completed by a significant other.

Primary outcome measures

Psychological flexibility

There were two measures of psychological flexibility administered, the Acceptance and Action Questionnaire-Acquired Brain Injury (AAQ-ABI) (Whiting, Deane, Ciarrochi, McLeod, & Simpson, 2015) and the Acceptance and Action Questionnaire-II (Bond et al., 2011). The AAQ-ABI measures both acceptance and avoidance of thoughts that may arise from having a brain injury (e.g., "*I would give up important things in my life if I could make the brain injury so away.*"). It uses a 5-point Likert scale (0 = "not at all true" to 4 = "very true") with scores ranging from 0 to 36. Higher scores indicate greater psychological inflexibility. The AAQ-ABI correlates highly with the Acceptance and Action Questionnaire-II (AAQ-II) ($r_s = 0.70$, $N = 75$, $p < .01$)(Whiting et al., 2015).

The AAQ-II (Bond et al., 2011) is a seven-item questionnaire utilising a 7-point Likert scale with scores ranging from 0 to 49. Higher scores reflect greater psychological inflexibility and are associated with higher

Table 1 Neuropsychological profiles for both participants

Tests	Participant 1		Participant 2	
	Raw score	Percentile/SS (*z*-score)	Raw score	Percentile/SS (*z*-score)
Premorbid functioning[a]		76 (borderline)	19	76 (borderline)
Verbal memory				
WMS III/IV[b]				
Logical Memory I	38	9	18	7
Logical Memory II	15	7	14	7
RAVLT/CVLT-II[c]				
Immediate recall—trials 1–5	30	(−4.2)	34	35 (*T* score)
Short delayed free recall			10	(−0.5)
Long delay free recall	4	(−3.7)	9	(−1.0)
Total learning trials 1–5				
Visual memory				
WMS III/IV[b]				
Visual Reproduction I	13	84	41	12
Visual Reproduction II	8	25	27	9
Recognition	9	37	7	>75
Rey Complex Figure				
Time to copy	138	>16th %ile	198	>16
Immediate	35	>16th %ile	23.5	50
Delay	19	5 (T34)	25	54
Recognition	Correct		21	42
Language skills				
COWAT (FAS)	11	(−2.71)	19	(−2.01)
Animal naming	9	(−2.57)	14	(−1.38)
Executive skills				
WAIS III/IV[b]				
Similarities	15	7	20	7
Trials A	40	(−2.47)	38	(−1.56)
Trials B	87	(−3.00)	89	(−3.1)
WCST				
No. of categories completed	6	>16%	6	>16%
Perseverative errors	5	95%	13	T51
Failure to maintain set	1	>16%	3	2–5%

WMS III/IV, Wechsler Memory Scale III/IV; RAVLT/CVLT-II, Rey Auditory Verbal Learning Test/ California Verbal Learning Test Version II; COWAT (FAS), Controlled Oral Word Association Test (FAS); WAIS III/IV, Wechsler Adult Intelligence Scale III/IV; WCST, Wisconsin Card Sort Test.

[a] Participant 1—WTAR = Wechsler Test of Adult Reading and Participant 2—simple demographics predictive model.

[b] Participant 1 completed the WMS and WAIS III and Participant 2 completed the WMS and WAIS IV.

[c] Participant 1 completed RAVLT and Participant 2 completed CVLT-II.

levels of psychological distress. Satisfactory reliability and validity have been demonstrated across a number of samples (e.g., Cronbach's α ranging from 0.78 to 0.88) (Bond et al., 2011).

Secondary outcome measures

Psychological distress

The Hospital Anxiety and Depression Scale (HADS; Zigmond & Snaith, 1983) was used to assess psychological distress. The HADS has two subscales (seven items each) measuring self-reported anxiety and depression with total scores ranging from 0 to 21. Scores on the subscales have high internal consistency (Cronbach's $\alpha = 0.90$: Moorey et al., 1991) and high test-retest reliability ($r = 0.92$; Zigmond & Snaith, 1983).

The DASS-21 (Lovibond & Lovibond, 1995) is a 21 item self-report measure that assesses depression, anxiety, and stress over the previous week using a 4-point scale. The DASS-21 was used for a threshold measure (moderate range or above, *z*-score > 1) to determine participants' inclusion in the intervention as well as an outcome measure. The measure has good reliability on all three subscales (Cronbach's $\alpha = 0.73$–0.81; Lovibond & Lovibond, 1995) and the factor structure was found to be replicated in samples with a severe TBI (Randall, Thomas, Whiting, & McGrath, 2016).

