

The Pain Catastrophizing Scale: Development and Validation

Michael J. L. Sullivan and Scott R. Bishop
Dalhousie University

Jayne Pivik
The Rehabilitation Centre

In Study 1, the Pain Catastrophizing Scale (PCS) was administered to 425 undergraduates. Analyses yielded a three component solution comprising (a) rumination, (b) magnification, and (c) helplessness. In Study 2, 30 undergraduate participants were classified as catastrophizers ($n = 15$) or non-catastrophizers ($n = 15$) on the basis of their PCS scores and participated in an cold pressor procedure. Catastrophizers reported significantly more negative pain-related thoughts, greater emotional distress, and greater pain intensity than noncatastrophizers. Study 3 examined the relation between PCS scores, negative pain-related thoughts, and distress in 28 individuals undergoing an aversive electrodiagnostic medical procedure. Catastrophizers reported more negative pain-related thoughts, more emotional distress, and more pain than noncatastrophizers. Study 4 examined the relation between the PCS and measures of depression, trait anxiety, negative affectivity, and fear of pain. Analyses revealed moderate correlations among these measures, but only the PCS contributed significant unique variance to the prediction of pain intensity.

The role of catastrophizing in mediating responses to pain has received considerable attention in recent years (Chaves & Brown, 1987; Jensen, Turner, Romano, & Karoly, 1991; Keefe, Brown, Wallston, & Caldwell, 1989; Keefe, Caldwell, Queen, Gil, Martinez, Crisson, Ogden, & Nunley, 1987; Spanos, Radtke-Bodorik, Ferguson, & Jones, 1979; Sullivan & D'Eon, 1990). Although research has demonstrated a consistent relation between catastrophizing and distress reactions to painful stimulation, the precise nature of this relation remains unclear (Heyneman, Fremouw, Gano, Kirkland, & Heiden, 1990; Keefe et al., 1989; Vallis, 1984). As an initial step in developing a line of research addressing the processes underlying the relation between catastrophizing and distress reactions, our goal was to develop and validate a self-report measure of catastrophizing.

Although the defining criteria for catastrophizing have never been explicitly stated, there is general consensus that catastrophizing involves an exaggerated negative orientation toward noxious stimuli. However, investigators differ with respect to the

components of catastrophizing they view as primary. The early work of Chaves and Brown (1978, 1987) emphasized magnification, negative expectations, and increased accessibility of previous memories of painful episodes in their measurement of catastrophizing. Spanos and his colleagues (1979) have used participants' expressions of worry and excessive focus on negative aspects of the pain situation, expectations of negative outcomes, and the inability to cope effectively with pain as a basis for classification of catastrophizing (Spanos et al., 1979). Finally, Rosenstiel & Keefe (1983) have conceptualized catastrophizing primarily in terms of helplessness and the inability to cope effectively with pain.

One of the questions addressed by the present research was whether the different perspectives on catastrophizing reflected different dimensions of a conceptually integrated concept or whether they were conceptually distinct. We were also interested in addressing the degree of concordance between individuals' scores on a self-report measure of catastrophizing and their responses to interview-based measurement procedures that have been used in previous experimental pain research (Spanos et al., 1979). Finally, our goal was to develop a self-report measure that provided a valid index of catastrophizing in both non-clinical and clinical populations.

Study 1 describes the development and psychometric properties of the Pain Catastrophizing Scale (PCS). Study 2 addressed the validity of the PCS by examining the relation between participants' scores on the PCS and their reports of catastrophizing ideation in a structured interview following an experimental pain procedure. Study 3 addressed the validity of the PCS in a clinical sample of individuals undergoing an aversive electrodiagnostic medical procedure. Study 4 compared the PCS with measures of related constructs including depression, trait anxiety, negative affectivity, and fear of pain.

Study 1

Drawing on previous research on catastrophizing and pain, we constructed a self-report scale that incorporated the nonre-

Michael J. L. Sullivan, Department of Psychology and Department of Psychiatry, Dalhousie University, Halifax, Nova Scotia, Canada; Scott R. Bishop, Department of Psychology, Dalhousie University, Halifax, Nova Scotia, Canada; Jayne Pivik, Institute for Rehabilitation Research and Development, The Rehabilitation Centre, Ottawa, Ontario, Canada.

We extend thanks to W. Chaplin, K. Davidson, J. D'Eon, P. McGrath, M. Raven, and N. Spanos for helpful comments on a previous version of this article. We also thank J. Lawlor for her assistance in conducting Study 2. The research was supported by grants from the Social Sciences and Humanities Research Council of Canada, from Dalhousie University, and from the Royal Ottawa Health Care Group Foundation. Portions of this article were presented at the 100th and 101st Annual Conventions of the American Psychological Association, in Washington, DC, and Toronto, Ontario, Canada, respectively.

Correspondence concerning this article should be addressed to Michael J. L. Sullivan, Department of Psychology, Dalhousie University, Halifax, Nova Scotia, Canada B3H 4J1. Electronic mail may be sent via Internet to sully@ac.dal.ca.

dundant dimensions of catastrophizing that were emphasized by different investigators. These included the tendency to increase attentional focus on pain-related thoughts (Spanos et al., 1979), to exaggerate the threat value of pain stimuli (Chaves & Brown, 1987), and to adopt a helpless orientation to coping with painful situations (Rosenstiel & Keefe, 1983). We expected to find support for a three-dimensional model of catastrophizing. In light of previous research suggesting that women may be more emotionally expressive than men in response to stress, we also expected that women would show higher levels of catastrophizing than men (e.g., Endler & Parker, 1994).

Method

Participants

Four hundred and thirty eight introductory psychology students volunteered to complete the PCS at the end of class time. Thirteen individuals were excluded because of incomplete data ($n = 5$) or being identified as multivariate outliers ($n = 8$). The final sample consisted of 127 men and 302 women with a mean age of 20.1 years ($SD = 5.1$).

