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Pain Catastrophizing and Beliefs Predict Changes in Pain Interference and Psychological Functioning in Persons with Spinal Cord Injury

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Abstract

The current study sought to examine how changes in pain-related beliefs and coping responses are related to changes in pain interference and psychological functioning in individuals with spinal cord injuries (SCI) and pain. To measure longitudinal changes in these variables, respondents completed a survey which included measures of pain intensity, pain interference, and psychological functioning, as well as specific psychosocial variables (pain-related beliefs, coping, and social support), and then completed the same survey 6 months later; analyses included only the individuals who reported pain at both times (N = 40). Demographic and injury-related variables were also assessed, but none were found to be significantly associated with changes in functioning. Changes in catastrophizing and belief in one's ability to control pain were each significantly associated with changes in the outcome variables: greater pain interference and poorer psychological functioning. Changes in specific coping strategies and social support were not predictors of changes in pain, interference, or psychological functioning . These findings support a biopsychosocial model of pain in persons with SCI. Intervention studies targeting maladaptive pain-related beliefs and catastrophizing may help to identify the causal nature of these relationships and may improve multidisciplinary treatment of pain in SCI.

Perspective—Intervention studies targeting catastrophizing and maladaptive pain-related beliefs may be the next step in determining which variables play a causal role in the pain interference and psychological functioning of individuals with pain and SCI.

Keywords

coping; cognitions; spinal cord injury; pain; mental health; catastrophizing

Pain is a common[8,16] and often difficult to treat[4,50,51] problem in persons with spinal cord injuries (SCI) which can be associated with increased physical and psychological dysfunction, independent of the effects of the injury.[16,27,32,41,43] Given the refractory nature of pain in

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persons with SCI, the use of adaptive pain coping skills may be especially important for maintaining quality of life.[52]

Pain-related beliefs and coping methods have been shown to influence levels of psychological and physical dysfunction for individuals with chronic pain in general.[2,17,22,39-40,44,46] A growing body of research has sought to extend these findings specifically to SCI and pain, demonstrating that particular beliefs and coping strategies are linked to adjustment to pain in persons with SCI. For example, catastrophizing, characterized as a tendency to exaggerate the negative consequences of a situation, has been associated with reported sensory and affective pain,[12] pain intensity,[45] psychological distress,[45,29] pain-related disability[45] and pain interference[29] in cross-sectional studies of individuals with SCI. A number of other specific belief/appraisal variables have been associated with functioning. In one study, a belief in one's ability to have control over pain was associated with greater mental health, and a number of beliefs were associated with levels of pain interference, such as beliefs that pain signifies damage or that a medical cure exists for pain.[29] Regarding coping responses linked to pain in SCI, two studies in particular have demonstrated that particular coping responses are associated with better mental health, such as greater use of task persistence,[29] coping self-statements, and ignoring pain,[45] while other coping responses are associated with higher levels of pain interference, such as greater use of resting, guarding, and asking for assistance.[29] In addition, social environmental variables, such as perceived social support[29,31] and negative perceived partner responses to pain,[38] have been associated with adjustment.

The above cross-sectional findings provide preliminary support for a biopsychosocial model of pain adaptation in SCI, in which one's beliefs about and coping responses to pain and one's perceived social support influence pain adaptation, above and beyond pain intensity itself. However, the role of psychosocial variables in predicting <u>changes</u> in pain adaptation over time has not yet been examined. Such research would not only provide a further test of the model, but would help to identify those psychosocial variables which may potentially play a causal role in adjustment, and that should therefore be the target of future experimental research testing causal relationships.

The current study is a continuation of the cross-sectional survey study of SCI and pain, described above,[29] which examined the associations between coping, cognitive, and social environmental variables with psychological functioning and pain interference. The primary purpose of the current study was to examine the same variables longitudinally to see if a similar pattern of associations would be found over time. The individuals who completed the original survey were asked to complete the same survey 6 months later. We hypothesized that changes in pain-related beliefs, coping, and social support would be associated with concurrent changes in several key outcomes (pain intensity, pain-related interference with functioning, and psychological functioning) over this same time period. Specifically, we hypothesized that catastrophizing and maladaptive pain beliefs would be associated with decreases in psychological functioning and increases in pain intensity and interference, and that adaptive coping and social support would be associated with the reverse.

