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Enhanced Appreciation of Life Following Acquired Brain Injury: Posttraumatic Growth at 6 Months Postdischarge

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Preliminary research supports that acquired brain injury (ABI) can act as a catalyst for positive psychological changes, and that such posttraumatic growth (PTG) increases with time since injury. In this study, posttraumatic growth refers to positive psychological changes in domains including interpersonal relationships, new possibilities, personal strength, spirituality and appreciation for life. This study aimed to identify associations between levels of subjective impairment and depressive symptoms at discharge, and PTG at 6-months postdischarge following ABI. Sixty participants (73% male) with ABI (Mean days of hospitalisation = 32.92, $SD = 40.74$) were consecutively recruited from an inpatient rehabilitation unit at discharge and were administered measures of subjective impairment (Mayo-Portland Adaptability Index-4; MPAI-4) and depression (Depression, Anxiety Stress Scales; DASS). Participants were followed up at 6-months postdischarge and administered the Post-Traumatic Growth Inventory, DASS and MPAI-4. The results indicated that levels of PTG reported at six months postdischarge were relatively modest and ranged between no to very small degree of change ('spirituality') and a small to moderate degree of change ('a greater appreciation of life'). Level of subjective impairment at discharge significantly predicted overall level of PTG at 6-months follow-up ($\beta = .40, p < .05, sr^2 = .28$). Further, at 6-months postdischarge, individuals with a greater appreciation for life reported significantly higher levels of subjective impairment ($r = .35; p < .01$) and depressive symptoms ($r = .34, p < .01$) at that time point. These findings indicate that individuals who perceive greater functional consequences of their ABI are more likely to experience PTG. Further, the process of reevaluating priorities and values in life after ABI may be associated with emotional distress during the early stages of community reintegration.

Keywords: brain injury, posttraumatic growth, subjective impairment, depressive symptoms

Life following acquired brain injury (ABI) is often marked by intense changes, in terms of personal abilities and life circumstances. A plethora of studies highlight the adverse functional and psychosocial consequences of ABI that include loss of independent living skills, relationship

breakdown, unemployment and emotional dysfunction (Jorge et al., 2004; Soo & Tate, 2007; Tate & Broe, 1999). However, these typically negative repercussions only partially represent the outcomes that may be experienced. In particular, there has been little emphasis on positive

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changes associated with ABI (Collicutt McGrath, 2008). A considerable body of literature supports that traumatic life events may also serve as a catalyst for growth that goes beyond individuals' level of pretrauma psychological functioning (Hayes, Laurenceau, Feldman, Strauss, & Cardaciotto, 2007). Such 'posttraumatic growth' (PTG) may entail enhanced interpersonal relationships, new possibilities, increased personal strength, spiritual changes and greater appreciation for life (Tedeschi & Calhoun, 2004). The present study aimed to identify factors related to posttraumatic growth at 6-months postdischarge following ABI.

The concept of growing through suffering has been a theme in philosophy throughout history (e.g., Caplan, 1964; Frankl 1963; Nietzsche, 1955; Yalom, 1980). More recently, the positive psychology movement has focused on drawing on psychological strengths to improve wellbeing and prevent disorders (Seligman & Csikszentmihalyi, 2000). Accordingly, there has been a surge of interest in the study of psychological growth following traumatic events (Hefferon, Greal, & Mutrie, 2009; Helgeson, Reynolds, & Tomich, 2006; Joseph & Linley, 2006). Positive psychological changes are referred to by a variety of terms including benefit finding (Tomich & Helgeson, 2004), posttraumatic growth (Tedeschi & Calhoun, 1996), meaning-making (Park, 2010; Thompson, 1991), positive adjustment, finding meaning, positive consequences, adversarial growth and stress-related growth (Gillen, 2005; Linley & Joseph 2004; Mols, Vingerhoets, Coebergh, & Van de Poll-Franse, 2009; Park, Cohen, & Murch, 1996). In the present study, the term posttraumatic growth (PTG) is used, based on the perspective that such growth may either reflect a *coping process* of construing meaning (Davis, Nolen-Hoeksema, & Larson, 1998; Park, 2010), or the *outcome* of an initial struggle and subsequent adaptation to a major life crisis or trauma, through which one's belief systems are fundamentally altered (Calhoun, Cann, Tedeschi, & McMillan, 2000).

