THE ROLE OF PAIN CATASTROPHIZING

AND THREAT/ HARM APPRAISALS

IN PAIN RESPONSIVITY

by

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ABSTRACT

The primary aim of this secondary data analysis was to examine the relation between pain catastrophizing and threat/harm appraisals and to determine if either construct uniquely predicts pain responsivity. An ancillary aim was to replicate race and sex differences in pain catastrophizing, threat/harm appraisals, and pain responsivity that have been previously found in the literature (Dixon, Thorn, & Ward, 2004; Osman, Barrios, Gutierrez, Kopper, Merrifield, & Grittmann, 2000). Analyses were performed on a dataset collected from 93 undergraduate students at the University of Alabama who completed the cold pressor task, an experimental pain manipulation, and then responded to the Composite Catastrophizing Measure (Clements, 2006). Statistical procedures included multivariate regression and two-way between-subjects analysis of variance. Together, pain catastrophizing and threat/harm appraisals predicted a small percent of the variance in pain intensity, but neither variable had any independent predictive ability. For tolerance, the combined model also predicted a small percent of variability. Here, pain catastrophizing and threat/harm appraisals each uniquely predicted tolerance times, although pain catastrophizing explained slightly more variance. No significant results were found in regards to this study's hypotheses surrounding race and sex differences in pain responsivity, catastrophizing, and threat/harm appraisals; this may be due to the small sample size and unequal cells. Findings from this study suggest that pain catastrophizing and threat/harm appraisals, while closely related, tap into unique aspects of pain-related maladaptive cognitions.

LIST OF ABBREVIATIONS AND SYMBOLS

a Cronbach's index of internal consistency

β (SE) The standard effort the regression coefficient

beta The probability that a statistic will generate a false-negative result

df Degrees of freedom: number of values free to vary after certain restrictions have been placed on the data

F Fisher's *F* ratio: A ratio of two variances

M Mean: the sum of a set of measurements divided by the number of measurements in the set

N Size of the sample

η The linear predictor for a linear regression model

p Probability associated with the occurrence under the null hypothesis of a value as extreme as or more extreme than the observed value

r Pearson product-moment correlation

R^2 Coefficient of determination: proportion of variability in a dataset that is accounted for by the statistical model

SD Standard deviation: a measure of variability from the mean

< Less than

> Greater than

= Equal to

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Introduction

The experience of pain is a complex interplay between psychological, biological, and cultural factors. Researchers and clinicians are no longer satisfied with the biomedical model of pain, which postulates that severity of pain is directly (and simply) related to the extent of tissue damage (Turk, Meichenbaum, & Genest, 1983). Cognitive factors are being studied to understand how appraisals, beliefs, and coping strategies all influence how pain is perceived (Lazarus & Folkman, 1984) and to account for differences in pain responsivity between individuals. For example, pain catastrophizing—the tendency to dwell on, and consequently, magnify, the negative aspects of a situation— has been recognized as a robust predictor of numerous pain outcomes (Sullivan, Tripp, & Santor, 2000; Keefe et al., 2004). Catastrophizing has been widely researched in both clinical and experimental contexts (Sullivan, Stanish, Waite, Sullivan, & Tripp, 1998; Sullivan & D'Eon, 1990; Sullivan & Neish, 1999) and offers an important angle to understand how psychological processes affect pain. Other cognitive factors, such as primary appraisals, offer potentially interesting and important roles in the pain experience, but have received far less empirical attention. By better understanding how different psychological factors uniquely affect pain outcomes and by exploring these factors' relation to catastrophizing, we can create a more comprehensive understanding of how pain is shaped by maladaptive cognitive patterns.

Lazarus and Folkman (1984) developed the transactional model of stress to describe the cognitive processes, including appraisals, beliefs, and coping strategies, underlying individuals'

responses to stressful situations. In this framework, primary appraisals are the initial evaluations made when an individual is confronted by a stressor; he or she evaluates the danger or likelihood of harm associated with the situation. The stressor may be interpreted as a threat (feeling unprepared and incapable of dealing with the situation), a harm/loss (perceiving negative or damaging outcomes associated with the situation), or a challenge (efficacy in being able to persevere and successfully deal with the situation). Secondary appraisals are evaluations that determine whether a person believes he or she possesses the coping strategies necessary to deal with the stressor.