The Positive and Negative Affect Scales (PANAS) (Watson, Clark, & Tellegen, 1998) was selected because the 20-item measure assesses both positive and negative mood. Total scores range from 10 to 50 for each subscale

(5-point scale). The PANAS has good internal consistency on both subscales and is sensitive to short-term mood state changes (Watson et al., 1998). A short form version of the PANAS (I-PANAS-SF) (five items each scale) was used for weekly administration to reduce test burden whilst retaining good internal consistency (Cronbach's α = 0.78 and 0.76; Thompson, 2007).

The General Health Questionnaire-12 (GHQ-12: Hardy, Shapiro, Haynes, & Rick, 1999) was administered to assess minor psychiatric disorders and distress. The GHQ-12 uses a 4-point Likert scale with a score range of 0–36. The scale shows good reliability (Cronbach's α = 0.89) and test–retest correlation (r = 0.73) (Hardy et al., 1999) and higher scores have been associated with greater psychological inflexibility (Bond et al., 2011).

Participation

The Motivation for Traumatic Brain Injury Rehabilitation Questionnaire (MOT-Q: Chervinsky et al., 1998) measures change in the willingness of the participant to engage in rehabilitation. The MOT-Q comprises 31-items assessing attitudes to brain injury rehabilitation using a Likert type response format. There are four subscales, Lack of Denial, Interest in Rehabilitation, Lack of Anger, and Reliance on Professional Help. Internal consistency for the total score as assessed by Cronbach's α was 0.91 (Chervinsky et al., 1998).

The Sydney Psychosocial Reintegration Scale-2 (SPRS-2) is a clinician or significant other rated scale of social participation. It comprises 12 items rated on a 5-point Likert scale giving a global score across three domains of psychosocial outcome (occupation, relationships, and independent living). The total score ranges from 0 to 48 with higher scores indicating an increasing level of independence. Internal consistency, test–retest and inter-rater reliability and concurrent validity have been found to be satisfactory in prior studies (Tate, Simpson, Soo, & Lane-Brown, 2011).

Quality of life

The Short Form Health Survey (SF-12) (Ware, Kosinski, & Keller, 1996) is a 12-item self-report questionnaire designed to measure a person's perceived health status and has also been described as a measure of quality of life. The SF-12 gives two subscales, mental and physical health with a score from 0 (worst) to 100 (best) and demonstrates good reliability and validity (Ware et al., 1996).

Weekly measures

A subset of measures from the larger battery was administered on a weekly basis at the commencement of the therapy session. These included the AAQ-ABI, AAQ-II DASS-21, and PANAS-SF.

Review of program content, mode of delivery, and measures

A data protocol was devised comprising of both behavioural observation of participants' completion of outcome measures and their engagement in the intervention protocol. In addition, participant attendance rates were recorded. Specifically, for the outcome measures, behavioural observations included whether items were missed, the time taken to complete the measures, participants' comments about the measures and whether any assistance was required to complete the individual items. Regarding the mode of delivery and program content, sessions were recorded and evaluated by the therapist. This involved observation of participants on their degree of engagement with each other, their ability to attend to the program, their degree of interaction in the program and engagement in homework tasks. In addition, participants' committed action in response to identified values (sessions 6–7) was evaluated to assess congruence.

Treatment Protocol

The seven session, manualised treatment protocol (1.5 hr per session) had a sessional focus on each component of the ACT model (see Table 2) with session 7 occurring after a one month break as a relapse prevention session. In-session tasks involved psycho-education, discussion, and experiential exercises and concluded with instructions for a home task.

Procedure

Following ethical approval from the Sydney South West Local Health District Human Research Ethics Committee, participants were recruited from Liverpool Brain Injury Rehabilitation Unit. Treatment was delivered in a dyad with pre-treatment measures and weekly measures (AAQ-ABI, AAQ-II, DASS-21, and I-PANAS-SF) administered by the intervention therapist. Post-treatment measures were administered by an independent assessor (graduate psychologist) two weeks after session 7.