Conceptual Underpinnings and Findings of the Broader PTG Literature

Despite various conceptual differences, most models of stress and coping, including models of PTG, emphasise the importance of cognitive appraisals in response to a traumatic event (Joseph et al., 2005; Tedeschi & Calhoun, 2004). Cognitive appraisal refers to the process in which an individual evaluates the meaning of an event in

regards to its personal significance and impact (Lazarus & Folkman, 1984; Park & Folkman, 1997). The appraisal process influences the coping responses employed; thus, when situations are appraised as stressful, coping responses are implemented (Aldwin & Revenson, 1987; Kendall & Terry, 2009). Coping strategies are classified as problem-focused (e.g., confronts problem and changes the situation), emotion-focused (e.g., suppression, expressing feelings) (Lazarus & Folkman, 1984) or perception-focused coping (Pearlin & Schooler, 1978), which includes positive reappraisal or searching for meaning. The subjective appraisal process explains why an event may be perceived as stressful to one individual but not to another (Park & Folkman, 1997) and this is an integral factor propelling PTG (Joseph et al., 2005; Tedeschi & Calhoun, 1996). Theoretical perspectives of PTG predict that individuals who perceive the impact of a stressful event to be greater are more likely to experience PTG. The empirical support for this perspective is mounting (Gangstad, Norman, & Barton, 2009; Harrington, McGurk, & Llewellyn, 2008; Helgeson et al., 2006; Kim, Schulz, & Carver, 2007; Linley & Joseph, 2004; Park, 2010; Sears, Stanton, & Danoff-Burg, 2003; Tedeschi & Calhoun, 1996, 2006).

Many factors have been found to be associated with PTG in the broader literature. A meta-analysis (Helgeson et al., 2006) conducted on 87 cross-sectional studies covering a range of traumatic events reported that level of PTG was most consistently related to the following: age, gender (i.e., females report more growth), cognitive appraisals (e.g., perceived threat-stress), objective trauma severity, coping variables (e.g., acceptance, denial, positive reinterpretation, positive reappraisal), optimism, religiosity and time since the event. PTG was associated with various mental health outcomes including less depression and greater positive wellbeing (Helgeson et al., 2006). The majority of these studies were cross-sectional in nature whereby predictors were examined concurrently with measures of PTG. One of few longitudinal studies by Frazier, Conlon and Glaser (2001) found that the greatest increase in PTG occurred between 2 weeks and 2 months post-trauma, a finding that is contrary to cross-sectional studies that imply that growth is a long and gradual process (Helgeson et al., 2006). Although the concept of PTG and its associations with different variables has been investigated across many clinical populations, research on psychological growth following ABI is limited.

Empirical Research Investigating PTG Following ABI

Numerous qualitative studies focusing on adjustment to ABI have highlighted how individuals seek to understand, make sense of and derive meaning from their postinjury experiences (e.g., Adelbratt & Strang, 2000; Gillen, 2005; Nochi, 2000; Strang & Strang, 2001). A literature search was conducted to identify quantitative studies that have specifically assessed PTG following ABI, and included the following databases: Medline® and ProQuest® Dissertations and Theses–Full Text, PsychInfo® and Science Direct® Psychology. The keywords entailed a large list of terms describing positive adjustment (e.g., benefit, growth, existential, meaning, sense-making, new possibilities, positive effects/consequences/changes, spiritual) combined with terms referring to brain injury (e.g., stroke, head injury, brain tumour) in the abstract. The reference lists of all relevant articles were also searched to identify further studies possibly suitable for inclusion. A total of six empirical studies (Collicutt McGrath & Linley, 2006; Gangstad et al., 2009; Hawley & Joseph, 2008; Powell, Ekin-Wood, & Collins, 2007; Thompson, 1991; Warren, 2008) were identified that administered quantitative measures of PTG and two of those six studies also examined PTG in carers (Thompson, 1991; Warren, 2008).

The six empirical studies included three focusing on a mixed sample of ABI (Powell et al., 2007; Collicutt McGrath & Linley, 2006; Warren, 2008), two on stroke (Gangstad et al., 2009; Thompson, 1991) and one on TBI (Hawley & Joseph, 2008). Sample size varied from ten individuals (Collicutt McGrath & Linley, 2006) to 174 participants (Hawley & Joseph, 2008). The majority of studies were cross-sectional with only one longitudinal study (Hawley & Joseph, 2008) — with the latter study focusing mainly on associations between demographic and injury factors and PTG at variable follow-up of 9 to 25 years. Severity of injury or disability of participants varied considerably, with some studies including mild to severe ABI (Hawley & Joseph, 2008; Powell et al., 2007) whereas others only included individuals with severe ABI (Collicutt McGrath, & Linley, 2006) and others did not specify (Gangstad et al., 2009; Thompson 1991; Warren, 2008). Time since injury also differed greatly both within and between samples. For example, chronicity for stroke participants varied between 5 and 99 months in the study by Gangstad et al. (2009), and individuals with ABI were between 1.7 and 11.6 years postinjury in the study by Powell et al. (2007).

