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The Role of Negative Cognitive Appraisals in PTSD Symptoms Following Spinal Cord Injuries

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Abstract. This study aimed to investigate factors associated with persistent Post-Traumatic Stress Disorder (PTSD) in people with Spinal Cord Injury (SCI). In the context of a cognitive model, it sought to determine how influential cognitive appraisals were in predicting persistent PTSD when compared to other known predictor variables in the literature such as injury severity. A sample of 50 inpatients receiving rehabilitation for SCI who were 3–24 months post-injury were interviewed using a series of standardized measures of PTSD symptoms and diagnosis, post-traumatic cognitive appraisals, social support, and injury severity. For PTSD symptoms, significant relationships were found for greater injury severity, lower satisfaction with social support and more negative cognitions. Negative cognitions were found to predict variance in PTSD symptoms over and above the non-cognitive variables, although gender and injury severity were also predictors. The only significant predictor of PTSD diagnosis was the cognitive sub-scale "negative cognitions about the self". Cognitive appraisals were found to be important predictors of persisting PTSD in an SCI population. This supports the cognitive model of PTSD and the development of cognitive therapies for PTSD in this population.

Keywords: PTSD, cognitive appraisals, spinal cord injuries.

Introduction

This study aimed to investigate the factors associated with persisting Post Traumatic Stress Disorder (PTSD) symptoms in a sample of people who have sustained spinal cord injuries (SCI). In particular, it sought to determine the influence of subjective cognitive appraisals of the trauma and its consequences in predicting persistent PTSD symptoms when compared to objective injury severity.

Negative appraisals have not been explored in relation to PTSD in an SCI sample before. Investigation of this would aid confirmation of whether or not the current dominance of cognitive behavioural treatment approaches is justified with traumatically injured people and would help shape priorities for psychological assessment and treatment.

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Ehlers and Clark's (2000) cognitive model of persisting PTSD

Ehlers and Clark (2000) have proposed a cognitive model of PTSD which, while drawing on previous models (e.g. Brewin, Dalgleish and Joseph, 1996; Foa, Steketee and Olasov-Rothbaum, 1989; Foa and Riggs, 1993; Horowitz, 1973 and Janoff-Bulman, 1992), focuses on explaining persistent PTSD. This model postulates that PTSD becomes persistent when individuals process the trauma in a way that leads to a sense of serious current threat. This arises as a consequence of two mechanisms that differ across individuals. Firstly, excessively negative appraisals of the trauma and/or its sequelae, and secondly, disturbance of autobiographical memory. The first will be the focus of this paper.

Ehlers and Clark argue that because appraisals (both of the trauma and its consequences) foster a sense of continued current threat (accompanied by intrusions, arousal symptoms and other distressing emotional responses), the individual is motivated to engage in cognitive and behavioural strategies to reduce perceived threat and distress. Such strategies include avoidance and safety behaviours, which, while reducing distress short-term, maintain the disorder long-term by preventing cognitive change.

Ehlers and Clark (2000) suggest two main types of negative appraisals can produce a sense of current threat that maintains PTSD. First, negative appraisals of the traumatic event, which can arise in several ways – as a result of over-generalizations from the event to perceiving a range of normal activities as more dangerous than they are (e.g. avoidance of driving after a car accident), from exaggerations of the probability of occurrence of further catastrophe in general, and from interpretations of the occurrence of the event happening to them and not others (e.g. "bad things always happen to me").

Second, negative appraisals of trauma sequelae. These include individuals' interpretations of initial PTSD symptoms (e.g. "my reactions since the event mean I'm going crazy"), interpretations of other people's reactions (e.g. "I cannot rely on others") and appraisals of physical consequences the trauma has had in other life domains (e.g. pain or impairment in occupational functioning interpreted as "my life is permanently ruined").

Evidence for the role of negative appraisals in persistent PTSD

The important role of negative appraisals is strengthened by empirical evidence (e.g. Ehlers and Steil, 1995; Foa and Riggs, 1993). Researchers have highlighted a range of core beliefs regarding safety, trust, intimacy, meaningfulness of the world and personal esteem that are vulnerable to disruption following a traumatic experience, particularly if held rigidly (e.g. McCann and Pearlman, 1992; Epstein, 1993; Janoff-Bulman, 1992). Foa, Ehlers, Clark, Tolin and Orsillo, (1999) have collapsed these cognitive themes into three areas. These are outlined here and examined in this study.

