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Psychological characteristics of people with spinal cord injury-related persisting pain referred to a tertiary pain management center

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Abstract—This study examines the psychological characteristics of a cohort of individuals with spinal cord injury (SCI) and persisting pain referred to a tertiary pain management center. Forty-five individuals completed measures of pain, mood, disability, and both pain- and SCI-related psychological variables such as self-efficacy and catastrophizing. Compared with a general pain clinic population attending the same tertiary pain management center (n = 5,941), the sample was found to have lower pain intensity, comparable pain catastrophizing levels, and less activity interference due to pain. In contrast, those with SCI pain reported poorer mood. Pain catastrophizing was associated with anxiety, depression, and activity interference due to pain; pain self-efficacy was close to being significantly associated with these variables also. SCI acceptance and self-efficacy were also associated with some of these variables. These findings suggest that the biopsychosocial model of pain is applicable in this sample and that further treatment benefits could be obtained through use of interventions targeting psychological and social variables within this model.

Key words: acceptance, anxiety, catastrophizing, depression, disability, pain, pharmacotherapy, rehabilitation, self-efficacy, spinal cord injury, treatment.

INTRODUCTION

Background

Research has consistently demonstrated that chronic pain among individuals with spinal cord injury (SCI) is associated with increased psychological distress and reduced physical function [1–5]. Within the biopsychosocial model of chronic pain, chronic pain as a psychological phenomenon following SCI has only recently attracted systematic attention [1–5]. Studies investigating the role of pain coping strategies and cognitions in the context of SCI pain have found that in addition to pain intensity itself, these variables contributed significantly to variation in mood and physical function among these samples [2,4–5]. In addition, more general aspects of adjustment to SCI, such as locus of control, are important in accounting for

Abbreviations: HADS = Hospital Anxiety and Depression Scale, MCS = (SF-12) Mental Component Score, MPI = Multidimensional Pain Inventory, MSES = Moorong Self-Efficacy Scale, PCS = (SF-12) Physical Component Score, PRSS-Catastrophizing = Pain-Related Self-Statements Scale—Catastrophizing Subscale, PSEQ = Pain Self-Efficacy Questionnaire, SCI = spinal cord injury, SCL CSQ = Spinal Cord Lesion-Related Coping Strategy Questionnaire, SD = standard deviation, SF-12 = (Medical Outcomes Study) Short Form Health Survey-12, SF-36 = (Medical Outcomes Study) Short Form Health Survey-36.

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variation in mood and disability [6–10], with recent evidence showing a synergistic interaction between pain and low SCI self-efficacy in their effect on health-related quality of life [11].

Despite a burgeoning body of literature concerning chronic pain in community samples of people with SCI, only one study in the literature concerns those with SCI presenting to pain management services [12]. They are an important group to understand, however, as their pain problems are significant enough to motivate them to seek treatment. In addition, much of the existing literature on community samples of people with SCI pain suggests a high degree of dissatisfaction with currently available treatments, which are largely dominated by pharmacological treatments [1,13]. In other chronic pain populations, cognitions associated with pain-related distress and disability, such as pain catastrophizing, have provided an important additional target for intervention. However, whether these variables are equally salient in those with SCI presenting to pain clinics is unclear. Identifying whether cognitions, such as pain catastrophizing and pain self-efficacy, have the same importance in those presenting for treatment of their SCI pain as in other chronic pain populations will help clarify whether interventions targeting them, such as pain management programs, play a role in their management. In addition, examining whether other variables, such as SCI self-efficacy, are as significant among this subgroup of the SCI population as in the wider SCI population will help to clarify whether more broadly based psychological interventions may play a part.

Aims of Current Study

This study examined psychological factors associated with SCI-related chronic pain among a sample presenting to a tertiary pain service. The aims were to compare this group to a group with general chronic pain conditions seeking treatment in the same tertiary pain service and to examine the relationships between pain intensity, mood, physical function, and both pain-related and SCI-related psychological variables within the SCI group.