Most studies assessed PTG with the Post-Traumatic Growth Inventory (PTGI; Tedeschi & Calhoun, 1996), which is a 21-item questionnaire that assesses overall positive outcomes and its five factors distinguish between growth in the areas of *new possibilities*, *personal strength*, *appreciation of life*, *spiritual change*, and *relating to others*. Hawley and Joseph (2008) administered the Positive changes in outlook (CiOP), which is the positive subscale of the Changes in Outlook Questionnaire (Joseph et al., 2005). Thompson (1991) administered a scale measuring ‘meaningfulness in life’, which consists of 11 items tapping a sense of order, fairness and purpose (see Thompson & Janigian, 1988). Overall, the heterogeneity of sample characteristics and methodological differences makes comparisons between studies difficult. Nonetheless, the key findings that emerged from the review regarding the factors related to PTG are summarised in Table 1.

As shown in Table 1, variables found to be significantly positively associated with PTG include age (Hawley & Joseph, 2008; Thompson, 1991), education (Gangstad et al., 2009), perceived social support, mutuality in spouses (Warren, 2008), time since injury (Collicutt McGrath & Linley, 2006; Gangstad et al., 2009; Powell et al., 2007) and the following coping styles: positive cognitive restructuring, downward social comparisons and denial (Gangstad et al., 2009). Mental health outcomes significantly related to higher PTG included less depression (Collicutt McGrath & Linley, 2006; Gangstad et al., 2009; Hawley & Joseph, 2008; Thompson 1991) and reduced anxiety in some studies (Gangstad et al., 2009; Hawley & Joseph, 2008). However, as one exception, Collicutt McGrath and Linley (2006) reported a positive association between anxiety and PTG. Interestingly, Gangstad et al. (2009) identified that the relationship between PTG and emotional adjustment varied as a function of time since injury, whereby PTG was negatively related to depression only for those with greater time since stroke. Overall, the review highlighted that PTG for individuals with ABI and their caregivers is related to greater time since injury and, most typically, is associated with lower emotional distress. It is important to note that these findings were predominantly based on nonconsecutive recruitment for sampling and cross-sectional data. Research is yet to examine factors related to the development of PTG using a longitudinal cohort design.

Theoretical perspectives argue that PTG is motivated by a highly stressful event that is *perceived* as traumatic and hence challenges one’s fundamental beliefs and values or ‘assumptive world’

TABLE 1
Factors Related to Posttraumatic Growth following Acquired Brain Injury (ABI)

Variables examined	Studies investigating each variable	Studies ^a reporting significant positive or negative (+/-) correlations with Posttraumatic Growth
Pre-injury variables		
Age	1, 3, 5	+1 (mild TBI group only), NS, -5
Gender	1, 3	NS
Education	3	+3
Injury and functional predictors		
Injury Severity (TBI only)	1	NS
Glasgow Outcome Scale	1, 2	NS
Functional Assessment at Discharge	1	NS
Community Outcome Scale	1	NS
Other variables/measures		
Time since ABI	1, 2, 3, 4	+1, +2, +3, +4
Social support	6	+6
Spouse mutuality	6	+6
Life satisfaction	2	NS
Functional outcomes of rehabilitation	2	NS
Sense of coherence	4	NS
Cognitive processing styles		
Positive cognitive restructuring	3	+3
Downward comparisons	3	+3
Resolution	3	NS
Denial	3	+3
Emotional wellbeing measures		
Hospital Anxiety Depression Scale	1, 3, 4	-1, -3 (depression & anxiety), +4 (anxiety)
Geriatric Depression Scale	5	-5

Note: ^a (1) Hawley & Joseph (2008); (2) Powell, Ekin-Wood & Collins, (2007); (3) Gangstad, Norman & Barton (2009); (4) Collicutt-McGrath & Linley (2006); (5) Thompson, 1991; (6) Warren (2008). NS = nonsignificant, TBI = Traumatic Brain Injury.

