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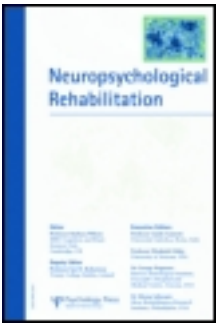

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Post-traumatic growth, illness perceptions and coping in people with acquired brain injury

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Post-traumatic growth, illness perceptions and coping in people with acquired brain injury

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Post-traumatic growth is a process by which an individual who has faced a significantly adverse and life-altering event, can show evidence of an ability meaningfully to construe benefits from such adversity. The purpose of this study was to investigate, in a sample of people with acquired brain injury (ABI), the contribution of illness perceptions, distress, disability, and coping strategies and health to post-traumatic growth. Seventy people with an ABI took part in this cross-sectional investigation, comprising 70% males and 30% females. Traumatic brain injury accounted for the majority of brain injuries (56%), with 31% arising from a cerebrovascular accident and the remaining 13% arising from hypoxia, brain tumours, brain abcesses and encephalitis. The average time since injury was 70.43 months ($SD = 55.30$, range = 7–350). Participants completed assessments comprising post-traumatic growth (Post-traumatic Growth Inventory), beliefs about their condition (Illness Perception Questionnaire Revised), coping strategies (Brief COPE), anxiety and depression (Hospital Anxiety and Depression Scale) and functional disability (Functional Independence Measure and Functional Assessment Measure). All participants were accessing post-acute brain injury rehabilitation and support services. Results showed that greater levels of post-traumatic growth were associated with greater use of adaptive coping strategies (r=.597), lower levels of distress ($r = -.241$) and stronger beliefs about treatment-induced controllability of the effects arising from brain injury (r=.263). Greater use of adaptive coping strategies accounted for the greater proportion

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of the variance in post-traumatic growth ($sr^2 = 0.287$) and was the only variable found to make a unique and statistically significant contribution to the prediction of growth. Illness perceptions more generally were not significantly associated with growth experiences. This study provides additional evidence of the factors associated with the process of post-traumatic growth, in particular adaptive coping strategies that may help to facilitate growth, although the direction of this relationship requires further empirical investigation. The findings of this study may have implications for professionals providing neurorehabilitation services.

***Keywords*:** Post-traumatic growth; Acquired brain injury; Illness perceptions; Coping.

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INTRODUCTION

Acquired brain injury (ABI) is the leading cause of death and disability in young adults (18–24 years); risk of ABI increases again in older age. ABI affects approximately 200 per 100,000 individuals (Hyder, Wunderlich, Puvanachandra, Gururaj, & Kobusingye, 2007) and is associated with a high likelihood of life-long functional challenges, including a range of physical, cognitive, emotional and behavioural changes and is frequently associated with both personal and social difficulties for individuals (Jones et al., 2011). Given the ramifications of brain injury, survivors can face a dramatically altered life as a result.

While research commonly and appropriately focuses on post-ABI diminution of functioning, such as difficulties with social or community integration, cognitive deficits and symptoms of psychological distress (Cattelani, Zettin, & Zoccolotti, 2010; Hesdorffer, Rauch, & Tamminga, 2009; Horner, Selassie, Lineberry, Ferguson, & Labbate, 2008), within the past 12 years a more positive conceptualisation of the experiences of people with ABI has gained momentum. In particular, the idea that injury to the brain can represent a significant event which can challenge and change, not solely in a negative way, the person's values, beliefs and behaviour across a number of dimensions of experience (Collicutt-McGrath, 2011; Collicutt-McGrath, & Linley, 2006; Hawley & Joseph, 2008; Nochi, 2000; Powell, Ekin-Wood, & Collin, 2007; Powell, Gilson, & Collin, 2012). Such positive changes, which have been termed post-traumatic growth (or adversarial growth) in the literature, may include (1) a change in priorities about what is important in life, (2) development of new interests and opportunities, (3) increased perception of competence and self-reliance, (4) acceptance of one's vulnerability and negative emotional experiences, (5) improved inter-personal relationships, (6) increased compassion and empathy for others, (7) greater appreciation of

one's own existence, (8) greater appreciation for life, and (9) an increase in religious faith or spirituality (Tedeschi & Calhoun, 2004).