Measure

Eight statements of the PCS were derived from examples of catastrophizing ideation provided by Spanos et al. (1979; Spanos, Brown, Jones, & Horner, 1981) and Chaves & Brown (1987). In addition, five items from the catastrophizing subscale of the Coping Strategies Questionnaire (CSQ; Rosenstiel & Keefe, 1983) were included in the PCS. The PCS instructions asked participants to reflect on past painful experiences and to indicate the degree to which they experienced each of 13 thoughts or feelings when experiencing pain on a 5-point scale from 0 (*not at all*) to 4 (*all the time*).

Procedure

Participants were told that the study was concerned with individuals' thoughts and feelings related to pain and distress. They were asked to complete the PCS and were thanked for their participation at the end of the study.

Results and Discussion

A principal components analysis with oblique rotation yielded a three-component solution with eigenvalues greater than 1. The loadings from the pattern matrix are presented in Table 1. The first component, labeled *ruminative*, accounted for 41% of the total variance and contained 4 items describing ruminative thoughts, worry, and an inability to inhibit pain-related thoughts. The second component, labeled *magnification*, accounted for 10% of the total variance and contained 3 items reflecting magnification of the unpleasantness of pain situations and expectancies for negative outcomes. The third component, labeled *helplessness*, accounted for 8% of the total variance, and contained the 5 items from the CSQ and one item reflecting the inability to deal with painful situations. Scale items loaded negatively on the third component so that higher scores indicate lower levels of helplessness. Rumination and helplessness were highly correlated, $r = -.50$. Rumination and helplessness also showed moderate relations to magnification, $r = .32$ and $r = -.30$, respectively.

Three subscales corresponding to the component structure of

the PCS were computed by summing items within each factor (using unit weighting of items). Coefficient alphas were .87, .60, and .79 for the rumination, magnification, and helplessness subscales, respectively. Coefficient alpha for the total PCS was .87 (Cronbach, 1951). The moderate correlations among the three components of the PCS and the high internal consistency of the total PCS suggest that rumination, magnification, and helplessness can be viewed as different dimensions of the same underlying construct. The comparatively low internal reliability coefficient for the magnification scale may reflect differences in appraisal as a function of the diversity of pain situations that individuals may have considered in completing the questionnaire. The development of the PCS proceeded from the assumption that pain situations share sufficient commonality to elicit similar cognitive-affective reactions across pain situations. This assumption may hold more strongly for rumination and helplessness than for magnification. The small number of items and efforts to minimize item redundancy may have also contributed to the low reliability coefficient. It is also possible that individuals who engage in one form of magnification (e.g., anticipating negative outcomes) may not engage in other forms (e.g., thinking of other painful experiences), thus constraining the potential magnitude of reliability coefficients (see Billings & Moos, 1984, for a similar argument).

There was a significant gender effect for the total score of the PCS with women ($M = 19.5$, $SD = 8.5$) reporting higher levels of catastrophizing than men ($M = 16.4$, $SD = 7.3$), $t(425) = 3.66$, $p < .001$. Examination of the individual subscales revealed that women reported higher levels of rumination and helplessness than men (women: $M = 2.2$, $SD = .9$; men: $M = 1.8$, $SD = .8$), $t(425) = 3.5$, $p < .001$, and (women: $M = 1.2$, $SD = .6$; men: $M = 1.0$, $SD = .6$), $t(436) = 3.8$, $p < .001$, respectively. There were no gender differences for the magnification subscale (women: $M = 1.1$, $SD = .7$; men: $M = 1.0$, $SD = .6$), $t(436) = 1.1$, $n.s.$ The observed gender differences in rumination and helplessness are consistent with theory and research suggesting that women are more likely than men to adopt a ruminative and emotionally expressive orientation toward dealing with stress situations (Conway, DiFazio, & Bonneville, 1991; Endler & Parker, 1994; Nolen-Hoeksema, 1987). Previous research on coping with chronic pain has also shown that women are more likely to catastrophize than men (Jensen, Nygren, Gamberale, Goldie, & Westerholm, 1994).

Study 2

The primary aim of Study 2 was to examine the construct validity of the PCS. In experimental studies, level of catastrophizing has been typically assessed by examining participants' thought content during or immediately following a "cold pressor" procedure in which participants immerse one arm in a container of ice water. The construct validity of the PCS was examined by comparing participants' questionnaire responses to their responses to the interview-based procedure used by Spanos and his colleagues (1979). It was predicted that high scores on the PCS would be associated with a higher frequency of catastrophizing thoughts during the cold pressor procedure.

Study 2 also examined the temporal stability of the PCS. There is evidence that catastrophizing in chronic pain patients,

Table 1
Pattern Matrix of the Pain Catastrophizing Scale

Item	Components			M	SD	Item total r
	1	2	3			
Rumination						
11. I keep thinking about how badly I want the pain to stop.	.87	.01	.00	2.0	1.2	.70
8. I anxiously want the pain to go away.	.84	.04	.13	2.7	1.1	.57
9. I can't seem to keep it out of my mind.	.80	.04	-.11	1.7	1.6	.70
10. I keep thinking about how much it hurts.	.79	.00	-.12	1.9	1.1	.71
Magnification						
13. I wonder whether something serious may happen.	-.12	.76	-.14	1.3	1.0	.37
6. I become afraid that the pain may get worse.	.15	.64	-.04	1.4	1.0	.47
7. I think of other painful experiences.	-.01	.67	.12	0.6	0.9	.22
Helplessness						
2. I feel I can't go on.	-.11	-.07	-.86	0.7	0.8	.46
3. It's terrible and I think it's never going to get any better.	-.01	.11	-.68	0.9	0.9	.51
1. I worry all the time about whether the pain will end.	.11	.04	-.58	1.4	0.9	.51
4. It's awful and I feel that it overwhelms me.	.31	.05	-.53	1.1	0.9	.65
5. I feel I can't stand it any more.	.38	-.01	-.48	1.3	1.0	.64
12. There is nothing I can do to reduce the intensity of the pain.	.22	.30	-.31	1.3	0.9	.53