(Tedeschi & Calhoun, 1996, 2004). Thus, subjective experience is particularly important in models of PTG. As shown in Table 1, two studies examined objective severity indices and found no significant association with PTG (Hawley & Joseph, 2008; Powell et al., 2008). In the context of ABI, there is a lack of research on subjective experience or the perceived impact of trauma, which is emphasised as a key factor propelling PTG in both the theoretical and empirical literature (Helgeson et al., 2006; Tedeschi & Calhoun, 2004). Therefore, this study aimed to investigate the influence of early perceived functional impairment (i.e., subjective impairment) and early emotional distress on the later development of PTG. It was hypothesised that higher levels of subjective impairment and depressive symptoms at time of discharge from an inpatient unit would be significantly associated with greater PTG at 6-months follow-up. An exploratory component of the study examined whether the strength of the association between PTG and levels

of subjective impairment and depressive symptoms varies according to different aspects of growth.

Method

Participants

Individuals with ABI were recruited on a consecutive discharge basis from two inpatient units (brain injury rehabilitation unit and acute neurosciences ward) of a large metropolitan-based hospital in Queensland over a 12-month period (December 2008 to December 2009). The nature of referral to the brain injury rehabilitation unit typically entailed those with more severe brain injury and longer hospital stay; whereas participants from the acute neurosciences ward had typically sustained a less severe ABI. Participants were recruited as part of a broader study on hospital transition outcomes. Inclusion criteria for the study were: diagnosis of ABI (e.g., TBI, stroke or other nonprogressive causes of ABI) as documented in a medical report, aged between 18

and 60 years, adequate verbal communication skills to complete self-report measures, able to give informed consent, a minimum stay of four days in hospital. Further, participants were only included in the study if they were expected to return to a home or community setting upon discharge.

Measures

Mayo-Portland Adaptability Inventory (MPAI-4; Malec, 2005.) The MPAI-4 is a self-report questionnaire that was designed to measure the functional consequences of brain injury, relating to physical, cognitive, emotional, behavioural and social problems. The MPAI-4 consists of 29 items that comprise three domains: (1) Abilities, (2) Adjustment and (3) Participation. The items are rated on a 5-point scale from 0 (*no problem*) to 4 (*severe problem*) with lower scores indicating better self-perceived functioning. Raw scores are converted to standard scores (see Malec, 2005) with higher total scores indicating greater subjective impairment. The psychometric properties reported for the MPAI-4 indicate that it is a valid and reliable instrument ($\alpha = .89$). The scale structure is supported by Rasch analysis with item (.99) and personal reliability reported as high (.88) (Malec et al., 2003).

Depression Anxiety Stress Scales (DASS; Lovibond & Lovibond, 1995). The DASS is a 21-item self-report instrument that measures the emotional states of depression, anxiety and stress. The depression subscale consists of seven items that are rated on a 4-point Likert scale between 0 (*did not apply to me at all*) and 3 (*applied to me very much*). Greater scores indicate higher levels of depressive symptoms with a cut-off score of 10 or higher indicating clinical levels of depression. Although the complete DASS was administered, only the depression subscale was used in this study for two reasons. First, unlike the anxiety and stress scales, the depression scale consists of affective and behavioural symptoms (e.g., sadness, loss of interest, life was meaningless), rather than physical and cognitive symptoms that potentially overlap with TBI sequelae. Second, satisfactory psychometric properties have been reported for the depression scale, including high internal consistency ($\alpha = .88$) and sound test-retest reliability ($r > .75$) over a 1–3-week interval (Owens, Little, Turner, Hawkes, & Shum, 2008). The depression scale was found to have good internal consistency for the ABI sample in the present study ($\alpha = .90$).

Post-Traumatic Growth Inventory (PTGI; Tedeschi & Calhoun, 1996). The PTGI is a 21-item questionnaire designed to provide an overall

assessment of positive outcomes that may occur in response to major life crises or trauma. The measure also distinguishes between five domains of growth: (1) Relating to Others, (2) New Possibilities, (3) Personal Strength, (4) Spiritual Change and (5) Appreciation of Life. In the present study participants were asked to indicate the degree to which each statement had occurred as a result of their ABI (e.g., 'I can better appreciate each day'). Each item requires a response on a 6-point Likert scale from 0 (*Not at all*) to 5 (*Very great degree of change*). The PTGI has sound psychometric properties, with the five subscales derived from factor analysis (Tedeschi & Calhoun, 1996). High internal consistency has been reported for the PTGI in previous research with individuals with stroke ($\alpha = .92$, Gangstad et al., 2009). In the present study, internal consistency of the PTGI was high for the total scale ($\alpha = .89$) and was considered adequate for the subscales ($\alpha = .60-.81$).