First, there are negative cognitions about the self. These include those of initial symptoms (as outlined earlier), of emotional reactions as frightening or uncontrollable (e.g. "I won't be able to control my anger and will do something terrible") and perceptions of permanent change (as outlined earlier). Studies have found relationships between negative cognitions about the self and chronic PTSD (Davis, Brickman and Baker, 1991; Ehlers and Steil, 1995; Foa and Riggs, 1993). Second, negative global beliefs about the world (e.g. "The world is a dangerous place") and people (as outlined earlier) have been highlighted in studies (Dunmore, Clark and Ehlers, 1999; Janoff-Bulman, 1992). Third, there are self-blame cognitions, which include

appraisals of behaviour during the trauma (e.g. "The event happened because of the way I acted"). Researchers have found self-blame cognitions to be associated with greater PTSD (Frazier and Schauben, 1994; Joseph, Yule and Williams, 1993). A measure has been designed to access these appraisals, The Posttraumatic Cognitions Inventory (Foa et al., 1999).

Pertinent to the current study, researchers have found that cognitive appraisals predict equal or more of the variance in PTSD than trauma severity variables both cross sectionally and longitudinally (e.g. Ehlers, Mayou and Bryant, 1998; Dunmore et al., 1999; Steil and Ehlers, 2000; Dunmore, Clark and Ehlers, 2001; Smith, in preparation). Cognitive models currently predominate our psychological understanding of PTSD and there is a growing body of evidence (based on studies of survivors of a range of traumas but mainly road traffic accidents [RTA] and assaults) supporting the role of negative appraisals in persistent PTSD. However, the cognitive model has not been applied to an SCI population and so the role of negative appraisals in the presentation of persistent PTSD in this group remains unknown. This study investigates whether negative appraisals are also predictive of persistent PTSD in this group.

The clinical context – PTSD in SCI samples

PTSD is a distressing condition causing significant impairments to individuals' vocational and social functioning (Shalev, Bonne and Eth, 1996). It is frequently accompanied by other mental health problems such as depression and substance misuse, is associated with increased physical health problems and often has a chronic course (Yule, Williams and Joseph, 1999) with up to 30% of those who experience initial symptoms post trauma continuing to suffer persisting symptoms (Breslau, 1998).

PTSD can be particularly problematic in SCI populations where it can interfere with rehabilitation, adjustment and long-term management of physical disability (Williams, 1997). This is especially pertinent given that the circumstances in which SCIs occur often overlap with those where psychological trauma can occur and PTSD may be expected (Boyer, Tollen and Kafkalas, 1998).

The prevalence of PTSD in those exposed to traumatic events has been estimated at 10–25% in epidemiological studies (Breslau, 1998; Green, 1995). Despite the fact that SCI is one of the most serious physical injuries that can be sustained and so, according to Kennedy and Evans (2001), PTSD can be expected to be a common sequelae, the prevalence rates in SCI samples are similar at 12–33% (Boyer et al., 1998; Kennedy and Evans, 2001; Radnitz *et al*., 1995). This suggests that objective trauma severity alone cannot account for variation in PTSD outcome and so highlights the importance of examining other variables such as appraisals.

Summary

The prevalence of PTSD following SCI is similar to that found in trauma-exposed samples generally. PTSD is problematic in SCI populations because it can interfere with rehabilitation and long-term management of SCI. The expression of trauma following SCI is likely to differ from that of other injured populations due to its severity and rehabilitation requirement. It would therefore be worthwhile to examine the types of negative cognitive appraisals that are most frequent in this population and how strongly they predict chronic PTSD. This would

clarify validation of the cognitive model and provide directions for assessment and treatment of PTSD in this population.

Rationale and hypotheses

The study aimed to investigate predictors of persistent PTSD in an SCI population. Given the current dominance of the cognitive behavioural model in terms of understanding and treating PTSD and the increasing importance of negative appraisals in predicting persistent PTSD, it seemed important to determine how well cognitive factors predict PTSD in populations where other variables are likely to be important (e.g. trauma severity, indexed in this study by injury severity).

In line with research that has found cognitions to predict PTSD variance when non-cognitive variables are controlled (e.g. Dunmore et al., 1999), the present study predicted that cognitions would be positively associated with PTS symptoms. Furthermore, it hypothesized that cognitive factors would predict variance in PTS symptoms and PTSD diagnosis over and above that accounted for by non-cognitive factors, including injury severity or demographic factors, gender, psychiatric history or social support.