Note. $N = 425$; components: 1 = rumination, 2 = magnification, and 3 = helplessness. Items 1–5 were drawn from the Coping Strategies Questionnaire (described in Rosenstiel & Keefe, 1983); items 6, 7, and 13 were developed from descriptions of catastrophizing provided by Chaves and Brown (1978, 1987); and the remaining items were developed from descriptions of catastrophizing provided by Spanos et al. (1979). Items 1–5 are from the *Coping Strategies Questionnaire* by A. K. Rosenstiel and F. J. Keefe, 1983. Copyright 1983 by A. K. Rosenstiel and F. J. Keefe. Reprinted with permission. Copies of the Pain Catastrophizing Scale may be obtained from Michael J. L. Sullivan.

in the absence of intervention, may be markedly stable over time (Keefe et al., 1989). However, a number of investigators have demonstrated that catastrophizing can be significantly reduced or eliminated by interventions that foster the use coping strategies (Spanos et al., 1979, 1981; Vallis, 1984). In Study 2, no interventions were used to modify level of catastrophizing, and it was predicted that PCS scores would remain stable over a 6-week period.

Method

Participants

Forty students enrolled in introductory psychology at Dalhousie University participated in the research in exchange for course credit. The mean age of the sample was 18.8 years ($SD = 4.6$). All participants had completed the PCS as part of a screening procedure approximately 6 weeks prior to testing. Those scoring above 24 and below 15 on the PCS, both at the time of screening and at the time of testing, were classified as catastrophizers (6 men and 9 women) and noncatastrophizers (9 men

and 6 women), respectively. These cut-off scores correspond to the upper and lower thirds of the distribution of PCS scores. Students were not considered for participation if they were suffering from a medical condition associated with persistent pain (e.g., migraine or back pain), or other medical conditions that may be adversely affected by the pain procedure (e.g., cardiovascular problems, asthma, or previous frostbite).

Apparatus

A cold pressor apparatus was used consisting of a Styrofoam cooler, measuring $30 \times 40 \times 30$ cm, divided into two compartments separated by a wire mesh. The entire cooler was filled with water, and one compartment was filled with ice. The other compartment was equipped with a movable armrest used to immerse a participant's arm in the ice water. Water temperature was maintained at 2° – 4° C. The apparatus was similar to that described by Spanos et al. (1979). All participants were video-taped during the procedure.

Procedure

All participants were told that the study was concerned with the relation between thoughts and physical discomfort. They were assured that

the procedure would not result in physical injury. The students were made aware that they would receive course credit even if they did not complete the study. There were no cases of participant withdrawal.

To regulate arm temperature, participants immersed their arm for 5 min in a container of room-temperature water. They were then instructed to place their arm on the movable armrest of the cold pressor apparatus and to lower their arm into the ice water. Participants were signaled by a voice on a tape recording to give 3 verbal ratings of their current level of pain at 20-s intervals during the water immersion. At the end of 1 min, they were signaled to remove their arm from the ice water and to rest their arm on a towel placed on their lap. Immediately following the ice water immersion, participants were asked to complete the PCS and to rate the intensity of different moods they experienced. The measure of mood consisted of 12 mood adjectives drawn from the Profile of Mood States (McNair, Lorr, & Droppleman, 1971) that were combined to yield 4 separate subscales: (a) sadness (sad, discouraged, or hopeless), (b) anger (angry, hostile, or irritable), (c) anxiety (anxious, afraid, or worried), and (d) happiness (happy, delighted, or joyful). Participants were asked to rate their current mood on an 11-point scale from 0 (*not at all*) to 10 (*extremely*). Alpha coefficients were .75, .77, .67, and .89 for the sadness, anger, anxiety, and happiness subscales, respectively.

Postimmersion interview. Approximately 3–5 min following the ice water immersion, the students participated in a semistructured interview adapted from Spanos et al. (1979). The first interview question asked participants to report all the thoughts and feelings they experienced during the ice water immersion. Seven additional questions were used to address more specifically the nature of coping strategies (e.g., "Did you engage in any mental strategy or did you do anything to control or decrease your pain or discomfort while your arm was in the ice water?") or catastrophizing thoughts (e.g., "Did you at any time during the immersion think to yourself that you could no longer stand it or that you could no longer go on?") that participants may have experienced during the ice water immersion.

Data reduction. Two judges who were blind to the participants' group classifications reviewed the video recordings and coded responses to the interview questions according to catastrophizing, coping, and neutral content. Sentence structure and changes in thought content were used as the basis for unitizing participants' responses. According to guidelines provided by Spanos et al. (1979) and Heyneman et al. (1990), thoughts reflecting fear, worry, anticipation of negative outcomes, exaggeration of the aversive aspects of the situation, and the inability to cope effectively with pain were classified as catastrophizing thoughts. Thoughts reflecting the use of strategies such as distraction, positive imagery, or positive self-statements were classified as coping. Thoughts were classified as coping only if there was a clear indication that they were invoked with the goal of reducing pain or emotional distress. Neutral thoughts consisted of verbal content during the interview that was not clearly related to catastrophizing or coping (e.g., reiterating procedural details of the task). The two judges coded the first 10 videotapes together in order to ensure consistency in the interpretation of the coding criteria. The two judges then independently coded the remaining 20 videotapes, and percentage agreement was 94%, 87%, and 85% for catastrophizing, coping, and neutral content, respectively. Discrepancies were resolved through discussion.