Linley and Joseph (2004) refer to post-traumatic growth as the positive changes that some individuals experience through the process of struggling with adversity. However, "post-traumatic growth is not simply about coping but refers to changes that cut to the very core of our way of being in the world" (Joseph, 2011, p. 147). As described by Tedeschi, Park, and Calhoun (1998), post-traumatic growth can be seen as developing out of a cognitive process that is initiated to cope with traumatic events that extract an extreme cognitive and emotional toll. In addition, Zoellner and Maercker (2006) propose a two-component model of post-traumatic growth (the Janus-Face model of growth; Maercker & Zoellner, 2004). This model suggests that post-traumatic growth has a functional, self-transcending or constructive side and also an illusory, self-deceptive or dysfunctional side (Zoellner & Maercker, 2006).

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Acquired brain injury and growth experiences

While the issue of positive psychological growth has been examined over the past 20 years across a number of conditions and events that have potential to be traumatic (for reviews see Hefferon, Grealy, & Mutrie, 2009; Helgeson, Reynolds, & Tomich, 2006; Linley & Joseph, 2004; Zoellner & Maercker, 2006), it is only within the past 12 years that the possibility that such growth could exist for people with brain injury has been explored empirically. Nochi (2000) conducted the first qualitative study investigating the reconstruction of self-narratives in coping with traumatic brain injury. Collicutt-McGrath and Linley (2006) carried out the first systematic quantitative study of post-traumatic growth in people with ABI. In their study, they found that people with ABI who had a longer duration since sustaining their injury, reported more growth experiences than people who sustained their injury more recently. Moreover psychological distress (in this case anxiety) tended to be significantly and positively associated with post-traumatic growth, suggesting that distress may provide a springboard for growth. By contrast, in a longitudinal study of 165 people with traumatic brain injury, Hawley and Joseph (2008) found a negative correlation between positive growth (as assessed by the Changes in Outlook Questionnaire; Joseph, Williams, & Yule, 1993) and anxiety and depression at 10 years follow-up suggesting that in the longer term, higher levels of growth seem to be associated with better psychological adjustment. Powell and colleagues (2007) examined a cohort of people with traumatic brain injuries at 11 years post-TBI. The cohort was examined again (Powell et al., 2012) at 13 years post-injury ($n = 21$) and demonstrated that growth was best predicted by individuals having a high level of sense of purpose. Interestingly, there

was no significant change in levels of growth between 11 and 13 years post-injury. Looking at the possibility of growth at 6 months post-ABI, Silva, Ownsworth, Shields, and Fleming (2011) reported a small to moderate degree of growth, with such growth being associated with higher levels of subjective impairment, suggesting the absence of a monotonic relationship between growth and other indices of ABI outcome.

Cognitive representations of ABI

While psychological distress may affect growth, other areas of the person's experience of illness suggest that individuals are not passive objects on which negative events such as illness, disease or trauma impact. Rather people with an ABI are active problem solvers who construct relatively complex cognitive models in relation to their condition and its effects (Whittaker, Kemp, & House, 2007). Leventhal and colleagues (Leventhal, Meyer, & Nerenz, 1980; Leventhal et al., 1997) developed the Self-Regulation Model which proposes that the cognitive representation of a condition tends to be oriented around a number of areas of the experience of a condition: namely beliefs about (1) identity or symptoms associated with the label of a particular condition, (2) timeline or perceptions about how long the condition will last (acute, chronic or cyclical), (3) the nature of the perceived consequences of the condition, (4) beliefs about potential causes, (5) issues of control or cure (personal or treatment-induced), (6) coherence – whether the condition makes sense to the person, and (7) the emotional representations of the condition (emotional reactions to the experience of the condition and/or symptoms) (Frostholm et al., 2005).

Using the Illness Perception Model in their study on patients with mild head injury, Whittaker et al. (2007) found that beliefs about the seriousness and enduring nature of their injury was a significant factor in accounting for risk of experiencing significant and enduring post-concussional symptoms. Similar findings with respect to poor outcomes were reported by Snell, Siegert, Hay-Smith, and Surgeonor (2011) in mild traumatic brain injury. Little is known about the effects of illness perceptions on more positive outcomes in people with more severe brain injuries. One study by Gangstad, Norman, and Barton (2009) found cognitive processing (positive cognitive restructuring, downward comparison, resolution and denial) to be an important process for engendering post-traumatic growth after stroke. It is clear that the role that illness perceptions play in the development of growth experiences warrants further investigation.