Method

Participants

Fifty people who were inpatients receiving rehabilitation at the National Spinal Injuries Centre (NSIC) in Buckinghamshire, UK, between October 2001 and May 2002 were recruited as consecutive admissions where they met inclusion criteria. The NSIC covers a broad geographical region including urban, suburban and rural areas. The service admits people with SCI of any severity for rehabilitation. This was not a completely consecutive sample as it depended on availability and willingness of individuals to participate during the time period. It was therefore subject to sampling biases arising from researcher availability and participant self-selection.

A formal statistical power analysis was not conducted because, to the authors' knowledge at the time of writing, there were no directly comparable studies conducted with SCI populations. An examination of related studies that investigated similar research questions with different populations (that is comparing the relative influence of demographic, trauma-related and cognitive variables on PTSD symptoms – Dunmore et al., 1999) revealed that 50 participants would be adequate to test the hypotheses. Additionally, a sample size of 50 was considered adequate to use linear regression analysis given nine independent variables (Tabachnick and Fidell, 2001).

Participants were included if aged 18–65, 3–24 months post injury (so participants can qualify for "chronic PTSD" where they met diagnostic criteria), had experienced a traumatic onset SCI (e.g. from accident rather than illness, a distinction made in previous research that increased comparability) and were newly injured (i.e. not readmitted, for example, for complications from the injury – to control for effects of community experience). Participants were excluded if they sustained moderate-severe head injury (HI) at the time of SCI. Presence of HI was determined by documentation in medical notes. Where HI was not documented, the patient was excluded if he/she reported unconsciousness for >15 minutes at the time of injury.

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This cut off was used in previous research to distinguish minor from moderate HI (Mayou, Black and Bryant, 2000). Participants were also excluded where ward staff deemed them too unwell to participate and/or unable to understand English and/or had cognitive disabilities that would have prevented independent completion of the questionnaires.

Design

A single group survey design using standardized questionnaires was used. It was cross-sectional, examining concurrent predictors of PTSD symptomatology using multiple regression analyses.

Measures

Single item self-report questions were used to obtain information on age, gender, cause of injury, period of unconsciousness and psychiatric history.

Injury severity (indexed by impairment and disability severity). a) Impairment severity. Impairment severity was determined using an adaptation of Frankel Classification (Frankel *et al*., 1969, devised by Kennedy and Rogers, 2000). They developed a 5-point scale that groups levels of injury according to functionally significant boundaries. Incomplete injuries (Frankel-grades D and E) scored zero, while complete injuries (Frankel-grades A, B and C) were rated as follows: C1 to C4 = 5, C5 to C7 = 4, C8 to T7 = 3, T8 to T12 = 2 and L1 and below = 1. Higher scores indicate greater impairment. This scale has been widely used in research (e.g. Kennedy et al., 2000; Kennedy and Rogers, 2000). *b) Disability severity.* The Functional Independence Measure (FIM, Hamilton and Granger, 1990) was used to measure disability severity. It quantifies extent of disability by assessing physical and cognitive functioning. It is an 18-item self-report measure assessing six areas of function: self-care, sphincter-control, mobility, locomotion, communication and social cognition. The FIM has been used in SCI research (e.g. Kennedy et al., 2000) and has been standardized and found to be internally consistent (Stinemen et al., 1996) with good reliability (Segal, Ditunno and Stass, 1993) and validity (Grey and Kennedy, 1993).

The Posttraumatic Diagnostic Scale (PDS; Foa, 1995). The PDS is a 49-item self-report measure designed to diagnose PTSD. The structure and content map on to DSM-IV diagnostic criteria. After consultation with two inpatients with SCI, the nine questions about impairment in social and occupational functioning were altered to make them appropriate for this population. They were collapsed into three areas: 1) work/rehabilitation progress; 2) social life/leisure activities; and 3) family life and home responsibilities. Examples were tailored to inpatient-life (e.g. regarding work, they were asked to consider rehabilitation progress). The criterion F requirement of two endorsed categories was retained even though this may have made the diagnosis more stringent.