Our specific hypotheses were that individuals with SCI-related chronic pain would have levels of usual pain, pain catastrophizing, pain self-efficacy, life interference due to pain, and mood consistent with those with general chronic pain conditions presenting to the same pain management center. We also hypothesized that the SCI group would have lower levels of physical function than those with general chronic pain conditions. In addition, we hypothesized that within the SCI-related chronic pain sample, usual pain, pain catastrophizing, and pain self-efficacy would be significantly correlated with symptoms of anxiety and depression and that, likewise, SCI acceptance and SCI self-efficacy would be significantly correlated with symptoms of anxiety and depression.

METHODS

Participants

Our SCI-related chronic pain sample was outpatients attending a pain management center between 2005 and 2007. All had an SCI (of either traumatic or nontraumatic origin) and persistent pain and had been referred for a multidisciplinary evaluation of their pain problems. Inclusion criteria were having a confirmed SCI and a related persistent pain problem lasting 3 months or longer and exclusion criteria included command of English inadequate to complete questionnaires, psychotic disorders, and traumatic brain injury sufficient to interfere with ability to complete the questionnaires (assessed clinically on report of a history of loss of consciousness and posttraumatic amnesia for 24 hours or longer).

Our general chronic pain conditions sample was patients presenting to the same pain management center between June 1994 and May 2004 for assessment of general chronic pain conditions arising from a range of origins [14]. A total of 6,124 patients presented during this period, of whom 5,941 (97%) completed a set of commonly used questionnaires on a number of dimensions of pain. Traumatic onset of pain was reported in 43.3 percent of the sample.

Measures

Demographic Checklist

The demographic checklist records age; sex; marital, educational, and occupational status (based on standardized hospital format); pain sites; and usual intensity of pain on an 11-point numerical rating scale. In the SCI-related chronic pain sample, scores were converted to "mild," "moderate," and "severe" pain based on previous studies of the relevant cut-points in SCI samples [15].

Pain-Related Self-Statements Scale—Catastrophizing Subscale

The Pain-Related Self-Statements Scale—Catastrophizing Subscale (PRSS-Catastrophizing) is a nine-item self-report inventory that measures the frequency of a patient's catastrophic cognitions that impede the individual's ability to cope with severe pain [16]. Patients are asked to rate the frequency with which they experience particular catastrophic thoughts during an episode of pain, and the overall score is calculated with a range of 0 to 5, with higher scores reflecting more frequent endorsement of catastrophic thoughts. No previous reports have been published on the use of this measure in a sample with SCI-related chronic pain; however, the PRSS Catastrophizing is a well validated and widely used measure in clinical chronic pain samples [16]. The Cronbach alpha coefficient in the SCI-related chronic pain sample was 0.84 and in the general pain conditions sample was 0.86.

Pain Self-Efficacy Questionnaire

The Pain Self-Efficacy Questionnaire (PSEQ), a 10-item self-report inventory that meas-ures patients' beliefs about their ability to complete a range of daily activities in spite of the presence of pain [17], is based on Bandura's concept of self-efficacy [18]. Patients are asked to rate how confident they are that they could currently complete various specified tasks despite having pain by selecting a number on a 7-point scale, from 0 = "not at all confident" to 6 = "completely confident." Responses on each of the items are summed, with a total score ranging from 0 to 60, with higher scores indicating higher levels of confidence. The reliability and validity of the PSEQ are established [17] and the measure is used widely in clinical chronic pain samples; however, this measure has not previously been reported in people with SCI pain. The Cronbach alpha coefficient in the SCI-related chronic pain sample was 0.91, and in the general pain conditions sample was 0.93.

Multidimensional Pain Inventory

The West Haven-Yale Multidimensional Pain Inventory (MPI) is a 60-item self-report questionnaire based on the cognitive behavioral model of chronic pain [19]. A modified version for SCI has been developed (MPI-SCI) and the reliability and validity examined [20–21]. For this study, we used the Life Interference subscale, which is an overall estimation of the perceived interference to physical functioning due to pain and is recommended by the Initiative on Methods, Measurement, and Pain Assessment in Clinical Trials group as a core outcome measure for chronic pain treatment studies [22].

