

Women's Adaptation to Chronic Back Pain: Daily Appraisals and Coping Strategies, Personal Characteristics and Perceived Spousal Responses

LYNDA D. GRANT & BONITA C. LONG
University of British Columbia, British Columbia, Canada

J. DOUGLAS WILLMS
University of New Brunswick, New Brunswick, Canada

BONITA C. LONG is Professor of Counselling Psychology at the University of British Columbia. She is currently doing research on stress and coping processes, and is interested in workplace stress and the stress of chronic illnesses.

LYNDA D. GRANT is a psychologist at the Vancouver Occupational Rehabilitation Centre. Her current research interests involve treatment interventions for chronic pain patients.

J. DOUGLAS WILLMS is a professor and the NB/CIBC Chair in Human Development at the University of New Brunswick. His research interests include child development, international studies of educational systems and the application of statistical methods.

ACKNOWLEDGEMENTS. This article is based in part on Lynda Grant's doctoral dissertation completed in the Department of Counselling Psychology at the University of British Columbia, under the direction of Bonita Long, and was partially supported by the Social Sciences and Humanities Research Council of Canada.

COMPETING INTERESTS: None declared.

ADDRESS. Correspondence should be directed to:
BONITA C. LONG, 2125 Main Mall, University of British Columbia,
Vancouver, British Columbia, V6T 1Z4, Canada. [Tel. +1 604 822 4756;
Fax +1 604 822 2328; email: bonita.long@ubc.ca]

Journal of Health Psychology
Copyright © 2002 SAGE Publications
London, Thousand Oaks and New Delhi,
[1359-1053(200209)7:5]
Vol 7(5) 545-563; 026675

Abstract

Daily diary methodology was used to examine within- and between-person associations among pain appraisals, coping strategies, personal characteristics, perceived spousal responses and daily (30 days) changes in negative mood and pain for 88 women with chronic back pain. Multilevel models revealed that control appraisals and distraction and ignoring pain coping strategies were associated with same-day reductions in negative mood and pain; whereas catastrophizing appraisals and praying and hoping coping strategies were associated with an increase in negative mood or pain. With appraisals and coping controlled for, average within-day decreases in depression were associated with perceived control in one's life; increases in anxiety were associated with spousal distracting responses; and increases in pain intensity were associated with spousal punishing responses and pain interference.

Keywords

coping strategies, daily diary, individual differences, pain appraisals, spousal responses, women's back pain

MANY PAIN SUFFERERS experience higher than average depression and anxiety (for a review, see Banks & Kerns, 1996; Strahl, Kleinknecht, & Dinnel, 2000). In order to explain adaptational differences among chronic pain sufferers and to develop behavioral interventions, pain researchers and clinicians have relied heavily on stress and coping theory (e.g. Affleck, Tennen, Keefe, Lefebvre, Kashikar-Zuck, Wright, Starr, & Caldwell, 1999; Boothby, Thorn, Stroud, & Jensen, 1999; Zautra, Hamilton, & Burke, 1999). The most widely accepted stress and coping theory is Lazarus's (1991; Lazarus & Folkman, 1984) transactional model, wherein pain appraisals (i.e. personal judgments about pain) and coping strategies (i.e. cognitive and behavioral efforts to manage pain) are believed to play a central role in how well people adapt. Researchers have begun to examine this dynamic process by studying the temporally unfolding relations among variables within an individual (Tennen, Affleck, Armeli, & Carney, 2000). Such within-person studies allow participants to serve as their own controls, thereby mitigating confounding by stable-person or situational factors and strengthening causal inferences. However, recent within-person studies have also revealed substantial but unexplained individual differences (i.e. between-person variance) in day-to-day covariation in pain and mood (e.g. Keefe, Affleck, Lefebvre, Starr, Caldwell, & Tennen, 1997). This variance may be due to stable characteristics of the person or the environment, whereas within-person variance may be due to situational demands or constraints (e.g. how changeable the situation is, competing demands and goals).

Although Lazarus (1991) acknowledges the contribution of individual differences in how people adapt, he posits that between-person factors are potentially reflected in the appraisal process. Several studies have explored individual differences and daily processes associated with chronic pain (e.g. Affleck, Tennen, Urrows, & Higgins, 1994) yet to our knowledge no study has addressed both between- and within-person variability in pain severity and negative mood by examining daily appraisals and coping efforts, *and* a range of individual differences. Thus, the purpose of this study was to determine whether daily appraisals and coping responses to chronic back pain are associated with daily changes in

negative mood and pain, and whether individual differences contribute to change in daily distress above and beyond that of appraisal and coping responses.

Cognitive appraisals that are considered the most central to adaptation to chronic pain relate to beliefs in changeability or options for controlling the pain. The best known of these beliefs is the concept of efficacy (Bandura, 1986), which includes outcome efficacy (the belief that there is a strategy that can bring about the desired outcome) and self-efficacy (the individual's belief that he or she can perform the behavior). Self-efficacy has been found to relate to daily ratings of pain and mood (Lefebvre, Keefe, Affleck, Raezer, Starr, Caldwell, & Tennen, 1999). In addition, outcome efficacy, assessed as the perceived ability to control and decrease pain, has been associated with less depression and anxiety (e.g. Keefe & Williams, 1990; Spinhoven & Linssen, 1991) and less daily pain intensity (e.g. J. K. Keefe et al., 1997; Lefebvre et al., 1999). Both types of expectations are needed to encourage adaptation to chronic pain. Thus, the extent to which self-efficacy and outcome efficacy (i.e. control over pain) is associated with less daily negative mood and pain intensity has important clinical implications, and is the focus of the present study.

Pain researchers have also focused on catastrophizing (i.e. an individual's tendency to focus on and exaggerate the threat value of painful stimuli and negatively evaluate one's ability to deal with pain; Rosenstiel & Keefe, 1983), which reflects a sense of hopelessness (Turner, 1991). Several authors have argued that even though catastrophizing is frequently assessed as a measure of coping (e.g. Coping Strategy Questionnaire; Rosenstiel & Keefe, 1983), it should be considered a cognitive appraisal because the catastrophizing scale assesses the degree which people worry and display negative thinking in response to pain, rather than as a strategy for coping with pain (e.g. Jensen & Karoly, 1991; Turner, 1991). Thus, in the present study catastrophizing is considered an appraisal. Consistent findings suggest that catastrophizing is related to greater pain intensity, anxiety and depression for patients with chronic back pain or rheumatic arthritis, even after controlling for pain (e.g.

Geisser, Robinson, & Henson, 1994; McCracken & Gross, 1993). Thus, we examined how daily self-efficacy, control and catastrophizing appraisals, in conjunction with coping efforts, relate to daily changes in negative mood and pain intensity.

The coping strategy praying and hoping has shown a consistent relationship with greater pain severity and greater affective distress (Geisser, Robinson, & Henson, 1994; Hill, 1993). More frequent use of coping by ignoring pain has been related to better psychological functioning (Jensen & Karoly, 1991); whereas diverting attention (i.e. distraction) has had mixed results (Geisser, Robinson, & Henson, 1994; Jensen & Karoly, 1991). The association between other coping strategies (e.g. reinterpreting pain sensation) and health outcomes has been less clear. Given the intractable, unrelenting and unpleasant nature of chronic pain, it may be that coping strategies have limited effectiveness. Moreover, many of the samples have been recruited from pain clinics (for a review, see Boothby et al., 1999) and may not reflect the coping strategies of individuals not currently undergoing treatment. Therefore, we examined the extent to which daily appraisals *and* coping responses uniquely predict changes in same-day outcomes for individuals suffering from chronic back pain.

In addition to daily appraisals and coping responses, there is some evidence that individual differences influence adaptation to chronic pain (Turk & Rudy, 1988). Studies using the Multi-dimensional Pain Inventory (MPI; Kerns, Turk, & Rudy, 1985) have revealed that, for chronic pain patients, a general sense of control in one's life is associated with less depression (e.g. Turk, Okifuji, & Scharff, 1995), and the extent to which pain interferes with life has been related to less perceived ability to decrease pain (Geisser, Robinson, & Henson, 1994) and to higher levels of depression (Turk et al., 1995). Based on the MPI scales, an adaptive copier has lower pain severity, lower interference with everyday activities, lower affective distress and higher life control, compared with a dysfunctional copier (Rudy, 1989). Moreover, interpersonally distressed copiers have significantly lower levels of social support from significant others (e.g. Bergstroem, Bodin, Jensen, Linton, & Nygren, 2001). In the present study, we

expected these patterns of adaptation to emerge in relation to outcomes such as daily negative mood and pain intensity.

