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Factors Associated With Depressed Mood in Chronic Pain Patients: The Role of Intrapersonal Coping Resources

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Abstract: The purpose of this study was to examine processes through which chronic pain can result in depressed mood and to determine whether intrapersonal coping resources, namely high self-esteem and optimism, affect these processes. We hypothesized that pain severity contributes to depressed mood largely because pain interferes with involvement in important pursuits. We then examined whether intrapersonal resources are directly associated with pain severity, interference, and depressed mood and whether resources moderate associations between pain and interference or between interference and depressed mood. Structured interviews containing psychometrically robust measures were conducted with 141 outpatients of a university hospital-affiliated chronic pain center. As predicted, interference mediated much of the association between pain severity and depressed mood, and high resources were associated with less severe pain, less interference, and lower depressed mood. The association between pain severity and interference was stronger for people with high than people with low intrapersonal resources. The pattern of results that emerged from this study illustrates that intrapersonal coping resources may affect chronic pain patients through a variety of differentiated mechanisms. Pain severity appears to have greater adverse impact on the activity of people who possess highly positive self-views and outlook, but these resources are also associated with better emotional status.

Perspective: Pain had greater adverse impact on the activity of people with highly positive self-views and outlook, but these coping resources were also associated with better emotional status. Chronic pain sufferers with few resources may require different interventions than those with more positive views of themselves and the world around them.

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Key words: Chronic pain, depression, interference, optimism, self-esteem.

People who experience chronic pain are more depressed on average than the general population.^{2,23,26,37} However, in many studies, pain erodes mood only when it interferes with important life domains and affects a person's ability to function.^{14,28,39,49} Devins et al^{14,15} posit a model of "illness intrusiveness" whereby pain hinders participation in activities that

were once enjoyed, reducing positive experiences and rewards, and adversely affecting quality of life.

Coping resources represent an important category of variables that may influence adaptation to chronic pain. Of particular relevance are intrapersonal coping resources such as self-esteem that foster control and mastery, buffering individuals from the negative effects of a chronic stressor.^{8,17,19} For chronic pain sufferers, high self-esteem is likely to be especially valuable because chronic health conditions often threaten self-worth.^{33,46} People with high self-esteem believe in their abilities and strengths.⁶ Self-esteem has been linked to better adjustment, lower depression, and less helplessness in people with a variety of health problems.^{16,17,32,45} Optimism is another intrapersonal coping resource that buffers the impact of negative events and is associated with less de-

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pression, greater well-being, and health benefits in numerous populations.^{7,41,43,47,48} Optimists expect that the future will be positive, even if their current situation is not.⁴⁰ Optimists use a variety of active coping strategies, such as problem-focused coping, positive reinterpretation, and seeking social support, which are associated with less distress and better adjustment.^{1,21,30,42}

The impact of intrapersonal resources such as high self-esteem and optimism in people experiencing chronic pain has received little attention. It is reasonable to expect that these resources might offer benefit to people coping with pain. However, the intractability of chronic pain may produce psychological conflict among those with a generally positive world view or positive self-perceptions. Holding beliefs that challenge actual experience results in an uncomfortable state of cognitive tension or dissonance¹⁸ that can have negative emotional and physiological sequelae. This may help to explain why optimism has sometimes been shown to produce unfavorable outcomes in people undergoing uncontrollable or chronic stress (but not brief or controllable stress).^{13,35,44} Similarly, although people with high self-esteem tend not to worry about personal failure because they do not expect it to happen, they show a more dramatic response to failure when it does occur than people with low self-esteem.^{4,5,9,31} Thus, self-esteem and optimism may have benefits or disadvantages for chronic pain patients, affecting their perceptions of pain, perceptions of its impact on them, their emotions, or associations among these. The purpose of the present study was to differentiate these possibilities and examine various mechanisms by which intrapersonal resources may influence pain severity, interference, or emotions. This was done using a model reflecting the finding, elaborated above, that the association between chronic pain and depressed mood is mediated by interference with important life domains. We first confirmed the fit of this model. Then we examined whether intrapersonal resources reduce pain severity, interference, or depressed mood (main effects of resources). In addition, we examined whether intrapersonal resources affect the pathways between the variables in the model, which represent the ways in which pain results in depressed mood; that is, we examined whether resources influence the association between pain severity and interference, between interference and depressed mood, or between pain severity and depressed mood (moderated mediation by resources). Because self-esteem and optimism are strongly correlated and often have overlapping benefits,³⁶ we combined the 2 traits into a single intrapersonal resources variable.