Medical Outcomes Study Short Form Health Survey-12

The Medical Outcomes Study Short Form Health Survey-12 (SF-12) is a 12-item self-report questionnaire that assesses symptoms, functioning, and health-related quality of life [23]. It generates a Mental Component Score (MCS) and a Physical Component Score (PCS) and uses a subset of items from the longer Medical Outcomes Study Short Form Health Survey-36 (SF-36) that was designed for use in general practice. The SF-12 has been validated for use among people with SCI [24], and this study found that neurological impairment was associated with the PCS but not the MCS. A scorer validated on the Australian community was used to score the responses [25]. Scores on each component are designed to have a mean of 50 and standard deviation of 10, with lower scores denoting greater disability. Scores between 40 and 50 represent mild disability, between 30 and 40 represent moderate disability, and 30 and below represent severe disability.

The participants from the SCI-related chronic pain sample also completed the additional measures described next.

SCI Checklist

The SCI checklist records the neurological level, completeness, and date of SCI. These details were confirmed clinically by the pain specialist as part of the medical component of the multidisciplinary pain assessment.

Moorong Self-Efficacy Scale

The Moorong Self-Efficacy Scale (MSES) is a 16-item self-report questionnaire that assesses the respondent's confidence in his or her ability to complete a range of daily tasks despite having an SCI on a 7-point Likert scale from 1 = "very uncertain" to 7 = "very certain" [26]. The total scale score is obtained by calculating the sum of the individual scores with a range from 16 to 112; higher scores indicate higher levels of confidence. Reliability and validity have been established in an Australian sample of people with SCI [26]. The Cronbach alpha coefficient in the current study was 0.93.

Spinal Cord Lesion-Related Coping Strategy Questionnaire

The Spinal Cord Lesion-Related Coping Strategy Questionnaire (SCL CSQ) is a 12-item self-report questionnaire

that assesses the degree to which the respondent endorses a series of statements representing three coping strategies used by people to cope with SCI: acceptance (revaluation of life values), fighting spirit (minimizing the effect of the injury), and social reliance (tendency toward dependent behavior) [27–29]. Respondents respond on a 4-point scale from 1 = "strongly disagree" to 4 = "strongly agree." Scores for each domain are obtained by calculating the mean value of each item within that domain, giving an overall score with a range from 1 to 4 with higher scores indicating higher endorsement of the domain. The scales were originally constructed and validated in Swedish, and subsequently English and German versions have been developed. In a recent evaluation of the psychometric adequacy of the English and German versions of the SCL CSQ [30], only the acceptance subscale was found to be valid. Therefore, only this subscale is used in this study. The Cronbach alpha coefficient for the acceptance subscale in this study was 0.74.

Hospital Anxiety and Depression Scale

The Hospital Anxiety and Depression Scale (HADS) is a 14-item self-report inventory that assesses the frequency of symptoms on an Anxiety subscale (seven items) and Depression subscale (seven items) [31]. Respondents rate each item on a 4-point scale from 0 = "not at all" to 3 = "very often indeed." Scores for each subscale are summed, with higher scores indicating higher frequency of symptomatology. The HADS has been widely used in populations with physical pathology, including post-SCI with adequate internal consistency [32]. It is considered useful in such populations because of the relative lack of somatic items. The HADS manual recommends that the raw scores on each dimension be used to identify mild (scores of 8–10), moderate (scores of 11–15), and severe cases (scores of 16) [33]. In the current study, the Cronbach alpha coefficients for the anxiety and depression subscales were 0.83 and 0.86, respectively.

Procedures

All clients with an SCI referred to a specialized pain management center for a multidisciplinary evaluation of pain between February 2005 and June 2007 were asked to complete the measures as part of the standard assessment procedure. Participants were asked to give consent for their assessment data to be included in the research project and were provided with written information and a consent form approved by the appropriate human research ethics committee. Fifty-two people with SCI-related chronic pain were assessed during the study period. Four individuals were excluded because they did not meet inclusion criteria (traumatic brain injury, $n = 1$; inadequate English, $n = 3$), and three refused to complete the questionnaires. A total of 45 individuals were suitable for inclusion in the study and willing to participate.