MATERIALS AND METHODS

Participants

Participants in this study were recruited from the pool of individuals with spinal cord injury (SCI) who completed a survey regarding psychosocial functioning and the nature and scope of pain in persons with SCI,[16,29] and who agreed to be contacted for future research (n = 142, 90% of survey completers). Detailed information regarding the pool of participants who completed the initial survey has been reported elsewhere.[16] In the current study, the same survey was sent to 68 of the original 142 participants 6 months after initial survey completion

(Footnote 1). Of the 68 surveys mailed at the 6-month timepoint, 51 useable surveys were returned, yielding a response rate of 77% (51/66, excluding 1 participant who could not be located, and 1 participant who was sent the wrong survey due to a clerical error). Because the majority of variables we wished to examine over time were related to pain (i.e., pain coping, pain cognitions), the current study could only include the participants who reported pain at both time points (n = 40); therefore, all analyses were conducted with these 40 participants, and the study will report on this subset of 40 participants from this point forward. It should be noted that of the initial 51 survey respondents, the overwhelming majority (78%, or 40/51) reported a pain problem lasting at least 6 months.[1]

The same procedures were employed to assess the study variables at each time point. Each mailed questionnaire included a consent form and a cover letter inviting recipients to participate in the study. Subjects were paid $25 for completing and returning the consent forms and survey at each time point. If surveys were incomplete or any responses were unclear, research staff called participants to clarify their answers. The study questionnaire and protocol were approved by the University of Washington Human Subjects Review Committee.

Measures

Demographic Information—Respondents were asked to provide information concerning their age, sex, ethnic/racial group, education, and marital status. The survey also assessed a number of SCI-related variables, including level, cause, and date of SCI. These demographic and injury-related characteristics are reported in Table 1.

Some of the data from the initial survey completion have already been presented. These focus on the prevalence and course of pain problems and functioning in persons with SCI,[16] the utility of different pain treatments for persons with SCI,[4] the psychometric properties of pain-interference measures in persons with SCI,[30] and the utility of a biopsychosocial model of adjustment to pain in SCI.[29] The longitudinal data assessed at 6 months following the initial survey have not yet been reported.

Average Pain Intensity—Survey respondents were screened for a recent pain problem using the following question: “Are you currently experiencing, or have you in the past three months experienced, any pain (other than occasional headaches or menstrual cramps)?” Respondents who answered “yes” to this question were then asked to rate the average intensity of this pain during the past week on a 0 – 10 numerical rating scale, with 0 = “No pain” and 10 = “Pain as bad as could be.” The reliability and validity of 0 – 10 scales have been shown by their strong association with other measures of pain intensity over time.[21]

Pain Interference—Pain interference was assessed using a 10-item scale adapted from the Brief Pain Inventory (BPI).[5-6] Using an 11-point rating scale (0 = does not interfere, 10 = completely interferes), the original version of the BPI Pain Interference scale asked participants to rate the degree to which pain interferes with 7 daily activities: general activity, mood, walking ability, normal work, relations with other people, sleep, and enjoyment of life. Our modified version of this scale, which we have used in previous studies of persons with disabilities and pain[14,48] has been changed in two ways. First, item 3 pertaining to “Walking ability” was changed to read “Mobility, that is, your ability to get around,” to be more appropriate for the participants in the current and previous studies, many of whom cannot walk. Second, we added three items to assess interference of pain with self-care, recreational activities, and social activities, to obtain a broader-based assessment of areas that could potentially be affected by pain. The original BPI Pain Interference scale has demonstrated

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[1] Only 68 of 142 possible surveys were sent because of an administrative error in the study procedures.

validity through its strong association to pain severity across a number of different populations[6,14,48] and the modified 10-item version of this scale has demonstrated high levels of internal consistency (Cronbach's alpha = .89) and validity through its strong association with pain intensity in previous samples of persons with disabilities.[48] In the current sample, the internal consistency coefficient of this scale was 0.95.

