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The Communal Coping Model of Pain Catastrophizing in Daily Life: A Within-Couples Daily Diary Study

John W. Burns, PhD,

Rush University Medical Center

James I. Gerhart, PhD,

Rush University Medical Center

Kristina M. Post, PhD,

University of La Verne

David A. Smith, PhD,

University of Notre Dame

Laura S. Porter, PhD,

Duke University Medical Center

Erik Schuster, MA,

Rush University Medical Center

Asokumar Buvanendran, MD,

Rush University Medical Center

Anne Marie Fras, MD, and

Duke University Medical Center

Francis J. Keefe, PhD

Duke University Medical Center

Abstract

The Communal Coping Model (CCM) characterizes pain catastrophizing as a coping tactic whereby pain expression elicits assistance and empathic responses from others. Married couples ($N = 105$ couples; one spouse with chronic low back pain) completed electronic daily diary assessments 5 times/day for 14 days. On these diaries, patients reported pain catastrophizing, pain, function, and perceived spouse support, criticism and hostility. Non-patient spouses reported on their support, criticism, and hostility directed toward patients, as well as their observations of patient pain and pain behaviors. Hierarchical linear modeling tested concurrent and lagged (3 hours later) relationships. Principal findings included: a) within-person increases in pain

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Corresponding Author: John W. Burns, PhD, Department of Behavioral Sciences Rush University Medical Center 1645 W. Jackson Blvd., Chicago, IL 60612, Phone: 312 942 0379, FAX: 312 942 4990, john_burns@rush.edu.

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catastrophizing were positively associated with spouse reports of patient pain behavior in concurrent and lagged analyses; b) within-person increases in pain catastrophizing were positively associated with patient perceptions of spouse support, criticism, and hostility in concurrent analyses; c) within-person increases in pain catastrophizing were negatively associated with spouse reports of criticism and hostility in lagged analyses. Spouses reported patient behaviors that were tied to elevated pain catastrophizing, and spouses changed their behavior during and following elevated pain catastrophizing episodes. Pain catastrophizing may affect the interpersonal environment of patients and spouses in ways consistent with the CCM.

Keywords

Pain catastrophizing; Communal Coping Model; daily diary; spouse responses

Pain catastrophizing is related to acute pain intensity among healthy people³¹ and ³⁸ and to pain severity and poor function among patients with chronic pain.^{28, 29} and ³⁹ Pain catastrophizing is defined as a tendency to ruminate on, magnify and feel helpless about pain.²⁰ and ³⁸ Pain catastrophizing has been cast in terms of various theoretical models, including cognitive appraisal³⁰ and attention-bias models.^{8, 14} and ²⁴ These models have a common focus on *intrapersonal* processes, such as catastrophic cognitive appraisals and information processing biases toward the most threatening aspects of pain. Another conceptualization argues that pain catastrophizing represents a coping response by which people's pain expressions prompt assistance or empathic responses from others.³⁹ This Communal Coping Model (CCM) of pain catastrophizing emphasizes *interpersonal* processes and the social context in which pain and pain behavior is embedded.

A variety of studies suggest that pain catastrophizing is indeed related to responses of others toward people in pain. Patient pain catastrophizing is related to patient-reported spouse solicitousness, social support,²² and otherwise positive responses.^{3, 12} and ¹³ However, some studies also suggest that patient pain catastrophizing is related to patient-reported spouse punishing and negative responses.^{2, 34} and ⁴³

A key tenet of the CCM is that in order to be communicative, pain catastrophizing cognitions must "produce" detectable signs of pain. Going beyond the traditional self-report paradigm, Sullivan et al.⁴⁰ found, among healthy people, that high pain catastrophizers displayed facial and vocal pain behaviors during a cold pressor for a longer duration when with another person than when alone. Sullivan et al.⁴¹ also found, again with healthy subjects, that the relationship between pain catastrophizing and observer ratings of subject pain intensity during a cold pressor was mediated by observer-rated displays of subjects' facial pain behavior. Keefe et al.²² addressed whether cancer patient pain catastrophizing was related to *spouse reports of their own responses* to patients. Not only was patient pain catastrophizing related to spouse ratings of patient pain intensity and frequency of pain behaviors, but it was also related to spouse reports of high caregiver stress and critical responses toward patients. Cano et al.⁷ conducted an observational study of couples discussing the impact of chronic pain on their lives. They found that patient pain catastrophizing was related to greater frequency of patient emotional disclosure about pain

to the spouse, but that these more frequent disclosures predicted more frequent invalidating responses by the spouse.

Taken together, pain catastrophizing appears to produce noticeable signs of pain – both physical and verbal – and is linked to responses from others, although these are not necessarily positive, supportive responses. Still, it is difficult to draw firm conclusions from these studies. Most (aside from Keefe et al.²², and Cano et al.⁷) relied on questionnaire-based patient self-reports of pain and perceptions of spouse responses, possibly capitalizing on shared reporter variance. In addition, previous studies were cross sectional. Missing are studies of longitudinal relationships wherein pain catastrophizing could show effects on *subsequent* responses by others in naturalistic settings, as stipulated by the CCM. Finally, to better understand pain catastrophizing in its full interpersonal context, both the relationship between pain catastrophizing and subsequent spouse responses and the reverse causal pathways need to be tested. That is, certain behaviors of others may stimulate patient pain catastrophizing.

To test these relationships, we used electronic diary methods to evaluate the degree to which pain catastrophizing among chronic low back pain (CLBP) patients, occurring in the course of daily life, was related not only to patient-reported pain, function, and perceptions of spouse support, criticism and hostility, but also to *spouse-observed* patient pain behavior and *spouse reports* of their own supportive, critical, and hostile expressions toward patients. Spouse reports were used to estimate cross-spouse effects absent common reporter method variance.³³

To the degree the CCM is valid, we expect patient pain catastrophizing, pain intensity, and negative mood to be greater when the spouse was present than when absent, and we expect patient pain catastrophizing to be related to increases in patient pain behaviors as observed by the spouse in both concurrent and lagged analyses. Given the inconsistent findings in the literature, we cannot hypothesize that pain catastrophizing will be related primarily to either positive or negative spouse responses. If the CCM is valid, we expect at least that pain catastrophizing will be *related* to changes in patient perceptions of spouse support, criticism, and hostility, as well as to changes in spouse ratings of the support, criticism, and hostility they express toward the patient in both concurrent and lagged analyses. In exploratory analyses, we also evaluated whether the degree to which spouses responded to increases in pain catastrophizing would be partly accounted for by the degree to which they noticed increases in patient pain expression (i.e., their observations of changes in patient pain intensity and pain behaviors). Reverse (cross-) lagged effects were also evaluated to illuminate the broader interpersonal context of pain catastrophizing. The CCM would be supported to the extent that lagged associations proceeding from a “pain catastrophizing → spouse behavior” pathway generally exceed lagged associations proceeding from a “spouse behavior → pain catastrophizing” pathway. Finally, we controlled for patient state negative affect in all analyses to determine whether observed relationships between pain catastrophizing and spouse responses were not actually reflecting relationships between simple negative affect and spouse responses.