Statistical Methods

All analyses were conducted with the SPSS 12 statistical computer package (SPSS, Inc; Chicago, Illinois). Because of missing values in some of the data, participants with missing data of less than 10 percent on an individual scale had the individual items replaced with a prorated value based on their responses to other items on that scale. In the event that more than 10 percent of values for a scale for an individual participant were missing, the response for that scale was scored as missing.

We inspected the distribution of all study variables to ensure that they met the assumptions of the statistical tests performed. All scales met conditions for normality and hence parametric tests were used. All tests were two-tailed, and statistical significance was set at $p < 0.05$. Because of the exploratory nature of the study, the importance of identifying possible differences between the SCI and general pain clinic samples, as well as the small sample size, we did not adjust the level of statistical significance set in the comparisons between the two groups. However, to provide some protection against Type I errors in examining the relationships between variables within the SCI-related chronic pain sample, we applied the Bonferroni adjustment. With 9 variables examined, this requires $p < 0.05/9 = 0.005$ for significance. With such small numbers, this does raise the risk of Type II errors, but we decided to err on the conservative side.

The scores of the SCI-related chronic pain sample on each of the measures were compared with those of the general pain conditions sample with two-sample *t*-tests. For the scores on the SF-12 MCS and SF-12 PCS, the variances in the two samples were markedly different and therefore we handled this difference as recommended by Ferguson and Takane [34]. We calculated Pearson correlation coefficients between usual pain intensity and the other variables.

RESULTS

Demographic and SCI Variables

Demographic and descriptive details of the sample are reported in **Table 1**. The mean age of the SCI-related

Table 1.
Demographic characteristics of participants.

Characteristic	SCI-Related Chronic Pain Sample *n* (%)*	General Pain Conditions Sample *n* (%)
Sex		
Male	38 (84)	2,528 (43)
Female	7 (16)	3,413 (57)
Marital Status		
Single	11 (24)	800 (18)
Defacto or Married	25 (55)	2,886 (64)
Divorced or Separated	4 (9)	544 (12)
Educational Status		
Year 11 or Lower	2 (4)	2,395 (55)
High School	20 (44)	453 (10)
Vocational/Technical College	13 (29)	1,529 (35)
Undergraduate Study	1 (2)	—
Postgraduate Study	4 (9)	—
Other (Not Specified)	1 (2)	—
Employment Status		
Employed	11 (24)	1,348 (30)
Self-Employed	3 (7)	394 (9)
Student	1 (2)	—
Homemaker	1 (2)	462 (10)
Retired	8 (19)	804 (18)
Unemployed	16 (36)	1,430 (32)
Level of Injury		
Tetraplegia	14 (31)	—
Paraplegia	26 (58)	—
Completeness of Injury		
Complete	20 (44)	—
Incomplete	23 (51)	—

*Percentages based on total sample; thus where data are missing, they may not add up to 100%.
SCI = spinal cord injury.

chronic pain sample was 46 ± 16 years, with mean duration of 93 months of injury (range 3–389 months) and 52 months of pain (range 3–336), respectively. (Data are shown as mean ± standard deviation [SD] unless otherwise indicated.) The sample with general chronic pain conditions had a mean age of 48 ± 16 years, with a mean duration of pain of 80 ± 111 months. A summary of individual participants' SCI and pain characteristics is provided in **Table 2**.

Comparison of SCI and General Pain Clinic Samples

The mean level of usual pain intensity among the SCI-related chronic pain sample was 5.3 ± 1.7, which is significantly lower than the score of 6.4 ± 2.1 in the general pain conditions sample (t (43) = 4.047, $p < 0.001$).

In two of the measures available for both samples, the scores for each group were consistent. The SCI-related chronic pain sample had a level of pain catastrophizing comparable to that of the general pain conditions sample (t (45) = –0.364, $p = 0.718$). In addition, scores on the SF-12 PCS were similar, contradicting the predicted lower levels of physical functioning in the SCI-related chronic pain sample (t' = –1.809, $t'0.05 = 2.016$, $p > 0.05$) (**Table 3**).