Psychological Funtioning—Psychological functioning served as the final outcome domain in this study, and was assessed with the five-item Mental Health scale from the Medical Outcomes Study 36-Item Short-Form Health Survey (SF-36).[49] The Mental Health scale has a possible range from 0 to 100, with higher scores indicating better psychological functioning. This commonly used measure has demonstrated reliability, as shown by high internal consistency coefficients (Cronbach's alpha ranging from 0.81 – 0.95) and test-retest stability coefficients (0.75 – 0.80).[49] Its validity as a measure of psychological functioning is supported by its association with other measures that assess this same construct.[49]

Pain Cognitions—Pain-related cognitions pertain to an individual's ideas about the nature of his or her pain, as well as to beliefs regarding his or her own and others' roles in dealing with pain. Pain-related cognitions were assessed using the Survey of Pain Attitudes (SOPA).[22] The SOPA includes the following 7 multi-item subscales which measure the extent to which an individual holds certain beliefs about pain: Control (belief in one's own control over pain), Disability (belief that one is unable to function because of pain), Harm (belief that pain is an indication of damage and that activities should be avoided), Emotion (belief that emotions influence pain), Medication, (belief that medications are suitable for treating chronic pain), Solicitude (belief that others should offer assistance in response to pain behaviors), and Medical Cure (belief that there exists a medical cure for one's pain). Items are rated on a scale from 0 - 4 ("this is very untrue for me" to "this is very true for me."); item scores are averaged to create the subscale scores, and higher scores indicate a stronger belief in that idea about pain. The SOPA has demonstrated good test-retest stability, internal consistency, and criterion validity.[22,37]

Catastrophizing—The 6-item Catastrophizing scale of the Coping Strategies Questionnaire (CSQ)[33] was used to assess pain catastrophizing cognitions (e.g., "It is terrible and I feel it is never going to get any better," "I worry all the time about whether it will end). Respondents rate the extent, in general, to which they engage in that activity or thought when experiencing pain, on a scale from 0 – 6 ("never do that" to "always do that"). The subscale score is the mean of all 6 items, and higher scores indicate more frequent pain catastrophizing. The Catastrophizing scale of the CSQ has demonstrated excellent internal consistency reliability and validity in numerous studies.e.g.,[13,15,33] Its validity has been demonstrated by associations with measures of psychosocial dysfunction and depression.[11,18,25,39]

Coping—Coping with pain was measured using the Chronic Pain Coping Inventory (CPCI),[23] which was developed to quantify the specific coping strategies that tend to be encouraged in multidisciplinary pain programs, as well as those strategies that tend to be discouraged.[23] The original CPCI consists of eight subscales that each assess a different coping response to pain: resting (7 items), task persistence (6 items), guarding (9 items), asking for assistance (4 items), relaxation (7 items), coping self-statements (11 items), exercise/stretch (12 items), and seeking social support (12 items). An additional scale (6 items) to assess the coping strategy of pacing was added later to the CPCI,[28] and is included in the current study. The frequency of these coping strategies is measured by the total number of days that the strategy was used in the past week (0-7). The subscale score is the mean of all of the subscale items. These scales have demonstrated good internal consistency and test-retest reliability, and have shown validity through significant correlations in the expected directions with measures of patient functioning, and through significant correlations between patient and significant other versions of the scales.[23,28]

Social Environmental Factors—Perceived social support was assessed with the 12-item Multidimensional Scale of Perceived Social Support (MSPSS),[53] which was scored to measure global perceived support (e.g., “There is a special person around when I am in need.”). The items are rated on a scale from 1- 7 (“very strongly disagree” to “very strongly agree”). Internal consistencies of the subscales and total scale are all excellent (Cronbach’s alphas = .85 to .91), and the scales have demonstrated strong test-retest stability over a two- to three-month interval (r = .72 to .85). Validity of the total MSPSS scale has been demonstrated through its significant (negative) association with depression.[53]