Materials and Methods

Research Design and Procedure

The present study was part of a larger project examining physical and psychological factors in chronic pain patients. All study procedures and materials were approved by an institutional review board. Participants were recruited during a routine visit to a university hospital-

affiliated pain center that treats people with a wide variety of pain complaints, including low back pain, pelvic pain, and myofascial pain, stemming from a variety of sources such as injury, arthritis, or other disease processes. Inclusion criteria for the larger project required that participants have a non-cancer-related chronic pain condition for a period of 6 months or longer, that they visited the pain center on a regular basis, and that they could write for a duration of 20 minutes. Almost all patients who visited the pain center during the 4-month period of data collection were approached and approximately 80% of eligible patients agreed to participate. Following provision of informed consent, study instruments were administered in a structured interview lasting approximately 25 minutes that was conducted by a trained research assistant. Thirteen participants were excluded from study analyses due to missing data on critical study variables; 9 participants were multivariate outliers and were removed to meet the assumptions of multivariate normality, resulting in a sample size of 141.

Participants

The majority of participants were female (60%), which represents the gender distribution of patients attending the pain center. Participants ranged in age from 22 to 70 years of age ($M = 46 \pm 8.2$). The majority were white (89%) and approximately half were married or living with a partner as if married (53%). Socioeconomic status of participants was heterogeneous, with approximately two-thirds reporting annual household income less than \$50,000. Forty-two percent were high school graduates and 20% held college or advanced degrees.

The most common sources of pain (some participants had more than one source) was injury (55%), arthritis (27%), or another disease process (23%). Back pain was particularly common, with 66% participants reporting primary or secondary back pain. The majority of patients (72%) were not working, and of these, 88% were not working because of pain.

Measures

Depressed Mood

The Center for Epidemiological Studies Depression Scale³⁴ (CES-D) is a self-report measure of depressive symptoms that has been used extensively in medical populations, including patients with chronic pain.^{22,45} The CES-D is a 20-item scale with statements such as, "In the past week I could not shake off the blues even with help from my family or friends." Responses range from 0 (rarely or none) to 3 (most or all of the time). Four items are reverse-scored.

Pain Severity and Interference

Pain severity and pain-related interference were measured by the Pain Severity and Interference subscales of the West Haven-Yale Multidimensional Pain Inventory (MPI),²⁹ a widely used self-report measure developed exclusively for use with chronic pain patients.^{37,45} There is substantial support for the reliability and validity of

these subscales, based on heterogeneous samples with a variety of pain complaints.^{29,45}

The pain severity subscale of the MPI comprises 3 items that measure average levels of pain and suffering as well as current levels of pain. The scale was modified with permission of its primary author by adding the phrase "during the last week" to each question. In addition, a fourth question was added to the scale to assess severity of pain during the previous day. Responses ranged from 0 (not at all severe) to 6 (extremely severe).

The interference subscale of the MPI consists of 10 items that assess the degree to which pain interferes with family and marital relations, as well as work and social activities. The scale was modified in 2 ways, with permission of its primary author. First, to specify a time frame, the phrase "in the last week" was added to each question. In addition, questions such as "how much has your pain changed the amount of satisfaction you get from family-related activities?" was modified to read "how much has your pain interfered with the amount of satisfaction you get from family-related activities?" For 9 items, responses range from 0 (no interference) to 6 (extreme interference). An additional item concerning current work status uses a dichotomous response scale and was therefore not included in analyses. In addition, confirmatory factor analysis indicated that 1 item assessing enjoyment of work did not load significantly and was excluded from further analyses.

Intrapersonal Resources

Dispositional optimism was measured with the revised version of the Life Orientation Test.⁴³ Participants rated items such as "I usually expect the best" and "I hardly ever expect things to go my way" on a scale from 1 (strongly agree) to 5 (strongly disagree). Four of the 10 items are fillers and are not scored. Three items are reverse-scored.