The MPI also links the family to adaptational outcomes by assessing whether a pain sufferer feels that their spouse or partner responds to their pain with punishing, solicitous or distracting responses. For example, punishing responses have been positively associated with greater average pain and depression (Kerns, Haythornthwaite, Southwick, & Giller, 1990; Schwartz, Slater, & Birchler, 1996); whereas solicitous and distracting responses have been associated with higher levels of pain behavior and pain severity (e.g. Kerns et al., 1990; Lousberg, Schmidt, & Groenman, 1992; but see Burns, Johnson, Mahoney, Devine, & Pawl, 1996; Schwartz et al., 1996, for conflicting results). Given that spouse/partner behaviors may act as social reinforcers (Romano, Turner, Friedman, Bulcroft, Jensen, Hops, & Wright, 1992), we expected that perceived spousal responses would be positively related to increases in daily negative mood and pain intensity.

In summary, we hypothesized that individuals who report higher levels of catastrophizing appraisals and the use of praying and hoping coping would report increases across the day in pain intensity and depressed and anxious mood. We hypothesized that individuals who report higher levels of self-efficacy and control appraisals, and more frequent use of ignoring pain coping strategies would report decreases in pain intensity and negative mood across the day. We also expected that adaptive copiers and those who perceive their spousal responses as less punishing, distracting or solicitous would report less negative mood and pain intensity. Further, we were interested in whether the relationship between individual differences and outcomes would change after controlling for daily appraisals and coping; but because of a lack of empirical support, these effects were examined for exploratory purposes. Finally, although we included distraction and reinterpreting pain sensation coping strategies, no hypotheses were posited due to inconsistent research findings (Boothby et al., 1999). This study focused on only female pain sufferers because analysis of gender differences in response to pain is complex and would involve interaction effects of gender and contextual factors that may influence

responses (see Keefe, Lefebvre, Egert, Affleck, Sullivan, & Caldwell, 2000).

Method

Participants

Participants were 88 women with chronic low back pain recruited through media advertisements in a large Western Canadian urban city. Inclusion criteria were: (a) low back pain for at least six months experienced on a daily basis; (b) not attending a multidisciplinary pain clinic at the time of the study (i.e. a facility staffed by professionals who specialize in the diagnosis and management of patients with chronic pain); and (c) living in a married or common-law relationship. Of the 132 women who responded, 100 met the criteria and started the study. Seven dropped out for reasons unknown, two reported that their pain had stopped just after starting the study, two felt too distressed to continue and one was too busy to continue, leaving 88 participants for data analyses. Analyses comparing those who dropped out of the study ($n = 12$) with those retained revealed that the dropouts were more emotionally distressed, $F(1,99) = 6.84, p < .01$, felt less control in their lives, $F(1,99) = 6.85, p < .01$, and felt that their spouse or partner was more supportive of their pain, $F(1,99) = 6.64, p < .01$. The two groups did not differ on demographic or pain characteristics.

The mean age of the final sample of women was 46.83 years ($SD = 11.90$, range 23 to 80 years), mean years since pain began was 16.69 ($SD = 12.78$, range six months to 47 years) and mean years since pain was experienced on a daily basis was 10.75 ($SD = 10.46$, range three months to 40 years). Forty-one percent reported that their pain was due to an accident and 6 percent were involved in litigation for their pain. Seventy-three percent were on daily pain medication and 23 percent had visited a physician in the last six months. Seventy-eight percent had college or university training, 55 percent were employed outside of the home, 50 percent had a yearly family income of under 60,000 Canadian dollars and 94 percent were Caucasian.

Procedure

During one-hour individual interviews with L. Grant, each participant completed a demographic questionnaire, the MPI, an informed

consent form and was trained in the use of daily diaries (i.e. participants completed a practice set of forms). To facilitate completion of the diaries, participants were given a package containing a concertina file holder with 30 morning and 30 night-time sets of questionnaires arranged in a morning and night-time sequence. A stamped addressed envelope separated each week of diaries. On each day of the 30-day-diary period, participants completed questionnaires concerning self-efficacy for pain, depressed and anxious mood, and pain intensity within one hour of getting up in the morning; and coping strategy use, depressed and anxious mood, catastrophizing and control appraisals and pain intensity within one hour of going to bed. Participants were instructed to: (a) miss the recording period entirely if they did not fill in a diary within the specified time period; (b) complete the diary based on their experience *for that day only*; (c) seal the diary after completing it (seals and a pen were included in the package); and (d) mail in their responses in stamped addressed envelopes at the end of each block of seven days. Participants were telephoned at the end of each week to remind them to mail in their diaries, to confirm that they were complying with instructions and to problem solve any recording difficulties. Participants were also telephoned the day they were due to finish the study to inquire about their experience of being in the study. The only incentive offered to participants was a report of the study findings.

Daily diary measures

Daily pain coping The Coping Strategy Questionnaire (CSQ; Rosenstiel & Keefe, 1983) assesses cognitive and behavioral responses to pain, and is the most widely used measure of pain coping strategies (Jensen, Turner, Romano, & Karoly, 1991). The CSQ subscales used in this study were those derived by Swartzman, Gwadry, Shapiro and Teasell (1994), and include Praying and Hoping (four items), Ignoring Pain Sensations (eight items), Distraction (eight items) and Reinterpreting Pain Sensation (six items). Respondents are asked to rate on a seven-point scale (0 = *never do that* to 6 = *always do that*) how frequently they engage in different activities when they experience pain. Higher mean scores indicate more frequent engagement in a coping strategy. The instructions were

changed to reflect the time period (e.g. since getting up). Cronbach's alphas were computed for the 1st, 15th and 30th day ($M = .88$) and ranged from .80 to .94 for these subscales.

Pain appraisals We used three pain appraisal measures: catastrophizing, control over pain and self-efficacy for pain. The six-item Catastrophizing subscale of the CSQ (Rosenstiel & Keefe, 1983) was used to assess catastrophizing appraisals. This scale assesses participants' negative thoughts related to pain as well as catastrophic thoughts and ideation about pain. Participants are asked to rate the frequency they have these thoughts when they feel pain using a seven-point scale (0 = *never do that* to 6 = *always do that*). The higher the mean score, the more frequent the catastrophic thoughts. Test-retest stability for this subscale has been shown to be moderate to strong over intervals ranging from 24 hours to six months (Main & Waddell, 1991). In the present study, Cronbach's alpha ranged from .89 to .92 ($M = .90$) for the 1st, 15th and 30th day. One of the CSQ items, perceived control over pain, was used to measure pain control appraisals and was assessed on a seven-point scale (0 = *no control* to 6 = *complete control*). Instructions were changed to reflect the amount of control over pain for that day. The item assessing participants' perceived ability to control pain read as follows: 'Based on all the things you did to cope, or deal with your pain today, how much control did you have over it?'. The five-item Self-Efficacy for Pain subscale of the Arthritis Self-Efficacy Scale (Lorig, Chastain, Ung, Shoor, & Holman, 1989) was used to measure the level of confidence respondents had in their ability to manage their pain on a 10- to 100-point scale (10 = *very uncertain* to 100 = *very certain*). Because this scale measures a participant's predictions concerning their ability to manage pain (i.e. how certain they are that they can perform a particular task), it was administered in the morning. The scale score is the mean of the items, with higher scores indicating higher levels of self-efficacy. This subscale has been validated for use with chronic back-pain patients (Anderson, Dowds, Pelletz, Edwards, & Peeters-Asdourian, 1995). Cronbach's alpha were computed for the 1st, 15th and 30th day ($M = .81$) and ranged from .75 to .85

Daily mood The state anxiety (STPI-SA) and state depression (STPI-SD) subscales of the State-Trait Personality Inventory (Spielberger, 1979) were used to measure depression and anxiety. The STPI-SA scale was based on the 10 strongest items of the State-Trait Anxiety Inventory-State scale (Spielberger, 1992). The STPI-SD is based on the best set of 10 items that emerged from a factor analysis of 20 items selected from the four most widely used measures of depression. For both the STPI-SA and the STPI-SD, respondents are asked to rate how they feel *right now, that is, at this moment* on a four-point scale (1 = *not at all* to 4 = *very much so*). Scores range from 10 to 40, with higher scores indicating higher levels of depressed or anxious mood. In the present study, Cronbach's alpha ranged from .79 to .89 ($M = .84$) for the STPI-SD and .78 to .90 ($M = .86$) for the STPI-SA for the 1st, 15th and 30th day, morning and evening.