Method

Participants

One hundred and twenty-one married couples were recruited through referrals from staff at the pain clinics of Rush University Medical Center in Chicago, IL, Duke University Medical Center in Durham, NC, Memorial Hospital in South Bend, IN, through advertisements in local newspapers, and via flyers provided through various health care agencies. Each participant received \$150. The protocol was approved by the Institutional Review Boards at Rush University Medical Center, Duke University Medical Center, and University of Notre Dame. Patient inclusion criteria were: a) pain of the lower back stemming from degenerative disk disease, spinal stenosis, or disk herniation (radiculopathy subcategory), or muscular or ligamentous strain (chronic myofascial pain subcategory); b) pain duration of at least 6 months with an average intensity of at least 3/10 (with 0 being “no pain” and 10 “the worst pain possible”); and c) age between 18 and 70 years. The inclusion criterion for spouses was age between 18 and 70 years.

Exclusion criteria for both patients and spouses were: a) current alcohol or substance abuse problems or meeting criteria for alcohol or substance abuse or dependence within the past 12 months; b) a history of, or current psychotic or bipolar disorders; c) inability to understand English well enough to complete questionnaires; d) acute suicidality; and e) meeting criteria for obsessive-compulsive disorder or posttraumatic stress disorder within the past 2 years. A further exclusion criterion for patients was pain due to malignant conditions (e.g., cancer, rheumatoid arthritis), migraine or tension headache, fibromyalgia, or complex regional pain syndrome. A further exclusion criterion for spouses was current acute pain from any other source (i.e., migraine headaches) or history of chronic pain within the past 12 months.

Inclusion and exclusion criteria were assessed by a detailed medical and psychosocial history, including administration of the Mood Disorder, Psychotic Screening, and Substance Use Disorders modules of the Structured Clinical Interview for DSM-IV Axis I Disorders - Non-Patient Edition (SCID-IV/NP).¹¹

Of the 121 couples recruited, eight couples declined to participate in the diary portion of the study, three couples withdrew before completing 14 days of data collection, four couples lost data due to PDA malfunctions, and one couple's data were lost due to failure to upload it from the PDA at an appropriate time. Thus, the final sample was 105 couples. Women comprised 48.6% of the patients in the sample ($n = 51$). See Table 1. Demographic characteristics of couples not included in this investigation did not differ significantly from those who were included.

Electronic Diary

The PDA program signaled participants to complete five assessments each day, starting at 8:50 am and occurring every three hours until 8:50 pm. Frequent assessments helped minimize retrospective bias in ratings.³⁵ Daily diary data obtained in this manner also appear to suffer little from reactivity effects that are sometimes caused by monitoring.^{4, 9 and 19} Variability in ratings within the day is also captured well by this method.^{25 and 36} Previous studies support the reliability, validity, and compliance with

electronic diary strategies when used to assess pain, affect, and behavior.^{9, 19, 25 and 35} Electronic diaries with time-stamped entries also allowed us to accurately assess when ratings were made, something that cannot be done with paper diary methods.¹⁹

PDA assessment also enabled branching assessment algorithms that reduce participant burden by determining whether patients and spouses interacted with each other – in person, or via phone, text or email – in the past three hours. If patients and spouses reported interacting, they were given questions concerning perceived support, criticism, and hostility from the spouse (per patient), and about whether they directed support, criticism, and hostility at the patient (per spouse). If the spouses did not interact with each other they were not asked questions about their interactions.

Both patients and spouses completed electronic diary measures five times per day for 14 consecutive days. We used the Experience Sampling Program (ESP),¹ which operated on handheld Palm® Zire 22 PDAs, running the Palm OS platform.

Measures

Trait Patient Pain Catastrophizing—The six-item pain catastrophizing subscale of the Coping Strategies Questionnaire (CSQ-CAT)²⁷ assessed trait-level pain catastrophizing for validation of the three-item state pain catastrophizing measure that was deployed in the PDA assessments. Ratings were made on a 7-point scale to indicate the frequency with which pain catastrophizing is used to appraise pain. The CSQ-CAT measures helpless and pessimistic cognitions related to the pain experience. The psychometric properties of this subscale are sound.^{23, 26 and 27}

State Patient Pain Catastrophizing—At each assessment, patients rated three items indicating the extent to which they had pain catastrophizing thoughts. These were:

When you felt pain during the past 3 hours, to what degree did you:

1. feel afraid that the pain may get worse?
2. keep thinking about how much it hurts?
3. feel that the pain was awful and overwhelming?

These responses were rated on 9-point scales with anchors at 0 (*not at all*), 2 (*somewhat*), 4 (*much*), 6 (*very much*), and 8 (*extremely*). A pain catastrophizing variable was computed by summing the three items.

Patient-Reported Pain-Related Variables—At each assessment, patients also rated “how intense was your pain,” “to what degree did your pain interfere with you being physically active,” and “how much did you rest (sit, lie down) because of your pain” during the past 3 hours. These responses were rated on the same 9-point Likert scale as the pain catastrophizing items described above.

Patient Perceived Spouse Criticism, Hostility, and Support—At each assessment patients were asked, “Did you interact with your spouse during the last 3 hours?” If the

participant responded, “yes,” then they were prompted to answer questions about the encounter. Patients then indicated the average amount of criticism occurring during the interactions they had with their spouses during the previous 3 hours. Patient perceived criticism was assessed with a variation on the Hooley and Teasdale item,¹⁷ asking “How critical of you was your spouse during the past 3 hours?” Similar to this criticism item, patients indicated how hostile their spouse was during the past three hours. We defined hostility for patients as any negative or attacking remark, no matter how mild, especially remarks about the patient in general if such remarks are not intended to be helpful, corrective, or supportive in some way, including those that are rejecting or that express dislike of the patient. We did not, however, explicitly define “criticism” for the patient. We treated criticism and hostility as separate variables. This separation echoes the Expressed Emotion literature,¹⁸ which separates etiological factor(s) from target(s) of intervention. Although both patient perceived and spouse reported criticism and hostility were correlated $r = .49$ and $r = .74$, respectively, in this sample (see Table 2), we examined them as separate variables and not as composites.