In the remaining measures that were available for both samples, significant differences existed between the two samples. Notably, the SCI-related chronic pain sample reported lower scores on the Life Interference subscale of the MPI ($t(43) = 9.702$, $p < 0.001$), as well as having significantly higher levels of pain self-efficacy ($t(45) = –5.286$,

Table 2.

Patient spinal cord injury (SCI) and pain characteristics of SCI-related chronic pain sample ($n = 43^{*}$).

Sex	Age	Level of Lesion	Months Since Injury	Completeness	Cause	Pain Type	Pain Duration (Months)
M	39	NK	58	C	T	BLNP	58
F	57	T2	44	I	NT	BLNP; MS†	60
M	41	C6	5	C	T	BLNP	5
M	27	T4	18	C	T	ALNP; BLNP; MS	17
M	37	L1	116	I	T	BLNP	116
M	52	L3	5	I	T	BLNP	4
F	55	CE	26	I	NT	MS; O	16
M	23	T11	25	C	T	BLNP	25
M	22	C5	71	I	T	BLNP	71
M	64	T12	121	I	T	BLNP	118
M	25	T9	12	C	T	BLNP; MS†	14
F	42	T5	8	C	T	ALNP	7
M	54	C4	9	I	T	ALNP	8
M	47	T12	336	I	T	BLNP	336
M	60	T11	4	I	T	BLNP	3
M	37	C4	156	NK	T	BLNP; VP	90
M	64	C4	7	I	NT	BLNP; O	7
F	44	T12	325	I	T	BLNP; MS	NK
M	33	T12	10	I	T	MS; ALNP; O	3
M	45	C3	12	I	T	ALNP; O	7
M	64	T4	24	C	T	ALNP	22
M	68	C4	26	I	NT	BLNP	24
M	31	T7	4	C	T	BLNP	4
M	28	NK	13	I	NT	BLNP; MS	13
M	67	L1	6	I	T	BLNP	6
M	23	T12	28	I	T	ALNP	4
M	29	T12	18	C	T	ALNP; BLNP	5
M	33	NK	235	NK	T	BLNP	160
M	19	C4	23	C	T	ALNP, BLNP	6
F	48	C5	34	I	T	BLNP	15
M	44	NK	212	NK	T	NK	104
M	69	T7	47	C	T	BLNP	40
F	75	C5	71	I	NT	BLNP	60
M	59	NK	367	C	T	BLNP	8
M	21	L1	24	I	T	BLNP	22
F	53	T3	275	C	T	BLNP	131
M	70	C5	14	C	T	BLNP	14
M	55	C5	251	C	T	ALNP; MS	251
M	60	T10	5	I	T	BLNP; MS	5
M	45	T11	7	C	T	ALNP	7
M	45	L1	4	I	T	O	4
M	46	T12	294	C	T	BLNP; O	294
M	81	CE	62	I	T	BLNP; O	62

*Full details not available for two participants.

†Due to non-SCI causes.

Sex: F = female, M = male.

Level of lesion: C = cervical, CE = cauda equina, L = lumbar, NK = not known, T = thoracic.

Completeness: C = complete, I = incomplete, NK = not known.

Cause: NT = nontraumatic, T = traumatic.

Pain Type: ALNP = at-level neuropathic pain, BLNP = below-level neuropathic pain, MS = musculoskeletal pain, O = other pain (including cauda equina, central cord, complex regional pain syndrome, and syringomyelia), VP = visceral pain.

Table 3.
Mean ± standard deviation of variables.

Variable	SCI-Related Chronic Pain Sample (n = 45)	General Chronic Pain Conditions Sample (n = 5,941)
SCL CSQ Acceptance	2.9 ± 0.7	NA
MSES	75.1 ± 22.4	NA
PRSS Catastrophizing	2.6 ± 1.1	2.7 ± 1.2
PSEQ	35.9 ± 12.8	25.5 ± 13.8
MPI* Life Interference	3.1 ± 1.6	4.3 ± 1.2
SF-12 MCS	42.1 ± 7.3	55.5 ± 21.1
SF-12 PCS	38.1 ± 6.3	39.9 ± 25.3
HADS Anxiety†	7.5 ± 4.3	—
HADS Depression†	7.4 ± 4.3	—

*In case of those with SCI, amended version was completed.