Pain intensity Participants were asked to rate their pain intensity on an 11-point numerical rating scale (NRS) in the morning and at night (0 = *no pain* to 10 = *pain as bad as it could be*). The validity of NRS has been well documented, and has demonstrated significant, positive relationships with other measures of pain intensity (Jensen & Karoly, 1992) and sensitivity to changes due to treatment (Kaplan, Melzger, & Jablecki, 1983). The NRS has demonstrated moderate test-retest stability over a period of seven days (Jensen & McFarland, 1993).

Personal characteristics and perceptions of spouse responses

The MPI is designed to measure psychosocial and functional characteristics important to the experience of chronic pain, and contains three parts with 12 subscales (Kerns et al., 1985). Part I consists of five subscales measuring perceptions of: (a) Pain Severity (three items); (b) Interference of Pain on vocational, marital/family and recreational/social functioning (nine items); (c) Support from Significant Others (three items); (d) Life-Control (two items); and (e) Affective Distress (three items). Part II assesses perceptions of the spouse or partner's Punishing (four items), Solicitous (six items) and Distracting (four items) Responses to the

respondent's demonstrations and complaints of pain. Part III consists of four activity subscales of common activities, these were summed for a General Activity Level (GAL) composite scale (22 items). All subscales of the MPI have demonstrated adequate levels of stability over a two-week test period (Kerns et al., 1985). Scores for the subscales range from 0 to 6, and higher scores (item means) indicate more frequent endorsement.

Hierarchical analyses of diary data

In our study, multiple assessments of appraisals, coping, depression, anxiety and pain intensity (time-variant data referred to as Level-1 variables or *within-person* data) obtained from the 30-daily-diary reports are nested with the time-invariant data or Level-2 variables (i.e. *between-person* data obtained from the MPI). Thus, we used hierarchical linear modeling (HLM) as our statistical model (Bryk & Raudenbush, 1992; Bryk, Raudenbush, & Congdon, 1996), which provides a means of examining repeated measures data (diary data) that have a hierarchical structure. We examined change in mood and pain from morning to evening by controlling for the morning score for each of the dependent variables. We also controlled for change from morning to evening in pain intensity when examining within-day change in anxiety and depression.

In a preliminary step in the analyses, we first examined the extent to which the 88 women varied in their own assessments from day to day, relative to the extent to which they varied among themselves. This is accomplished by fitting a *null* model (a model without any covariates) to the data for each measure. HLM partitions the variance into a within-person component attributable to day-to-day variation, and a between-person component attributable to variation among women in their (30-day) average scores. Equation 1 describes the simplest within-person model (null model), specifying that a particular level of depression on any given day (*i*th day by person *j*) is a function of the mean level of depression (β_{0j}) and a random residual component (ϵ_{ij}):

$$\text{Night-time depressed mood}_{ij} = \beta_{0j} + \epsilon_{ij} \quad (1)$$

In order to assess the reliability of the daily

change scores (e.g. morning to night), this model was extended to include the morning assessment of the outcome measure as a covariate. We also computed reliability coefficients that express the extent to which measures can distinguish between women on their (30-day) average scores.

Thereafter, to test our hypotheses, three multilevel regression equations were fitted separately for each outcome variable—depression, anxiety and pain intensity. The first model, which we refer to as the within-person model, fit the outcome measures on the variables denoting daily appraisals and coping strategies. This model included the morning assessment of the outcome measure, such that the estimated coefficients provide an indication of the extent to which the appraisal or coping strategy relates to *changes* in a woman's outcome from morning to night. Change in pain intensity (morning pain minus evening pain) across the day was controlled for in the depression and anxiety equations. An example of the within-person equations for Model 1 for depressed mood is presented below:

$$\begin{aligned} \text{Night-time depressed mood}_{ij} = & \beta_{0j} + \\ & \beta_{1j}(\text{a.m. depressed mood}) + \beta_{2j}(\text{change in} \\ & \text{pain intensity}) + \beta_{3j}(\text{Self-Efficacy}) \\ & + \beta_{4j}(\text{Control}) + \beta_{5j}(\text{Catastrophizing}) + \\ & \beta_{6j}(\text{Distraction}) + \beta_{7j}(\text{Ignoring Pain}) + \\ & \beta_{8j}(\text{Praying and Hoping}) + \epsilon_{ij} \end{aligned} \quad (2)$$

In the initial analyses, the within-person coping factor, reinterpreting pain sensation, was not significantly related to change in depression or anxiety and was dropped from these models. The coefficient for morning assessments varied significantly among women for all three outcomes, which suggested that the women differed significantly in the extent to which the morning and evening assessments were related. Thus, we modeled the morning assessment for each of the outcome measures as random effects (see Bryk & Raudenbush, 1992). Following Bryk and Raudenbush (1992, p. 151), the Level-1 time-varying covariates were modeled as fixed effects. To aid in parameter estimation, Kreft, deLeeuw and Aiken (1995) recommend centering the Level-1 predictor variable (e.g. group mean vs. grand mean). We chose the computationally simpler of the two methods, the grand-mean centering scheme.

The second model (see equation 3), which we refer to as the between-person model, fit the outcome measures on the MPI variables. This model provides estimates of the extent to which individual differences (Pain Severity, Interference, Life Control, Support, Affective Distress, General Activity, and Spousal Distracting, Punishing, and Solicitous Responses) are related to each woman's average day-to-day change in level of depression, anxiety, or pain intensity. An example of the equations for the second between-person model for MPI variables is presented below:

$$\beta_{0j} = \phi_{00} + \phi_{01}(\text{Pain Severity}) + \phi_{02}(\text{Interference}) + \phi_{03}(\text{Life Control}) + \phi_{04}(\text{Support}) + \phi_{05}(\text{General Activity}) + \phi_{06}(\text{Distracting}) + \phi_{07}(\text{Punishing}) + \phi_{08}(\text{Solicitous}) + U_{0j} \quad (3)$$

The third model, the full model, includes both the within- and between-person factors by combining Models 1 and 2 (i.e. equations 2 and 3). Here individuals' Level-1 coefficients (β_{0j} or average change in depression levels, controlling for daily appraisals and coping strategies) are regressed on the between-person characteristics. It provides a means of assessing the significance of the individual difference factors, while controlling for the daily appraisal and coping factors. In the models for depressed and anxious mood, the between-person MPI variable of affective distress was dropped from the models as it was collinear with the daily assessment of mood. For the same reason, pain severity was dropped from the model for pain intensity.

Results

Daily diary descriptive statistics

Correlations and descriptive statistics for the aggregated daily variables appear in Table 1. The means, standard deviations and Cronbach's alphas for the MPI scales appear in Table 2. The anxiety and depression outcome variables had strong positive correlations; however, they were only weakly related to pain intensity. (Although not shown here due to space limitations, anxiety and depression correlated differentially with the MPI individual difference variables.) Table 3, reflecting the null model results, displays the mean score and the partitioning of variance for each of the daily measures. Because these data

were structured hierarchically, both the within- and between-person measures of deviation are important. For example, the mean self-efficacy score was 60.52 across the 88 women. But women varied in self-efficacy from day to day—on average, the standard deviation within persons was 8.98. Women also varied among each other in their average assessments of self-efficacy—the standard deviation for their 30-day average scores was 16.77.

As a preliminary step in testing our hypotheses, we wanted to know the extent to which women varied in their own assessments from day to day, relative to the extent to which they varied among themselves. As Table 3 revealed, women differed more from each other (between-person proportions ranged from 60% to 91%) in their daily appraisals and coping strategies than individuals did from day to day (within-person proportions ranged from 9% to 40%). Table 3 also provides estimates of the variation in negative mood and pain after controlling for the morning assessment. As one would expect, much of the variation for each woman in her evening assessment was accounted for by her morning assessment.

However, the results indicated that there was considerable variation among women in their day-to-day assessments. For depression, for example, 73 percent of the overall variation was associated with day-to-day fluctuations, and only 27 percent was associated with variation between women. For anxiety, 64 percent of the overall variation was associated with day-to-day fluctuations, and for pain, slightly more than half of the variation was between individuals (57%). The HLM reliability coefficient indicates whether substantial random variance lies between individuals, with smaller values on a scale ranging from 0 to 1.0 indicating less substantial variance among the intercepts than higher values (Bryk & Raudenbush, 1992). Thus, highly reliable variance existed between participants in all of the measures (ranging from 0.92 to 1.00, after rounding to two decimal places), including the change measures.