Data Analyses—First, the distributions of all study variables were examined and none were significantly skewed, thus meeting the assumptions necessary for the subsequent statistical analyses. Next, change scores (time 2 – time 1) were calculated for all of the hypothesized predictor and criterion variables. These change scores were used to compute bivariate correlational (for continuous variables) and t-test (for categorical variables) analyses to examine the extent to which demographic and SCI-related variables were associated with the criterion variables of interest; that is, change in pain intensity, pain interference, and mental health. Demographic variables included age, gender, marital status (married/living with significant other or living alone), educational level (college graduate/advanced degree or less than college graduate); and SCI variables included time since injury, age at injury, and level of injury (tetraplegia or paraplegia). None of the demographic or SCI variables was significantly related with changes in mental health or pain interference, therefore, these variables were not included as control variables in the subsequent regression analyses. To further reduce the number of belief and coping measures in the planned regression analyses, we computed univariate correlations between the criterion variable change scores (change in pain intensity, pain interference, and mental health) and the predictor variable change scores, and limited the measures used in each of the regression analyses to include only predictor change scores that were correlated at a significance level of $p < .10$ with the criterion measure at hand. For change in pain intensity, the predictor change scores were entered in a single step. For change in pain interference and change in mental health, the pain intensity change score was entered in the first step of the equation to control for its effects (if any), and the predictor change scores were entered as a block in the second step.

RESULTS

Average pain intensity, pain interference, and psychological distress

On average, these individuals with chronic pain and SCI reported a moderate level of pain intensity (M = 5.0 at both T1 and T2) and a mild-to-moderate level of pain interference (M = 3.8 at T1, M = 3.6 at T2). The mean SF-36 Mental Health score was 69.6 at T1 and 69.2 at T2.

Regarding changes in pain intensity, 28% (n = 11) of the sample reported a 30% or greater (a standard for clinically meaningful change in pain)[10] increase in pain intensity over the 6-month study period, and 20% (n = 8) reported a 30% or greater decrease in pain intensity. No significant systemic change was found for any of the outcome variables over the 6-month study period; that is, similar proportions of individuals reported increases or decreases in these variables. Regarding the predictor variables, only two measures, the SOPA control scale and the CPCI Relaxation scale, demonstrated significant differences from T1 to T2. Sample-wide changes in all other predictor variables were not significant. Using a standard for clinical importance of change of a 0.50 effect size (ie, a change in one-half the standard deviation of the initial score)[7] we found that the majority of variables demonstrated meaningful change for at least half the participants, with the exceptions of the SOPA Harm, Exercise, and Medication scales (48%, 40%, and 43% of the participants evidenced meaningful change, respectively), the CPCI Exercise, Coping Self-statements, and Seeking Social Support scales (45%, 45%, and 38%, respectively), the Catastrophizing scale (43%) and the MSPSS (social support) scale (40%).

Univariate correlations were performed to determine which variables were correlated with pain intensity, pain interference or psychological functioning at a significance level of at least 0.10 and would therefore be included in the regression equations. Catastrophizing was associated with greater pain interference and lower mental health (*r*s = .42 and -.41, respectively, *p*s < .01). SOPA control evidenced strong correlations with pain interference and psychological functioning (*r* = -.53 and .55, *p*s < .001), and was moderately correlated with pain intensity (*r* = -.38, *p* < .01). In addition, SOPA Disability (the belief that one is disabled) was moderately correlated with pain interference and mental health (*r*s = .33 and -.32, respectively, *p*s < .05) and SOPA Harm (the belief that pain equals harm) was moderately correlated with mental health (*r* = -.38, *p* < .05). Among the coping scales, CPCI Exercise was moderately associated with pain intensity and mental health (*r*s = -.31, and -.32, respectively, *p*s < .05) and more strongly associated with pain interference (*r* = -.44, *p* < .01). The only other significant coping scale, CPCI Relaxation, was moderately associated with Mental Health (*r* = .33, *p* < .05).