In relation to this model, catastrophizing can be viewed as a secondary appraisal process (Haythornthwaite & Heinberg, 1999; Thorn, Rich, & Boothby, 1999). Catastrophizing describes the sense of helplessness, rumination, and magnification of a negative experience that may be activated in the face of a stressful event (Sullivan, Bishop, & Pivik, 1995). It may reflect an individual's doubts and fears about being able to handle the emergent situation. Catastrophic thinking is connected to a number of negative outcomes related to pain, including increased severity, greater functional impairment, and lower threshold and tolerance of pain (Granot & Ferber, 2005; Sullivan et al., 1998; Sullivan et al., 2000; Keefe et al., 2004). These findings hold true across experimental samples, patients with pain-related conditions, and individuals experiencing procedural pain in medical settings (Sullivan et al., 1998; Sullivan & D'Eon, 1990; Sullivan & Neish, 1999). Women (Osman et al., 2000; Thorn et al., 2004) and racial minorities (Dixon, Thorn, & Ward, 2004; Pence, Thorn, Day, & Shelby, under review) are more likely to engage in catastrophic thinking and, for women, catastrophizing mediates the relation between sex differences and pain responsivity (Keefe et al., 2000; Sullivan et al., 2000).

Although primary appraisals have been less researched, there are some studies that address how these processes are associated with pain responsivity. For example, challenge appraisals have been associated with increased pain tolerance (Pence, Thorn, Day, & Shelby, under review; Sanford, Kersh, Thorn, Rich, & Ward, 2002) and are used more often by males than females (Pence et al., under review; Unruh, Ritchie & Marskey, 1999). Individuals who engage in threat appraisals are more likely to have low tolerances times (Pence et al., under review) and report greater pain severity and interference in their daily lives (Unruh et al., 1999). African-Americans are more likely to use threat appraisals when dealing with a stressor (Pence et al., under review). Finally, harm/loss appraisals have been associated with negative emotions including sadness and grief and psychological dysfunction (Regan, Lorig, & Thoresen, 1988).

The Current Study

The major aim of this study was to examine the relation between pain catastrophizing (as measured by the Pain Catastrophizing Scale) and threat/harm appraisals (as measured by the Pain Appraisal Inventory) by doing a secondary data analysis on previously collected information. Few published investigations have looked at primary appraisals in regards to pain responsivity (Unruh et al., 1999; Regan et al., 1988) and none have sought to determine if pain catastrophizing or threat/harm appraisal uniquely predict different pain responses. Therefore, this present study sought to discover if pain catastrophizing and threat/harm appraisals offer unique contributions in the prediction of experimental pain outcomes. First, it was expected that these two variables would be strongly correlated, but below .80. This would suggest that they share a good deal of conceptual overlap, but that threat/harm appraisals capture a distinct aspect of pain-related cognitions. It was also expected that the combination of these two variables would predict a significant degree of the variance in pain responses. Furthermore, it was hypothesized that pain catastrophizing and threat/harm appraisals would serve as unique predictors for pain unpleasantness, intensity, and tolerance time. Because pain catastrophizing has been shown to be a robust predictor of numerous pain-related outcomes in experimental and clinical settings (Dixon et al., 2004; France et al., 2004; Sullivan et al., 2000; Keefe et al., 2004) it was expected that it would explain more of the variance than threat/harm appraisals, but that this latter variable would nonetheless add significantly to the model's predictive ability.

Also, an additional aim of this study was to examine race and sex differences in pain responsivity, threat/harm appraisals, and pain catastrophizing. Given the small sample size, this

was an exploratory arm of the study, which may provide preliminary data for future study designs. Based on previous work (Dixon et al., 2004; Osman et al. 2000, Sullivan et al., 2000), it was expected that women and African-Americans would have higher pain responsivity (higher ratings for pain unpleasantness and pain intensity and lower tolerance times). Additionally, it was expected that women and African-Americans would endorse higher levels of pain catastrophizing and threat/harm appraisals.