†Not completed by general chronic pain conditions sample.

HADS = Hospital Anxiety and Depression Scale, MPI = Multidimensional Pain Inventory, MSES = Moorong Self-Efficacy Scale, PRSS = Pain-Related Self-Statements Scale, PSEQ = Pain Self-Efficacy Questionnaire, SCL CSQ = Spinal Cord Lesion-Related Coping Strategy Questionnaire, SF-12 MCS = (Medical Outcomes Study) Short Form Health Survey-12 Mental Component Score, SF-12 PCS = SF-12 Physical Component Score.

$p < 0.001$). However, in contrast, the SCI-related chronic pain sample reported significantly lower SF-12 MCS scores ($t' = -11.942$, $t'0.05 = 1.040$, $p < 0.05$). On the basis of these scores, the SCI-related chronic pain sample fell into the "mild disability" category, while those in the general pain conditions sample were in the "no disability" category.

Associations Between Variables in SCI Pain Sample

Correlations between the variables measured are reported in **Table 4**. Using a Bonferroni correction, we set the required p-value at 0.005 for all correlations. In the SCI-related chronic pain sample, injury duration and pain duration were significantly positively correlated (r = 0.684, $p < 0.001$) with each other but not with any other variables. Usual pain intensity was significantly associated only with the MPI Life Interference Subscale score, although this was a relatively weak correlation [35]. The correlation with the HADS Anxiety score (r = 0.422, p = 0.008) and PRSS-Catastrophizing (r = 0.397, p = 0.008) were close to significance. No significant correlation existed between usual pain intensity and other measures of mood and physical functioning.

Predictably, the mood measures (HADS Anxiety and Depression subscales and the SF-12 MCS) had low to moderate levels of association. Moderate associations also existed between mood measures and the pain-specific psychological variables (pain catastrophizing and pain self-efficacy). In addition, depression scores were also significantly correlated with the two SCI-related psychological variables (MSES and SCI acceptance), of which the relationship with SCI acceptance was the strongest association found. In contrast, contradictory to the predictions of the biopsychosocial models of pain, no statistically significant associations existed between scores on the SF-12 PCS and any of the other variables examined. However, the association of the SF-12 PCS with the MSES scores was close to significance (r = 0.426, p = 0.006). As would have been expected, the MPI-SCI Life Interference Subscale score was moderately associated with pain catastrophizing and both pain and SCI self-efficacy.

As would be expected from other chronic pain samples, a significant negative association existed between pain self-efficacy and catastrophizing. However, significant associations also existed between all the other cognitive variables. These were generally low, aside from the relationship between pain self-efficacy and SCI acceptance, which would be considered moderate.

DISCUSSION

Comparisons with Others Attending Tertiary Pain Services

This SCI-related chronic pain sample attending a tertiary pain management center was significantly different in a number of important ways from the sample with general pain conditions attending the same center [14]. Contrary to what was predicted, the usual level of pain intensity among the SCI-related chronic pain sample was significantly lower than that reported by those with general pain conditions. However, this may not be a clinically significant difference, because in both cases the mean scores fell into the moderate severity category [15]. The current SCI-related chronic pain sample also reported that their pain was associated with less interference and higher levels of pain self-efficacy. While we are unsure what is responsible for this difference between the samples, at least two possibilities exist. First, the difference may be due to difficulties estimating the relative contribution to function of the SCI itself or the associated pain. Second, the difference may be a form of response shift, the sample having experienced the devastating impact on function of acute SCI. Although we note that the SCI-related chronic pain sample had significantly higher levels of pain self-efficacy than the general pain conditions sample, the former group's scores were still substantially lower than levels consistent with

Table 4.
Correlations (*r*) in SCI-related chronic pain sample (*n* = 45).