Patients were also asked, “How supportive of you was your spouse during the last 3-hours?” We defined support in terms of whether the spouse was receptive to patient’s needs or helped the patient in some way. Responses were made on a 9-point scale with anchors at 0 (not at all), 2 (somewhat), 4 (much), 6 (very much), and 8 (extremely).

Spouse Observed Patient Pain-Related Variables—At each assessment, spouses were asked, “Did you observe your spouse during the past 3 hours?” A “yes” response activated a branching algorithm through which spouses were asked about their observations of patients’ pain. The items “how much pain did he/she appear to be in”, and “how many ‘pain behaviors’ (complaining, grimacing, etc) did you hear or see?” were administered. Responses for the pain intensity item were made on a 9-point scale with anchors as described above, and the pain behavior item used anchors, 0 (*none*), 2 (*a few*), 4 (*some*), 6 (*many*), and 8 (*very many*). “Pain behaviors” were defined for spouses as “anything spoken (complaining, sighing, groaning, etc.) or physically gestured (facial grimace, rubbing, limping, bracing against something, etc.) that tell you your spouse was in pain.”

Spouse Reported Criticism and Hostility Directed Toward Patient—As for patients, at the time of each entry, spouses were asked, “Did you interact with your spouse during the last 3 hours?” As above, a “yes” response prompted spouses then to indicate the average amount of criticism and hostility they directed toward patients and how much support they provided over all of the interactions they had with their spouse during the previous 3 hours. Spouse reported criticism was assessed with the item, “How critical of him/her were you during the last 3-hours?” Similarly, spouse hostility was assessed with the item, “How hostile toward him/her were you during the last 3-hours?” Finally, spouse support was assessed with the item, “How supportive of him/her were you during the last 3-hours?” Responses were made on 9-point scales with anchors at 0 (not at all), 2 (somewhat), 4 (much), 6 (very much), and 8 (extremely).

Patient State Negative Affect—At each assessment, patients rated the extent to which they felt anxious, on edge, and uneasy, sad, helpless and discouraged during the past 3

hours. These items were summed and averaged to create a composite State Negative Affect rating. Responses were made on 9-point scales with anchors at 0 (not at all), 2 (somewhat), 4 (much), 6 (very much), and 8 (extremely). This variable was used to test whether pain catastrophizing contributed significant unique variance in predicting patient and spouse variables beyond that accounted for by negative affect.

Procedure

Patients and spouses who inquired about participation underwent screening procedures over the phone. Screened-eligible patients and spouses then attended an initial session during which they signed consent forms to participate, and completed initial questionnaires. Patients and spouses were instructed to carry the PDAs with them throughout the day for 14 consecutive days. Research assistants described and defined terms contained in the diary items for participants and provided them with printed instructions as well. For instance, the term “hostility” was explicitly defined for spouses, as above. Participants were also given printed versions of these instructions for later reference and were asked to phone the research assistants with any problems or questions.

Starting at 8:50 am, and then again every three hours until 8:50 pm, participants were prompted by the PDA alarm to complete assessments. Following this alert, participants had 15 minutes in which to respond to the PDA administered items. After the initial alarm, the PDA would emit a signal every 30-seconds until participants responded. Participants were also given the option to tap the screen to dismiss the alarms and delay the signal as long as they completed the assessment within 15 minutes. If participants did not respond in any way within 15 minutes of the original prompt, the time period was coded as missing data. Data for each assessment session was time stamped. After 14 days of data collection, participants returned the PDA, data were downloaded, and participants were debriefed.

Data Preparation

Any item responses submitted outside the 15-minute response interval were discarded. After deleting these responses, out of the 7350 possible total responses, there were 80.01–87.06% complete data for the various items in the diary. For patients and spouses, 87.1% and 89.1% of records were complete, respectively. This amount of missing records is in the range typically observed in other electronic diary studies involving pain patients.³² In sum, spouse criticism, hostility and support – as reported by both the patient and spouse – were recorded only during epochs when spouses and patients interacted in person, over the phone, via text or via email. Spouse observations of patient pain intensity and patient pain behaviors were recorded only during epochs when spouses and patients were together in person. The “spouse present” versus “spouse absent” variable, used below, was determined on the basis of whether patients and spouses were together in person during a given epoch.

Data Analyses

All analyses were conducted in SPSS version 20 (IBM, 2011). Our main analyses focused on concurrent and lagged relationships between pain catastrophizing and spouse observations of the patient and their behavior toward the patient. For these analyses, hierarchical linear modeling was used. Predictor variables were centered using person mean

centering. As a consequence of this centering algorithm, parameters represent deviation from individual participants' own average over the course of the study. Parameters, therefore, represent within-subjects effects.¹⁶ Autocorrelation of the dependent variable (DV) over time was accounted for by controlling for DV values measured three hours prior. The equations also adjusted for time since the start of the study to account for patient reactivity, and to account for the unequal spacing of time points due to the nighttime lag between 8:50 pm and 8:50 am measurements. Random effects were included for intercept to account for individual differences at baseline. With lagged analyses, we thus modeled statistical causality to the extent that change in predictor variables were not only correlated but also preceded change in subsequent DVs, while also ruling out important potential extraneous variables.¹⁰

Two general models were computed. The first model was computed to estimate concurrent effects and the second to estimate lagged effects. Concurrent models were those in which patient pain catastrophizing (independent variable; IV) was related to either patient perceived spouse response variables or spouse reported responses (e.g., criticism) at the same time (DV) while controlling for prior values of the spouse-related factor. A representative level-1 model for concurrent effects (i.e., all variables are measured at the same time point, aside from prior measurement of the dependent variable) is:

$$\text{Perceived Criticism}_{ij} = \pi_{0ij} + \pi_{1ij} (\text{Pain Catastrophizing}) + \pi_{2ij} (\text{Perceived Criticism at } t-1) + \pi_{3ij} (\text{Time}) + r_{ij},$$

where i represents the “ i ”th time point and j represents the “ j ”th person. Time is measured in hours since the start of the study and is centered at 0 so that the intercept, π_0 , represents patient perceived criticism at the first time point of the study. “Pain Catastrophizing” is the patient's deviation in pain catastrophizing from his or her pain catastrophizing scores across the entire study. The DV, Perceived Criticism, is the patient's present self-reported level of perceived criticism from the spouse. Perceived Criticism at $t-1$ represents the score of the DV at the prior time point (viz., three hours earlier).