Predicting Change in Pain Intensity

Change in pain intensity was not significantly associated with any of the demographic or SCI-related variables (age, gender, marital status, education level, age at injury, time since injury, or level of injury (paraplegia/tetraplegia). Age demonstrated a non-significant trend to be correlated with change in pain intensity (r = 0.28, *p* < .10); greater age was associated with greater pain intensity. Regarding relationships with the other criterion variables, change in pain intensity was significantly correlated with change in pain interference (*r* = .51, *p* < .001), but not with change in psychological functioning (*r* = -.12, n.s.).

In the regression model predicting change in pain intensity, the predictor variable change scores as a whole accounted for a significant (*p* < .05) 17% of the variance in pain intensity change score (see Table 2). Change in perceived control over pain (SOPA control) demonstrated a non-significant trend toward making an independent contribution to the variance in change in pain intensity (β = -.30, *p* < .10), suggesting that greater perceived control may be associated with decreased pain intensity.

Predicting Change in Pain Interference

In the regression model predicting change in pain interference, change in pain intensity explained a large and significant (*p* < .001) 26% of the variance in the BPI pain interference change score (see Table 2). The predictor variable change scores as a whole accounted for an additional, and significant (*p* < .01), 25% of the variance in BPI pain interference change score. In addition, two predictor variables, change in perceived control over pain and change in catastrophizing (β = -.34 and .33, respectively, *p*s < .05), made significant and independent contributions to the variance in the pain interference change score. Increased perceived control, and decreased catastrophizing, were each associated with decreased pain interference.

Predicting Change in Psychological Functioning

In the regression model predicting change in psychological functioning, change in pain intensity did not make a significant contribution. However, the predictor variable change scores as a whole accounted for a very large and significant (p < .01) proportion, 49% of the variance in the SF-36 Mental Health scale change score. In addition, two predictor variables, change in perceived control over pain and change in catastrophizing (β = .42 and -.35, respectively, *p*s

$< .05$), made significant, independent contributions to the prediction of the criterion variable. Specifically, increased perceived control, and decreased catastrophizing, were each associated with improved psychological functioning.

DISCUSSION

The primary finding of this study is that changes in adjustment to pain could not be fully explained by changes in pain intensity. Changes in pain intensity, pain interference, and psychological functioning were associated with changes in pain-related coping and cognitive variables, with changes in catastrophizing and perceived control over pain making significant independent contributions to changes in pain interference and psychological functioning. These findings provide preliminary support for the potentially important role played by coping and cognitive variables in short-term longitudinal outcomes for individuals with SCI and chronic pain.

Except for age, none of the demographic or SCI-related variables were significantly related to changes in pain intensity in the multivariate analyses. The two predictor variable change scores included in the regression analyses (change in exercise coping and perceived control over pain) were associated with a significant 17% of the variance in change in pain intensity, with a trend for greater perceived control over pain to be associated with decreased pain intensity. Change in pain was significantly associated with one of the other outcome variables -- change in pain interference -- but was not associated with change in psychological functioning.

Change in catastrophizing was a significant independent predictor of changes in adjustment; individuals with decreased catastrophizing tended to report decreased pain interference and improved psychological functioning. These longitudinal findings are consistent with previous cross-sectional studies of pain in SCI, which also found significant associations between catastrophizing and outcome variables (e.g., pain intensity, pain-related disability,[12,45] pain interference,[29] and psychological distress[29,45]). Given that most of the individuals in our sample had lived with SCI for several years or more, changes in catastrophizing cannot be explained by initial reactions to injury. The current study suggests the possibility that catastrophizing could potentially have a causal influence on both pain interference and psychological functioning, supporting the need for trials to test this hypnosis (via assignment to conditions that do, and that do not, alter catastrophizing see [9]). Although it is possible that increasing pain causes increased catastrophizing or that the relationship is bi-directional, cognitive-behavioral interventions that target catastrophizing have been shown to reduce depression and disability in samples of individuals with chronic pain,[34-35] and the maladaptive effects of catastrophizing are strongly supported by the general chronic pain literature. [2,17,19-20,39-40,44,46] Therefore, testing a de-catastrophizing intervention in the SCI population would be a logical next step.