The aim of this current study was to examine the contribution of illness perceptions, distress, and coping to post-traumatic growth in people with ABI. Using Leventhal et al.'s (1997) Self-Regulation Model of Illness Behaviour as a basis, we sought firstly to investigate the relationship between

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distress and post-traumatic growth. Secondly, given that cognitive moderators and coping strategies can be powerful determinants of recovery following traumatic brain injury (Godfrey, Knight, & Partridge, 1996), and the well-established finding that focusing on negative emotions (particularly for long periods) can impede adjustment (Thompson et al., 2010), we hypothesised that maladaptive coping strategies would be associated with distress. Finally, we hypothesised that participants' cognitive representations of their condition (beliefs about consequences, emotional representations, coherence, and personal control) would account for the greatest proportion of the variance in post-traumatic growth.

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METHOD

Participants

A total of 100 individuals with acquired brain injury who fulfilled inclusion criteria (18–65 years old and English as a first language), and who were deemed to be appropriate to contact by the multidisciplinary team were approached regarding participation in the study. Initial contact was through a letter of invitation and an advertisement providing a background to the study and what would be involved for participants. Follow-up phone calls were made to those who expressed an interest in taking part in the study and arrangements made to meet them for the purposes of conducting an interview. In addition to the inclusion criteria above, exclusion criteria were applied as follows: (1) presence of a communication disorder that would prevent the successful completion of a semi-structured interview, (2) a level of cognition that would prevent the successful completion of a semi-structured interview, and (3) presence of a major medical illness unconnected to the acquired brain injury. Of the 100 individuals contacted, 70 individuals (70%) agreed to take part in the study. All participants were accessing post-acute rehabilitation and support services in the Republic of Ireland.

Participants were aged between 19 and 65 years ($SD = 12$). Seventy percent ($n = 49$) of the sample were men and 30% ($n = 21$) were women. Traumatic brain injury (TBI) accounted for 56% of the brain injuries ($n = 39$), 31% ($n = 22$) had suffered a cerebrovascular accident (CVA) and 13% ($n = 9$) had suffered other types of brain injury including hypoxia, brain tumours, brain abscesses and encephalitis. Of the 39 participants who had a traumatic brain injury, 87% were classified as severe brain injury and 13% were classified as moderate brain injury. Of the 31 participants who had a non-traumatic brain injury, all were classified as moderate brain injuries. The average time since injury was 70.43 months ($SD = 55.30$, range = 7–350). Of the 70 participants, 69 self-identified as Irish and one as Asian.

Eleven participants (16%) were residing in residential rehabilitation services, while the remaining 84% ($n = 59$) lived at home. Fifty-seven percent ($n = 40$) were living with family. Seventy percent ($n = 49$) were unemployed or retired on ill-health grounds, while 30% ($n = 21$) were engaged in full-time, part-time or volunteer work or had returned to education. The majority of participants (56%, $n = 39$) were single. In relation to education level, 6% had left school without formal qualifications ($n = 4$), 24% ($n = 17$) had attained junior/intermediate certificate (GCSE) level, 36% ($n = 25$) had completed their secondary school education (A level), with one third of participants ($n = 24$) having gone on to third level education (34%).

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Measures

Demographic information. Information was collected on gender, age, time since injury, severity of brain injury, type of ABI, current access to ABI services, employment status, relationship status, living status, occupation prior to injury, education level, alcohol use, previous mental health history and ethnicity. Severity of traumatic brain injury was classified according to the criteria proposed by the Medical Disability Society – The Management of Traumatic Brain Injury (Royal College of Physicians, 1988) utilising duration of post-traumatic amnesia, duration of unconsciousness and Glasgow Coma Scale score. Severity of non-traumatic brain injury was determined by functional status using the Functional Independence Measure (Turner-Stokes, Nyein, Turner-Stokes, & Gatehouse, 1999).

Post-traumatic growth. The Post-Traumatic Growth Inventory (PTGI; Tedeschi & Calhoun, 1996) is a 21-item scale used to measure positive outcomes/post-traumatic growth reported by people who have experienced traumatic events. It includes five factors: (1) Relating to Others, (2) New Possibilities, (3) Personal Strength, (4) Spiritual Change, and (5) Appreciation of Life. Each item is scored on a six-point Likert-type Scale (0 = I did not experience this change as a result of my crisis, 5 = I experienced this change to a very great degree as a result of my crisis). Possible scores for the entire scale range from 0 to 105. It has been previously utilised in research with people with brain injury (e.g., Powell et al., 2007; 2012). The PTGI has good internal reliability (full scale $\alpha = .90$; separate subscales $\alpha = .67–.85$) and test–retest reliability of the full PTGI is adequate ($\alpha = .71$). In the current study Cronbach's alpha coefficient for the full scale was .93.