Effects on depression, anxiety and pain intensity

Tables 4 through 6 show the results of each of the three multilevel regression equations for the three dependent variables. Positive relations

Table 1. Descriptive statistics and correlations

Variable	M	SD	1	2	3	4	5	6	7	8	9	10	11	12
1. Self-efficacy	60.79	18.92	-											
2. Catastrophizing	0.78	1.15	-.30**	-										
3. Control	3.30	1.48	.66**	-.33**	-									
4. Distraction	2.38	1.49	.04	.17**	.14**	-								
5. Ignoring Pain	3.30	1.52	.23*	-.07**	.28**	.28**	-							
6. Praying & Hoping	1.28	1.64	-.03	.36**	.04	.37**	.21**	-						
7. Reinterpreting Pain	0.77	1.20	.06*	.21**	.04	.43**	.28**	.26**	-					
8. Depressed Mood pm	17.54	4.82	-.31**	.39**	-.36**	-.01	-.23**	.02	-.02	-.02				
9. Anxious Mood pm	17.29	5.09	-.28**	.34**	-.33**	.04	-.15**	.08**	-.04	.78**	-			
10. Pain Intensity pm	4.51	2.58	-.41**	.32**	-.35**	.17**	.02	.19**	.03	.22**	.27**	-		
11. Depressed Mood am	17.13	4.61	-.40**	.29**	-.32**	-.02	-.21**	.01	-.04	.73**	.59**	.16**	-	
12. Anxious Mood am	17.33	4.97	-.31**	.26**	-.27**	.04	-.13**	.10**	-.05*	.61**	.75**	.18**	.75**	-
13. Pain Intensity am	4.45	2.36	-.45**	.16**	-.26**	.15**	.08**	.15**	.04	.17**	.21**	.67**	.28**	.28**

Note: N = 88. All measures are aggregated over the 30 days. *p < .05, **p < .01, two-tailed.

Table 2. Means, standard deviations and Cronbach's alphas for the MPI subscales

Variables	M	SD	α
Affective Distress	3.06	1.20	.81
Life Control	3.78	1.34	.81
Support	3.80	1.66	.87
General Activity Level	3.10	0.77	.78
Interference	3.35	1.36	.92
Pain Severity	3.50	1.10	.82
Distracting Responses	2.02	1.49	.74
Punishing Responses	1.68	1.32	.80
Sollicitous Responses	2.90	1.50	.80

Note: $N = 88$. The higher the score, the greater the attribution

our predictions, self-efficacy was not associated with decreases in depression or anxiety during the day; but was associated with a small although statistically significant increase, rather than a decrease in pain intensity. The self-efficacy coefficients were very small (.006 to .009) and of approximately equal magnitudes for all three dependent variables, but the small standard error (.004) in the pain intensity regression resulted in a statistically significant value. Zero-order correlations revealed that self-efficacy was negatively related to all three outcome measures, and had a strong positive correlation

Table 3. Means, standard deviations, variance components and estimates of reliability for daily appraisals, coping strategies and outcomes

	Within Person			Between Person		Reliability ^a Coefficient
	M	SD	Percentage of Variance	SD	Percentage of Variance	
<i>Appraisals</i>						
Self-Efficacy	60.52	8.98	22.3	16.77	77.7	0.99
Catastrophizing	0.79	0.61	27.8	0.98	72.2	0.99
Control	3.29	0.93	40.0	1.14	60.0	0.98
<i>Coping Strategies</i>						
Distraction	2.39	0.53	12.5	1.40	87.5	1.00
Ignoring Pain	3.29	0.69	20.7	1.36	79.3	0.99
Praying and Hoping	1.30	0.49	8.8	1.59	91.2	1.00
Reinterpreting Pain	0.77	0.45	14.0	1.12	86.0	0.99
<i>Outcome Assessments</i>						
Depressed Mood	17.56	3.27	46.6	3.50	53.4	0.97
Anxious Mood	17.35	3.31	42.6	3.85	57.4	0.98
Pain Intensity	4.53	1.46	32.1	2.13	67.9	0.98
<i>Adjusted for Morning Assessment</i>						
Depressed Mood	17.56	2.96	72.6	1.82	27.4	0.92
Anxious Mood	17.35	3.07	64.2	2.29	35.8	0.94
Pain Intensity	4.53	1.40	42.8	1.62	57.2	0.98

Note: $N = 88$. ^aReliability coefficients reflect the extent to which measures can distinguish between women on their 30-day average scores

indicate an increase in the dependent variable (i.e. an increase from morning to evening), whereas negative relations indicate a decrease in the dependent variable across the day.

Within-person effects (Model 1) With regard to the appraisals, our hypotheses were partially supported, as higher levels of catastrophizing were associated with daily increases in depressed and anxious mood and pain intensity. Also, higher levels of control appraisals were associated with decreases in depressed and anxious mood and pain intensity. Contrary to

with control ($r = .66$), thus its effect was suppressed by the control covariate in the model (Cohen & Cohen, 1983).

The direction of relationships between the coping strategies and change in mood (after controlling for change in pain intensity) and pain was as expected, but significant relationships varied depending on the outcome measure. Ignoring pain was associated with a decrease in depression across the day, but not with anxiety or pain intensity. Praying and hoping was associated with an increase in pain intensity, but not with negative mood.

Table 4. Regression coefficient estimates for multivariate hierarchical linear models describing the relationships between coping strategies and MPI subscale scores and women's assessment of depressed mood

Variables ^a	Model 1		Model 2		Model 3	
	B	SE B	B	SE B	B	SE B
<i>Within-Person Factors</i>						
Intercept	17.533**	.220	17.570**	.212	17.545**	.201
Morning Assessment	.399**	.032	.498**	.032	.393**	.032
Change in Pain	-.202**	.033	-.370**	.033	-.203**	.033
<i>Appraisals</i>						
Self-Efficacy	.009	.006			.008	.007
Catastrophizing	1.357**	.093			1.318**	.093
Control	-.346**	.065			-.345**	.065
<i>Coping Strategy</i>						
Distraction	-.366**	.090			-.421**	.092
Ignoring Pain	-.213**	.074			-.191**	.074
Praying and Hoping	-.105	.090			.126	.090
<i>Between-Person Factors</i>						
Interference			.133	.153	.119	.183
Support			-.161	.178	-.191	.210
General Activity Level			.152	.240	.114	.286
Pain Severity			-.027	.177	-.213	.212
Life Control			-.629**	.169	-.487**	.199
Punishing Responses			.247	.158	.362	.187
Solicitous Responses			-.127	.184	.060	.217
Distracting Responses			.316*	.149	.320	.181

Note: Model 1 is the within-person model; Model 2 is the between-person model; Model 3 includes both within- and between-person factors. The intercept tests whether average levels of the criterion differ from zero. ^aNegative coefficients reflect a decrease in depressed mood and positive coefficients reflect an increase in depressed mood across the day. ** $p < .01$, * $p < .05$

Distraction was associated with decreases in depression and anxiety, but not with pain intensity. Reinterpreting pain was not associated with change in anxious or depressed mood and was dropped from these analyses.

Between-person effects (Model 2) Model 2 analyses were concerned with whether individual differences on the MPI subscales predicted the average daily change in participants' levels of depression, anxiety and pain intensity, before controlling for the effects of coping and appraisals. The results indicated that spouses distracting responses and less life control were significantly related to average daily increases in levels of depression and anxiety. The results also indicated that the extent to which pain was perceived to interfere with daily functioning significantly related to average daily increases in pain intensity.