Method

Participants

Participants were 143 students, ages 18 and older, who were recruited from the University of Alabama and Stillman College. This investigation was approved by the Institutional Review Board at the University of Alabama and all participants gave written informed consent. Students received either course credit or extra credit for their participation. Exclusionary criteria included a number of health-related conditions— cardiovascular disease, chronic pain conditions, neuropathic pain, hemophilia, pregnancy, Raynauld's disease, diabetes, hypertension, and psychiatric disorders—and any current use of pain medication. Due to missing data in the original data set, information from 93 participants was pulled for use in the analyses of this current study.

Materials

The cold pressor apparatus is an insulated plastic basin that allows participants to rest their forearm on a shelf, fully submerged in chilled water. The basin contains an internal pump, which circulates water, maintaining its temperature between 0 and 2˚ C. The particular cold pressor task (CPT) system that was used for this study is the Neslab RTE Series refrigerated bath created by Thermo Scientific. The CPT is one of several commonly used pain manipulations and is often selected due to its generalizability. The pain induced through the CPT—an aching, crushing sensation (Turk et al., 1983)— is considered analogous to clinical conditions in respect to the quality, duration, and urgeny of pain experienced (Clark & Hunt, 1971; Smith, Egbert, Markowitz, Mosteller, & Beecher, 1966).

Procedure

Participants first reviewed and signed the informed consent sheet. They also completed an exclusionary criteria sheet and a baseline rating of their current pain intensity and pain unpleasantness, using the Visual Analog Scales (VAS; Price, McGrath, Rafii, & Buckingham, 1983). Then, participants began the cold pressor task (CPT) by placing his or her hand in the cold water. After thirty seconds, he or she was instructed to remove his or her arm and complete another set of VAS ratings for unpleasantness and intensity. Participants were then asked to place his or her hand back in to the cold water basin and, this time, to keep it there for as long as possible. After an uninformed time limit of 5 minutes, any participant who had not already withdrawn his or her hand was asked to take it out at this time. Participants immediately completed a third set of VAS ratings for intensity and unpleasantness, this time, in reference to the pain they experienced at the conclusion of the CPT. Next, participants filled out the Composite Catastrophizing Measure (CCM; Clements, 2006) using the CPT experience as the basis for their responses. Dixon et al.'s (2004) study suggests that catastrophizing measures given after an experimental manipulation, such as the CPT, are better able to predict pain responsivity than the same measures given before the pain manipulation. Furthermore, administering the CCM following the CPT assesses catastrophizing and other related cognitive processes as state-like constructs, which are particularly responsive to situations, rather than as trait-like constructs.

Measures

Visual Analog Scales (VAS; Price et al., 1983). Two components of pain responsivity, unpleasantness and intensity, were measured through participants' markings along a 10-cm. scale. Intensity scores range from ratings of 0 ("No pain") to 10 ("Pain as bad as it can be"); the

unpleasantness ratings also range from 0 ("No aversiveness") to 10 ("As aversive as can be"). The VAS have been shown to be reliable measures of chronic and experimental pain (Price et al., 1983).

Pain Tolerance. The third dimension of pain responsivity that was studied in this investigation was pain tolerance. Tolerance was measured as the time, in seconds, that passed from when a participant first placed their arm in the CPT basin to the instant that they removed it.