Cognitive representations. The Illness Perception Questionnaire–Revised (IPQ-R; Moss-Morris et al., 2002) was used to assess components of illness representations from Leventhal's Self-Regulatory Model

(Leventhal et al., 1997). Eight components are examined across 38-items: Identity, Timeline (acute/chronic), Consequences, Personal Control, Treatment Control, Illness Coherence, Cyclical Timeline Perceptions, and Emotional Representations. Except for Identity, the items on the IPQ-R are rated by the patient on a 5-point Likert scale in terms of degree to which they agree with the statement (1 = strongly disagree, 5 = strongly agree). All the subscales show good internal reliability, ranging from $\alpha = .79$ to $\alpha = .89$ (Moss-Morris et al., 2002). The IPQ-R shows good test–retest reliability over a 3-week period with correlations ranging between .46 (personal control) to .88 (risk factor attributes), and acceptable consistency over a 6-month time period. In the current study the Cronbach alpha coefficient for the sub-scales of the IPQ-R ranged from $\alpha = .88$ (identity) to .17 (accident or chance attribution). Sub-scales with an α value of less than .7 were removed from analysis as they had poor internal consistency, resulting in the retention of illness identity ($\alpha = .88$), time-line (acute/chronic) ($\alpha = .84$), treatment control ($\alpha = .7$), emotional representations ($\alpha = .77$), and three causal attributions subscales namely, psychological attributions ($\alpha = .85$), risk factors ($\alpha = .72$) and infection/immunity ($\alpha = .77$).

Coping strategies. The Brief COPE (Carver, 1997) is a 28-item brief version of the scale developed by Carver, Scheier, and Weintraub (1989). This measure incorporates 14 distinct scales of two items each. The scale requires respondents to indicate the extent to which they use the individual coping strategies to cope with a named event – in this case their ABI. Scores range from 1 = I haven't been doing this at all; to 4 = I've been doing this a lot. Coping strategies were divided into those that were considered adaptive (self-distraction, active coping, use of emotional support, use of instrumental support, positive reframing, planning, use of humour, acceptance and use of religion/spirituality) and those considered maladaptive (denial, substance use, venting, behavioural disengagement and self-blame). In terms of reliability and validity of the adaptive and maladaptive subscales, Carver (1997) indicated acceptable Cronbach's alpha values for adaptive coping variables ($\alpha = .57–.82$) and maladaptive coping variables ($\alpha = .50–.90$). In the current study the Cronbach alpha coefficient for adaptive coping was .87 and for maladaptive coping it was .80. The brief COPE has been used previously in studies on people with brain injury (Gillen, 2006; Krpan, Stuss, & Anderson, 2010; Snell et al., 2011).

Distress. The Hospital Anxiety and Depression Scale (HADS; Zigmond & Snaith, 1983), a 14-item measure, was used to assess symptoms of anxiety and depression. Items are rated on a 0–3 point scale indicating the strength of agreement with each item. Thus, scores for each subscale range from 0–21. It has been widely used in studies with patients with brain

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injury and has been shown to be an appropriate measure of anxiety and depression and of distress more generally (e.g., Dawkins, Cloherty, Gracey, & Evans, 2006; Schonberger & Ponsford, 2010). According to Zigmond and Snaith (1983) a score of 8 or above indicates possible clinical levels of anxiety or depression, and a score of 11 or above on either subscale is suggestive of probable clinical disorder. In the current study the Cronbach alpha coefficient for anxiety on the HADS measure was .83 and for depression was .79.

Functional status. The FIM + FAM (Functional Independence Measure and Functional Assessment Measure) scale is designed for measuring disability in the brain injured population (Seel, Wright, Wallace, Newman, & Dennis, 2007; Turner-Stokes et al., 1999). Items are scored on the level of assistance required for an individual to perform activities of daily living. Each item is scored from 1 to 7 based on level of independence, where 1 represents total dependence and 7 indicates complete independence. In the current study the Cronbach alpha coefficient for the FIM was .83 and for FAM was .84.