Change in perceived control over pain was also a significant predictor of adjustment. This pain belief has been consistently associated with pain interference, disability, and depression in research with other chronic pain populations.[17,19,20,25,37,42,44,47] Our previous study based on the initial survey completion provided the first evidence, to our knowledge, of the relationship between control appraisals and pain in SCI; greater perceived control over pain was associated with better mental health and lower levels of pain interference.[29] In the current study, we provided additional support for this relationship by demonstrating that changes in perceived control over time were associated with changes in these outcomes. Further research is needed on a potential causal role for control beliefs, and, if a causal influence is found, to develop interventions that can enhance such beliefs.

Overall, pain cognitions appeared to have the strongest relationships with longitudinal changes in functioning, especially if catastrophizing is characterized as a set of maladaptive pain cognitions or a cognitive style. In contrast, change in pain coping variables and change in perceived social support did not evidence significant relationships with change in psychological functioning or pain interference after controlling for change in pain intensity and all other change variables. Therefore, our hypothesis that changes in pain beliefs would be associated with changes in pain interference and psychological functioning was supported, but changes in specific coping and social environmental variables were not associated with outcomes as we hypothesized. The latter results differ somewhat from the cross-sectional study results, which found that passive pain coping and perceived social support demonstrated significant relationships with adjustment to pain.[29] It is possible that relationships found at one point in time may not hold true for changes over time. It is also possible that the smaller sample size of the current study did not provide adequate power for some associations to be identified.

Regarding the coping variables, at least one other cross-sectional study of SCI and pain found significant associations between coping and functioning;[45] however, the coping measure used in that study (the Coping Strategies Questionnaire;CSQ)[33] focuses mostly on cognitive coping strategies, in contrast to the measure used in this study, the CPCI, which places more emphasis on behavioral strategies, such as resting, exercise, and relaxation. In addition, the scales of the CPCI favor the use of a greater number of strategies rather than more frequent use of fewer strategies,[20] which may be especially relevant for the exercise scale, given that individuals with SCI may have fewer options for exercise and exercise patterns may not change greatly over time. In addition, consistently weak support has been found for some behavioral coping strategies in the general chronic pain literature.[20] In the study employing the CSQ,[45] mainly cognitive coping strategies (and catastrophizing) were associated with criterion variables. In our previous cross-sectional study,[29] passive coping was associated with a negative outcome (greater pain interference), but proactive coping was not associated significantly with any outcome. Taken together, these results suggest that changes in psychological functioning and pain interference in SCI are more strongly related to changes in cognitive coping than to changes in active behavioral strategies. Cognitive coping strategies may be especially important for this population given the physical limitations of SCI.

An important next step may involve controlled intervention studies or daily process studies of perceived control over pain and catastrophizing, in order to shed light on the causal nature of these relationships. Widerstrom-Noga has suggested that for a subgroup of SCI individuals with high affective distress and dysfunctional coping styles, interdisciplinary approaches that include psychological interventions, such as cognitive-behavioral therapy, may be most appropriate.[51-52] Preliminary support for potential efficacy multidisciplinary management of SCI-related pain can be found in Budh and colleagues' treatment study of SCI-related neuropathic pain, which utilized educational, cognitive, and behavioral interventions, resulting in decreased levels of anxiety and depressioncompared to a control group.[3]

Significant findings emerged in our study despite the fact that we found (and expected to find) few major systematic changes in pain or adjustment. The individuals in this study had been living with SCI and pain for years, as opposed to adjusting to a new injury, and research has shown that pain in SCI remains relatively stable over time.[16,36] Our results may be relevant mainly for individuals at a later stage of adjustment to SCI, given that we do not know how our results may have differed in a sample demonstrating more dramatic change. Given the different challenges posed by initial adjustment to SCI,[26] longitudinal research at earlier phases of adjustment to SCI may be very important.