Results and Discussion

Analysis of Thought Content

The mean scores for the PCS, at the time of screening and at the time of testing, and the frequencies of catastrophizing and coping thoughts reported by catastrophizers and noncatastrophizers during the postimmersion interview are presented in

Table 2
PCS Scores and Frequencies of Catastrophizing, Coping, and Neutral Thoughts During the Ice Water Immersion

Variable	Catastrophizers (<i>n</i> = 15)		Noncatastrophizers (<i>n</i> = 15)	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
PCS				
Screening	31.4	6.33	6.7	2.74
Testing	33.4	6.53	6.6	3.25
Thought content				
Catastrophizing	8.8	3.51	2.8	2.40
Coping	1.0	1.13	1.9	2.15
Neutral	5.4	1.08	5.0	1.39

Note. PCS = Pain Catastrophizing Scale. Values for thought content represent the total frequency of catastrophizing, coping, and neutral thoughts reported during the postimmersion interview.

Table 2. Participants' thought content during the interview was initially analyzed as a three-way mixed factorial with condition (catastrophizer vs. noncatastrophizer) and gender (men vs. women) as between-groups factors, and thought type (catastrophizing, coping, or neutral) as the within-groups factor. There were no significant effects of gender, and thus the results are presented collapsed across gender.

Analysis revealed a significant main effect for group, $F(1, 28) = 15.6, p < .001$, qualified by a significant Group \times Thought Type interaction, $F(1, 28) = 30.9, p < .001$. Simple effects revealed that catastrophizers reported a higher frequency of catastrophizing thoughts ($M = 8.8, SD = 3.5$) than noncatastrophizers ($M = 2.8, SD = 2.4$), $t(28) = 5.4, p < .001$. Catastrophizers and noncatastrophizers did not differ significantly in the frequency of coping thoughts, $t(28) = 1.5, ns$, or neutral thoughts, $t(28) = 1.1, ns$. The most frequent coping activity reported by catastrophizers and noncatastrophizers was the use of distraction strategies (e.g., focus on breathing, counting backwards, or focusing on daily tasks).

Consistent with previous research, within-groups analyses revealed a differential relation between coping thoughts and pain ratings as a function of level of catastrophizing (Spanos et al., 1979). For noncatastrophizers, increases in the number of coping thoughts were associated with decreased pain ratings during the last 20 s of the immersion period, $r = -.58, p < .01$, but not during the first and second 20-s periods of the immersion, $r = -.19$ and $r = -.20$, respectively. For catastrophizers, there was no significant relation between the frequency of coping thoughts and pain ratings during the first, second, or third 20-s span of the immersion period, $r = .14, r = .16$, and $r = -.13$, respectively.

Pain and Emotion During the Ice Water Immersion

A two-way mixed analysis of variance for pain ratings made during the immersion revealed significant main effects for group and time period, $F(1, 28) = 9.9, p < .01$ and $F(2, 56) = 24.9, p < .001$, respectively. As shown in Table 3, catastrophizers reported significantly more pain than noncatastrophizers

Table 3
Pain and Emotion Ratings During the Ice Water Immersion

Variable	Catastrophizers (<i>n</i> = 15)		Noncatastrophizers (<i>n</i> = 15)	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Pain ratings				
20 s	6.9	2.20	5.2	2.34
40 s	8.2	1.87	6.3	1.54
60 s	8.9	1.60	6.6	1.55
Emotion ratings				
Sadness	10.7	8.53	2.2	3.81
Anxiety	15.0	7.07	6.7	4.95
Anger	13.4	6.98	4.0	5.31
Happiness	1.3	2.66	1.2	2.11

Note. Pain ratings were made on a scale ranging from 0 to 10. Values for emotion ratings represent the sum of ratings made to three emotion adjectives on scales ranging from 0 to 10. Except for happiness, all univariate comparisons were significant at $p < .01$.

throughout the immersion period, and both groups reported increasing levels of pain over time.

A one-way multivariate analysis of variance was conducted on participants' emotion ratings during the ice water immersion. Consistent with previous research (Jensen et al., 1991; Turk & Rudy, 1992), catastrophizers experienced more emotional distress during the ice water immersion than noncatastrophizers, multi $F(4, 26) = 5.0, p < .01$. The two groups did not differ significantly in their ratings of happiness.

Temporal Stability of the PCS

Test-retest correlations for the PCS on all participants tested ($n = 40$) indicated a high degree of stability across the 6-week period, $r = .75, p < .001$. Five participants originally classified as catastrophizers and 5 originally classified as noncatastrophizers did not place within their respective categories at the time of testing. However, these participants' scores fell within 5 points of the respective cut-off scores for all but 2 of the participants. Inclusion or deletion of these participants did not affect the pattern of findings.

In summary, the findings of Study 2 indicate that the PCS is a valid index of catastrophizing ideation. Consistent with previous research, catastrophizing, as measured by the PCS, was associated with heightened levels of physical and emotional distress in response to aversive stimulation (Chaves & Brown, 1987; Spanos et al., 1979). The results also support the position that in the absence of intervention, catastrophizing remains stable over time. Although gender differences were not observed in this study, it is important to note that the modest sample size reduced the probability of detecting relations with small effect sizes.

Study 3

The purpose of Study 3 was to examine the validity of the PCS as an index of catastrophizing ideation in a clinical sample. The PCS was administered to a sample of individuals referred for electrodiagnostic evaluation, a medical procedure that in-

volves the electrical stimulation of nerves with needle electrodes. This procedure is used to diagnose peripheral nerve disorders and is associated with physical discomfort. Following the electrodiagnostic procedure, all patients participated in a semi-structured interview to elicit the thoughts or feelings they experienced. It was hypothesized that high scores on the PCS would be associated with increased reports of catastrophizing thoughts, pain, and emotional distress.

Method

Participants

Twenty women and eight men referred for electrodiagnostic investigation at The Rehabilitation Centre in Ottawa, Ontario, Canada, participated in the research. The mean age of the sample was 40 years ($SD = 8.7$). As in Study 2, individuals who scored above 24 and below 15 on the PCS were invited to participate. The sample consisted of individuals with provisional diagnoses of nerve entrapment ($n = 18$) and radiculopathy ($n = 10$). Individuals who had previously undergone this procedure or had a literacy level sufficiently low to compromise their ability to complete the self-report measures were not invited to participate. Literacy level was considered acceptable if the individual was able to read the consent form aloud.