Procedure

Ethical approval was obtained prior to the start of the study. Participants were recruited from post-acute specialist rehabilitation and support services throughout the Republic of Ireland. Clinicians and local rehabilitation service managers introduced the research project to individuals on their caseload who met inclusion criteria. Information sheets were provided and the researchers discussed the study and clarified any queries. Assessments were administered as part of a face-to-face semi-structured interview.

Data analysis

Data were screened for normality, skewness, kurtosis and to check for outliers. Checks were also made for homogeneity of variance. Group differences were examined using *t*-tests and one-way ANOVAs as appropriate. Correlation analysis was conducted for the main study variables with checks made for violation of the assumptions of linearity and homoscedasticity and to check for outliers. Where there was no violation, Pearson's correlation test was used and where there was violation, Spearman's rho test was used. Hierarchical multiple regression analysis was conducted to investigate the principal research question, with checks made for normality and multicollinearity. Effect sizes (Cohen's f^2, η^2 and effect size r) are provided as appropriate. SPSS version 17 was used for all statistical analyses.

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RESULTS

Study variables

Descriptive data for the main study variables are shown in Table 1. The mean score for post-traumatic growth (PTGI score) was 53.76 ($M = 53.\ 76$, $SD = 22.88$) with a range from 9–99 (from a possible range of 0–105). In relation to illness perception scores, the highest adjusted mean value was for treatment control ($M = 3.57$). Scores on the coping measure show highest mean scores for acceptance ($M = 6.44$, $SD = 1.54$), active coping

TABLE 1
Descriptive statistics for study variables

Variable	*Adjusted Score*[1]	*Mean*	*SD*	*Range*	*Possible Range*
PTGI Total score		53.76	22.88	9–99	0–105
IPQ-R					
Identity	0.40	10.00	4.49	1–21	0–25
Timeline (acute/chronic)	3.56	21.30	4.42	6–29	6–30
Treatment Control	3.57	17.86	3.28	9–25	5–25
Emotional Representations	2.90	17.37	4.18	6–26	6–30
Psychological Attributions	2.10	12.63	5.77	6–25	6–30
Risk Factors	2.12	14.81	5.26	7–27	7–35
Infection/Immunity	1.80	5.39	2.54	3–12	3–15
COPE					
Self–Distraction		5.04	1.70	2–8	2–8
Active Coping		6.21	1.69	2–8	2–8
Denial		3.13	1.54	2–8	2–8
Substance Abuse		2.79	1.47	2–8	2–8
Emotional Support		6.01	1.81	2–8	2–8
Instrumental Support		5.69	1.66	2–8	2–8
Behavioural Disengagement		2.77	1.51	2–8	2–8
Venting		4.10	1.74	2–8	2–8
Positive Reframing		5.43	1.82	2–8	2–8
Planning		5.67	1.68	2–8	2–8
Humour		4.11	2.07	2–8	2–8
Acceptance		6.44	1.54	2–8	2–8
Religion		3.64	1.90	2–8	2–8
Self–Blame		4.06	1.74	2–8	2–8
Adaptive Coping		48.26	10.04	30–71	18–72
Maladaptive Coping		16.84	5.34	10–32	10–40
HADS					
Anxiety		7.27	4.24	0–21	0–21
Depression		5.80	3.78	0–17	0–21
Distress (anxiety and depression combined)		13.07	7.13	1–38	0-42

[1]Adjusted score for IPQ-R represents mean score per item for each subscale.

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($M = 6.21$, $SD = 1.69$) and emotional support ($M = 6.01$, $SD = 1.81$). The mean score for adaptive coping was 48.26 ($M = 48.26$, $SD = 10.04$) from a possible range of 18–72 and the mean score for maladaptive coping was 16.84 ($M = 16.84$, $SD = 5.34$) from a possible range of 10–40. The mean score for anxiety ($M = 7.27$, $SD = 4.24$) was higher than the mean score for depression ($M = 5.80$, $SD = 3.78$). The mean score for functional status/disability was 187.27 ($M = 187.27$, $SD = 16.17$) from a possible range of 30–210 (where a higher score indicates higher functioning).