Composite Catastrophizing Measure. The recently developed Composite Catastrophizing Measure (CCM; Clements, 2006) was given to participants following their exposure to the CPT. The CCM was created to facilitate the revision of the Pain Catastrophizing Scale (PCS; Sullivan, Bishop, & Pivik, 1995), a frequently used instrument in clinical and experimental contexts, to enhance its comprehensiveness. The 92-item CCM contains questions drawn from a number of measures including all 13 items of the PCS, the threat/harm subscale from the Pain Appraisal Inventory (PAI; Unruh, Ritchie, & Merskey, 1999; Unruh & Ritchie, 1998), the Inventory of Negative Thoughts in Response to Pain (Gil, Williams, Keefe, and Beckham, 1990), the catastrophizing subscales of the Cognitive Coping Strategies Inventory (Butler, Damarin, Beaulieu, Schwebel, & Thorn, 1989), the Coping Strategies Questionnaire (Rosenstiel & Keefe, 1983), the Pain Anxiety Symptoms Scale (McCracken, Zayfert, & Gross, 1992), in addition to 13 items created by Clements (2006). Participants indicated how frequently they experienced a thought or feeling described in each item using a 5-point Likert scale, ranging from 1 (not at all) to 5 (all the time). The PAI and PCS items are of most interest to this study; these items were pulled from the CCM and analyzed independently. Therefore, information regarding both of these instruments is also provided.

Pain Appraisal Inventory. The PAI is a 16-item measure designed by Unruh & Ritchie (1998) to assess individuals' primary appraisals of pain-related stressors. Two categories of appraisals are assessed: challenge appraisal (e.g., "I think the pain makes me a stronger person") and threat/harm (e.g., "I am concerned that the pain might become more than I can manage"). A 6-point Likert scale, ranging from 1 ("Strongly Disagree") to 6 ("Strongly Agree"), is used by respondents to indicate how much they agree with each statement. Sufficient reliability (threat/ harm alpha=.80 and challenge alpha=.86) has been established for each of these subscales (Unruh & Ritchie, 1998).

The Pain Catastrophizing Scale. Developed by Sullivan, Bishop, and Pivik (1995), this 13-item instrument assesses catastrophic thinking in response to pain. For each item, participants indicate the frequency of which they have experienced a specific pain-related thought/ feeling through the use of a 5-point Likert scale, which ranges from 0 ("not at all") to 4 ("all the time"). In addition to a total score, the PCS also yields three subscale scores that represent three dimensions of catastrophizing: rumination, magnification of the negative experience, and helplessness. Analyses have determined that the PCS has high internal consistency (Cronbach's alpha= 0.91) and high test-retest reliability (r=0.78) (Sullivan et al., 1995; Van Damme, Crombez, Bijttebeir, Goubert, & Van Houdenhove, 2002).

Demographics. Information regarding the participants' age, race, and sex was also collected.

Statistical Analyses

First, Pearson product moment correlations were run to examine the strength of the relation between pain catastrophizing and threat/harm appraisals. Two-way between-subject ANOVAs were used to investigate whether previously reported race and sex differences in pain

responsivity emerged in this relatively small sample. In addition to examining main effects, these ANOVAs were used to determine the possibility of an interaction. Finally, simple linear regressions, with PCS scores and PAI scores entered simultaneously, were run to determine if pain catastrophizing and threat/harm appraisals predict pain responsivity.

Results

Selected cases (N=93)—those with complete information for the PAI, PCS, pain responsivity, race, and sex variables—were drawn from the original data set. This sample includes 43 females (46.2%) and 50 males (53.8%). Participants included 72 Caucasians (77.4%) and 21 African-Americans (22.6%). The participants' mean age was 19.4 years (SD=1.172).

Table 1

Means and Standard Deviations by Sex and Race

	Sex		Race	
Variable	Male	Female	Caucasian	African-Americans
	M (SD)	M (SD)	M (SD)	M (SD)
Intensity	6.74 (1.96)	7.14 (1.80)	7.04 (1.80)	6.52 (2.16)
Unpleasantness	7.77 (2.14)	8.20 (1.73)	7.99 (1.91)	7.89 (2.18)
Tolerance	131.65 (104.25)	51.20 (52.59)	96.59 (88.89)	87.14 (108.60)
Threat/harm appraisals	17.76 (5.11)	16.98 (5.55)	17.79 (5.11)	16.05 (5.84)
Pain catastrophizing	30.45 (7.60)	33.09 (10.62)	31.94 (8.65)	30.80(10.90)

Note. The original values (pre-transformation) for unpleasantness and tolerance are reported here.