The general lagged effects model was the same as the concurrent effects model except that all of the IV's were lagged, or measured at the prior time point, three hours earlier. Lagged models tested whether either patient pain catastrophizing predicted patient-perceived or spouse-reported responses (e.g., criticism) three hours later while controlling for prior values of the spouse-related variables. Thus, the general lagged level-1 model of pain catastrophizing and perceived criticism is:

$$\begin{aligned} \text{Perceived Criticism}_{ij} = & \pi_{0ij} + \pi_{1ij} (\text{Pain Catastrophizing at } t-1) \\ & + \pi_{2ij} (\text{Perceived Criticism at } t-1) + \pi_{3ij} (\text{Time}) + r_{ij}. \end{aligned}$$

We focused on relatively short, 3 hour, lags rather than the longer lags often found in extant literature, such as evening of Day 1 to evening of Day 2. A short assessment window allowed us to capture acute effects of immediate pain catastrophizing that might be obscured over longer intervals.

Cross-lagged associations were also tested in which IVs and DVs were reversed. For example, we initially tested the association of lagged patient pain catastrophizing on subsequent spouse criticism. In cross-lagged analyses, we tested the association of lagged spouse criticism with subsequent patient pain catastrophizing. For spouse criticism and patient pain catastrophizing, the model is:

$$\text{Pain Catastrophizing}_{ij} = \pi_{0ij} + \pi_{1ij} (\text{Perceived Criticism at } t - 1) + \pi_{2ij} (\text{Pain Catastrophizing at } t - 1) + \pi_{3ij} (\text{Time}) + r_{ij}.$$

In the case of spouse reported criticism and hostility toward the patient, values were positively skewed. Thus, generalized linear mixed models utilizing a log-link function were computed to more accurately model the data. This approach is beneficial for modeling skewed multilevel data where variance and skew may occur across levels (i.e., within patients and between patients). Variable transformation could potentially conflate these sources of variance and bias estimates.

Results

Descriptive Values and Correlations

Table 2 presents means, standard deviations and intercorrelations of study variables aggregated within participants over the approximately 70 assessments of the 14-day diary study. CSQ-CAT scores were correlated significantly and strongly with aggregated state patient pain catastrophizing, supporting the validity of the three-item diary assessment. CSQ-CAT scores were also correlated significantly with aggregated spouse observations of patient pain intensity and spouse-reported frequency of patient pain behaviors. CSQ-CAT scores were also correlated significantly and positively with aggregated patient perceptions of *both* spouse support and patient perceptions of spouse criticism and hostility. CSQ-CAT scores were correlated significantly and positively *only* with aggregated spouse reported criticism and hostility toward the patient. In general, fluctuations in patient state pain catastrophizing aggregated over 70 assessments within each person are strongly related to fluctuations in pain, function, and observable signs of pain over the same 70 assessments. Further, patient pain catastrophizing is related to patient-perceived and spouse-reported spouse behavior toward the patient.

Patient Pain-Related Factors When Spouse was Present and Absent

Mixed models were used to compare mean differences in patient-reported pain catastrophizing and pain-related variables when the spouse was present versus absent. These values were aggregated across all observations. Spouse presence versus absence were dummy coded as 0 = absent and 1 = present and entered into each model as the independent variable. This procedure produced an estimated mean difference in variables of interest across spouse presence versus absence. Estimated marginal means are shown in Table 3. Results showed that patient pain catastrophizing was significantly higher when spouses were present than when they were not. Patient pain intensity and interference were also significantly higher when spouses were present than when spouses absent. Only patient downtime was similar when spouses were present versus absent. Findings suggest that

patients report worse pain catastrophizing, pain intensity and pain interference when in the presence of the spouse than when the spouse is not present.

Concurrent Associations Between Pain Catastrophizing and Pain-Related Variables

Concurrent analyses (i.e., pain catastrophizing at time 1 related to pain-related variables also at time 1) showed that greater patient pain catastrophizing was significantly associated with increased patient-reported pain intensity, pain interference, and downtime. See Table 4 for values. Controlling for concurrent patient state negative affect did not appreciably alter results. Concurrent analyses also showed that greater patient pain catastrophizing was significantly associated with increases in spouse observations of how intense the patient's pain appeared, and increases in the frequency of spouse observed pain behaviors. Controlling for concurrent patient state negative affect, again did not significantly change results. These findings suggest that within-person fluctuations in pain catastrophizing within a 3-hour epoch are linked to changes in patient reports of pain and function, and to changes in signs of pain visible to the spouse.

Lagged Associations Between Pain Catastrophizing and Pain-Related Variables

Lagged analyses (i.e., pain catastrophizing at time 1 predicting pain-related variables three hours later at time 2) showed that patient pain catastrophizing at time 1 was significantly associated with increased patient-reported pain intensity, pain interference, and downtime three hours later. See Table 4. Patient pain catastrophizing at time 1 was also significantly associated with increased spouse observations of how intense the patient's pain appeared, and increases in the frequency of spouse observed pain behaviors three hours later. Controlling for patient lagged state negative affect did not appreciably change results. Thus, initial increases in a patient's level of pain catastrophizing predicted worsening of pain and function three hours later as rated by the patient and by the spouse.

Cross-Lagged Associations Between Pain-Related Variables and Pain Catastrophizing

Cross-lagged analyses (i.e., pain-related variables at time 1 predicting pain catastrophizing three hours later) showed that greater patient-reported pain intensity and pain interference at time 1 was significantly associated with increases in *patient pain catastrophizing* three hours later. See Table 5. Patient reported downtime at time 1 was not associated significantly with pain catastrophizing three hours later. Cross-lagged analyses also revealed that greater spouse observed patient pain intensity and frequency of pain behaviors at time 1 were significantly associated with increases in pain catastrophizing three hours later.

Results of concurrent, lagged, and cross-lagged analyses document the strong connection between patient pain and function and prior, current, and later patient pain catastrophizing. Moreover, *spouse* observations of patient pain and function were likewise related to prior, current, and later *patient* pain catastrophizing.