Procedure

Ethical clearance was obtained from hospital and university human research ethics committees. During the initial assessment, the MPAI-4 and the DASS were administered face-to-face (predischARGE) by doctoral students or by telephone within one week of the discharge date. For the telephone-based assessment the researchers read out each question and described the range of possible responses according to the Likert scale for each measure. The measures formed part of a broader set of questionnaires that took approximately 1 hour to administer at each time point. The follow-up assessment was conducted over the telephone at 6-months postdischarge and entailed the MPAI-4, DASS and the PTGI.

Data Analysis

Data were screened and analysed using the Statistical Package for the Social Sciences (SPSS) for Windows, Version 16. Data were screened for missing values; 15 participants (18.1%) were identified as discontinuing from the study at Time 2; eight participants (9.6%) had data at Time 2, but no data at Time 1 and were thus excluded. A total of 60 participants completed all measures at Time 1 and 2 (73.5%). Participant attrition analyses were conducted using chi-square and *t* tests. Paired *t* tests were used to examine change in levels of subjective impairment and depressive symptoms between the discharge and 6-months follow-up assessments. Pearson's correlations were performed to examine associations among levels of subjective impairment, depressive symp-

toms and posttraumatic growth. Regression analysis was conducted to examine whether subjective impairment and depressive symptoms at discharge could predict PTG at 6-months postdischarge

Results

Eighty-three participants were recruited at discharge; however, 23 participants were either not available at the 6-months postdischarge follow-up or had excessive missing data at the discharge assessment. Chi-square tests and *t* tests conducted to compare participants who remained in the study (*n* = 60) and those who were unavailable at follow-up or with missing data (*n* = 23) identified no significant differences in terms of age, education, discharge depressive symptoms or discharge subjective impairment (*p* > .05). Groups also did not differ according to injury type (TBI vs. other

ABI) or relationship status (*p* > .05). Those who discontinued in the study were significantly more likely to be female (*p* < .05); unemployed pre-injury (*p* < .01); and have longer hospital stays (*p* < .05). The demographic and injury characteristics of the ABI sample are displayed in Table 2. As shown in Table 2, the majority of participants had sustained a TBI (58%). Information obtained from medical records indicated that 83% of these participants had sustained a severe TBI (Glasgow Coma Scale < 9, posttraumatic amnesia > 24 hours).

An analysis of descriptive data for the sample (see Table 3) identified that at the time of discharge 43% of participants were in the clinical range for depression. At 6-months postdischarge 33% of participants were in the clinical range for depression. There was no significant difference in level of depressive symptoms at discharge and 6-months postdischarge *t*(59) = 1.67, *p* > .05. Level of subjec-

TABLE 2
Demographic and Injury Characteristics for Individuals with ABI (*n* = 60)

Characteristics	<i>N</i> (%) or <i>M</i> (<i>SD</i>), range
Age	44.18 (11.32) 19–60
Education (years)	13.05 (2.92) 8–21
Gender	
Male	44 (73.3)
Female	16 (26.7)
Relationship status at time of injury	
Single	13 (21.7)
Defacto/partner	11 (18.3)
Married	29 (48.3)
Separated	2 (3.3)
Divorced	4 (6.7)
Widowed	1 (1.2)
Pre-ABI injury employment status	
Employed	54 (90%)
Unemployed/homemaker/retired	6 (10%)
Cause of injury	
TBI (<i>n</i> = 35, 58%)	
Traffic	9 (15%)
Assault	8 (13.3%)
Fall	18 (30.5%)
Other ABI (<i>n</i> = 25, 42%)	
Stroke (e.g., aneurysm)	12 (20%)
Hypoxic event	1 (1.7%)
Encephalitis	1 (1.6%)
Unknown ABI	8 (13.3%)
Other	3 (5%)
Length of hospital stay (days)	32.92 (40.74) 4–205

Note: ABI = acquired brain injury; TBI = traumatic brain injury.