Reliability statistics were run to compare the internal consistency of the PCS and PAI as they were given in the current sample with normative data. According to Unruh and Ritchie (1998), the threat/harm subscale of the PAI has good reliability, with a Cronbach alpha coefficient of .80. In the current study, the Cronbach alpha coefficient was .68. The PCS has a reported internal consistency of .91 (Sullivan et al., 1995). With the current sample, the PCS Cronbach alpha coefficient was .86.

Pearson product moment correlations were conducted, determining that there is a strong, positive correlation between pain catastrophizing and threat/harm appraisals, $r=.727$, $n=92$, $p < .01$. As expected, higher levels of pain catastrophizing are strongly associated with greater endorsement of threat/harm appraisals.

Table 2

Summary of Standard Regression Analysis for Variables Predicting Pain Responsivity

	Pain Intensity					
	F	R^2	*p*	β (SE)	beta	*p*
Overall model	3.34	.07	*.04*			
Threat/ harm appraisals				.06(.05)	.18	.24
Pain catastrophizing				.02(.03)	.11	.47

	Pain Unpleasantness					
	F	R^2	*p*	β (SE)	beta	*p*
Overall model	2.24	.05	.11			
Threat/harm appraisals				.00(.02)	.01	.96
Pain catastrophizing				-.01(.01)	-.22	.14

	Tolerance					
	F	R^2	*p*	β (SE)	beta	*p*
Overall model	6.32	.12	.003			
Threat/harm appraisals				.03 (.01)	.39	.01
Pain catastrophizing				-.02 (.01)	-.51	.00

Simple linear regression was used to assess the ability of the PAI and PCS to predict pain responsivity (measured by pain unpleasantness, pain intensity, and tolerance time). Preliminary analyses were conducted to ensure that there was no violation of the assumptions of normality, linearity, multicollinearity, and homoscedasticity. Two of the dependent variables— tolerance

and unpleasantness— violated the requirements for normality. Logarithmic and square root transformations were performed on tolerance and unpleasantness, respectively, and these newly created variables were used in the analyses. Following the transformations, their skewness and kurtosis statistics more closely approached 0 and outliers were eliminated; these variables now meet the assumption that the data is normally distributed.

Next, PAI threat/harm scores and PCS scores were entered into a regression model to test the ability of these variables to predict pain intensity. The overall model explains 7.1% of the variance in intensity ratings, $F(2, 87) = 3.34$, $R^2 = .071$, $p < .05$. However, neither threat/harm appraisals nor pain catastrophizing serve as unique predictors for pain intensity. In the next model, pain catastrophizing and threat/harm appraisals did not significantly account for variance in pain unpleasantness, $F(2, 89) = 2.24$, $R^2 = .048$, $p = .112$. However, the pain catastrophizing and threat/harm model explained 12.4% of the variance in tolerance times, $F(2, 89) = 6.325$, $R^2 = .124$, $p < .01$. At the zero order level, the correlation, $r = .014$, $N = 92$, $p = .448$, between threat/harm appraisals and tolerance is insignificant. However, when threat/harm appraisals is entered simultaneously with pain catastrophizing, it significantly contributes a small degree of predictive value over and above pain catastrophizing alone. Pain catastrophizing, beta = -.514, p = .001, uniquely predicts more variance than threat/harm appraisals, beta = .388, p = .009, for tolerance.