Concurrent Associations Between Pain Catastrophizing and Spouse Behavior Variables

Concurrent analyses showed that greater patient pain catastrophizing was significantly associated with increased patient perceived spouse support during the same epoch. See Table 6. Analyses also showed that greater pain catastrophizing was related significantly to

increased patient perceived spouse criticism and hostility. Controlling for patient concurrent state negative affect did not substantially change results. Patient pain catastrophizing was not related significantly to changes in spouse reported support or criticism. Patient pain catastrophizing was significantly related to increases in spouse reported hostility, and remained significant after controlling for patient state negative affect. Results indicate that fluctuations in pain catastrophizing were related to patient perceptions of spouse responses, although this effect was not in a consistent direction. Patient pain catastrophizing was related to *both* increases in support and increases in criticism and hostility perceived by patients. Patient pain catastrophizing was related to increases in spouse reports of their hostility directed toward the patient.

Lagged Associations Between Pain Catastrophizing and Spouse Behavior Variables

Lagged analyses (i.e., pain catastrophizing at time 1 predicting spouse behavior variables three hours later) showed that greater patient pain catastrophizing at time 1 was significantly associated with increases in patient perceived spouse support three hours later. See Table 6. Pain catastrophizing at time 1 was not significantly associated with changes in patient perceived spouse criticism and hostility. Pain catastrophizing at time 1 was not related significantly to spouse reported support directed to the patient three hours later. However, greater pain catastrophizing at time 1 was associated significantly with *decreases* in spouse reported criticism and hostility directed to the patient three hours later.

Results for lagged analyses offer a more consistent pattern of significant findings – supporting the communal model – in that greater initial patient pain catastrophizing predicted subsequent increases in patient perceived spouse support and decreases in spouse reported criticism and hostility toward patients. These relationships remained significant after controlling for lagged patient state negative affect.

Cross-Lagged Associations Between Spouse Behavior Variables and Pain Catastrophizing

Cross-lagged analyses (i.e., spouse behavior variables at time 1 predicting patient pain catastrophizing three hours later) showed that patient perceived spouse support ($B=.03$, $SE=.03$, $t=.98$, $P=.329$), criticism ($B=-.02$, $SE=.04$, $t=-.55$, $P=.583$) and hostility ($B=.05$, $SE=.06$, $t=.86$, $P=.384$) at time 1 were not related significantly with patient pain catastrophizing three hours later. Similarly, spouse reported support ($B=.01$, $SE=.03$, $t=.16$, $P=.872$), criticism ($B=-.05$, $SE=.05$, $t=-1.01$, $P=.312$) and hostility ($B=.10$, $SE=.07$, $t=1.40$, $P=.163$) directed toward the patient at time 1 were not associated significantly with patient pain catastrophizing three hours later. Thus, the inverse pathway – spouse responses to the patient predicting later pain catastrophizing – was not supported.

Exploratory Analyses

If patient pain catastrophizing affects spouse responses to the patient because the spouse notices signs of catastrophizing, then spouse observations of changes in patient pain intensity and pain behaviors may partly account for how spouses respond. In these exploratory analyses, we examined whether the previously reported concurrent significant relationship between patient pain catastrophizing and increased spouse reported hostility was partly accounted for by spouse observed increases in pain intensity and pain behaviors.

After controlling for spouse observed pain intensity, the relationship between pain catastrophizing at time 1 and spouse reported hostility at time 1 was no longer significant ($B=.01$ $SE=.02$, $P=.650$). The same was true after controlling for spouse observed pain behaviors ($B=.01$ $SE=.02$, $P=.496$).

Similarly for lagged analyses, after controlling for spouse observed pain intensity at time 2, the relationship between patient pain catastrophizing at time 1 and decreases in spouse reported hostility at time 2 was no longer significant ($B=.00$ $SE=.01$, $P=.800$). The same was again true after controlling for spouse observed pain behaviors. However, the relationship between pain catastrophizing at time 1 and spouse reported criticism at time 2 remained significant after controlling for spouse observed pain behaviors at time 2 ($B=-.08$ $SE=.01$, $P<.001$). Results suggest that links between patient pain catastrophizing and spouse responses may be partly due to spouse observed changes in patient pain intensity and pain behaviors.

Discussion

According to the CCM of pain catastrophizing, this factor may be conceptualized as a coping tactic whereby individuals who engage in pain expression receive assistance or empathic responses from others. We extended previous work by using a within-couple daily diary method, with spouses providing observations of patient behavior and reports of their own responses to patients. Results suggest that patient pain catastrophizing affects the interpersonal environment of patients and their spouses in ways that are consistent with the CCM.

If pain catastrophizing has an interpersonal, communicative dimension, then it is reasonable to expect that pain catastrophizing would be greater when there is someone there to notice. Patient reports of pain catastrophizing were significantly greater when the spouse was present than when he or she was absent. Although relatively high levels of pain catastrophizing were reported by patients when the spouse was absent, pain catastrophizing was even higher when the spouse was there to witness the distress.

Again, if pain catastrophizing has an interpersonal, communicative dimension, then it is reasonable to expect that pain catastrophizing would be related to patient behaviors that signal increased pain and would be detectable by others. Concurrent analyses showed that greater patient pain catastrophizing at time 1, for example 9 a.m., was significantly related to increases in spouse ratings of patient pain intensity and frequency of patient pain behaviors also at 9 a.m. Patient pain behaviors such as groaning, grimacing, bracing, etc., may signal pain catastrophizing to others.¹⁵ Thus, greater levels of patient pain catastrophizing were, in fact, “noticed” by their spouses. Results of lagged analyses showed that greater pain catastrophizing at one time was related to increases in spouse ratings of patient pain intensity and the frequency of patient pain behaviors three hours later. Consistent with lagged findings that greater pain catastrophizing at time 1 is related significantly to patient reported increases in pain intensity at time 2, pain catastrophizing at time 1 also predicted increases in spouse-reported patient pain. Thus, the lagged effect of patient pain catastrophizing on patient-reported pain was corroborated by spouse ratings of patient pain.

The overriding point here – consistent with the CCM – is that fluctuations in patient pain catastrophizing are meaningfully related to fluctuations in observable pain behaviors sufficient to be noticed by spouses.