Within- and between-person effects (Model 3)

The third model estimates the within- and between-person effects simultaneously. The aim was to estimate the effects of the characteristics measured by the MPI on average daily changes in the outcome measures, while controlling for daily appraisals and coping strategies. There were several changes as a result of the inclusion of the within-person daily appraisal and coping factors. For average daily change in depressed mood, spousal distracting responses became non-significant as a predictor. Although the coefficients were approximately the same, the standard error was larger in Model 3, rendering the coefficient non-significant ($p = .074$). Therefore, for depressed mood, there was no meaningful change between the results of Model 1 and 3. For average daily change in anxious mood, the life control factor became non-significant, leaving only spousal distracting responses a significant predictor. Finally, for average daily change in

Table 5. Regression coefficient estimates for multivariate hierarchical linear models describing the relationships between coping strategies and MPI subscale scores and women's assessment of anxious mood

Variables ^a	Model 1		Model 2		Model 3	
	B	SE B	B	SE B	B	SE B
<i>Within-Person Factors</i>						
Intercept	17.266**	.264	17.297**	.215	17.272**	.244
Morning Assessment	.377**	.029	.437**	.028	.361**	.030
Change in Pain	-.202**	.035	-.326**	.035	-.200**	.035
<i>Appraisals</i>						
Self-Efficacy	.006	.007			-.005	.007
Catastrophizing	1.049**	.101			1.002**	.101
Control	-.294**	.071			-.304**	.071
<i>Coping Strategy</i>						
Distraction	-.441**	.099			-.530**	.102
Ignoring Pain	-.147	.081			-.110	.081
Praying and Hoping	.097	.100			.070	.100
<i>Between-Person Factors</i>						
Interference			.348	.192	.392	.221
Support			-.195	.224	-.224	.256
General Activity Level			.153	.301	.229	.364
Pain Severity			.114	.221	-.141	.256
Life Control			-.514**	.210	-.353	.241
Punishing Responses			.235	.200	.332	.229
Solicitous Responses			-.251	.229	-.046	.262
Distracting Responses			.485**	.185	.530**	.217

Note: Model 1 is the within-person model; Model 2 is the between-person model; Model 3 includes both within- and between-person factors. The intercept tests whether average levels of the criterion differ from zero. ^aNegative coefficients reflect a decrease in anxious mood and positive coefficients reflect an increase in anxious mood across the day. ** $p < .01$, * $p < .05$

pain intensity, spousal-punishing responses became a statistically significant predictor. Thus, within-person daily appraisals and coping strategies diminished the effect of life control on average daily change in anxious mood, and enhanced the effect of perceived spousal punishing responses on average daily change pain intensity.

Discussion

This study used a daily diary methodology to address questions concerning within- and between-person associations among appraisals, coping strategies, personal characteristics, perceived spousal responses and changes in daily negative mood and pain intensity. We found that daily appraisals (i.e. catastrophizing, control over pain, self-efficacy for pain) and coping strategies (i.e. distraction, ignoring pain and

praying and hoping) were associated with daily changes in depression and anxiety (even after controlling for change in pain), or daily changes in pain intensity. Support was also found for the role of individual differences in accounting for variance in daily average changes in negative mood (e.g. spousal distracting responses, life control) and pain intensity (pain interference, spousal punishing responses), beyond that accounted for by daily appraisals and coping.

As a preliminary step in testing our hypotheses, we wanted to know the extent to which women varied in their own assessments from day to day, relative to the extent to which they varied among themselves. Our results revealed that the women differed more from each other in their daily appraisals and coping strategies than they did from day to day. Thus, variability in the daily reports was due to the systematic tendency for some individuals to experience

Table 6. Regression coefficient estimates for multivariate hierarchical linear models describing the relationships between coping strategies and MPI subscale scores and women's assessment of pain intensity

Variables ^a	Model 1		Model 2		Model 3	
	B	SE B	B	SE B	B	SE B
<i>Within-Person Factors</i>						
Intercept	4.536**	.177	4.550**	.164	4.513**	.171
Morning Assessment	.256**	.029	.348**	.030	.254**	.027
<i>Appraisals</i>						
Self-Efficacy	.008*	.004			.009*	.003
Catastrophizing	.477**	.046			.476**	.046
Control	-.421**	.031			-.424**	.031
<i>Coping Strategy</i>						
Distraction	-.021	.047			-.043	.048
Ignoring Pain	-.036	.038			-.024	.038
Praying and Hoping	.281**	.050			.273**	.050
Reinterpreting Pain	.080	.057			.084	.057
<i>Between-Person Factors</i>						
Interference			.357*	.170	.381*	.176
Support			.002	.162	-.076	.167
General Activity Level			-.287	.247	.162	.256
Affective Distress			.014	.205	-.258	.211
Life Control			.008	.173	.019	.179
Punishing Responses			.200	.152	.314*	.157
Solicitous Responses			-.067	.167	.146	.174
Distraction Responses			.224	.137	.126	.142

Note: Model 1 is the within-person model; Model 2 is the between-person model; Model 3 includes both within- and between-person factors. The intercept tests whether average levels of the criterion differ from zero. ^aNegative coefficients reflect a decrease in pain intensity and positive coefficients reflect an increase in pain intensity across the day. ** $p < .01$, * $p < .05$

certain appraisals and coping strategies more often than others. Thus, we can conclude that there is a large trait component to the utilization of these appraisals and coping strategies. This is consistent with the findings of Schwartz, Neale, Marco, Shiffman and Stone (1999) who found that escape-avoidance coping and the use of religion exhibited trait-like properties for a sample of men and women with high work and marital stress (see also Carver & Scheier, 1994; Long & Schutz, 1995). It should be noted that because all participants focused on a similar stressor (i.e. back pain), they were more likely to report engaging in the same type of appraisals and coping strategies. Thus, the appearance of consistent individual differences may partially reflect situational effects, and inflate the estimate of dispositional appraisal and coping.

In contrast, the proportions of variance attributable to day-to-day variation (within person) were greater than the variation between

members of the sample for *changes* in depressed and anxious mood. Thus, we can conclude that there is a substantial situational or state component in daily negative mood reports. However, unreliability or random error (i.e. participants may randomly misreport their daily mood) may have resulted in an overestimation of the within-person variability of daily change, and underestimation of dispositional mood and pain intensity. With regard to change in pain intensity, the proportion of variance attributable to within- and between-person variability was very similar indicating that there is both consistency in how the women reported their pain intensity, as well as situational variability.

Changes in daily anxious and depressed mood and pain intensity

Individual variation across days revealed that participants with higher levels of catastrophizing

appraisals and lower appraised control over pain reported increases in depressed and anxious mood and pain intensity from morning to night. These results are consistent with previous findings in which greater catastrophizing and less control appraisals were related to greater negative mood and pain (e.g. Flor & Turk, 1988; Geisser, Robinson, & Henson, 1994). Catastrophizing has sometimes been viewed as simply the byproduct of depression; however, depressed mood may heighten pain intensity by fostering a sense of helplessness, which in turn may enhance catastrophizing about pain (Feldman, Downey, & Schaffer-Neitz, 1999; Geisser, Robinson, Keefe, & Weiner, 1994) and lower control over pain appraisals. Thus, the reciprocal relationship between depression, pain intensity and catastrophizing and control appraisals warrants further investigation. Moreover, Keefe et al. (2000) suggested that it is possible that catastrophizing exerts its effects on pain perception by altering the processing of pain signals at the spinal cord level. Future studies may be able to examine individual differences in catastrophizing and measures of descending control over pain transmission.

As expected, appraisals of control over pain (i.e. outcome expectations) were associated with decreases in daily depression, anxiety and pain. However, our findings for self-efficacy appraisals were contrary to previous findings and our expectations. Higher levels of self-efficacy for pain were not associated with decreases in depressed or anxious mood, but were associated with a statistically significant, although small, *increase* in pain intensity across the day. In part, this may be explained by a suppression effect (Cohen & Cohen, 1983). That is, when the common variance for control over pain was removed, the relationship between self-efficacy and change in negative mood and pain was altered. We could speculate that when pain sufferers hold strong self-efficacy beliefs that pain-related behaviors can be performed but do not hold outcome expectations that pain can be controlled or decreased (or vice versa), self-efficacy for pain is no longer or only weakly related to change in negative mood or pain. Conversely, it may be that as pain intensity increases from morning to evening, those individuals who hold self-efficacy beliefs that they can perform pain-related behaviors, but do not believe they

can control the pain, experience little no change in pain intensity or negative mood. To some extent, these findings support an identity disruption model in which incongruence between an individual's outcome expectations and actual outcomes result in psychological disturbance (Brown & McGill, 1989), and are also consistent with Bandura's (1986) theory that both outcome expectancies (e.g. beliefs that there is a strategy that can bring about the desired outcome—a decrease pain) and self-efficacy expectations (beliefs that one can perform the desired behaviors) are important considerations in adaptation.

In the present study, we focused on self-efficacy beliefs that pain-related behaviors could be performed. However, the results of a recent study by Lefebvre et al. (1999) revealed that several self-efficacy domains (i.e. symptoms, physical function and pain) were differentially associated with positive and negative mood and pain. Self-efficacy beliefs in one's ability to perform activities of daily living, despite pain, were associated with less reported pain at a six-month follow-up assessment of patients in a rehabilitation intervention (Altmaier, Russell, Kao, Lehmann, & Weinstein, 2000). Thus, future studies would benefit from examining a range of self-efficacy beliefs, in addition to self-efficacy for pain-related behaviors.