Variable	SCL CSQ Acceptance	MSES	PRSS Catastrophizing	PSEQ	MPI-SCI Life Interference	SF-12 MCS	SF-12 PCS	HADS Anxiety	HADS Depression
Usual Pain Intensity	–0.119, $p = 0.476$	–0.358, $p = 0.027$	0.397, $p = 0.008$	–0.197, $p = 0.265$	0.481, $p = 0.002$	–0.230, $p = 0.165$	–0.266, $p = 0.106$	0.422, $p = 0.008$	0.225, $p = 0.174$
SCL CSQ Acceptance	—	0.469, $p = 0.002$	–0.465, $p = 0.002$	0.657, $p < 0.001$	–0.426, $p = 0.008$	0.319, $p = 0.051$	0.174, $p = 0.295$	–0.425, $p = 0.006$	–0.777, $p < 0.001$
MSES	—	—	–0.459, $p = 0.003$	0.499, $p = 0.004$	–0.549, $p = 0.001$	–0.317, $p = 0.052$	0.426, $p = 0.006$	–0.428, $p = 0.006$	–0.592, $p < 0.001$
PRSS Catastrophizing	—	—	—	–0.459, $p = 0.005$	0.579, $p < 0.001$	–0.430, $p = 0.006$	–0.147, $p = 0.378$	0.616, $p < 0.001$	0.524, $p = 0.001$
PSEQ	—	—	—	—	–0.539, $p = 0.002$	0.528, $p = 0.002$	–0.069, $p = 0.720$	–0.474, $p = 0.009$	–0.511, $p = 0.003$
MPI-SCI Life Interference	—	—	—	—	—	–0.234, $p = 0.170$	–0.391, $p = 0.015$	0.638, $p < 0.001$	0.495, $p = 0.002$
SF-12 MCS	—	—	—	—	—	—	–0.167, $p = 0.315$	–0.344, $p = 0.035$	–0.422, $p = 0.007$
SF-12 PCS	—	—	—	—	—	—	—	–0.292, $p = 0.075$	–0.225, $p = 0.175$
HADS Anxiety	—	—	—	—	—	—	—	—	0.582, $p < 0.001$

Note: Statistical significance adjusted for multiple comparisons, $p < 0.005$.

HADS = Hospital Anxiety and Depression Scale, MPI = Multidimensional Pain Inventory, MSES = Moorong Self-Efficacy Scale, PRSS = Pain-Related Self-Statements Scale, PSEQ = Pain Self-Efficacy Questionnaire, SCL CSQ = Spinal Cord Lesion-Related Coping Strategies Questionnaire, SF-12 MCS = (Medical Outcomes Study) Short Form Health Survey-12 Mental Component Score, SF-12 PCS = SF-12 Physical Component Score.

being able to work despite pain [36]. Relative to the general pain conditions sample, one may therefore conclude that the SCI-related chronic pain sample is less adversely affected by their experience of pain. This observation may simply reflect the lower level of pain intensity experienced by the SCI-related chronic pain sample. However, interestingly, the SCI-related chronic pain sample did have a comparable level of pain catastrophizing and poorer mood compared with the general pain conditions sample. This pattern of relationships is consistent with a previous study in another sample of individuals with SCI presenting to a pain clinic that reported the lower use of affective descriptors for pain among the SCI groups but similar levels of psychological distress among both SCI and general pain groups [12]. The level of distress was attributed to other SCI-related issues, despite pain levels being significantly lower than the general chronic pain population. Furthermore, compared with another sample of people with SCI-related pain, the sample with SCI-related chronic pain described in this study reported similar levels of life interference due to pain [37].

The sample of people with SCI-related chronic pain described in this study appears to be experiencing poorer mental health compared with community samples of people with SCI including those with and without pain. The current sample had similar average levels of anxiety, but higher levels of depressive symptoms with twice the number of possible cases of depression in comparison with a community sample of people with SCI in the United Kingdom [32]. This finding is consistent with the lower scores on the SF-12 MCS in the present SCI-related chronic pain sample compared with a community SCI sample in the United States [24]. These findings suggest that those seeking treatment for SCI-related pain may have increased psychological distress and this requires further examination.