The PDS has been validated with a large sample ($n = 264$) of male and female victims of a wide range of traumas. It is a recognized diagnostic tool for PTSD (Foa, Cashman, Jaycox and Perry, 1997) and has also been used with SCI samples (Boyer et al., 1998). The PDS demonstrates high internal consistency, good test re-test reliability and high sensitivity and specificity (Foa et al., 1997). In terms of validity, the PDS shares good diagnostic agreement with the Structured Clinical Interview for DSM (SCID; Spitzer, Williams and Gibbon, 1987).

The Impact of Event Scale (IES; Horowitz, Wilner and Alvarez, 1979). The IES is a 15-item self-report measure of subjective distress related to two characteristic aspects of post-traumatic psychopathology, intrusion and avoidance. Although not suitable for diagnosing PTSD (Joseph, 2000) it is the most widely used self-report measure of PTSD symptoms, both clinically and in trauma-research (Jeavons, 2000) and has been used with SCI populations (e.g. Radnitz et al., 1998). It was found to be highly significantly correlated with PTSD severity (Radnitz, et al., 1998) and to discriminate well between individuals who are not being treated but have experienced similar levels of objective trauma (Horowitz et al., 1979). Both sub-scales have been shown to have high test-retest reliability estimates and high internal consistency (Zilberg, Weiss and Horowitz, 1982).

The Posttraumatic Cognitions Inventory (PTCI; Foa et al., 1999). The PTCI is a 33-item measure of trauma-related thoughts and beliefs. It was derived from clinical observations and current theories of post-trauma psychopathology. The PTCI specifies three sub-scales of negative appraisals: about the self (21 items, range = 21–147), about the world (7 items, range = 7–49) and self-blame (5 items, range = 5–35). Participants rate strength of agreement with each statement (e.g. "I can't stop bad things happening to me") on a 7-point scale ranging from 1 (totally disagree) to 7 (totally agree). The mean score for each sub-scale is summed to give a total score (range = 33–231). The researchers are unaware of any normative severity cut-offs for this measure. In their validation study, Foa et al. (1999) found the PTCI to have a stable factor structure, high internal consistency and good test-retest reliabilities. They found evidence of good convergent, predictive and criterion-related validity.

The Short Form Social Support Questionnaire (SSQ6; Sarason, Shearin, Pierce and Sarason, 1987b). The SSQ6 is a 6-item version of the original 27-item SSQ (Sarason, Levine, Basham and Sarason, 1983). It yields two measures of social support: one is quasi-structural and provides information on the number of supports available. Participants list up to nine people who provide particular types of support. Scores range between 0–54. The other is a global functioning measure of satisfaction with support. Participants rate satisfaction with types of support on a scale of 1 (very dissatisfied) to 6 (very satisfied). Scores range from 6–36. There are no norms for the SSQ6 so it is impossible to identify whether individual scores reflect high or low levels of support or satisfaction. Both number and satisfaction sub-scales show high internal consistency and high test re-test reliability (Sarason et al., 1987b). Sarason, Sarason, Shearin and Pierce (1987a) report considerable evidence for the validity and sensitivity of the original scale and Sarason et al. (1987a) report the SSQ6 has similar properties.

Procedure

The local research ethics committee granted ethical approval. Patients were individually approached and introduced to the study both verbally and via an information sheet and given a day to think about whether they wished to participate. The researchers ensured that there were many opportunities to ask questions and a contact number was provided for further queries. Those who were unwilling to participate were thanked for their time and reminded that their decision would not affect their treatment in any way. Those who agreed to participate were then met at an agreed time in a private room. They were given a consent form followed by the questionnaires, administered in a structured interview format to standardize administration

Table 1. Distribution of impairment severity scores

Impairment severity category	Score	Frequency	Percentage
C1 to C4	(5)	8	16
C5 to C7	(4)	17	34
C8 to T7	(3)	9	18
T8 to T12	(2)	8	16
L1 and below	(1)	3	6
Frankel Grades D and E	(0)	5	10
Total		50	100

for participants with paraplegia and tetraplegia. The researchers emphasized their right to withdraw at any time without explanation and that this would not affect their treatment. Participants were offered a copy of the results on completion of the study.

Results

Characteristics of the sample

Of 62 consecutive admissions, 9 were excluded due to age, language or HI and 3 declined making a sample size of 50. No significant differences were found between participants and non-participants on demographic characteristics (age: Mann Whitney test, $U = 226.000$, $p = .634$; and gender: Fisher's Exact test, $p = .126$) or on injury characteristics (level of injury-paraplegia/tetraplegia: χ^2 (1) .397, $p = .528$; completeness of injury: Fisher's Exact test, $p = .591$ and severity of impairment: Mann Whitney test, $U = 213.500$, $p = .114$).