As expected, decreases in depressed mood (but not anxious mood) across the day were associated with greater use of ignoring pain coping, and may be due to the fact that this type of coping could be interpreted as an attempt deliberately to view pain as a challenge (e.g. 'I tell myself I can't let pain stand in the way of what I have to do'). Lazarus and Folkman (1984) state that this type of cognitive strategy is accompanied by emotions such as eagerness and excitement, which may be incompatible with feelings of depression.

Contrary to our expectations, praying and hoping coping was not associated with increases in negative mood, although it did predict increases in pain intensity. These strategies focus on a 'powerful other' to take away the pain (e.g. 'I pray to God it won't last long'), rather than personal action. Relying on praying and hoping coping has been related to lower self-efficacy for performing daily tasks; which, in turn is related to greater pain (Keefe, Kashikar-Zuck, Robinson, Salley, Beaupre, Caldwell, Baucom, &

Haythornthwaite, 1997). Thus, future studies might examine the mediating effects of self-efficacy on the relationship between praying and hoping coping and daily pain intensity. However, given the limited forms of praying and hoping assessed in the present study, there is a need to examine other forms of daily prayer and spiritual practices used to cope with chronic pain to determine whether other efforts relate to daily changes in negative mood.

Although previous findings for distracting coping have been inconsistent, we found that women who reported using more distracting coping reported a decrease in negative mood, even after controlling for change in pain intensity. These results are consistent with the cognitive-behavioral theory of depression (Beck, 1976; Lewinsohn, 1974), which postulates that depression is both a function of cognitive errors and the reduction in general of pleasurable activities. It should be noted that the items on the distraction subscale reflect the deliberate engagement in pleasurable activities. Compas, Connor, Osowiecki and Welch (1997) have suggested that distraction is associated with better outcomes when it involves at least a temporary escape from the negative emotions associated with a stressor. However, it may also be that high levels of depression and anxiety make it harder for people to use distraction as a coping strategy. There is some indication that our community sample of female pain sufferers had lower levels of affective distress, pain interference, and pain severity than the typical pain patient,¹ which may account for previous conflicting findings (see Jensen & Karoly, 1991) and the adaptive function of distraction for this sample.

Although ignoring pain and distracting coping strategies were significant predictors of changes in negative mood, they did not predict change in pain intensity. These results are somewhat consistent with much of the previous research (see Boothby et al., 1999). Coping strategies that require people to try deliberately to change the pain sensation by ignoring it, thinking of other things or by thinking of it in different terms (e.g. 'I just think of it as some other sensation, such as numbness') have not proven to be associated with pain intensity.

Finally, our findings that pain appraisals account for more variance in change in negative mood, compared with coping strategy use, are

consistent with previous research (Jensen, Turner, & Romano, 1994). Because chronic pain, by its very definition, is difficult, intractable and unrelenting, it is possible that there is a limit to the effectiveness of coping strategies; and, consequently, people may rely on changing their appraisals. Alternatively, Wills (1997) posits that over time, coping strategies may become routinized, blurring the distinction between appraisals and coping. Further study is needed into what factors are associated with the use of certain pain appraisals and coping strategies over others, and what determines the frequency of the use of these strategies.

MPI personal characteristics and spousal interactions

Our findings revealed that when the variance for all the MPI subscales were accounted for, only a few of the MPI personal characteristics were differentially related to daily average change in negative mood or pain intensity. Greater control in one's life was associated with average daily decreases in depression and anxiety, consistent with other research findings (Flor & Turk, 1988; Turk et al., 1995), and greater pain interference with vocational, marital/family, recreational and social functioning was associated with average daily increases in pain intensity. Our findings also revealed that the effects of life control on change in anxiety were diminished with the inclusion of appraisal and coping factors, and may have been partially due to the positive association between life control and pain control appraisals, which were moderately correlated. Thus, one could speculate that life control beliefs affect average daily change in anxiety through daily control appraisals; or conversely, as anxiety increases, the appraisal that pain can be controlled is diminished, which in turn diminishes the general belief that one has control over one's life.

Our results revealed that, after controlling for daily appraisals and coping strategies, average daily increases in pain intensity, but not depression or anxiety, were related to the perception that one's spouse/partner is responding in a punishing manner. Spousal distracting responses were associated with average daily increases in anxiety and depression, although their effects on depression were slightly diminished when appraisals and coping were added to

the model (i.e. distracting responses approached significance; $b = .32$, $p < .07$, in Model 3). However, solicitous and distracting responses were not associated with an increase in pain intensity, results that are consistent with previous research that also did not find a relationship between these responses and pain (e.g. Burns et al., 1996; Schwartz et al., 1996). In contrast, Jensen (1996; see also Romano et al., 1992) found that solicitous spousal responses predicted increased pain behavior when the responses were given immediately following an expression of pain. Thus, the temporal nature of the responses should be examined in future studies.

Thus, increased negative interactions with a spouse or partner may lead to increased pain or anxiety through unintentional reinforcement, or conversely, higher levels of pain or anxiety may lead women with chronic back pain to interpret spousal/partner interactions in a more negative light. These findings reflect a complex pattern of interrelationships among spouse/partner responses and daily negative mood and pain. Additional research is needed to identify the mechanisms by which interpersonal relations are associated with various aspects of pain (e.g. a person/situation perspective). However, taken together, these results are of clinical interest because they suggest that interventions designed to enhance spousal/partner relationships, foster a sense of control over one's life, and reduced pain interference might have an impact on changes in daily negative mood or pain (see Kerns, 1999).

Several limitations of the present study should be noted. We relied exclusively on participants' self-reports of subjective states. Yet, actual coping behavior or pain may deviate significantly from an individual's report, and may be more or less variable over time than self-reports would suggest. Future studies should consider behavioral indices that would help control for within-person confounds. Generalizations from this study are limited to women with chronic low back pain who have a spouse or partner, and who are not currently being treated at a multi-disciplinary pain center. In addition, the volunteers were mostly Caucasian, middle-aged and middle class, and were from a metropolitan area. Although more highly educated than a representative sample of chronic pain sufferers

from the community and more likely to attribute their pain to an accident, they were just as likely to be employed outside the home (approximately 50%) (Crook, Weir, & Tunks, 1989).² Women who dropped out of the study were more emotionally distressed, felt less control over their lives, but perceived themselves as having more interpersonal support than those women who completed the study, also limiting generalizability.

Because this was a correlational study, causal relationships among the variables cannot be inferred. For example, the finding that spousal punishing responses were related to an increase in pain intensity may reflect a greater sensitivity to interpersonal behaviors when in pain, rather than punishing responses per se. However, within-person relationships explained some of the day-to-day variation for each individual. Thus, all of the between-person factors (e.g. age, socioeconomic status) that weaken causal inference in a typical cross-sectional study are explicitly controlled. Therefore, although we cannot claim that these appraisals or coping strategies reduce depression, anxiety or pain, the results provide a strong case for developing randomized experiments where participants are called upon to use particular appraisals or coping strategies.

A potential drawback of this type of data collection is that diary monitoring causes participants to attend to their pain more than they otherwise might. This heightened attention might potentially change a person's experience of the pain, compromising the validity of the diaries as a measurement tool. However, there is some indication that this may not be as much a concern as previously thought, at least for pain and mood. For example, Cruise, Broderick, Porter, Kaell and Stone (1996) found that chronic pain patients are so accustomed to their pain that attending to it exerts little, if any, influence in their experience of pain or mood. We asked participants at the end of the study whether they thought their participation in any way changed the way they thought about their pain or the types of coping strategies they used. A few participants did report that the daily monitoring made it more difficult for them to ignore the pain or distract themselves from it, which were strategies they had found quite helpful (see J. K. Keefe et al., 1997). Thus, future

studies will need to consider ways of determining the effects of heterogeneous measurement reactivity (see Affleck et al., 1999, for an extended discussion of this issue).