Associations Between SCI- and Pain-Related Psychological Variables, Mood, and Physical Function

Despite the noted differences between the current samples, many of the relationships among usual pain intensity, pain appraisal, disability, and mood measures predicted by biopsychosocial models and usually observed among chronic pain samples were also seen in this group. Both pain catastrophizing and pain self-efficacy were significantly associated with various measures of psychological distress and pain-related disability. In turn, pain-related life interference and psychological distress were also related.

One exception was that no significant association was observed between pain variables and general physical function as measured by the SF-12 PCS. These findings may be due to the obscuring effects of other sources of disability associated with the SCI, aside from pain, influencing scores on the SF-12 that measures general impairment of physical function. However, also importantly, while many of the associations could be classified as moderate, they did not quite reach statistical significance because of our application of the Bonferroni adjustment. The conservative nature of this adjustment may have disguised the expected relationships between these variables. Power high enough to detect these relationships would require a larger sample size and fewer variables, which would be addressed if centers and clinics dealing with this population could pool their data when using the same measures.

Taken together, these findings suggest that some of the relationships between variables predicted by the biopsychosocial models of pain, commonly used as a framework to understand primary chronic pain diagnoses, are reflected in those with SCI-related chronic pain. The findings also suggest, however, that in the context of SCI, the picture may be more complex, because significant relationships also existed between appraisals of SCI and other variables. However, the sample size of the current study is insufficient to examine this systematically.

Clinical Implications

A number of findings from this study have potential implications for clinical practice. Evidence suggests that psychological well-being is degraded among this sample of individuals with SCI-related chronic pain presenting to a pain clinic beyond that attributable to the SCI alone. This means that, while the factors that might differentiate those with SCI pain who do and do not seek help for their pain problems are still unclear, higher levels of psychological distress may indicate the need for specialist pain assessment or intervention. Given this, and the apparent influence of appraisal variables, a psychological review of those presenting with SCI-related chronic pain to specialist pain centers appears warranted. This multidisciplinary assessment approach is already considered good clinical practice for those presenting with other types of chronic pain conditions [38].

Equally, these findings would indicate that treatments targeting psychological variables such as mood and cognitions may help improve quality of life in people with SCI-related chronic pain. Such treatments, based on cognitive behavioral principles, are well established as an effective component of treatment for people with primary chronic pain conditions [39–40]. A number of reports have been published on the use of such approaches in SCI-related chronic pain, although few appropriate evaluations of this therapeutic approach exist [41–44]. The associations between the SCI-related psychological variables, such as SCI self-efficacy, acceptance, and mood, may also suggest that the focus of such interventions should be broadened to encompass these factors.

Limitations

This study has a number of significant limitations that restrict the conclusions that can be drawn. This sample is a very particular subset of those with chronic SCI pain, given that they were attending a tertiary pain service; significant differences between those with general pain conditions seen in these settings and those who do not present to such services are known to exist [45–46]. Second, while the results offer some tantalizing hints about relationships that may become targets for effective treatments for SCI-related chronic pain, the small sample size means that the relative contribution of these variables to important outcomes (such as emotional and physical functioning) could not be examined. In addition, examination of psychological responses to other consequences of SCI, such as catastrophizing or self-efficacy related to fatigue, may need to be included for full understanding.

Third, the study is cross-sectional in nature, and so causal attributions could not be made about the nature of the relationships between variables. Finally, the absence of specific theories that account for both pain-related and other SCI factors in adjustment to SCI presents challenges to both our understanding and management of these presenting problems.

CONCLUSIONS

This study highlights a number of similarities and differences between this sample of individuals seeking treatment in a tertiary pain management center for SCI-related chronic pain and general pain conditions. Results suggest that many of the same relationships between psychological pain variables and outcomes are as evident in the current sample as they are in the general pain clinic population, but that other SCI-related variables also appear to be influential. This finding suggests that such factors should be included in the assessment of individuals presenting with SCI pain and that they may be targets for psychologically based interventions.

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