Analysis

Aim (1): To determine the effectiveness of the intervention, the data were entered into a spreadsheet, and subscale scores were analysed by calculating reliable change indices (RCI) on the pre- and post-measures (Jacobson & Truax, 1991; Perdices, 2005). Subscale scores from the

Table 2 Summary of Acceptance and Commitment Therapy treatment program

Session no.	Session title	Content	Experiential exercises
1	Introduction and confronting the agenda	Group processes and guidelines Confronting the agenda Identifying individual issues, workability Introducing concept of homework, homework contract	Mindfulness of the breath
2	Control is the problem	Internal/external sources of control Normalcy of human suffering	Walking while telling yourself you can't Chocolate cake Let suffering get close[a] Passengers on the bus[b]
3	Acceptance and defusion	Defusion	Milk, milk, milk Physicalise the thought[b] Don't get eaten machine[b]
4	The observing self	Separating self from thoughts/feelings/actions Introduce mindfulness	Observer[c] Chessboard metaphor Mindfulness exercise—eating a sultana
5	Introduction of values	Difference between goals (committed action) and values	Survey of Life Principles 2.2[b] Funeral exercise for values exploration
6	Values and committed action	Engaging in committed action in conjunction with values Recap and review of each session	Recall experiential exercises and the rationale for exercise
7	Relapse prevention	Review of progress over previous four weeks Review course content	

Notes.
[a] Wilson and DuFrene (2009).
[b] Ciarrochi and Bailey (2008).
[c] Hayes et al. (2003).

weekly measures that showed significant RCI were graphed for a visual inspection of weekly change (Kratochwill et al., 2013). Participants' behaviours during the intervention were reviewed to provide qualitative data on committed action undertaken in accordance with values. Aim (2): Data on attendance rates was calculated and behavioural observations of participants' attendance, ability to complete measures, and engagement in the session content were recorded.

Results

Effectiveness

The results of pre- and post-measures with the RCI for both participants are presented in Table 3 and will be reported separately for each case.

Participant 1

P1 demonstrated improvements across a number of outcome measures from pre- to post-intervention but indicated a significant reliable change on only one measure the PANAS: negative affect. During treatment, P1 was involved in a motor vehicle accident (MVA) between sessions 4 and 5, resulting in a four week break due to physical injuries (soft tissue cervical injury). Though P1 did not indicate a reliable change on either measure of participation, qualitatively he engaged in committed action that had been set in conjunction with his values during the intervention. The identified behaviour was to return to driving after completing a formal driving assessment. This was achieved despite experiencing both elevated levels of anxiety and psychological inflexibility after being involved in the MVA.

A visual inspection of selected weekly measures including the Anxiety subscale of the DASS-21, the AAQ-ABI and the Negative Affect of the short form PANAS, are presented in Fig. 1. Initially, P1 showed movement in the correct direction on his weekly self-report measures, that is a gradual decrease in psychological distress (DASS-21 A, PANAS-N) and psychological inflexibility (AAQ-ABI). This change was not clinically significant as the movement was still within the same clinical range, for example, DASS-21 anxiety movement was within the extremely severe range. After the MVA and a break of four weeks, all weekly measures had an observable but not significant increase. When the intervention resumed, the downward trend resumed and this was maintained after the planned four-week break but scores did not move into a different clinical range.

Qualitatively, P1 demonstrated committed action consistent with his value of "*Being self-sufficient*" (Ciarrochi & Bailey, 2008) by being able to complete a formal driving assessment and return to both driving and work by the end of the programme.

Participant 2

P2 reported significant decreases across several self-report measures. These included psychological inflexibility (AAQ-ABI) and measures of mood (HADS, DASS-21 anxiety, PANAS-N). He also displayed significant increases in both the subscales of quality of life (SF-12) (Table 3). P2 demonstrated a change in severity classification category on all the subscales of the DASS-21 from the "*extremely severe*" or "*severe*" range to the "*moderate range*." Qualitatively P2 indicated his participation improved as an identified value of P2 was to engage in meaningful work. P2 reported that he wanted to change his career and over the course of the program enrolled into formal education to improve his qualifications in his chosen field.

A visual inspection of the weekly measures (Fig. 1) indicated a decrease across all plotted measures including DASS-21 anxiety, PANAS negative affect, and psychological inflexibility from baseline to week 4. This movement was clinically significant as DASS-21 anxiety showed movement from the "*extremely severe*" range to the "*mild*" range. An unscheduled four week break occurred due to P1 suffering an injury in an MVA (since participants were completing therapy together as a dyad). After the break, P2 showed a substantial increase in all the self-report scores but not to baseline levels. The decrease in psychological distress (DASS-21, PANAS-N) and psychological inflexibility (AAQ-ABI) from sessions 5 to 6 was not as dramatic as between sessions 1 and 4 but reductions in these scores were maintained at session 7 (relapse prevention) and at post-intervention testing. Regarding committed action in response to an identified value, *being a better father*, P2 enrolled into a computer course to enhance his employment opportunities and provide more support for his family.