Cognitive-behavioral pain treatment programs (Johansson, Dahl, Jannert, Melin, & Andersson, 1998; Kole-Snijders, Vlaeyen, Goossens, Rutten-van Mólken, Heuts, Van Eek, & Van Breukelen, 1999) have shown that improvements in one's sense of control over pain and self-efficacy are associated with short- and long-term reductions in pain. In contrast, various pain interventions used to encourage coping with pain have not been effective for patients who catastrophize (e.g. Geisser et al., 1994; Heyneman, Fremouw, Gano, Kirkland, & Heiden, 1990). Thus, future studies need to examine whether a reduction in catastrophizing will facilitate more effective coping for women suffering from chronic back pain. Our results suggest that these same appraisals and coping strategies relate to the daily management of chronic pain for a community sample of women with partners, but who are functioning at a higher level than typical pain patients. Moreover, one's sense of control in one's life and degree of pain interference play a role in daily changes in depression or pain intensity and could be the target of interventions. Finally, the importance of perceived spousal responses and daily changes in pain and anxiety is consistent with the results of clinical trials that include spousal training (Kole-Snijders et al., 1999). However, other family relationships may play a part in adaptation to chronic pain and should also be the focus of future studies (see Kerns, 1999).

In conclusion, the strength of this study includes a strong theoretical basis, a community-based sample and the application of a relatively new methodology for studying associations among appraisals, coping strategies, individual differences and negative mood and pain intensity. Our results provide evidence that this kind of design is a powerful means for assessing change. In psychological studies, change scores have been eschewed because they are notoriously unreliable (Willett, 1988). In this case also, if the design had relied on the report of the women's morning and evening pain for only one day, the change scores would have been quite unreliable because nearly half of the variation

was attributable to day-to-day fluctuations. Importantly, by having a 30-day record of each woman's morning and evening pain, we had a reliable measure for assessing the effects of individual differences.

Notes

1. Because chronic pain sufferers recruited from the community are generally not the focus of pain research, we compared data from the present study with scores on psychosocial and functional variables of pain patients. Two samples reported in the MPI manual were used for comparison—a heterogeneous chronic pain patient sample and a sample of lower back pain patients (Rudy, 1989). Two-tailed *t*-tests were used with significance set at .001. Results revealed that the community sample had significantly lower levels of affective distress, pain interference, pain severity and spouse support; and higher levels of life control and general activity level. No differences were found for spousal distracting and punishing responses, however, the pain patients reported significantly more solicitous responses. Based on limited comparisons, these findings suggest that our community sample was less functionally and psychologically impaired, and reported less reinforcement for their pain behavior from their spouses, compared with pain patients.
2. We compared our sample with a random sample of male and female persistent pain sufferers drawn from a Canadian Family Practice Clinic ($N = 87$, Crook et al., 1989). Our sample was more likely to report that their pain was due to an accident (41% vs 26%); moreover, they were better educated (78% vs 31% post-secondary training) and were more likely to be married or in a common-law relationship (100% vs 73%). However, in both samples, slightly over half were employed outside of the home or were students (55% vs 53%).

References

- Affleck, G., Tennen, H., Keefe, F. J., Lefebvre, J. C., Kashikar-Zuck, S., Wright, K., Starr, K., & Caldwell, D. S. (1999). Everyday life with osteoarthritis or rheumatoid arthritis: Independent effects of disease and gender on daily pain, mood, and coping. *Pain*, *83*, 601–609.
- Affleck, G., Tennen, H., Urrows, S., & Higgins, P. (1994). Person and contextual features of daily stress reactivity: Individual differences in relations of undesirable daily events with mood disturbance and chronic pain intensity. *Journal of Personality and Social Psychology*, *66*, 329–340.
- Altmaier, E. M., Russell, D. W., Kao, C. F., Lehmann,

- T. R., & Weinstein, J. N. (1993). Role of self-efficacy in rehabilitation outcome among chronic low back pain patients. *Journal of Counseling Psychology, 40*, 335-339.
- Anderson, K. O., Dowds, B. N., Pelletz, R. E., Edwards, W. T., & Peeters-Asdourian, C. (1995). Development and validation of a scale to measure self-efficacy beliefs in patients with chronic pain. *Pain, 63*, 77-84.
- Bandura, A. (1986). *Social foundation of thought and action: A social cognitive theory*. Englewood Cliffs, NJ: Prentice Hall.
- Banks, S. M., & Kerns, R. D. (1996). Explaining high rates of depression in chronic pain. A diathesis stress-framework. *Psychological Bulletin, 119*, 95-110.
- Beck, A. T. (1976). *Cognitive therapy and the emotional disorders*. New York: International University Press.
- Bergstroem, G., Bodin, L., Jensen, I. B., Linton, S. J., & Nygren, A. L. (2001). Long-term, non-specific spinal pain: Reliable and valid subgroups of patients. *Behaviour Research and Therapy, 39*(1), 75-87.
- Boothby, J. L., Thorn, B. E., Stroud, M. W., & Jensen, M. P. (1999). Coping with pain. In D. C. Turk & R. J. Gatchel (Eds.), *Psychosocial factors in pain* (pp. 343-359). New York: Guilford Press.
- Brown, J. D., & McGill, K. L. (1989). The cost of good fortune: When positive life events produce negative health consequences. *Journal of Personality and Social Psychology, 57*, 1103-1110.
- Bryk, A. S., & Raudenbush, S. W. (1992). *Hierarchical linear models*. Newbury Park, CA: Sage.
- Bryk, A. S., Raudenbush, S. W., & Congdon, R. T. (1996). *HLM: Hierarchical linear and nonlinear modeling with the HLM/2L and HLM/3L programs*. Chicago, IL: Scientific Software International.
- Burns, J. W., Johnson, B. J., Mahoney, N., Devine, J., & Pawl, R. (1996). Anger management style, hostility and spouse responses: Gender differences in predictors of adjustment among chronic pain patients. *Pain, 64*, 445-453.
- Carver, C. S., & Scheier, M. F. (1994). Situational coping and coping dispositions in a stressful transaction. *Journal of Personality and Social Psychology, 66*, 184-195.
- Cohen, J., & Cohen, P. (1983). *Applied multiple regression/correlation analysis for the behavioral sciences*, 2nd edn. Hillsdale, NJ: Lawrence Erlbaum.
- Compas, B. E., Connor, J., Osowiecki, D., & Welch, A. (1997). Effortful and involuntary responses to stress: Implications for coping with chronic stress. In B. H. Gottlieb (Ed.), *Coping with chronic stress* (pp. 105-130). New York: Plenum.
- Crook, J., Weir, R., & Tunks, E. (1989). An epidemiological follow-up survey of persistent pain sufferers in a group family practice and specialty pain clinic. *Pain, 36*, 49-61.
- Cruise, C. E., Broderick, J., Porter, L., Kaell, A., & Stone, A. A. (1996). Reactive effects of diary self-assessment in chronic pain patients. *Pain, 67*, 253-258.
- Feldman, S. I., Downey, G., & Schaffer-Neitz, R. (1999). Pain, negative mood, and perceived support in chronic pain patients: A daily diary study of people with reflex sympathetic dystrophy syndrome. *Journal of Consulting and Clinical Psychology, 76*, 776-785.
- Flor, H., & Turk, D. C. (1988). Chronic back pain and rheumatoid arthritis: Predicting pain and disability from cognitive variables. *Journal of Behavioral Medicine, 11*, 251-265.
- Geisser, M. E., Robinson, M. E., & Henson, C. D. (1994). The Coping Strategies Questionnaire and chronic pain adjustment: A conceptual and empirical reanalysis. *The Clinical Journal of Pain, 10*, 98-106.
- Geisser, M. E., Robinson, M., Keefe, F., & Weiner, M. (1994). Catastrophizing, depression, and the sensory, affective and evaluative aspects of chronic pain. *Pain, 59*, 79-83.
- Heyneman, N. E., Fremouw, W. J., Gano, D., Kirkland, F., & Heiden, L. (1990). Individual differences and the effectiveness of different coping strategies for pain. *Cognitive Therapy and Research, 14*, 63-77.
- Hill, A. (1993). The use of pain coping strategies by patients with phantom limb pain. *Pain, 55*, 347-354.
- Jensen, M. P. (1996). Validity of self-report and observational measures. Paper presented at the 8th World Congress on Pain, Vancouver, BC, August.
- Jensen, M. P., & Karoly, P. (1991). Control beliefs, coping efforts, and adjustment to chronic pain. *Journal of Consulting and Clinical Psychology, 59*, 431-438.
- Jensen, M. P., & Karoly, P. (1992). Self-report scales and procedures for assessing pain in adults. In D. C. Turk & R. Melzack (Eds.), *Handbook of pain assessment* (pp. 135-151). New York: Guilford Press.
- Jensen, M. P., & McFarland, C. A. (1993). Increasing the reliability and validity of pain intensity measurement in chronic pain patients. *Pain, 55*, 195-204.
- Jensen, M. P., Turner, J. A., & Romano, J. M. (1994). Correlates of improvement in multidisciplinary treatment of chronic pain. *Journal of Consulting and Clinical Psychology, 62*, 172-179.
- Jensen, M. P., Turner, J. A., Romano, J. M., & Karoly, P. (1991). Coping with chronic pain: A critical review of the literature. *Pain, 47*, 249-284.
- Johansson, C., Dahl, J., Jannert, M., Melin, L., & Andersson, G. (1998). Effects of a cognitive-behavioural pain-management programme. *Behaviour Research and Therapy, 36*, 915-930.