Spouses may notice pain behaviors linked to pain catastrophizing, but they may not necessarily respond to them. If pain catastrophizing has an interpersonal, communicative dimension, then it is reasonable to expect that pain catastrophizing would be related to changes in spouse behavior toward the patient. Results of concurrent analyses revealed that greater pain catastrophizing at time 1 was related not only to patient perceptions of increased spouse support toward the patient at time 1, but also to increased spouse criticism and hostility. These findings suggest that patients did indeed detect changes in spouse behavior when their pain catastrophizing was elevated. That is, spouses responded to patients, at least according to patients. Spouses, however, also reported increased hostility toward the patient. Here, patients reported perceiving *both* increased spouse support and criticism/hostility, whereas spouses reported their own increased hostility. Such a pattern could reflect spouses expressing empathy and offering help, but at the same time providing feedback, suggestions and advice that could be construed by patients as critical of what they are saying or doing. These results are consistent with past findings that pain catastrophizing was related to both positive^{3, 12, 13 and 22} and negative spouse responses.^{2, 34 and 43} Taken together, spouse responses in *general* may increase in response to a catastrophizing patient.

Further, greater patient pain catastrophizing at time 1 significantly predicted *decreases* in spouse reported criticism and hostility directed toward the patient three hours later. Greater patient pain catastrophizing at time 1 also predicted increases in patient perceived spouse support at time 2. To our knowledge, these are the first reported prospective effects indicating that greater pain catastrophizing *precedes and predicts* subsequent changes in spouse responses toward the patient. Lagged spouse responses are also in a uniformly positive direction, supporting the CCM principle that patient pain catastrophizing and concomitant behaviors elicit support, aid, and empathy from others. Present findings extend prior work, as well, by showing that *patient* ratings of their catastrophizing predict changes in *spouse* reports of their own behavior toward the patient. These cross-spouse effects greatly reduced the influence of common method variance caused by patients rating both their own behavior and their spouses' responses.³³

The exploratory analyses help bridge the gap between patient pain catastrophizing and spouse responses by suggesting that spouse perceptions of patient pain expressions may partly account for these links. Analyses suggest that the relationship between increases in patient pain catastrophizing and in spouse hostility toward the patient was partially accounted for spouses noticing increases in signs that the patient's pain intensity and pain behaviors had increased. Thus, patient increases in pain catastrophizing were associated with changes in spouse responses partly because spouses witnessed changes in patient behavior.

Taking together concurrent and lagged effects, it may be that in the midst of patient pain catastrophizing and accompanying behavior at one time, a mix of positive and negative spouse responses are stimulated, perhaps as the spouse tentatively experiments with how best to respond. Three hours later, however, spouse behavior toward the patient following

initial patient pain catastrophizing appears more consistently positive. That patient pain catastrophizing predicted increased patient perceived support and reduced spouse reported criticism and hostility suggests that such positive spouse behavior following pain catastrophizing could underlie, as others have argued,²¹ a maladaptive cycle in which pain catastrophizing is reinforced by positive consequences. Although pain catastrophizing behaviors may signal a cry for help that is answered positively by others, it is worth considering how perpetuating an appraisal and coping tactic firmly linked to poor adjustment through social reinforcement may ultimately prove ruinous to patient and family members alike.

Lagged analyses suggest patient pain catastrophizing at time 1 predicts spouse behavior change at time 2, which favors the pain catastrophizing → spouse behavior pathway implicit in the CCM over the reverse cross-lagged pathway which was not supported by *any* significant associations. The null cross-lagged effects provide important support for the CCM idea that pain catastrophizing emanates from the patient, which then in turn affects spouse behavior. There was no evidence for a process by which spouse criticism and hostility cause increases in patient pain catastrophizing.

It should also be mentioned that all significant relationships between patient pain catastrophizing and patient pain-related factors, and those between pain catastrophizing and spouse responses were not appreciably attenuated by controlling for patient state negative affect. Results underscore that changes in patient behavior attending pain catastrophizing that are then noticed by spouses cannot be entirely reduced to spouses detecting simple patient distress.

These data also bear on the controversy over whether increased pain intensity precedes pain catastrophizing or vice versa.^{5, 37 and 42} In the present study, we found significant lagged and cross-lagged relationships suggestive of a vicious spiral wherein greater pain intensity and pain interference at, for example, 9 a.m. predicts increases in patient pain catastrophizing at 12 p.m., which then predicts increases in pain intensity and interference at 3 p.m. Thus, greater pain intensity inspires more catastrophic appraisals followed by further amplification of pain. Unique to our findings are spouse corroborations of the patient ratings that have been typically reported. Spouse observations of greater patient pain intensity and more frequent pain behavior at, for example, 9 a.m. predicted patient reports of increased pain catastrophizing at 12 p.m., which in turn predicted spouse observations of increased patient pain intensity and interference at 3 p.m. Clearly, the pain and function of people with CLBP are closely intertwined with their prior, current and subsequent pain catastrophizing.

Some limitations need to be delineated. First, as is common with daily diary methods, we used single items to tap key constructs (e.g., perceived criticism), and we used only three items to assess state pain catastrophizing. From the standpoint of psychometrics, this may not be ideal. The pain catastrophizing items were adapted from the pain catastrophizing subscale of the Coping Strategies Questionnaire,²⁷ a widely-used questionnaire, and we reported initial psychometric data in the form of correlations between our computed state pain catastrophizing scale and the CSQ-CAT. Within person increases in state pain catastrophizing averaged over 70 observations were related positively and strongly with trait

pain catastrophizing. Second, on one level, the three-hour lags in assessments may have been too long to disentangle all the effects of pain catastrophizing on later spouse responses. More frequent assessments may be needed to flesh out these relationships. Conversely, we confined analyses to three hour lags, as opposed to, say, six or nine hour lags, in order to focus on events linked relatively closely in time and to limit the number of analyses. Examination of longer lags may, again, be needed to fully understand these relationships. Third, the magnitudes of the effect size coefficients we report suggest that many of the effects linking pain catastrophizing to spouse behavior were small to modest. On one level, it is worth noting, however, that effect size estimation in hierarchical linear modeling continues to evolve, and guidelines on how to interpret effects estimated from many within-person observations have not been established. On a second level, these small to modest effects occurring frequently throughout the day may be critical. While dramatic episodes of pain catastrophizing and accompanying behavior may exert large effects on spouse behavior, such events are likely infrequent. Less emotionally charged and short-lived episodes of patient pain catastrophizing that are more common – indeed, occurring many times a day – may represent persisting patterns of patient behavior with small but insidious cumulative effects on spouse behavior.