TABLE 3

Descriptive Data for Individuals with ABI ($n = 60$) at Discharge and 6-Months Follow-Up

	Discharge M (SD), range N (%)	Follow-up M (SD), range N (%)	Item mean response (0–5)
Depression (DASS)	9.5 (10.33), 0–38	7.3 (8.97), 0–32	
Normal (0–9)	34 (56.7%)	40 (66.7)	
Mild (10–13)	11 (18.3%)	11 (18.3)	
Moderate (14–20)	7 (11.5%)	2 (3.3)	
Severe (21–27)	3 (5%)	2 (3.3)	
Extreme (28+)	5 (8.3%)	5 (8.3)	
Subjective Impairment (MPAI-4 Total)	46.13 (6.58)	38.93 (13.44)	
Posttraumatic Growth Total Score (PTGI)	n/a	33.47 (18.26)	
Relating to others (7 items)	n/a	12.63 (7.53)	1.80 (1.08)
New possibilities (5 items)	n/a	5.62 (5.20)	1.12 (1.04)
Personal strength (4 items)	n/a	6.52 (4.71)	1.63 (1.18)
Spiritual change (2 items)	n/a	1.52 (2.79)	0.76 (1.39)
Greater appreciation for life (3 items)	n/a	7.02 (3.75)	2.39 (1.31)

Note: ABI = acquired brain injury, DASS = Depression Anxiety Stress Scales, MPAI-4 = Mayo-Portland Adaptability Index-4, PTGI = Post-Traumatic Growth Inventory.

tive impairment on the MPAI-4 at 6-months post-discharge was significantly lower than at discharge, $t(59) = 4.91$, $p < .01$. Inspection of item mean responses on the PTGI indicated that the highest endorsement occurred for ‘a greater appreciation for life’ (average rating: small to moderate degree of change), with ‘spiritual change’ receiving the lowest endorsement (average rating: no to very small degree of change). Paired sample t tests identified that a greater appreciation for life was endorsed at a significantly higher level than all other PTGI subscales ($p < .01$).

Associations Between Subjective Impairment, Depressive Symptoms and PTG

Pearson’s correlations identified that levels of depressive symptoms and subjective impairment were significantly positively correlated at both discharge and 6-months follow-up (see Table 4).

As hypothesised, level of subjective impairment at discharge was significantly correlated with PTG at 6-months postdischarge ($r = .23$, $p < .05$), indicating that individuals who perceived higher levels of functional impairment were more likely to report higher levels of PTG at 6-months follow-up. However, PTG was not significantly related to level of depressive symptoms at discharge or 6-months postdischarge, or subjective impairment at 6-months postdischarge ($p > .05$). There were no significant correlations between level of PTG and age, education and length of hospital stay ($p > .05$) and no between-group differences for gender, marital status or cause of injury ($p > .05$).

A standard multiple regression analysis examined whether levels of subjective impairment and depressive symptoms at discharge could predict PTG at 6-months postdischarge. Together, discharge subjective impairment and depressive symptoms accounted for 8% of the total variance in PTGI total score at 6-months postdischarge,

TABLE 4

Pearson’s Correlations between Subjective Impairment, Depressive Symptoms and PTG

	1	2	3	4	5
Depressive symptoms (discharge)	—				
Subjective impairment (discharge)	.72***	—			
Subjective impairment (6 months)	.35**	.58***	—		
Depressive symptoms (6 months)	.44**	.50***	.56***	—	
PTGI (total)	.04	.23*	.18	.09	—

Note: * $p < .05$, ** $p < .01$, *** $p < .001$ (one-tailed). PTGI = Post-Traumatic Growth Inventory.

which was not significant ($F(2,57) = 2.53, p = .09$). However, level of subjective impairment accounted for significant proportion of unique variance in PTGI ($\alpha = .40, p < .05, sr^2 = .28$).

Associations Between PTGI Subscales, Subjective Impairment and Depressive Symptoms

Pearson's correlations were conducted to examine associations between different aspects of PTG at 6-months follow-up and level of depressive symptoms and subjective impairment. Due to the multiple correlations examined, an adjusted alpha level was adopted ($p < .01$). As shown in Table 5, only one aspect of PTG was significantly related to level of subjective impairment and depressive symptoms. Specifically, at 6-months follow-up, individuals endorsing higher levels of a greater appreciation for life reported higher levels of subjective impairment and depressive symptoms. Scores on the PTGI domains were significantly but moderately correlated ($rs = .34-.56, p < .01$).

Discussion

The main objective of this study was to investigate levels of subjective impairment and depressive symptoms at discharge as predictors of PTG at 6-months postdischarge after ABI. As an exploratory component, this study also examined whether the association between levels of subjective impairment, depressive symptoms and PTG varied according to different aspects of growth at 6-months follow-up. Overall, the findings partly supported the hypothesis, as greater subjective impairment at discharge predicted higher levels of PTG at 6-months follow-up. However, PTG was not significantly related to level of depressive symptoms at discharge. The results indicated that levels of PTG reported at 6-months postdischarge were relatively modest and ranged between no to a

very small degree of change (spirituality) and a small to moderate degree of change. A key finding of the study was that greater appreciation of life was the most commonly endorsed aspect of PTG at 6-months postdischarge and was associated with higher levels of subjective impairment and depressive symptoms at that time point.