Two-way between-subject ANOVAs were conducted to explore the effect of race and sex on pain responsivity, pain catastrophizing, and threat/harm appraisals. The interaction effects between race and sex were not statistically significant for pain intensity, $F(1, 87) = .170$, $\eta e^2 = .002$, $p = .682$ (Table 3). The main effects for race, $F(1, 87) = .856$, $\eta e^2 = .01$, $p = .357$, and sex, $F(1, 87) = .993$, $\eta e^2 = .01$, $p = .322$ were also not statistically significant. In regards to unpleasantness, the interaction effect was not significant, $F(1, 89) = 1.157$, $\eta e^2 = .01$, $p = .285$

(Table 4). The main effects for race, F (1, 89) =. 032, ηe^2=. 00, p=. 859, and sex, F (1, 89) =1.913, ηe^2 =. 02, p =. 170, were not significant. Tolerance was the third pain outcome included in these analyses; however, this variable did not meet the assumptions underlying analysis of variance. In this case, the Levene's test, F (3, 89) =4.892, p<.01, was significant, which indicates that the variance of tolerance times across groups is not equal. In regards to threat/harm appraisals, the interaction between race and sex was not significant, F (1, 88) =1.744, ηe^2=. 02, p=. 190 (Table 5). Furthermore, the main effects for race, F (1, 88) =1.42, ηe^2 =.02, p=.236, and sex, F (1, 88) =.008, ηe^2 =.00, p=.926, were not significant. Main effects and the interaction could not be computed for pain catastrophizing, as this variable also did not pass the Levene's test, F (3, 88) =5.424, p=. 002, and therefore did not meet ANOVA's assumption of equal variance across groups.

Table 3

Two-Way Between-Subjects Analysis of Variance for Pain Intensity

Source	*df*	F	η	*p*
Race	1	.856	.010	.357
Sex	1	.993	.011	.322
Race * Sex	1	.170	.002	.682

Table 4

Two-Way Between-Subjects Analysis of Variance for Pain Unpleasantness

Source	*df*	F	η	*p*
Race	1	.032	.000	.859
Sex	1	1.913	.021	.170
Race * Sex	1	1.157	.013	.285

Table 5

Two-Way Between-Subjects Analysis of Variance for Threat/Harm Appraisals

Source	*df*	F	η	*p*
Race	1	1.421	.016	.236
Sex	1	.008	.000	.929
Race * Sex	1	1.744	.019	.190

Discussion

The results of the Pearson product moment correlation suggest that threat/harm appraisals and pain catastrophizing are closely related. This correlation, r = .72, indicates that there is 52% shared variance between these constructs. Pence et al. (under review) obtained a correlation of .57 for threat/harm appraisals and pain catastrophizing; although their findings reveal a moderately strong correlation, it also suggests that these may be two unique variables, despite their overlap. The correlation in the current study may have been inflated by certain aspects of data collection; both the PAI and PCS scores were obtained by drawing these items from the CCM. Therefore, participants completed items from both the PAI and PCS as if they were the same instrument. Participants may respond to items more similarly if they are presented on the same questionnaire, than if items (like those of the PCS and PAI) are presented on two separate questionnaires.

In regards to the reliability of these instruments, the PCS's Cronbach alpha coefficient was similar to what is commonly reported in the literature. However, for the present sample, the PAI threat/harm subscale's Cronbach alpha coefficient bordered on being unacceptably low. It can be a challenge to obtain a good alpha value with a scale consisting of few items; the PAI subscale contains only 8 items. These findings demonstrate that the PCS's reliability holds up well in contexts divergent from its normative sample; after all, it was administered in a questionnaire containing a number of other measures and given to a relatively small college student sample. The PAI subscale, however, does not do an equally good job in reliably measuring threat/harm appraisals in this sample.

This study also intended to determine whether pain catastrophizing and threat/harm appraisals serve as unique predictors of pain responsivity. It appears that, together, threat/harm appraisals and pain catastrophizing predicted a small percentage (7.1%) of the variance in pain tolerance. Unlike our predictions, neither uniquely predicted this facet of pain responsivity. The combined model for pain unpleasantness was not significant, indicating that, in this sample, threat/harm appraisals and pain catastrophizing did not account for any variance. However, threat/harm appraisals and pain catastrophizing did prove significant for pain intensity, accounting for 12.4% of this dependent variable. In this case, both threat/harm appraisal and pain catastrophizing uniquely predict pain intensity; as expected, catastrophizing explains more of the variance than threat/harm appraisals. However, when considered independent of pain catastrophizing, threat/harm appraisal's relation to tolerance is insignificant. That is, threat/harm appraisal alone does not predict any variance of tolerance times. In the presence of pain catastrophizing, it adds a small, but significant, increase in predictive value. Such findings suggest that pain catastrophizing and threat/harm appraisals tap into slightly different aspects of pain-related maladaptive cognitions and that the combination of these two explains more variance, than with each considered independently.