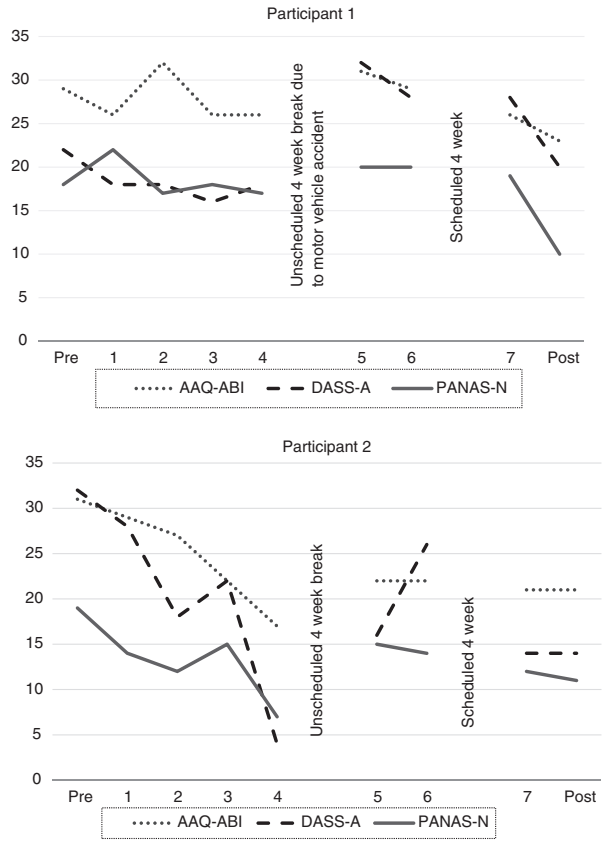

Figure 1 Weekly measures of psychological flexibility and psychological distress.

Table 3 Reliable change indexes (RCI)

Measure	Participant 1			Participant 2		
	Pre	Post	RCI	Pre	Post	RCI
Psychological flexibility						
AAQ-ABI	29	23	−1.61	31	21	−2.68*
AAQ-II	42	36	−1.32	35	37	0.44
Emotional distress						
HADS-A	15	11	−1.74	16	10	−2.61*
HADS-D	14	12	−0.80	11	5	−2.41*
DASS 21-D	34	34	0	23	16	−1.55
DASS 21-A	22	20	−0.42	32	14	−3.75*
DASS 21-S	24	22	−0.41	26	20	−1.24
PANAS-P	20	16	−1.12	19	19	0
PANAS-N	36	19	−4.76*	34	21	−3.64*
GHQ-12	2.5	2.42	−0.33	1.67	1.67	0
Participation						
MOT-Q	26	18	−0.92	24	23	−0.11
SPRS	36	36	0	32	38	1.03
Quality of life						
SF-12V2 PCS	39.5	36.9	−0.50	33.7	45.3	2.22*
SF-12V2 MCS	28.1	31.3	0.48	21.4	46.6	3.75*

Notes. AAQ-ABI, Acceptance and Action Questionnaire-Acquired Brain Injury; AAQ-II, Acceptance and Action Questionnaire-II; HADS, Hospital Anxiety and Depression Scale; DASS-21, Depression Anxiety Stress Scale-21; PANAS, Positive Affect Negative Affect Scale; GHQ-12, General Health Questionnaire-12; MOT-Q, Motivation for Traumatic Brain Injury Rehabilitation Questionnaire; SPRS-2, Sydney Psychosocial Reintegration Scale-2; SF-12V2, Short Form Health Survey Version 2 (PCS—Physical Health; MCS—Mental Health).

*RCI > 1.96 is significant at $p < .05$.

Review of content and delivery

Both participants maintained 100% attendance for the program, which required strategies to compensate for cognitive impairments (memory deficits and poor organisational ability). Weekly reminder phone calls were sent in addition to a text message on the day. The length of the session (1.5 hr) appeared appropriate in that both participants appeared to tolerate and maintain focus for the duration of the session.

Qualitatively, the suitability of the measures was also reviewed by the administering therapist. Both participants could complete the measures without assistance from a third party and no individual items were missed. P2 omitted answering the whole AAQ-II though, at the beginning of week 3. The dyad structure for therapy was observed by the therapist to facilitate high levels of engagement for each participant with both the therapist and each other. Co-therapy occurred where the participant would make suggestions to each other and provide prompts when the other participant had forgotten something, for example, when reviewing the content of homework. Participants expressed feeling less isolated in being able to share experiences with another person experiencing a TBI.