In accordance with previous research, level of subjective impairment was found to be significantly related to level of depressive symptoms at both time of discharge and 6-months follow-up (Malec, Testa, Rush, Brown, & Moessner, 2007). The relationship between subjective impairment and depression is likely to be a reciprocal one, whereby increased recognition of the functional consequences of ABI contributes to depressive symptoms which, in turn, serves to magnify one's focus on personal difficulties and activity limitations (Malec, Brown, Moessner, Stump, & Monahan, 2010). Consistent with Tedeschi and Calhoun's (2004) theory of PTG, greater perceived impact of the trauma (i.e., subjective impairment) was found to be associated with increased depressive symptoms at discharge, and predicted higher levels of PTG at 6-months follow-up. Such findings indicate that, at discharge, individuals who perceive the impact of the ABI on their personal abilities and lifestyle to be greater are more likely to undergo psychological changes that challenge how they view the world and themselves in it. It is well recognised that the early community reintegration period is a key time for adjustment, during which individuals begin to more fully comprehend the implications of their ABI for everyday life and the future (Ownsworth et al., 2011; Turner, Fleming, Ownsworth, & Cornwell, 2011). The present findings extend the literature by indicating that individuals recognising greater functional consequences of their ABI at discharge are more likely to derive positive meaning from their ABI at 6-months follow-up.

TABLE 5
Pearson's Correlations between Subjective Impairment, Depressive Symptoms and the Five Domains of the PTGI

PTGI domains (6-months postdischarge)	Depressive symptoms at discharge	Subjective impairment at discharge	Depressive symptoms at 6-months follow-up	Subjective impairment at 6-months follow-up
Relating to others	-.11	.10	-.03	.08
New possibilities	.14	.22	.20	.12
Personal strength	.17	.19	-.05	.07
Spiritual change	-.15	.09	-.09	.12
Greater appreciation for life	.11	.28	.34*	.35*

Note: * $p < .01$ (adjusted alpha due to multiple correlations). PTGI = Post-Traumatic Growth Inventory.

Tedeschi and Calhoun's (2004) theory of PTG argues that significant emotional distress is a pre-requisite for PTG, and that such distress propels individuals to: (a) ruminate over the traumatic event and its aftermath (initially in an automatic sense and later as more a more deliberate process) and (b) employ coping efforts to reduce distress, including self-disclosure, seeking social support, forming new goals and positive reappraisal of the situation. In turn, such rumination and coping efforts stimulate fundamental changes in personal beliefs, behaviours, identity and the development of 'wisdom' (Tedeschi & Calhoun, 2004; Zoellner & Maercker, 2006). This model specifically predicts that 'enduring distress' promotes the emergence of PTG. However, in the present study depressive symptoms at discharge and 6-months follow-up were not significantly associated with overall level of PTG.

Although the relatively small sample size ($n = 60$) may have affected statistical power, it is likely that the modest level of PTG reported in this study can account for these nonsignificant results. Classification levels have not been established on the PTGI; however, it is noteworthy that the mean total PTGI score of 33.47 ($SD = 18.26$) was considerably lower than levels reported after bereavement, war trauma and breast cancer (see Tedeschi & Calhoun, 2004). In comparison to other ABI studies, the level reported was similar to that reported on the PTGI by Powell et al. (2007) ($M = 36.5$) at approximately 7 months following TBI. Higher scores were reported by Gangstad et al. (2009) ($M = 50.9$), although the mean time since stroke was much longer ($M = 32$ months) than time since injury in the present study. In their study, Gangstad et al. (2009) reported a significant negative correlation between PTGI and depression. Consistent with the present findings, Hawley and Joseph (2008) found no significant association between PTG and depression in individuals at approximately 7 months post-ABI. However, level of PTG was significantly greater at approximately 10 years follow-up, when a significant negative association between PTG and depression was evident.

In the current study, the aspect of PTG most evident at 6-months follow-up was a greater appreciation for life, which was significantly positively associated with level of subjective impairment and depressive symptoms, thus supporting Tedeschi and Calhoun's (2004) view that emotional distress and PTG co-exist. Overall, these findings suggest that although the perceived impact of ABI plays a key role in stimulating the broader meaning-making process after ABI,

higher levels of both subjective impairment and distress may promote reevaluation of one's priorities and values in life. It is likely that individuals assessed at this relatively early stage of adjustment after ABI are still processing the meaning of their injury and its repercussions in other respects (e.g., personal strengths, new possibilities, relationships with others) and are yet to experience some conditions that are theorised to be important for developing PTG.