Procedure

Participants were told that the study was investigating how people respond to medical procedures. They were informed that they would be asked to rate their levels of anxiety and pain during the electrodiagnostic procedure and to complete a measure of their thoughts and feelings related to pain experience. There was variability across individuals in the number of needles inserted and the number of shocks delivered during the electrodiagnostic procedure. Thus, for the purpose of the present study, analyses focused only on participants' pain and anxiety responses to the first needle insertion and the first electric shock. After the first needle insertion and the first electric shock, participants were asked to rate their level of pain and anxiety on separate 100-mm visual analog scales with the endpoints *no pain-severe pain* and *no anxiety-severe anxiety*, respectively.

After the electrodiagnostic procedure, patients participated in a semistructured interview similar to that described in Study 2 but adapted for the electromyographic procedure. All interviews were audiotaped and transcribed verbatim. Two judges who were blind to participants' group classifications coded participants responses according to catastrophizing, coping, and neutral content, using the same criteria as in Study 2. The two judges coded the first 10 transcripts together in order to ensure consistency in the interpretation of the coding criteria. The two judges then independently coded the remaining 18 transcripts, and percentage agreement was 76%, 86%, and 85% for catastrophizing, coping, and neutral content, respectively. Discrepancies were resolved through discussion.

Results and Discussion

Analysis of Thought Content

Participants' thought content during the interview was analyzed as a two-way mixed factorial with level of catastrophizing (catastrophizer or noncatastrophizer) as the between-groups factor and thought type (catastrophizing, coping, or neutral) as the within-groups factor. Initial analyses revealed that there were no significant effects of gender, and the data were collapsed

Table 4
PCS Scores and Frequencies of Catastrophizing, Coping, and Neutral Thoughts During the Electrodiagnostic Procedure

Variable	Catastrophizers (<i>n</i> = 14)		Noncatastrophizers (<i>n</i> = 14)	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
PCS	33.6	5.7	10.9	3.3
Thought content				
Catastrophizing	2.1	1.7	0.6	1.3
Coping	2.2	2.7	1.7	2.0
Neutral	8.8	3.3	9.7	2.1

Note. PCS = Pain Catastrophizing Scale. Values for thought content represent the total frequency of catastrophizing, coping, and neutral thoughts reported during the semistructured interview.

across gender. A significant Group \times Thought type interaction was obtained, $F(1, 26) = 3.9, p < .05$. Consistent with Study 2, simple effects revealed that catastrophizers reported a higher frequency of catastrophizing thoughts ($M = 2.2, SD = 1.7$) than noncatastrophizers ($M = 0.6, SD = 1.3$), $t(26) = 3.5, p < .01$. Catastrophizers and noncatastrophizers did not differ significantly in the frequency of coping thoughts, $t(26) = .63, ns$, or neutral thoughts, $t(26) = .9, ns$ (see Table 4).

The frequency of catastrophizing thoughts reported by catastrophizers was considerably lower than the frequency reported by catastrophizers in Study 2. Differences in the intensity of pain experienced in the cold pressor and electrodiagnostic procedures may account for this discrepancy. In Study 2, both catastrophizers and noncatastrophizers provided ratings above the midpoint of the pain scale, but in Study 3, both groups provided ratings below the midpoint of the pain scale. The number of catastrophizing thoughts reported during the semistructured interview was positively correlated with pain intensity, suggesting that if the electrodiagnostic procedure had been more aversive, the mean number of catastrophizing thoughts in Study 3 may have been higher.

Unlike Study 2, within-group analyses revealed no evidence of a relation between coping activity and pain reduction. Examination of noncatastrophizers' pain ratings in Study 3 suggests that restricted range of values associated with floor effects may have attenuated the potential magnitude of correlations.

Pain and Anxiety Ratings

A two-way mixed analysis of variance on pain ratings with Group (catastrophizers or noncatastrophizers) as the between-groups factor and Pain Stimulus (needle insertion or shock) as the within-groups factor revealed a significant group main effect in which catastrophizers reported significantly more pain than noncatastrophizers $F(1, 26) = 12.1, p < .001$. The main effect for pain stimulus and the two-way interaction were not significant. A two-way (Group \times Pain Stimulus) ANOVA on anxiety ratings revealed a significant group main effect where catastrophizers reported more anxiety than noncatastrophizers, $F(1, 26) = 4.4, p < .05$. The main effect for pain stimulus and the

two-way interaction were not significant. Cell means are presented in Table 5.

The results of Study 3 support the use of the PCS as a valid measure of catastrophizing in clinical samples. PCS scores in individuals undergoing electrodiagnostic evaluation were associated with increased reports of catastrophizing thoughts during a semistructured interview and with increased pain and emotional distress during needle insertion and electric shock. As in Study 2, sample size was not sufficiently large to permit detection of gender differences.

Study 4

There has been some debate concerning the degree of overlap between catastrophizing and related cognitive-affective constructs (Haaga, 1992; Sullivan & D'Eon, 1990). For example, Sullivan & D'Eon (1990) suggested that catastrophizing may reflect the cognitive component of depression. Catastrophizing may also overlap with affective traits such as negative affectivity (Watson & Clark, 1984). Both catastrophizing and negative affectivity have been described in terms of excessive focus on negative aspects of situations, rumination, and heightened levels of emotional and physical distress (Rosenstiel & Keefe, 1983; Spanos et al., 1979; Watson & Clark, 1984; Watson & Pennebaker, 1989). More recently, fear of pain has been discussed as yet another variable that is associated with increased pain and distress in response to aversive stimulation (Hursey & Jacks, 1992; McCracken, Zayfert, & Gross, 1992; McNeil & Berryman, 1989). Examination of the item content of the PCS and measures of fear of pain indicates that there is considerable overlap (McCracken et al., 1992; McNeil, Rainwater, & Aljazireh, 1986).