In sum, we found a pattern of relationships that is very consistent with the CCM. Patient pain catastrophizing was greater when spouses were present than when absent, pain catastrophizing was related to increases in spouse observed patient pain behaviors, and pain catastrophizing was related to changes in patient and spouse reports of spouse behaviors. Strong indicators of intrapersonal cognitive aspects of pain catastrophizing were also evident in our data. An integration of the intrapersonal and interpersonal dimensions would address how the primarily cognitive phenomenon of pain catastrophizing may inspire, in the short term, critical and hostile responses from spouses (and other family members), thus exerting detrimental effects on important relationships. At the same time, in the longer term, patient pain catastrophizing may also inspire positive responses from others, thus underlying the maintenance and perhaps strengthening of such maladaptive cognitive appraisals. Beyond present findings, in the service of integrating intrapersonal with interpersonal dimensions of coping, future research may need to examine other factors which may magnify or reduce detrimental effects of pain catastrophizing. For instance, Cano et al.,⁶ found that pain catastrophizing was most strongly related to spouse negative responses among patients who also had a high level of feeling entitled to social support; a profile that created, according to Cano and colleagues, a sense among spouses that their support was not given voluntarily.

Further, if pain catastrophizing is reinforced by positive social consequences, it may prove difficult to reduce in a clinical setting with exclusive focus on the intrapersonal, individual level. As others have argued,^{21 and 22} as pain catastrophizing extends effects into the interpersonal realm, so too must interventions to reduce it. It may not be sufficient to address pain catastrophizing in a social vacuum when pain catastrophizing may have both detrimental effects on relationship quality and may shape relationships in ways that help perpetuate it. Put simply, interventions involving couples and/or family members aimed at altering the dynamic between pain catastrophizing and responses of others appear necessary to fully address the psychosocial context in which patients catastrophize about their pain.

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Disclosures

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Perspective

Pain catastrophizing may represent a coping response by which individuals' pain expression leads to assistance or empathic responses from others. Results of the present study support this Communal Coping Model, which emphasizes *interpersonal* processes by which pain catastrophizing, pain, pain behavior and responses of significant others are intertwined.

Highlights

- Patients reported greater pain intensity, interference, downtime and pain catastrophizing when the spouse was present versus absent.
- within-person increases in pain catastrophizing were positively associated with spouse reports of patient pain behavior at the same time and three hours later
- within-person increases in pain catastrophizing were positively associated with patient perceptions of spouse support, criticism, and hostility at the same time
- within-person increases in pain catastrophizing were negatively associated with spouse reports of criticism and hostility three hours later
- Pain catastrophizing may affect the interpersonal environment of patients and spouses

Table 1

Demographic Characteristics

	Patient	Spouse
Gender (female)	48.6% (n = 51)	51.4% (n = 54)
Age in years (M, SD)	46.30 (12.1)	45.96 (13.2)
Hispanic	4.8% (n = 5)	5.7% (n = 6)
African American	15.2% (n = 16)	18.1% (n = 19)
Caucasian	80.0% (n = 84)	76.2% (n = 80)
Employed	40.0% (n = 42)	63.8% (n = 67)
Disability Insurance	34.3% (n = 36)	13.3% (n = 14)
Length of Current Marriage (M,SD)	14.30 (14.0)	—
Low Back Pain Duration (M, SD)	9.04 years (7.8)	—

Table 2

Means (SDs) and Correlations among Aggregated Diary Variables

	<i>M</i>	<i>SD</i>	1	2	3	4	5	6	7	8	9	10	11	12	13
1 CSQ-CAT	15.01	6.79													
2 Pain Catastrophizing	5.63	4.84	.51												
3 Pain Intensity	3.09	1.63	.49	.78											
4 Pain Unpleasantness	3.07	1.61	.40	.83	.92										
5 Pain Interference	2.69	1.86	.41	.76	.85	.85									
6 Downtime	2.43	1.48	.40	.60	.62	.64	.79								
7 Spouse Observed Pain Intensity	2.49	1.44	.41	.63	.68	.67	.71	.60							
8 Spouse Observed Pain Behavior	2.08	1.44	.33	.48	.57	.53	.58	.44	.83						
9 Patient Perceived Support	3.74	1.74	.41	.24	.36	.33	.36	.19	.34	.36					
10 Spouse Reported Support	3.86	1.64	-.07	.14	.20	.18	.16	.10	.26	.18	.49				
11 Patient Perceived Criticism	0.88	1.05	.23	.19	.20	.07	.14	.13	.10	.12	-.30	-.01			
12 Spouse Reported Criticism	0.45	0.45	.20	.12	-.01	.05	.04	.04	.11	.24	-.21	-.18	.25		
13 Patient Perceived Hostility	0.34	0.48	.30	.29	.20	.24	.13	.23	.12	.07	-.26	-.16	.45	.36	
14 Spouse Reported Hostility	0.22	0.33	.20	.14	-.01	.04	.03	.01	.07	.17	-.19	-.20	.17	.74	.42

Note. Correlations with absolute value at or above $r = .19$, $p < .05$.

Table 3

Patient Pain-Related Factors When Spouse was Absent and Present

Mean (SEs)	Spouse Absent	Spouse Present	t-value
Pain Catastrophizing	5.33 (0.47)	5.89 (0.47)	5.66**
Pain Intensity	3.00 (0.16)	3.18 (0.16)	4.24**
Pain Interference	2.61 (0.18)	2.76 (0.18)	3.12*
Downtime	2.41 (0.15)	2.47 (0.15)	0.13

Note:

*
 $p < 0.01$.**
 $p < 0.001$.