Associations between demographic and injury characteristics and post-traumatic growth

No significant differences were found between post-traumatic growth scores and the demographic variables of gender, $t(68) = -1.03$, $p = .306$, ES $r = .12$, age ($\leq$39 years; $\geq$40 years), $t(68) = 1.33$, $p = .188$, ES $r = .16$, time since injury ($\leq$ 24 months; 25–120 months; $\geq$121 months), $F(2, 67) = 0.39$, $p = .677$, $\eta^2 = .01$, severity of injury (mild, moderate or severe), $F(2, 67) = 0.366, p = .70, \eta^2 = .01$, type of ABI (RTA, CVA, assault, fall, drug overdose, brain tumour, brain abcess or encephalitis), $F(8, 61) = 0.688$, $p = .70$, $\eta^2 = .08$, access to ABI services, $F(6, 63) = 0.309, p = .923, \eta^2 = .04$, employment status, $F(6, 63) = 1.383$, $p = .235$, $\eta^2 = .12$, relationship status, $F(4, 65) = 0.481, p =. 49, \eta^2 = .03$, living status, $F(3, 66) = 0.037$, $p = .990$, $\eta^2 = .00$, occupation prior to injury, $F(8, 61) = 1.327$, $p = .248$, $\eta^2 = .15$, education level, $F(3, 66) = 1.473$, $p = .230$, $\eta^2 = .06$, or previous mental health history, $t(68) = -1.104$, $p = .274$, ES $r = .13$.

Distress and post-traumatic growth

On the anxiety and depression scales, a score of 8–10 indicates possible clinical levels of anxiety or depression while a score of 11 or above indicates probable clinical levels of anxiety or depression. Eighteen (26%) participants showed possible clinical levels of anxiety and 12 (17%) participants showed probable clinical levels of anxiety. Twelve (17%) participants showed possible clinical levels of depression, and nine (13%) participants showed probable clinical levels of depression. An independent t-test found a significant difference between those showing possible/probable clinical levels of depression ($M = 37.80$, $SD = 17.93$) and those not showing clinical levels of depression ($M = 60.59$, $SD = 21.44$) in post-traumatic growth scores, $t(68) = 4.27$, $p < .001$, ES $r = .46$.

Univariate analyses

Correlation analysis was conducted on post-traumatic growth and weekly alcohol consumption and on post-traumatic growth and the main study

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variables (illness perception, coping and distress). Results for the main study variables are shown in the correlation table (Table 2). Results for Spearman's rho analysis are in the shaded cells of the table. There was no significant association found between post-traumatic growth and weekly alcohol consumption ($r = -.07$, $p = .579$).

Post-traumatic growth. Higher levels of post-traumatic growth was significantly associated with lower levels of distress ($r = -.241$; $p = .044$), higher usage of adaptive coping strategies ($r = .597$; $p < .001$) and stronger beliefs in the controllability of their brain injury from a treatment perspective ($r = .263$; $p = .028$).

Coping. Higher use of maladaptive coping strategies was significantly associated with higher levels of distress ($r = .551$; $p < .001$).

Illness perceptions. A number of illness perception variables were significantly positively associated with distress at a level of $p < .01$, for example illness identity ($r = .442$; $p < .001$), emotional representations (emotional reactions to the experience of symptoms) ($r = .609$; $p < .001$) and attributing the cause of their ABI to psychological factors ($r = .308$; $p = .009$). Controllability of their ABI from a treatment perspective was significantly and positively associated with use of adaptive coping strategies at a level of $p < .01$ (treatment control $r = .426$; $p < .001$).

Multivariate analyses

Hierarchical multiple regression analyses were conducted to examine the relationship between post-traumatic growth and the independent variables that were associated with post-traumatic growth at a level of at least $p < .05$. The variables that met this criterion were: beliefs in treatment control (from the IPQ-R), adaptive coping and distress variables (HADS). Following the Self-Regulation Model (Leventhal et al., 1997), wherein cognitive representations define targets for coping which in turn are suggested to affect factors such as distress (and from this, other outcomes such as growth), "treatment control" was entered in the first step of the model, followed by "adaptive coping" and then "distress".

The model in Table 3 below explained 39% of the variance in post-traumatic growth, $F(3, 66) = 13.80$, $p < .001$. Adaptive coping was the only variable found to make a unique and statistically significant contribution to the prediction of post-traumatic growth accounting for an additional 29%, $sr^2 = .29$, $F(1, 67) = 18.57$, $p < .001$, of the variance in growth, while the other two variables did not make a unique and statistically significant contribution to the prediction of growth in the final regression equations.