A recent unpublished study determined that threat/harm appraisals and pain catastrophizing differentially predict pain responsivity, with threat/harm appraisals uniquely predicting tolerance and pain catastrophizing uniquely predicting pain intensity and unpleasantness (Pence et al., under review). Findings from this study and the current one support the assumption that pain catastrophizing and threat/harm appraisals, together, predict pain responsivity. Both studies also suggest that—since there is some unique predictive ability—a distinction between pain catastrophizing and harm/threat appraisals is warranted. With a greater

sample size, it is possible that more pronounced differences in predictive ability may have emerged in the current study.

An ancillary aim of this study was to replicate race and sex differences in pain responsivity that have been documented in numerous investigations and explore possible differences in primary pain appraisals. Contrary to our hypotheses, there were no significant differences that emerged. Although it is possible that individual differences were not present in this population, it seems more likely that the nature of the sample limited the results. In addition to the relatively small size of the sample, the cells of the study were not equal: African-Americans composed only a minority of the sample at 22.6% and at, n=21, the overall number of African-Americans was quite low.

There are several limitations to consider when reflecting on the current study and its findings. As already mentioned, the sample size was relatively small; with a greater number of participants, it is likely that more significant results would emerge (especially for race and sex differences). The experimental context of this study also poses as a limitation for studying primary appraisals. Lander, Foewler-Kerry, and Hill (1990) indicate that the high degree of control in an experiment and the ease of which one can abruptly end the pain, may mean appraisals are less generalizeable to a CPT. Also, the PAI combined two types of appraisals, threat and harm, into one subscale, and this action could cloud its measurement of specific primary appraisals.

This investigation will hopefully serve as a launching point for future work exploring the construct of catastrophizing and its relation to other cognitive factors, such as primary appraisals. These associations hold implications for both clinical application and future investigations. If threat/harm appraisals and pain catastrophizing are distinct, albeit closely related constructs, this

information can inform cognitive-behavioral treatments of pain conditions. For instance, popular treatments for chronic pain already heavily rely on techniques for reducing pain catastrophizing (Thorn, 2004). If threat/harm appraisals also play a unique role in contributing to these conditions, drawing on a multi-dimensional approach, which additionally focuses on primary appraisals, could enhance treatment.

Finally, results from this investigation suggest that the pursuit of better understanding the construct of catastrophizing is an important avenue of research. If there is considerable overlap between pain catastrophizing and threat/harm appraisals then, perhaps, the definition of catastrophizing should be broadened to include primary appraisals. If these two constructs are distinct, then this suggests that more attention should be given to the spectrum of cognitive factors that contribute to the pain experience. As already mentioned, the PCS is a widely used measure to assess for psychological features that predict and explain higher pain ratings and poorer outcomes. Recent evidence suggests that the PCS may not be comprehensive enough; this instrument may fail to capture all the psychological processes related to catastrophizing that influence pain responsivity (Turner & Aaron, 2001). Information about the relation between pain catastrophizing and threat/harm appraisals can facilitate the revision of the PCS into a measure that more closely taps into those maladaptive cognitions that affect the experience of pain.

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APPENDIX

PCS and PAI threat/harm items in the Composite Catastrophizing Measure

Scale	Item
	1. During painful episodes it is difficult for me to think of anything besides the pain.
	2. I know if I do anything it is going to make my pain worse.
	3. I keep thinking about death.
	4. My sleeping patterns change.
	5. I am so inadequate.
PAI	6. I am concerned that the pain might mean something is wrong with me.
	7. I am worthless.
PCS	8. I feel I can't stand it anymore.
	9. I think that if my pain gets too severe, it will never decrease.
PAI	10. I think of the pain as a threat.
	11. I can't help but concentrate on how bad the pain actually feels.
	12. I can't do anything for others.
PCS	13. I wonder whether something serious may happen.
	14. When I feel pain, I become afraid of dying.
	15. I feel my life isn't worth living.
	16. Even though it hurts, I know that I'm going to be okay.
	17. It is my own fault I hurt like this.