A similar number of individuals reported an increase compared to a decrease in pain, suggesting that there is no general trend for individuals with SCI to have worsening pain intensity over the short-term. Similarly, the other variables did not demonstrate any systematic changes, with the exception of perceived control over pain and relaxation. Although it is possible that a lack of significant associations between certain variables could be due to a lack of change over time (no variation) in these variables rather than a real absence of association, most of the variables demonstrated a meaningful change (increase or decrease of at least ½ of a standard deviation) for half or close to half of the participants, suggesting that these variables did not remain static over the 6 month period.

As stated above, a larger sample size would have provided more power to detect associations, and some of the non-significant associations might have become significant. Therefore, our findings should be viewed as preliminary, and the coping and social support variables should not be disregarded even though their importance was not supported in this study. These results require replication in future studies. In addition, it is not possible to know how results would have differed if additional or different psychosocial factors had been included; however, we sought to measure the psychosocial variables supported by previous pain research. More diversity in education level and ethnicity would be desirable to strengthen the generalizability of the results. We do not know what was responsible for changes over time, and we did not assess if there were changes in other medical issues associated with SCI or in medical interventions.

Despite the limitations of this study, the findings demonstrated that changes in specific variables (perceived control over pain and catastrophizing) were associated with changes in pain interference and psychological functioning over a 6-month period, consistent with hypotheses derived from a biopsychosocial model of pain in persons with SCI. Identification of causal relationships may be furthered by intervention studies targeting pain cognitions and catastrophizing.

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Table 1

Demographic and injury-related information for participants with SCI who reported current pain problems at T1 and T2 (N = 40)

Age range, years	23 –73
Age, mean (SD)[*] years	49.3 (13.1)
Time since injury, mean (SD) years	17.9 (11.5)
Average age at injury (SD)	31.4 (15.5)
Sex, %	
Men	70
Women	30
Ethnicity,[†] %	
Caucasian	88
African-American	0
Asian-American	8
Hispanic American	8
Native American	13
Marital status, %	
Married/living with SO	53
Divorced	10
Widowed	8
Never Married	28
Educational level, %	
Some high school	5
High school graduate	15
Vocational/Technical school	8
Some college	38
College graduate	20
Graduate/Professional school	15
Self-reported injury level, %	
C1-C4	10
C5-C8	38
T1-T5	15
T6-T12	28
L1-S4,5	10
Completeness of injury, %	
Complete	40
Incomplete	50
Don’t know	10
Cause of injury, %	
Motor vehicle collision	30
Fall	18
Diving	10
Sports-related accident	8
Gunshot wound	3
Other	33

[*] SD, standard deviation.

[†] Participants could endorse more than one response, therefore percentages total more than 100%.

Table 2

Relationship between change in pain interference with changes in pain and psychosocial variables (N = 40).

Variables	**Total *R*2**	***R*2 change**	***F* change**	**β**
	Change in pain intensity			
1. Changes in Cognition and Coping Variables	0.17	0.17	3.78[*]	
SOPA Control				-.30 [†]
CPCI Exercise				-.17
	Change in pain interference (BPI interference)			
1. Change in Pain Intensity	0.26	0.26	12.44[***]	.32[*]
2. Changes in Cognition and Coping Variables	0.50	0.25	5.48[**]	
SOPA Control				-.34[*]
CPCI Exercise				-.04
Castastrophizing				.33[*]
	Change in psychological functioning (SF-36 MH)			
1. Change in Pain Intensity	0.01	0.01	0.54	.12
2. Changes in Cognition and Coping Variables	0.50	0.49	4.35[**]	
SOPA Control				.42[*]
SOPA Harm				-.12
SOPA Disability				-.18
CPCI Exercise				-.07
CPCI Relaxation				.05
CPCI Pacing				.15
Catastrophizing				-.35[*]

.05 < † < .10;

[*] *p* < .05;

[**] *p* < .01;

[***] *p* < .001.