Of the 50 participants, 43 (86.0%) were men and 7 (14.0%) women. The mean age was 38.9 years ($SD = 13.42$, range = 20.1–65.1 years). Six (12%) reported a psychiatric history and 44 (88%) did not.

For cause of injury, 25 (50.0%) sustained their injuries in RTAs, 13 (26.0%) through sporting accidents, 10 (20.0%) through falls and 2 (4.0%) through other causes (one suicide attempt and one through gunshot). For time since injury, 30 (60%) were injured between 3–6 months ago at the time of participation, 9 (18%) between 6–9 months, 7 (14%) between 9–12 months, 1 (2%) between 18–21 months and 3 (6%) between 21–24 months. Thirty-four (68.0%) had complete injuries and 16 (32.0%), incomplete injuries.

For injury level, 30 (60%) had tetraplegia and 20 (40%) had paraplegia. Table 1 shows the spread of injuries as categorized by the impairment severity measure. For the FIM, the mean score was 81.34 ($SD = 26.92$, range = 41–126). Note lower FIM scores denote greater disability.

Twelve participants (24%) met the diagnostic criteria for PTSD (as measured by PDS) and 38 (76%) did not. For PTS symptoms, the total IES mean was 15.00 ($SD = 15.12$, range = 0-57). The intrusion sub-scale mean was 6.92 ($SD = 6.90$, range = 0–23) and the avoidance sub-scale mean was 8.08 ($SD = 8.99$, range = 0–36).

Posttraumatic cognitions were measured using the PTCI total and sub-scale scores. The mean total was 78.86 ($SD = 31.14$, range = 37–162). The sub-scales had scaled scores as follows; negative cognitions about the self (mean = 2.15, $SD = 1.01$, range = 1.00–5.14),

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negative cognitions about the world (mean = 3.04, $SD = 1.36$, range = 1.00–6.29) and self-blame (mean = 2.50, $SD = 1.62$, range = 1.00–6.60).

Relationship between negative appraisals and PTS symptoms

A Pearson's correlation revealed a significant positive relationship between PTCI total score and PTS symptoms ($r = .651$, $p < .0005$). Significant positive relationships also emerged between two of the three PTCI sub-scale scores and PTS symptoms, "negative cognitions about the self", ($r = .594$, $p < .0005$) and "negative cognitions about the world", ($r = .628$ $p < .0005$). There was no significant correlation between "self-blame" and PTS symptoms ($r = .204$, $p = .078$) although there was a trend in the expected direction. Since this finding did not reach significance, it should be interpreted cautiously. The findings are summarised in Table 2.

Relationship between negative appraisals and PTSD diagnosis

Mann-Whitney tests revealed significant differences between the PTSD and no-PTSD groups in PTCI total scores ($U = 67.000$, $p < .0005$), "negative cognitions about the self" scores ($U = 48.000$, $p < .0005$) and "negative cognitions about the world" scores ($U = 110.000$, $p < .005$), where the PTSD group had higher scores. However, there were no significant differences in the PTSD and no PTSD groups for self-blame ($U = 163.000$, $p = .133$).

Linear regression analysis

A linear regression was performed with PTS symptoms as the dependent variable. The independent variables were entered in the following blocks:

1. The three cognition sub-scales including "negative cognitions about the self", "negative cognitions about the world" and "self-blame". The "enter" method was used.
2. Injury severity (disability severity only), gender, psychiatric history and social support (numbers and satisfaction). The impairment severity rating was ordinal and so unsuitable for linear regression. The "enter" method was also used for block 2.

For block one, where the cognitive variables were entered, the multiple $R = .712$ and adjusted $R^2 = .486$. This was significant (F (2,47) = 24.168, $p < .0005$). Examination of this regression equation revealed the significant predictors were negative cognitions about the self ($t = 3.276$, $p = .002$) and negative cognitions about the world ($t = 3.835$, $p < .0005$).

In block two, where the non-cognitive variables were entered, the amount of explained variance increased to multiple $R = .798$ and adjusted $R^2 = .576$. This significantly contributed to the prediction of PTS symptoms ($F(7,42) = 10.508$, $p < .0005$). Examination of this regression equation revealed there were no significant predictors but two variables approached significance: gender ($t = 2.365$, $p = .023$) and disability severity ($t = -2.288$, $p = .027$). See Table 3.