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TABLE 2
Correlation: Post-traumatic growth and study variables (Illness Perception, Coping and Distress)

	Variables	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*
1	Total PTG		**.085**	.087	**.263***	.013	**−.079**	**−.098**	**.056**	**.597****	**.066**	**−.241***
2	IPQ Identity			**.433****	.015	**.319****	.156	.070	.206	**.275***	**.342****	**.442****
3	IPQ Timeline				−.228	**.265***	−.057	−.044	.063	.177	.156	**.238***
4	IPQ Treatment Control					**−.330****	−.198	−.161	−.195	**.426****	**−.265***	**−.272***
5	IPQ Emotional Representations						.157	.140	**.353****	.048	**.573****	**.609****
6	IPQ Psychological Attributions							**.809****	**.694****	.213	−.127	**.308****
7	IPQ Risk Factors								**.525****	−.153	−.146	.160
8	IPQ Infection Immunity									−.178	**.270***	**.373****
9	Adaptive Coping										.027	−.126
10	Maladaptive Coping											**.551****
11	Distress											

*$p < .05$ (2-tailed) **$p < .01$ (2-tailed). Shaded values represent non-parametric Spearman's correlations while the non-shaded values represent Pearson's correlations.

TABLE 3
Hierarchical regression analysis: Post-traumatic growth and main independent variables

	β	*Sig.*	R^2	*Effect Size* (f^2)	sr^2	*F*	*Correlation (Part)*
Step 1 Treatment Control	−.036	.743	.069	0.07	.069	5.064	.263
Step 2 Adaptive Coping	.590**	.000	.357	0.55	.287	18.573	.536
Step 3 Distress	−.176	.083	.386	0.62	.029	13.802	−.170

*$p < .05$ **$p < .01$.

The "distress" variable had the next highest beta value with $\beta = -.176$, $p = .08$, followed by "treatment control" with $\beta = -.036$, $p = .74$.

DISCUSSION

This is the first study to date to investigate the contribution of illness perceptions, distress and coping to post-traumatic growth, using the Self-Regulation Model (Leventhal et al., 1997) in a sample of people with acquired brain injury (ABI). The principal objective of this study was to investigate the factors associated with the process of post-traumatic growth and determine which of these factors account for the greatest proportion of the variance in growth.

In the current study the mean score on the PTGI was 53.7, which is somewhat higher than the mean PTGI score reported by Silva et al. (2011) in their study of post-traumatic growth after ABI at 6 months post-discharge ($M = 33.4$), and that reported by Powell et al. (2007) at approximately 7 months following TBI ($M = 36.5$). However, it is similar to the mean PTGI score reported by Gangstad et al. (2009) ($M = 50.9$) where the mean time since injury was 32 months ($M = 32$ months), and is lower than the mean PTGI score reported by Powell et al. (2012) 13.3 years after injury ($M = 64.6$). The mean time since injury in the current study was almost 6 years and duration since injury is a likely explanation for the differences in mean PTGI scores reported by these various studies. In this context, this result supports the contention that more growth experiences are associated with a longer duration since sustaining injury.

In order to provide a fuller explanation of the possible common-sense cognitive processes underpinning growth, we utilised Leventhal's self-regulation theory, which suggests that individuals, when faced with the demands of a

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condition, develop a complex set of cognitive representations about their condition in order to give the problem meaning and enable them to consider suitable coping responses. One of our hypotheses was therefore that participants' cognitive representations of their condition would account for the greatest proportion of the variance in post-traumatic growth. However, this hypothesis was not supported and while distress and stronger beliefs about treatment-induced control of a person's ABI showed some initial relationship to levels of post-traumatic growth, adaptive coping accounted for the greater proportion of the variance in this respect.

Participants developed and identified many types of coping strategies in order to cope with the consequences of their ABI, including both adaptive and maladaptive strategies. We hypothesised that maladaptive coping would be associated with distress and this hypothesis was supported.

While adaptive coping was not associated with distress, it made a significant contribution to post-traumatic growth, suggesting the complexity of the relationships between coping, growth and distress. In terms of associations between the common-sense set of beliefs people held about their ABI, and coping strategies used, it is of interest that a sense of controllability of their ABI, from a treatment perspective, was significantly and positively associated with use of adaptive coping strategies.

Commensurate with the above, it is also recognised that PTG may represent adaptive as well as maladaptive processes for some people (Zoellner & Maercker, 2006). For example, adaptive processes would be representative of an initial struggle with adversity leading to significant positive benefits to the person. For other people, such statements of growth may represent more of a maladaptive process and function as positive illusions. Such positive illusions tend to be related more to issues of cognitive avoidance and denial (Taylor, Kemeny, Reed, Bower, & Gruenwald, 2000) than to adaptational significance. While not denying the possibility of such distorted positive illusions in responses, our results suggest no significant association between such maladaptive coping strategies (e.g., denial, self-blame, behavioural disengagement, etc.) and perceptions of growth in the current sample of people with ABI.