The conceptual and empirical usefulness of the PCS will be determined by the degree to which it can be distinguished from more basic psychological constructs. Toward this end, one of the aims of the present study was to compare the PCS with measures of depression, anxiety, negative affectivity and fear of pain, both in terms of their ability to predict pain responses and the degree of redundancy among measures.

The present study also addressed two of the shortcomings of Studies 2 and 3. First, the results of these studies do not rule out

Table 5
Pain and Anxiety Ratings Following Needle Insertion and Electric Shock

Variable	Catastrophizers (<i>n</i> = 14)		Noncatastrophizers (<i>n</i> = 14)	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Pain ratings				
Needle insertion	41.7	32.1	12.8	13.4
Shock	40.5	34.2	9.9	8.3
Anxiety ratings				
Needle insertion	43.7	29.9	25.1	31.2
Shock	49.9	33.0	24.0	24.4

Note. Ratings represent the distance in millimeters from the left anchor of a 100-mm line where the participant placed an x.

the possibility that catastrophizers' reports of increased pain and distress may reflect a response bias. In order to rule out this possibility, it is necessary to demonstrate that the relation between catastrophizing and increased distress remains significant even after controlling for distress responses to a nonaversive procedure. Second, although findings of Study 2 support the temporal stability of the PCS, it is possible that high test-retest correlations may have been inflated as a result of selecting participants from the upper and lower thirds of the distribution of scores. The use of an unselected sample of participants would provide a more accurate estimate of the temporal stability of the PCS. In addition, the use of an unselected sample will yield a more accurate estimate of the magnitude of the relation between catastrophizing and distress reactions.

Method

Participants

Sixty students (24 men and 36 women) enrolled in introductory psychology at Dalhousie University volunteered to participate in this study in exchange for course credit. The mean age was 19.5 years ($SD = 5.8$). All participants had previously completed the PCS as part of a screening procedure.

Measures

The Fear of Pain Questionnaire (FPQ; McNeil et al., 1986) was used as a measure of fear of pain. The FPQ consists of 30 items that describe different painful situations. Respondents are asked to rate how fearful they are of the pain associated with each situation. Although the FPQ yields three subscale scores for minor, severe, and medical pain, only the total score was used in this study.

The Positive Affect–Negative Affect Scale (PANAS; Watson, Clark, & Tellegen, 1988) was used to measure positive and negative affectivity. The PANAS is a 20-item scale that consists of emotional adjectives. Respondents are asked to rate the degree to which each of the adjectives generally describes them. The PANAS yields separate scores for positive affectivity and negative affectivity (NA).

The PCS was used as a self-report measure of catastrophizing ideation. Depression was measured with the Beck Depression Inventory (BDI; Beck, Ward, Mendelson, Mock, & Erbaugh, 1961), and trait anxiety was measured using the State–Trait Anxiety Inventory–Trait Form (STAI; Spielberger, Gorsuch, & Lushene, 1970).

Procedure

The procedure for this study was identical to that described in Study 2 with the following exceptions: Pain ratings were also elicited while participants immersed their arm in room temperature water immersions, and participants did not participate in a postimmersion interview. In addition to the measures used in Study 2, participants also completed the FPQ, PANAS, STAI, and BDI.

Results and Discussion

Correlations Among Measures

The correlation matrix for the PCS, FPQ, PANAS (NA), BDI, STAI, and pain are provided in Table 6. The PCS was significantly correlated with depression ($r = .26, p < .05$), trait anxiety ($r = .32, p < .05$), negative affectivity ($r = .32, p < .05$), and fear of pain ($r = .80, p < .001$). Examination of the

Table 6
Correlations Among Individual Difference Measures

Scale	PCS	FPQ	NA	PA	STAI-T	BDI	Pain
PCS	—						
FPQ	.80**	—					
NA	.32*	.33*	—				
PA	.02	.08	-.08	—			
STAI-T	.32*	.34**	.73**	-.42**	—		
BDI	.26*	.27*	.57**	-.30*	.72**	—	
Pain	.46**	.37**	.11	-.06	.15	.09	—

Note. $N = 60$. PCS = Pain Catastrophizing Scale; FPQ = Fear of Pain Questionnaire; NA = Negative Affectivity; PA = Positive Affectivity; STAI-T = State–Trait Anxiety Inventory–Trait; BDI = Beck Depression Inventory; pain = composite pain score computed by adding all three pain ratings.

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

correlation matrix reveals a significant degree of overlap among all measures of trait and state emotional distress, a finding that has been reported in several studies (see Watson & Clark, 1984, for a review).

Only the PCS and FPQ were significantly correlated with pain ratings during the ice water immersion, accounting for 21% and 14% of the variance, respectively. The relations between the PCS and pain, and the FPQ and pain remained significant even when controlling for levels of discomfort reported during the room temperature water immersion. Compared to other measures, the PCS also showed the strongest relation to state measures of anxiety, sadness, and anger during the ice water immersion.

In order to assess the unique contribution of the PCS, the FPQ, the STAI, the NA, and the BDI to the prediction of pain, all variables were entered in a direct multiple regression analysis. In a direct regression analysis, the contribution of each independent variable is evaluated controlling for the contributions of all other variables in the analysis. A significant multiple correlation was obtained, $R = .47, p < .001$. Examination of the semipartial correlations revealed that only the PCS contributed unique variance to the prediction of pain, $F(1, 56) = 5.4, p < .001$. The results of the regression analysis do not support the position that catastrophizing is conceptually confounded with depression, negative affectivity, or trait anxiety. Although zero order correlations revealed a high degree of overlap between catastrophizing and fear of pain, the PCS contributed unique variance to the prediction of pain but the FPQ did not. Results of the regression analysis are presented in Table 7.