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Table 2. Summary correlation analyses

	Gender	Impairment severity	Previous psychiatric history	Social support numbers (SSQ6)	Social support satisfaction (SSQ6)	Disability severity (FIM total)	PTCI negative cognitions re. self	PTCI negative cognitions re. world	PTCI self blame	PTS symptoms (IES total)	PTSD diagnosis (PDS)
Gender	1	.093	.206	−.085	.070	.008	−.051	.013	−.104	.204	.043
	50	.519	.152	.555	.631	.957	.725	.927	.470	.155	.766
		50	50	50	50	50	50	50	50	50	50
Impairment severity		1	−.060	.057	−.207	−.606**	.241	.137	−.144	.278	.157
		50	.677	.694	.150	.001	.092	.344	.317	.050	.278
			50	50	50	50	50	50	50	50	50
Previous psychiatric history			1	−.090	−.169	.189	−.101	.022	−.108	.029	.225
				.534	.241	.188	.485	.877	.456	.843	.117
			50	50	50	50	50	50	50	50	50
Social support numbers				1	.040	−.090	−.051	−.245	−.206	.016	−.035
					.782	.536	.727	.086	.151	.911	.810
				50	50	50	50	50	50	50	50
Social support satisfaction					1	.067	−.373**	−.311*	−.011	−.355	−.389**
						.643	.008	.028	.939	.012	.005
					50	50	50	50	50	50	50
Disability severity						1	−.263	−.284	−.025	−.441**	−.158
						50	.065	.046	.866	.001	.272
							50	50	50	50	50
PTCI negative cognitions re. self							1	.476**	.347*	.594**	.623**
								.001	.014	.001	.001
							50	50	50	50	50
PTCI negative cognitions re. world								1	.310*	.628**	.348*
								50	.029	.001	.013
									50	50	50
PTCI self blame									1	.204	.182
									50	.155	.207
										50	50
PTS symptoms										1	.541**
										50	.001
											50

Table 3. Summary statistics of predictive variables within the multiple linear regression

Predictor	Unstandardized coefficients B	Standard error	*t*	Sig.
Negative cognitions about the world	.710	.185	3.835	.001
Negative cognitions about the self	5.687	1.736	3.276	.002
Gender	9.795	4.142	2.365	.023
Injury severity (disability only)	−.130	.057	−2.288	.027

Logistic regression analysis

A binary logistic regression was performed because the dependent variable (PTSD diagnosis) was discrete rather than continuous. The independent variables were entered in the following blocks:

1. The three cognition sub-scales including "negative cognitions about the self", "negative cognitions about the world" and "self-blame". The "enter" method was used.
2. Injury severity (using both disability severity and impairment severity), gender, psychiatric history and social support (numbers and satisfaction). The "enter" method was also used for block 2.

The first model was found to be significant as indicated by the chi-square statistic (X^2 (3) = 20.837, $p < .0005$) and correctly predicted 84% of the PTSD and non-PTSD cases. The second model was also found to be significant X^2 (9) = 28.881, $p = .001$) and increased the accuracy of the prediction to 92% of the PTSD and non-PTSD cases. No significant predictor variables were identified.

Discussion

This study aimed to investigate factors associated with persisting PTSD symptoms and diagnosis in an SCI sample. Within the framework of a cognitive model, it sought to determine how predictive cognitive appraisals would be when compared with other known predictor variables from the empirical literature. These were injury severity, gender, psychiatric history and social support.

Summary and interpretation of results

Representativeness of the sample. The demographic and injury characteristics reflect the national epidemiological statistics for people who sustain traumatic SCI (Kennedy, 1991). The sample was comparable to previous research in terms of age (Radnitz et al., 1995) and gender (Kennedy and Evans, 2001). The most common cause of SCI in the present sample was RTA and there were approximately even numbers of people with tetraplegia (60%) and paraplegia (40%). These findings mirror previous research (e.g. Boyer et al., 1998). There were no significant differences between the present study and Kennedy and Evans' in disability severity (using mean scores on FIM).

PTS symptom scores were similar to those reported by Kennedy and Evans (2001). For PTSD diagnosis, the present study found 24% met DSM-IV criteria. This takes an intermediate

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position in the range reported in previous SCI samples, with Radnitz et al. (1995) reporting 12–17% and Boyer et al. (1998) reporting 33%.