In terms of distress and growth, we found that higher levels of post-traumatic growth were associated with lower levels of distress in the initial correlation matrix. However, levels of distress did not make a significant contribution to growth scores, accounting for just 3% of the unique variance in growth. Previous research has reported somewhat divergent findings with regard to the relationship between post-traumatic growth and distress following trauma from various causes. Some studies have reported small yet statistically significant associations between distress and growth (e.g., Collicutt-McGrath & Linley, 2006; Silva et al., 2011), others have reported either very low or no significant associations (e.g., Ackroyd et al., 2011;

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Danoff-Berg & Revenson, 2005; Fortune, Richards, Griffiths, & Main, 2005) and yet others have reported negative correlations between these two constructs (e.g., Frazier, Conlon, & Glaser, 2001; Hawley & Joseph, 2008; Katz, Flasher, Cacciapaglia, & Nelson, 2001; Milam, 2004; Siegel, Schrimshaw, & Pretter, 2005; Updegraff, Taylor, Kemeny, & Wyatt, 2002). Indeed in their review of PTG and various forms of psychological adjustment, Zoellner and Maercker (2006) found that the inconclusive nature of the relationship between adjustment and growth "does not seem to depend on the nature of the sample, the nature or severity of the traumatic event, or the methods used to measure post-traumatic growth and psychological adjustment" (p. 635).

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Limitations of the study

The participants in this study were receiving post-acute rehabilitation and support services and as such the results may not be generalisable to the entire population of people living with acquired brain injury. In addition, participants consisted of a heterogeneous group in terms of aetiology of brain injury. It is possible that aetiology of injury affected individuals' growth experiences (although no significant differences were found between demographic variables and levels of post-traumatic growth), illness perceptions, distress and coping strategies. Furthermore, although inclusion criteria specified that participants should have capacity to complete the assessments as defined by the local rehabilitation service multidisciplinary team, there was no formal assessment of participant's current cognitive functioning and their awareness of deficits for the purpose of this particular study. This is the focus of a current on-going study. Furthermore, while specific hypotheses may have obviated the need for significant correction to the alpha level for statistical tests, some correlations, while statistically significant, were relatively modest. A final limitation is the cross-sectional design of the study which prevents conclusions being drawn regarding direction of causality between correlated variables.

Conclusion and clinical implications

This study provides an insight into the factors associated with post-traumatic growth after ABI. Post-traumatic growth was initially associated with greater use of adaptive coping strategies, less distress and stronger beliefs about treatment-induced controllability of the effects arising from brain injury. However, in the final regression equations, adaptive coping accounted for the significant proportion of the variance in growth. The direction of causality is unclear, that is, does adaptive coping lead to more growth or does growth, or other factors that contribute to growth, lead to more adaptive coping? A longitudinal study investigating these two constructs would help to clarify further the relationship between these two variables.

These findings may have some clinical utility for clinicians and neurorehabilitation service providers in the promotion of such growth among people with an ABI. PTG can be thought of as an important part of rehabilitation given that a central aim of neuropsychological rehabilitation is the establishment of a meaningful and satisfactory life (Cicerone et al., 2008, p. 2239). This study underscores the importance of raising clinician's awareness of the possibility of growth for their clients, rather than working solely to "fix" a problem, given that a return to a pre-injury state may not be tenable.

Given the findings of the current study, the role that adaptive coping plays in relation to growth may have implications for clinical practice and provides an opportunity to collaborate more cogently on the development or maintenance of adaptive coping. Indeed similar work using a form of coping strategy enhancement has been developed in people with psychosis with good results (Farhall, Greenwood, & Jackson, 2007). While beyond the scope of the current study, the social network surrounding the person with ABI may also provide an opportunity for the development of post-traumatic growth. Some recent research in people with other neurological illness suggests that growth in patients tends to be best predicted by growth in their partners and vice versa (Ackroyd et al., 2011); thus a communal search for meaning seems to be a significant process by which growth may be maintained. Finally, Evans (2011), writing about the potential for positive psychology in rehabilitation, makes the point that the principles of positive rehabilitation (of which PTG is one strand) are consistent with the philosophy of building what is strong rather than solely striving to fix what is wrong.

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