Temporal Stability

PCS screening scores were obtained approximately 10 weeks (range of 8–12 weeks) before testing. Consistent with Study 2, the PCS scores showed a high degree of stability across the 10-week period, $r = .70, p < .001$. The predictive validity of the PCS is further strengthened by the finding that PCS scores obtained 10 weeks prior to testing were significantly correlated with participants' pain ratings during the ice water immersion, $r = .33, p < .01$.

In summary, the results of Study 4 support the conceptual

Table 7
Direct Multiple Regression Analysis Predicting Pain Intensity During Ice Water Immersion

Scale	β	Semipartial r	F	p	Zero-order r
PCS	.45	.29	5.03	.03	.46
STAI-T	.10	.06	0.22	.64	.15
FPQ	.02	.01	0.01	.93	.37
BDI	-.06	-.05	0.14	.71	.09
NA	-.08	-.06	0.19	.67	.11

Note. $N = 60$. PCS = Pain Catastrophizing Scale; STAI-T = State-Trait Anxiety Inventory—Trait; FPQ = Fear of Pain Questionnaire; BDI = Beck Depression Inventory; NA = Negative Affectivity.

distinctiveness of the catastrophizing construct. The results also suggest that the relation between catastrophizing and distress cannot be explained simply on the basis of a response bias. The correlation between catastrophizing and pain remained significant even when controlling for participants' ratings of distress during the room temperature water immersion. In other words, catastrophizers' heightened experience of physical distress was apparent only in response to an aversive stimulus.

General Discussion

Although the present study was not intended as a test of a particular theoretical model linking the different dimensions of catastrophizing, at a descriptive level, magnification, rumination, and helplessness share features with primary and secondary appraisal processes that have been discussed in relation to coping with stress (Jensen et al., 1991; Lazarus and Folkman, 1984). For example, magnification and rumination may be related to primary appraisal processes in which individuals may focus on and exaggerate the threat value of a painful stimuli. Helplessness may be related to secondary appraisal processes in which individuals negatively evaluate their ability to deal effectively with painful stimuli. Indeed, Jensen et al. (1991) have proposed that catastrophizing may be viewed as a negative appraisal of pain. As a function of a learning history characterized by excessive exposure to painful situations or exposure to others' catastrophic reactions to pain, individuals may develop enduring beliefs or schema about the high threat value of painful stimuli or about their inability to effectively manage the stress associated with painful experiences (Turk & Rudy, 1992). The high test-retest correlations of the PCS are consistent with the position that individuals may possess enduring beliefs about the threat value of painful stimuli.

Rumination accounted for the largest proportion of variance in the PCS. The items making up the rumination component reflect an inability to suppress or divert attention away from pain-related thoughts. The role of attentional factors in catastrophizing has been noted by several investigators. Heyneman et al. (1990) have reported findings suggesting that catastrophizers may be impaired in their ability to make effective use of distraction strategies. Spanos et al. (1979) have suggested that catastrophizers may fail to attend sufficiently to their coping strategies. It is possible that pain-related thought intrusions or

excessive focus on pain sensations may interfere with catastrophizers' attempts to invoke strategies to reduce their pain. Indeed, the data from Study 2 suggest that catastrophizers use as many coping strategies as noncatastrophizers; however, for catastrophizers, the use of coping strategies is not associated with pain reduction.

There are a number of limitations to the current research that must be considered. First, the PCS requires participants to rely on their memory of past painful experiences to answer items and proceeds from the assumption that cognitive-affective reactions to pain are consistent across different pain situations. Although the question of accuracy of memory was not addressed in this research, the correlations between PCS scores obtained at screening and those obtained during testing provide indirect support for cross-situational consistency of reactions to painful situations. When participants completed the PCS at screening, they were not exposed to an aversive stimulus and were not aware that they would participate in a painful experimental procedure 10 weeks later. Still, screening scores were significantly correlated with pain ratings during the cold pressor.

Although the PCS was tested on experimental and clinical samples, it is important to note that the pain situations used in this research were relatively nonthreatening. In both situations, participants received reassurance that no injury would result from the procedures. It is possible that pain situations associated with serious injury or life-threatening illness may elicit a qualitatively different pattern of cognitive-affective reactions. More research will be needed to address the reliability and validity of the PCS across different clinical samples. It will also be necessary to explore further the relation between gender and catastrophizing. The results of Study 1 suggest that women catastrophize more than men. However, the small sample sizes and disproportionate number of women who participated in our studies compromised our ability to examine the nature of gender differences in greater depth.

Despite these limitations, the PCS may prove to be a useful research instrument in efforts to understand the psychological processes that lead to heightened physical and emotional distress in response to aversive stimulation. In previous research, the requirement of a concurrent pain experience for the measurement of catastrophizing restricted the nature of empirical questions that could be addressed. In experimental studies, the requirement of a pain experience for group assignment posed problems for comparing catastrophizers and noncatastrophizers on the cognitive processes that may have preceded their distress responses. Similarly, although the CSQ has provided a useful tool for examining the correlates of catastrophizing in chronic pain patients, chronic pain patients cannot be examined in a pain-free state, and it is therefore difficult to rule out the possibility that the relation between catastrophizing and distress reactions may be due to preexisting variables unrelated to their pain experience (Sullivan & D'Eon, 1990).

From a clinical perspective, the PCS may be useful in identifying individuals who may be susceptible to heightened distress responses to aversive medical procedures such as chemotherapy or surgery. The work of Heyneman et al. (1990) suggests that strategies such as positive self-instruction are effective in reducing catastrophizers' distress and that distraction strate-

gies are less useful. Knowledge of individuals' level of catastrophizing may facilitate the application of coping interventions that will be most effective in promoting recovery from or adaptation to aversive medical procedures.