Related to this viewpoint, it is important to acknowledge that awareness of deficits and cognitive impairment were not examined within the current study. It is possible that individuals who lack self-awareness of their impairments, and/or have greater cognitive impairment take longer, or potentially have less capacity for developing PTG, given that the manner in which people cognitively process the meaning of a traumatic event is believed to be pivotal for growth (Tedeschi & Calhoun, 2004). Other theories of PTG, such as the Janus-Face-model of self-perceived PTG (Maercker & Zoellner, 2004), may have greater utility in guiding future research in this area. This two-component model highlights that PTG has a functional and adaptive side, whereby individuals initially struggle with their trauma but then experience profound positive changes (i.e., Tedeschi & Calhoun's account) and a distorted, self-deceptive and illusory side. The latter side could initially serve to offset emotional distress, through associated coping strategies such as denial and avoidance (Zoellner & Maercker, 2006). In the long term, it is predicted that, like persisting awareness deficits, ongoing self-deception may interfere with the development of adaptive coping strategies and increase psychological vulnerability to stress (e.g., see Ownsworth, 2005). The functional or 'self-transcending' component of the model predicts that with greater time since trauma, positive relationships between PTG and mental health are more likely to emerge, which is supported by the general PTG literature (Helgeson et al., 2006) and other ABI studies (Collicut-McGrath & Linley, 2006; Gangstad et al., 2009; Hawley & Joseph, 2008; Thompson 1991).

It is recommended that future research examine the utility of the two-component model of PTG in the context of ABI. Such research could investigate whether key factors relevant to ABI (e.g., awareness of deficits, cognitive impairment) and well as the components in theories of PTG (e.g., cognitive processing styles, self-disclosure, social support) can account for differences in levels of PTG at various stages of adjustment. Measures of specific coping strategies have been

recommended to distinguish the adaptive versus illusory sides of PTG (see Zoellner & Maercker, 2006). Prospective longitudinal research is needed to monitor the trajectory of PTG over time and determine both early and long-term associations between PTG and the key variables of subjective impairment, awareness deficits, cognitive function, coping strategies and emotional distress.

Limitations

This study had a number of limitations that need to be acknowledged. In particular, there was considerable heterogeneity in the cause of injury and length of hospitalisation. Such diverse sample characteristics affect the generalisability of the findings to specific types of ABI or severity subgroups. The participant attrition analysis suggests that the results may be less generalisable to females, those with longer hospital stays and to those who were unemployed prior to their ABI. Although the focus of the study was on subjective impairment, it would have been useful to include a measure of objective functional status to determine whether level of disability influenced the degree and nature of PTG reported at follow-up. Related to this issue, self-awareness was not measured to assess the influence of awareness deficits on PTGI. For practical reasons the 6-months follow-up assessments were conducted over the telephone. Telephone administration of self-report measures such as the DASS and MPAI-4 is common practice in brain injury research (Malec et al., 2010; Ownsworth et al., 2008); however, research is yet to determine whether mode of administration influences responses on these particular tools as well as the PTGI.

Furthermore, the PTGI has not been extensively used in the ABI population. In the present study the total PTGI had good internal consistency; however, internal consistency for the subscales was variable ($\alpha = .60-.81$). Further examination of the PTGI's psychometric properties is warranted, including a factor analysis to determine the tool's construct validity for this population. Overall, the findings from this preliminary study must be interpreted in the context of these limitations. More research into the nature, mechanisms and functions of PTG can ultimately guide the development of psychological interventions to promote positive psychological adjustment to ABI.

Conclusion

The present study found that levels of PTG at 6-months postdischarge were modest with the greatest changes evident in the domain of a greater appreciation of life. As hypothesised, level of PTG was significantly related to subjective impairment at

discharge; however, PTG was not related to depressive symptoms at discharge. Individuals endorsing a greater appreciation for life were found to report significantly higher levels of subjective impairment and depressive symptoms at 6-months postdischarge. Overall, the findings indicate that the process of reevaluating priorities and values in life after ABI is related to greater recognition of the functional consequences of ABI and emotional distress during early community reintegration. Further research is needed to characterise the trajectory of PTG over time, and factors related to its development.

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