- Kaplan, R. M., Melzger, G., & Jablecki, C. (1983). Brief cognitive and relaxation training increases tolerance for painful clinical electromyographic examination. *Psychosomatic Medicine*, *45*, 155-162.
- Keefe, J. K., Affleck, G., Lefebvre, J. C., Starr, K., Caldwell, D. S., & Tennen, H. (1997). Pain coping strategies and coping efficacy in rheumatoid arthritis: A daily process analysis. *Pain*, *69*, 35-42.
- Keefe, F. J., Kashikar-Zuck, S., Robinson, E., Salley, A., Beupre, P., Caldwell, D., Baucom, D., & Haythornthwaite, J. (1997). *Pain*, *73*, 191-199.
- Keefe, F. J., Lefebvre, J. C., Egert, J. R., Affleck, G., Sullivan, M. J., & Caldwell, D. S. (2000). The relationship of gender to pain, pain behavior, and disability in osteoarthritis patients: The role of catastrophizing. *Pain*, *87*, 325-334.
- Keefe, F. J., & Williams, D. A. (1990). A comparison of cognitive coping strategies in chronic pain patients in different age groups. *Journal of Gerontology*, *45*, 161-165.
- Kerns, R. D. (1999). Family therapy for adults with chronic pain. In R. J. Gatchell & D. C. Turk (Eds.), *Psychosocial factors in pain: Critical perspectives* (pp. 445-456). New York: Guilford.
- Kerns, R. D., Turk, D. C., & Rudy, T. E. (1985). The West-Haven Yale Multidimensional Pain Inventory (WHYMPI). *Pain*, *23*, 345-356.
- Kerns, R. D., Haythornthwaite, J., Southwick, S., & Giller, E. L. (1990). The role of marital interaction in chronic pain and depressive symptom severity. *Journal of Psychosomatic Research*, *34*, 401-408.
- Kole-Snijders, A. M. J., Vlaeyen, J. W. S., Goossens, M. E. J. B., Rutten-van Mülken, M. P. M. H., Heuts, P. H. T. S., Van Eek, H., & Van Breukelen, G. (1999). Chronic low-back pain: What does cognitive coping skills training add to operant behavioral treatment? Results of a randomized clinical trial. *Journal of Consulting and Clinical Psychology*, *67*, 931-944.
- Kreft, I. G., deLeeuw, W. J., & Aiken, L. (1995). The effect of different forms of centering in hierarchical linear models. *Multivariate Behavioral Research*, *30*, 1-22.
- Lazarus, R. S. (1991). *Emotion and adaptation*. London: Oxford University Press.
- Lazarus, R. S., & Folkman, S. (1984). *Stress, appraisal, and coping*. New York: Springer.
- Lefebvre, J. C., Keefe, F. J., Affleck, G., Raezer, L. B., Starr, K., Caldwell, D. S., & Tennen, H. (1999). The relationship of arthritis self-efficacy to daily pain, daily mood, and daily pain coping in rheumatoid arthritis patients. *Pain*, *80*, 425-535.
- Lewinsohn, P. M. (1974). Clinical and theoretical aspects of depression. In K. S. Calhoun, H. E. Adams, & K. M. Mitchel (Eds.), *Innovative treatment methods for psychopathology* (pp. 201-217). New York: John Wiley & Sons.
- Long, B. C., & Schutz, R. W. (1995). Temporal stability and replicability of a workplace stress and coping model for managerial women: A multiwave panel study. *Journal of Counseling Psychology*, *42*, 266-278.
- Lorig, K. L., Chastain, R. L., Ung, E., Shoor, S., & Holman, H. R. (1989). Development and evaluation of a scale to measure perceived self-efficacy in people with arthritis. *Arthritis and Rheumatism*, *32*, 37-44.
- Lousberg, R., Schmidt, A. J. M., & Groenman, N. A. (1992). The relationship between spouse solicitous and pain behavior: Searching for more experimental evidence. *Pain*, *51*, 75-79.
- Main, C. J., & Waddell, G. (1991). A comparison of cognitive measures in low back pain: Statistical structure and clinical validity at initial assessment. *Pain*, *46*, 287-298.
- McCracken, L., & Gross, R. (1993). Does anxiety affect coping with chronic pain. *Clinical Journal of Pain*, *9*(4), 253-259.
- Romano, J. M., Turner, J. A., Friedman, L. S., Bulcroft, R. A., Jensen, M. P., Hops, H., & Wright, S. F. (1992). Sequential analysis of chronic pain behaviors and spouses responses. *Journal of Consulting and Clinical Psychology*, *60*(5), 777-782.
- Rosenstiel, A. K., & Keefe, F. J. (1983). The use of coping strategies in chronic low back pain patients: Relationship to patient characteristics and current adjustment. *Pain*, *17*, 33-44.
- Rudy, T. E. (1989). Multiaxial Assessment of Pain Multidimensional Pain Inventory. *Computer Program Users Manual Version 2.1*. PA: University of Pittsburgh School of Medicine.
- Schwartz, J. E., Neale, J., Marco, C., Shiffman, S. S., & Stone, A. A. (1999). Does trait coping exist? A momentary assessment approach to the evaluation of traits. *Journal of Personality and Social Psychology*, *77*, 360-369.
- Schwartz, L., Slater, M. A., & Birchler, G. R. (1996). The role of pain behavior in the modulation of marital conflict in chronic pain couples. *Pain*, *65*, 227-233.
- Spielberger, C. D. (1979). Preliminary manual for the State-Trait Personality Inventory (STPI). Unpublished manuscript. University of South Florida, Tampa.
- Spielberger, C. D. (1992). State-Trait Anxiety Inventory (Form Y). In M. Hersen & A. S. Bellack (Eds.), *Dictionary of behavioral assessment techniques* (pp. 448-450). New York: Pergamon.
- Spinhoven, P., & Linssen, A. C. G. (1991). Behavioral treatment of chronic low back pain. I. Relation of coping strategy use to outcome. *Pain*, *45*, 29-34.
- Strahl, C., Kleinknecht, R. A., & Dinnel, D. L. (2000). The role of pain anxiety, coping, and pain self-efficacy in rheumatoid arthritis patient functioning. *Behaviour Research and Therapy*, *38*, 863-873.

- Swartzman, L. C., Gwadry, F. G., Shapiro, A. P., & Teasell, R. W. (1994). The factor structure of the Coping Strategy Questionnaire. *Pain, 57*, 311-316.
- Tennen, H., Affleck, G., Armeli, S., & Carney, M. A. (2000). A daily process approach to coping: Linking theory, research, and practice. *American Psychologist, 55*, 626-636.
- Turk, D. C., Okifuji, A., & Scharff, L. (1995). Chronic pain and depression: Role of perceived impact and perceived control in different age cohorts. *Pain, 61*, 93-101.
- Turk, D. C., & Rudy, T. E. (1988). Toward an empirically derived taxonomy of chronic pain patients: Integration of psychological assessment data. *Journal of Consulting and Clinical Psychology, 56*, 233-238.
- Turner, J. A. (1991). Coping and chronic pain. In M. R. Bond, J. E. Charlton, & C. J. Woolf (Eds.), *Proceedings of the VIth World Congress on Pain* (pp. 219-227). Amsterdam: Elsevier.
- Wills, T. A. (1997). Modes and families of coping: An analysis of social comparison in the structure of other cognitive and behavioral mechanisms. In B. P. Buunk & F. X. Gibbons (Eds.), *Health, coping and well-being: Perspectives from social comparison theory* (pp. 1167-1193). Mahwah, NJ: Erlbaum.
- Willett, J. B. (1988). Questions and answers in the measurement of change. In E. Z. Rothopf (Ed.), *Review of research in education* (vol. 15, pp. 345-422). Washington, DC: American Educational Research Association.
- Zautra, A. J., Hamilton, N. A., & Burke, H. M. (1999). Comparison of stress responses in women with two types of chronic pain: Fibromyalgia and osteoarthritis. *Cognitive Therapy and Research, 23*(2), 209-230.