In summary, the results of the studies reported here indicate that the PCS is a reliable and valid measure of catastrophizing. PCS scores were significant predictors of the intensity of physical and emotional distress experienced by participants experiencing cold pressor pain and undergoing electrodiagnostic evaluation. The results of this research also provide support for the operational and conceptual distinctiveness of catastrophizing as measured by the PCS. Compared to measures of related cognitive-affective constructs, the PCS showed the strongest association to pain and emotional distress. Questions concerning the mediating role of attentional factors in accounting for the relation between catastrophizing and pain are currently being addressed in our laboratory.

References

- Beck, A. T., Ward, C. H., Mendelson, M., Mock, J., & Erbaugh, J. (1961). An inventory for measuring depression. *Archives of General Psychiatry, 4*, 561-571.
- Billings, A. G., & Moos, R. H. (1984). Coping, stress, and social resources among adults with unipolar depression. *Journal of Personality and Social Psychology, 46*, 877-891.
- Chaves, J. F., & Brown, J. M. (1978). *Self-generated strategies for the control of pain and stress*. Paper presented at the 86th Annual Conference of the American Psychological Association, Toronto, Ontario, Canada.
- Chaves, J. F., & Brown, J. M. (1987). Spontaneous cognitive strategies for the control of clinical pain and stress. *Journal of Behavioral Medicine, 10*, 263-276.
- Conway, M., DiFazio, R., & Bonneville, F. (1991). Sex, roles, and response styles for negative affect: Selectivity in a free recall task. *Sex Roles, 25*, 687-700.
- Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika, 16*, 297-334.
- Endler, N. S., & Parker, J. D. A. (1994). Assessment of multidimensional coping: Task, emotional, and avoidance strategies. *Psychological Assessment, 6*, 50-60.
- Haaga, D. A. F. (1992). Catastrophizing, confounds, and depression: A comment on Sullivan and D'Eon (1990). *Journal of Abnormal Psychology, 101*, 206-207.
- Heyneman, N. E., Fremouw, W. J., Gano, D., Kirkland, F., & Heiden, L. (1990). Individual differences and the effectiveness of different coping strategies for pain. *Cognitive Therapy and Research, 14*, 63-77.
- Hursey, K. G., & Jacks, M. S. (1992). Fear of pain in recurrent headache sufferers. *Headache, 32*, 283-286.
- Jensen, I., Nygren, A., Gamberale, F., Goldie, I., & Westerholm, P. (1994). Coping with long term musculoskeletal pain and its consequences: Is gender a factor? *Pain, 57*, 167-172.
- Jensen, M. P., Turner, J. A., Romano, J. M., & Karoly, P. (1991). Coping with chronic pain: A critical review of the literature. *Pain, 47*, 249-283.
- Keefe, F. J., Brown, G. K., Wallston, K. A., & Caldwell, D. S. (1989). Coping with rheumatoid arthritis: Catastrophizing as a maladaptive strategy. *Pain, 37*, 51-56.
- Keefe, F. J., Caldwell, D. S., Queen, K. T., Gil, K. M., Martinez, S., Crisson, J. E., Ogden, W., & Nunley, J. (1987). Pain coping strategies in osteoarthritis patients. *Journal of Consulting and Clinical Psychology, 55*, 208-212.
- Lazarus, R. A., & Folkman, S. (1984). *Stress, appraisal, and coping*. New York: Springer.
- McCracken, L. M., Zayfert, C., & Gross, R. T. (1992). The Pain Anxiety Symptoms Scale: Development and validation of a scale to measure fear of pain. *Pain, 50*, 67-73.
- McNair, D. M., Lorr, M., & Droppleman, L. F. (1971). *Manual: Profile of Mood States*. San Diego, CA: Educational and Industrial Testing Service.
- McNeil, D. W., & Berryman, M. L. (1989). Components of dental fear in adults? *Behavior Research and Therapy, 27*, 233-236.
- McNeil, D. W., Rainwater, A. J., & Aljazireh, L. (1986, November). *Development of a methodology to measure fear of pain*. Paper presented at the Annual Meeting of the Association for Advancement of Behavior Therapy, Chicago, IL.
- Nolen-Hoeksema, S. (1987). Sex differences in unipolar depression: Evidence and theory. *Psychological Bulletin, 101*, 259-282.
- Rosenstiel, A. K., & Keefe, F. J. (1983). The use of coping strategies in chronic low back pain patients: Relationship to patient characteristics and current adjustment. *Pain, 17*, 33-44.
- Spanos, N. P., Brown, J. M., Jones, B., & Horner, D. (1981). Cognitive activity and suggestions for analgesia in the reduction of reported pain. *Journal of Abnormal Psychology, 90*, 554-561.
- Spanos, N. P., Radtke-Bodorik, H. L., Ferguson, J. D., & Jones, B. (1979). The effects of hypnotic susceptibility, suggestions for analgesia, and utilization of cognitive strategies on the reduction of pain. *Journal of Abnormal Psychology, 88*, 282-292.
- Spielberger, C. D., Gorsuch, R. L., & Lushene, R. E. (1970). *Manual for the State-Trait Anxiety Inventory*. Palo Alto, CA: Consulting Psychologists Press.
- Sullivan, M. J. L., & D'Eon, J. (1990). Relation between catastrophizing and depression in chronic pain patients. *Journal of Abnormal Psychology, 99*, 260-263.
- Turk, D. C., & Rudy, T. E. (1992). Cognitive factors and persistent pain: A glimpse into Pandora's Box. *Cognitive Therapy and Research, 16*, 99-122.
- Vallis, T. M. (1984). A complete component analysis of stress inoculation for pain tolerance. *Cognitive Therapy and Research, 8*, 313-329.
- Watson, D., & Clark, L. A. (1984). Negative affectivity: The disposition to experience aversive emotional states. *Psychological Bulletin, 96*, 465-490.
- Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology, 54*, 1063-1070.
- Watson, D., & Pennebaker, J. W. (1989). Health complaints, stress, and distress: Exploring the central role of negative affectivity. *Psychological Review, 96*, 234-254.

Received August 1, 1994

Revision received April 26, 1995

Accepted May 2, 1995 ■