Discussion

The current study indicated initial promise for utilising ACT with individuals after a severe TBI, delivered in the format of a dyad. The first objective related to whether a therapeutic benefit was evident. This was assessed through calculating reliable change and visual inspection of graphical representation of outcome measures. In operationalising the clinical significance of the extent of reliable change, Jacobson and Truax (1991) proposed a classification of clinical improvement incorporating two ranges: *recovered*, namely reliable change in outcome scores that move into a functional population range; and *improved*, a reliable change in outcome scores that still remains in the dysfunctional population range. Therefore, although reliable change may be achieved on scores, this only becomes clinically significant if there is movement to the range seen in a less severe population.

Based on these criteria, the gains made by P2 could be classed in the "*improved*" range. P2 showed reliable change for both the primary outcome measure of psychological flexibility, as well as secondary measures of psychological distress. Furthermore, within the ACT framework, P2's enrolment into a computer course to improve his employment opportunities would be understood as an important therapy outcome reflecting committed action based on values. In contrast, P1 showed less progress, but did achieve a reliable change in the reduction of negative affect on the PANAS. P1 did continue to engage in values based behaviour, returning to work after his MVA, continuing with his apprenticeship and passing his motor vehicle driving competency test to have his driver's licence reinstated. This was despite a stressful, intervening life event, demonstrating committed action in the service of values. In reviewing the treatment goals of ACT, both participants were able to increase their meaningful life engagement despite experiencing ongoing psychological distress.

The second aim related to reviewing the content of the intervention. Both participants achieved 100% attendance indicating the program was delivered to the participants as planned and previously published strategies were effectively implemented to cater for cognitive impairments such as memory problems, executive dysfunction and attention to enhance engagement (Whiting et al., 2017). Measures used to evaluate the intervention outcomes were also reviewed. Both participants could complete the measures without assistance and significant RCI pre- to post-intervention indicates the measures can be explored further in a clinical trial. The measure of participation though, did not appear to be sufficiently sensitive to change despite qualitative data suggesting that both participants showed specific examples of committed action. This may have been a function of ceiling effects on the measure with both participants scoring relatively high and above average on participation prior to the intervention. This suggests they were already more motivated and had higher levels of social participation than was indicated by the average person with a TBI (Chervinsky et al., 1998; Tate et al., 2011).

The group size of two appeared to have advantages in terms of group processes such as universality (others experiencing the same issues), cohesiveness, and sharing of information (Yalom & Leszcz, 2005). Having more than one person in treatment sessions anecdotally appeared to enhance adherence to the treatment protocol as it prevented individuals from diverting the session's content. Though it has been suggested that effective ACT interventions are delivered one-on-one (Kangas & McDonald, 2011), an increasing number of studies are finding delivery of ACT in group situations is efficacious (e.g., Kocovski, Fleming, & Rector, 2009; Ossman, Wilson, Storaasli, & McNeill, 2006). Limiting the group size to two allowed each participant to have sufficient time to engage with the therapist but still provided the benefits of a group process as has previously been demonstrated in other group interventions involving participants with TBI (Simpson et al., 2011). Further research is warranted to investigate the most optimal

method of delivering ACT (small groups or individually) to individuals with a severe TBI.

There were a number of limitations to the study. The study though reporting therapeutic outcomes did not use a single case study experimental design (SCED) (Tate, Perdices, McDonald, Togher, & Rosenkoetter, 2014) and therefore met the criteria of a pre-post design reducing methodological rigour (Vohra et al., 2015). The growing methodological quality of *n*-of-1 trials has been enhanced by the publication of quality rating scales (RoBiNT: Tate et al., 2013) of which this study met limited criteria (2 out of the 15 items). Thus, the therapeutic benefits of the intervention need to be interpreted with caution.

The unplanned break in treatment between sessions 4 and 5, due to P1's MVA, resulted in an increase in psychological distress and psychological inflexibility indicating this break may have contributed to a dilution of any treatment effects. Though the content was briefly reviewed, there was a disconnection in the flow of treatment and there was no indication that either participant engaged the strategies during the four-week break.

Overall, this study suggests some initial indications that ACT delivered in a dyad may result in therapeutic outcomes for people with a severe TBI. The information gained from this study will guide the formulation of a larger scale randomised controlled trial (Whiting, Simpson, McLeod, Deane, & Ciarrochi, 2012).

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