16. Even though it hurts, I know that I'm going to be okay.

17. It is my own fault I hurt like this.

18. My pain is getting worse.

19. I feel like crying.

20. No one cares about me anymore.

21. I have a change in appetite.

22. I am helpless.

23. I've injured myself again.

24. Bad things seem to always happen to me.

25. I worry when I am in pain.

26. I can't stand depending on my family and friends anymore.

27. Other people have to do everything for me.

PCS 28. It's awful and I feel that it overwhelms me.

29. I find myself expecting the worst.

30. Pain sensations are terrifying.

31. I lose interest in things I normally find pleasurable.

32. I think that I have a serious medical problem that my physician has failed to uncover.

33. I have trouble making decisions.

PAI 34. I am worried about being depressed or discouraged because of the pain.

35. I find it hard to concentrate when I hurt.

PCS 36. I can't seem to keep it out of my mind.

37. Other people do not believe I have pain.

PCS 38. I feel I can't go on.

39. I must have done something to bring on this pain.

40. Unless I start going with them (for example: my family, to a baseball game), I won't have anyone to go out with.

41. I can't think straight when in pain.

42. No one wants to hear about my problems.

43. My family has taken over all of my responsibilities.

44. I begin thinking of all the possible bad things that could go wrong in association with the pain.

45. When I feel pain, I am afraid that something terrible will happen.

PAI 46. I am concerned about how much pain I can take.

47. When pain comes on strong, I think that I might become paralyzed or more disabled.

PCS 48. I anxiously want the pain to go away.

49. I am going to become an invalid.

PCS 50. There's nothing I can do to reduce the intensity of the pain.

51. No one cares about my pain.

PCS 52. I become afraid that the pain will get worse.

PAI 53. I am worried about getting things done.

54. My mind is calm when I am in pain.

55. When I feel pain, I think that I might be seriously ill.

56. I begin to worry that something might be seriously wrong with me.

57. I won't be able to have sex.

58. I feel disoriented and confused when I hurt.

PAI 59. I am concerned that the pain might become more than I can manage.

60. I cannot control this pain.

61. I can't play sports.

62. Even if I do an activity that causes pain, I know it will decrease later.

63. I dread feeling pain.

64. I can think pretty clearly even while experiencing severe pain.

65. I can no longer do anything.

66. When I hurt, I think about the pain constantly.

67. I am more wound up than usual.

68. I feel hopeless.

69. It is not fair that I have to live this way.

70. I feel like I don't have energy.

71. The pain makes me feel sad.

72. I am bothered by unwanted thoughts when I'm in pain.

PCS 73. I keep thinking about how badly I want the pain to stop.

PCS 74. I keep thinking of other painful events.

75. I imagine the pain becoming even more intense and hurtful.

PCS 76. I worry all the time about whether the pain will end.

77. My thoughts are agitated and keyed up as pain approaches.

78. I tend to think that my pain is pretty awful.

79. If I don't get some time to relax during the day, I'm going to be bedridden and unable to work.

80. If my pain keeps up, I'll be crippled and won't be able to work or even walk.

PAI 81. The pain seems threatening.

82. I am a burden on my family.

PCS 83. It's terrible and I think its never going to get any better.

84. I am useless.

85. I feel like I just want to get up and run away.

86. I find it virtually impossible to keep my mind off of my pain and how bad it hurts.

87. I am afraid to do anything.

PCS 88. I keep thinking of how badly it hurts.

89. I find myself worrying about possibly dying.

90. I tell myself that I don't think I can bear the pain any longer.

91. I won't be able to exercise at all.

PAI 92. I feel controlled by the pain.