Table 4

Concurrent and Lagged Associations Between Patient Pain Outcomes

	Intensity				Interference				Downtime				Observed Pain Intensity				Observed Pain Behavior			
	B	SE	p	f ²	B	SE	p	f ²	B	SE	p	f ²	B	SE	p	f ²	B	SE	p	f ²
Intercept	3.14	.16	.000		2.78	.18	.000		2.42	.15	.000		2.49	.17	.000		2.12	.16	.000	
Time	.00	.00	.023		.00	.00	.001		.00	.00	.941		.00	.00	.614		.00	.00	.203	
Prior DV	.13	.01	.000		.08	.01	.000		.12	.01	.000		.27	.02	.000		.27	.02	.000	
Pain Cat	.20	.00	.000	.306	.22	.01	.000	.291	.08	.01	.000	.022	.10	.01	.000	.054	.09	.01	.000	.037
Intercept	3.11	.16	.000		2.76	.18	.000		2.43	.15	.000		2.47	.17	.000		2.10	.16	.000	
Time	.00	.00	.266		.00	.00	.009		.00	.00	.973		.00	.00	.122		.00	.00	.122	
Prior DV	.13	.01	.000		.08	.01	.000		.12	.01	.000		.26	.02	.000		.27	.02	.000	
Negative Affect	.04	.00	.000		.03	.00	.000		-.01	.01	.299		.03	.01	.000		.02	.01	.016	
Pain Cat	.18	.01	.000	.215	.21	.01	.000	.216	.09	.01	.000	.021	.09	.01	.000	.005	.08	.01	.000	.026
Intercept	3.12	.16	.000		2.75	.18	.000		2.41	.15	.000		2.46	.16	.000		2.09	.16	.000	
Time	.00	.00	.220		.00	.00	.027		.00	.00	.811		.00	.00	.446		.00	.00	.167	
Prior DV	.16	.01	.000		.12	.01	.000		.12	.01	.000		.25	.02	.000		.26	.02	.000	
Prior Pain Cat	.05	.01	.000	.011	.04	.01	.000	.005	.04	.01	.000	.004	.06	.01	.000	.020	.07	.01	.000	.025
Intercept	3.11	.16	.000		2.75	.18	.000		2.40	.15	.000		2.43	.17	.000		2.08	.16	.000	
Time	.00	.00	.241		.00	.00	.032		.00	.00	.633		.00	.00	.243		.00	.00	.091	
Prior DV	.16	.01	.000		.12	.01	.000		.12	.01	.000		.25	.02	.000		.26	.02	.000	
Prior Neg Affect	.00	.00	.654		.00	.00	.531		.01	.01	.029		.02	.01	.012		.02	.01	.012	
Prior Pain Cat	.05	.01	.000	.010	.04	.01	.000	.004	.03	.01	.000	.002	.05	.01	.000	.012	.06	.01	.000	.016

Note: Prior DV = The dependent variable of interest measured at the prior assessment period. Pain Cat = Pain Catastrophizing. Neg Affect = Negative Affect. Prior Neg Affect = Negative Affect measure at the prior assessment period.

Table 5

Cross Lagged Associations of Pain Variables and Pain Catastrophizing

	Pain Catastrophizing				Pain Catastrophizing g			
	B	SE	p	f ²	B	SE	p	f ²
Intercept	5.49	.48	.000		5.49	.48	.000	
Time	.00	.00	.125		.00	.00	.139	
Prior DV	.25	.01	.000		.27	.01	.000	
Pain Intensity	.12	.03	.000	.005	.07	.03	.028	.001
Intercept	5.50	.48	.000		5.50	.48	.000	
Time	.00	.00	.146		.00	.00	.153	
Prior DV	.26	.02	.000		.27	.02	.000	
Prior Negative Affect	-.01	.01	.475		.00	.01	.684	
Pain Intensity	.12	.03	.000	.002	.07	.03	.026	.001
Intercept	5.55	.49	.000		5.55	.49	.000	
Time	.00	.00	.713		.00	.00	.741	
Prior DV	.24	.02	.000		.24	.02	.000	
Observed Pain Intensity	.15	.04	.000	.005	.13	.04	.002	.003
Intercept	5.55	.49	.000		5.55	.49	.000	
Time	.00	.00	.715		.00	.00	.735	
Prior DV	.24	.02	.000		.24	.02	.000	
Prior Negative Affect	.00	.01	.994		.00	.01	.922	
Observed Pain Intensity	.15	.04	.000	.004	.13	.04	.002	.003

Note: Prior DV = The dependent variable of interest measured at the prior assessment.

Table 6
Concurrent and Lagged Associations Between Patient Catastrophizing and Spouse Reported Responses

	Hostility			Criticism			Support			Perceived Hostility			Perceived Criticism			Perceived Support		
	B	SE	p	B	SE	p	B	SE	p	B	SE	p	B	SE	p	B	SE	p
Intercept	-1.53	.11	.000	-.95	.08	.000	4.04	.17	.000	.37	.04	.000	.89	.05	.000	3.86	.17	.000
Time	.00	.00	.005	.00	.00	.873	.00	.00	.003	.00	.00	.100	.00	.00	.073	.00	.00	.504
Prior DV	.32	.02	.000	.30	.01	.000	.17	.02	.000	.16	.04	.000	.17	.03	.000	.18	.02	.000
Pain Cat	-.10	.02	.000	.01	.01	.159	.01	.01	.069	.03	.00	.000	.04	.01	.000	.04	.01	.000
Intercept	-1.57	.11	.000	-.95	.07	.000	4.05	.17	.000	.33	.03	.000	.84	.05	.000	3.87	.17	.000
Time	.00	.00	.005	.00	.00	.857	.00	.00	.002	.00	.00	.596	.00	.00	.456	.00	.00	.338
Prior DV	.30	.02	.000	.27	.01	.000	.17	.02	.000	.15	.04	.000	.16	.03	.000	.18	.02	.000
Negative Affect	.05	.01	.000	.04	.00	.000	-.01	.01	.158	.03	.01	.000	.05	.01	.000	-.01	.01	.012
Pain Cat	-.13	.02	.000	-.02	.01	.057	.02	.01	.027	.01	.01	.067	.02	.01	.102	.05	.01	.000
Intercept	-1.52	.13	.000	-.89	.10	.000	4.03	.17	.000	.37	.04	.000	.89	.06	.000	3.86	.17	.000
Time	.00	.00	.006	.00	.00	.744	.00	.00	.004	.00	.00	.168	.00	.00	.126	.00	.00	.624
Prior DV	.31	.02	.000	.32	.01	.000	.17	.02	.000	.16	.04	.000	.17	.03	.000	.18	.02	.000
Prior Pain Cat	-.12	.02	.000	-.05	.02	.002	.01	.01	.248	.00	.01	.593	.00	.01	.827	.02	.01	.011
Intercept	-1.56	.13	.000	-.90	.10	.000	4.04	.17	.000	.35	.03	.000	.89	.05	.000	3.85	.17	.000
Time	.00	.00	.011	.00	.00	.618	.00	.00	.002	.00	.00	.306	.00	.00	.120	.00	.00	.734
Prior DV	.27	.02	.000	.33	.02	.000	.17	.02	.000	.15	.04	.000	.17	.03	.000	.18	.02	.000
Prior Neg Affect	.04	.01	.000	.01	.01	.064	-.01	.01	.163	.01	.01	.039	.00	.01	.948	.01	.01	.224
Prior Pain Cat	-.14	.02	.000	-.04	.01	.001	.01	.01	.119	.00	.01	.810	.00	.01	.852	.02	.01	.050

Note: Prior DV = The dependent variable of interest measured at the prior assessment period. Pain Cat = Pain Catastrophizing. Neg Affect = Negative Affect. Prior Neg Affect = Negative Affect measure at the prior assessment period.