The findings

The relationships between cognitive factors and PTS symptoms and diagnosis. Significant positive relationships were found for total negative cognitions and two of the sub-scales, "negative cognitions about the self" and "negative cognitions about the world" in relation to PTS symptoms and diagnosis. There was a positive trend for "self-blame" relating to higher PTS symptoms. However, no relationship was found between "self-blame" and PTSD diagnosis. This overall pattern of findings is consistent with the theoretical assertion of the cognitive model, that negative appraisals about the trauma and sequelae play a key role in chronic PTSD (Ehlers and Clark, 2000).

The significant findings for "negative cognitions about the self" are supported by the empirical research of Ehlers and Steil (1995) and Foa and Riggs (1993). Dunmore et al. (1999) assert that "negative cognitions about the self" can maintain persistent PTSD through creating a sense of persistent current threat that resides *within* the person. For example, the experience of PTS symptoms can be viewed as a sign of inadequacy ("I am weak"). Some may interpret their emotional responses as signs of being "unstable" or "out of control". Such emotions therefore become a threat to their view of themselves. Dunmore et al. assert that inability to trust oneself can lead to particularly pervasive anxiety, avoidance and impairment in daily functioning. Furthermore, they assert that cognitions regarding one's life having been permanently damaged can impede acceptance and may contribute directly to diminished interest and the sense of a foreshortened future, characteristic of PTSD.

The significant findings for "negative cognitions about the world" support the findings of Dunmore et al. (1999) and Janoff-Bulman (1992). The former argue that negative cognitions about the world can lead to a sense of current threat by motivating individuals to engage in avoidance and safety behaviours that maintain negative beliefs in the long term by protecting them from disconfirmation.

The trend for "self-blame" to be associated with increased PTS symptoms was in the predicted direction. "Self-blame" has been related to social withdrawal and a lower likelihood of discussing the trauma with others (Joseph et al., 1993). Ehlers and Clark (2000) assert that social withdrawal can maintain PTSD through the reduction of opportunities for therapeutic reliving.

The lack of findings for "self-blame" in relation to PTSD diagnosis is inconsistent with most of the empirical literature (e.g. Frazier and Schauben, 1994). The fact that it was the smallest sub-scale of the PTCI (only 5 items in all) may have meant that it lacked sufficient variance. This coupled with the inhibiting effect of grouping for diagnostic comparisons may have made significant findings less likely.

The predictive power of cognitive factors and other demographic factors. The regression analyses found that cognitive variables significantly predicted unique variance in PTS symptoms and PTSD diagnosis over and above the non-cognitive variables. These findings are consistent with the empirical literature (e.g. Dunmore et al., 1999; Ehlers et al., 1998; Steil and Ehlers, 2000).

The strongest predictors of PTS symptoms were "negative cognitions about the world" followed by "negative cognitions about the self". It found that some of the non-cognitive variables approached significance (gender and disability severity) and that the addition of non-cognitive variables generally, increased the amount of variance predicted.

The combined effect of cognitive (accounting for 48.6% of the variance) and non-cognitive variables in increasing the accuracy of prediction (to 57.6% of the variance) can perhaps be understood as a model of interactions, as advocated by Brewin, Dalgleish and Joseph (2000) in understanding their meta-analytic findings. They assert their data are consistent with a model in which pre-trauma factors interact with trauma severity and trauma responses to increase the risk of PTSD. Joseph et al. (1993) emphasize that responses to trauma are multiply-determined and argue that although the first determinant is trauma severity (as the necessary aetiological factor in PTSD), the emotional processing of the trauma interacts with other factors within the individual and his/her environment. They assert that negative appraisals are likely to contribute to the severity and chronicity of PTSD symptoms.

Applying this assertion to the present findings, it is likely that injury severity could have influenced the content of negative cognitions. For example, those with more severe injuries may be more likely to have "permanent change" cognitions, which prevent them accepting the trauma and viewing it as a past event. It is also possible that pre-trauma factors (such as gender) may exert a separate influence on how the trauma is perceived and responded too in terms of cognitive appraisals. Such a model may help account for the amount of individual variance in the chronicity and severity of PTS symptoms across individuals (Joseph et al., 1993).

A similar interpretation can perhaps be applied to the logistic regression analysis, where both the first and second models were found to be significant. Cognitions alone correctly predicted 84% of PTSD and no PTSD cases and when non-cognitive variables were added, this prediction went up to 92%. However, there were no significant predictor variables, which may reflect the attenuating effect of the diagnostic grouping in reducing the likelihood of significant findings.

Methodological critique

The cross-sectional design of this study was a major limitation. It prevented an examination of causality in any of the observed relationships and a determination of "true" predictors of chronic PTSD, which only a longitudinal design could have accomplished. Although the overall sample size was relatively small, the attrition rate was low (4.8% declined to participate). No significant differences were found between participants and non-participants on demographic and injury characteristics. This suggests that the study was representative of the inpatient SCI population. However, it may be less representative of the SCI population with chronic PTSD. Participants were recruited 3–24 months post-injury, which could be viewed as being on the "early" side of PTSD chronicity. It is reasonable to expect a greater proportion of people with chronic PTSD to be outpatients with potentially different risk factors. However, the fact that the majority of people with SCI experience a lengthy in-patient rehabilitation phase coupled with the fact that early PTSD symptoms have been shown to be stable over time increases the representativeness of this sample to the chronic PTSD SCI population.

Like many similar studies, this study consisted of a series of questionnaires, validated as self-report instruments, administered in an interview format. As such, their reliability

and validity following interview administration is questionable and should be interpreted cautiously. Participants' responses could have been influenced by a response bias related to being interviewed, which may have inflated or minimized scores.

Clinical implications

PTSD can be problematic in SCI populations because it can interfere with rehabilitation progress and can impair long-term adjustment to disability (Williams, 1997). Indeed poor adjustment to SCI has been shown to have important economic as well as clinical implications (e.g. more frequent hospital admissions and poorer physical health long-term, Galvin and Godfrey, 2001).

In the present study, a significant proportion of the participants (24%) met the criteria for chronic PTSD. This figure would rise considerably if sub-syndromal PTSD were also considered. The fact that considerable numbers of people with SCI develop PTSD following injury, with associated serious effects on long-term physical health, coupled with the fact that early symptoms often lead to chronic PTSD, points to the importance of early detection of symptoms. There is an imperative to make assessment and intervention as effective as possible to promote secondary prevention of chronicity.

The findings have highlighted the importance of negative appraisals (over and above other non-cognitive variables) in the prediction of chronic PTSD. This is promising clinically as it indicates that changeable aspects explain variance beyond that explained by unchangeable aspects suggesting opportunities for treatment and secondary prevention of the disorder (Shalev, 2001). The study also provides support for the cognitive model of persistent PTSD and confirms its relevance to understanding PTSD in a SCI sample. Ehlers and Clark (2000) advocate cognitive behavioural therapy (CBT) to modify negative appraisals that lead to the sense of current threat.

Notwithstanding the limitations previously described, the findings may have a role in informing the knowledge bases of clinical psychologists. Clinical psychologists have important roles in teaching and consultation to rehabilitation staff regarding the detection of PTSD, how to provide clients with early normalizing information about PTS symptoms so that PTSD-related difficult client behaviour can be understood in this context. Williams (1997) asserts that rehabilitation staff should routinely provide realistic assessments of emotional disorder as well as physical limitations. Williams also notes that, unlike adjustment disorders, PTSD is unlikely to resolve at the end of rehabilitation and so it is important to also liaise with and educate community services in the provision of ongoing support.

Future research directions

Beyond the need for a replication of the findings with a larger sample and longitudinal design, an important untapped research area is a close examination of what the "core" or causal trauma(s) are for individuals following SCI. The SCI can involve several potential traumas such as the initial event, the realisation of the implications of injury or other factors (Boyer et al., 1998). This has not been previously investigated and may be best explored through qualitative designs or single case series.

Research determining "core" traumas for individuals could facilitate the exploration of relationships between the content of the core trauma and negative appraisals. This

may help narrow down a range of predictive cognitions for those with SCI and could lead to the development of shorter screening measures. It may also help to illuminate theoretical understandings of interactions and mediating influences between injury variables and individual variables in chronic PTSD presentations. In terms of interactions, it would be interesting to examine the impact of SCI on the wider social environment of the individual, when both inpatient and outpatient.

The present study only examined one of two key variables specified by Ehlers and Clark's cognitive model of PTSD. It would be worthwhile if future research examined the other, that is, a disturbance of autobiographical memory and, in particular, the interaction between this and negative appraisals. This may help to further clarify the mechanisms through which chronic PTSD is mediated.

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