Trait self-esteem was assessed with the use of the Rosenberg Self-Esteem Scale,³⁸ containing 10 items such as "I feel that I have a number of good qualities," including 5 that are reverse-scored. Responses range from 1 (strongly disagree) to 4 (strongly agree). An Intrapersonal Resource variable was created by standardizing and then summing scores on the optimism and self-esteem scales, which, as expected, were highly correlated ($r = .54, P < .01$).

Data Analysis

Correlations and one-way ANOVAs were evaluated for the existence of direct associations ("main effects") of resources with pain severity, interference, and depressed mood. Next, structural equation modeling (SEM), using Amos 6.0 (SPSS, Chicago, IL), was used to examine whether the association between pain severity and depressed mood was mediated by interference and whether intrapersonal resources moderated any of the paths in this mediational model. As recommended when using SEM with latent variables, measurement models that define the relation between the latent variables

(unobserved variables) and their respective indicators (measured variables) were tested first.¹¹ Goodness-of-fit indices, including χ^2 , the Comparative Fit Index (CFI), and the Root Mean Square of Approximation (RMSEA), were computed for each model. Modification indices were used to assess whether improvements in the model could be made.¹¹ To avoid atheoretical "model fitting," criteria were established a priori for modifying the measurement models.¹¹ If the CFI and RMSEA indicated that the model was a poor fit, meaningful and significant associations between the indicators and the latent variables were added 1 at a time. The model was then reevaluated after each modification. In the final stage of model testing, we examined the structural model, which was comprised of associations between the latent variables.

SEM has many benefits, including reduction of measurement error, enhanced power, and quantitative indicators of model adequacy. However, because of the statistical complexity and lack of consensus on testing moderator effects by using continuous variables in SEM,²⁰ we examined the hypothesized moderators by conducting multiple group comparisons by using dichotomized variables. To examine the models with continuous variables, we repeated these analyses by using hierarchical multiple regression. Variables were first standardized by using SPSS 14.0, and interaction terms were computed by multiplying continuous variables. To use the most conservative approach, we first examined a model containing all potential predictors of the criterion variable. Individual characteristics correlated with either the predictors or dependent variable were entered first, then the hypothesized predictors, followed by the moderator, and finally, all two-way interactions between predictors and the moderator. Statistical significance for each parameter in the model was examined, and nonsignificant parameters were removed. The model was then retested without these.

Results

Descriptive Statistics and Group Differences

Means, standard deviations, ranges, reliabilities, and correlations of study variables are presented in Table 1. Using a stringent, well-accepted cutoff (CES-D > 27) based on previous research with chronic pain patients,²² more than one-third (37%) of the sample exhibited clinically significant levels of depression. In addition, slightly less than one-third (31.5%) had a score between 16 and 27, indicating mild depression.³⁴ Correlations between all variables were in the expected directions. Two individual characteristics, age and gender, were correlated with pain severity, interference, or depressed mood and were therefore controlled in the regression analyses predicting these variables. Younger participants had lower resources ($F[1, 139] = 3.9, P = .05$) and greater depressed mood ($F[1, 139] = 5.20, P = .02$) than older participants. Women experienced significantly greater pain ($F[1, 139] = 9.27, P = .003$) and more interference ($F[1, 139] = 8.54,$

Table 1. Correlations, Ranges, Means, Standard Deviations, and Reliability of Study Variables

VARIABLE	1	2	3	4	5	6
1. Gender	—					
2. Age	.13	—				
3. Depressed Mood	-.15	-.23†	—			
4. Pain Severity	-.25†	-.04	.41†	—		
5. Pain Interference	-.24†	-.08	.51†	.66†	—	
6. Intrapersonal Resources	.03	.19*	-.72†	-.27†	-.35†	—
Range		22–70	2–53	1–6	1–6	
Mean		46.0	24.0	4.6	4.2	
Standard Deviation		8.2	12.7	1.0	1.2	
Reliability (Cronbach's α)			.91	.85	.81	

NOTE. N = 141. Gender: 0 = female, 1 = male. Self-esteem and optimism scores were standardized and then summed to create the Intrapersonal Resources variable.

* $P < .05$.

† $P < .01$.

$P = .004$) than men and were marginally more depressed ($F [1, 139] = 3.00, P = .09$).

Structural Equation Modeling

All variables were normally distributed with values of skewness and kurtosis less than 1.0. Multivariate normality was assessed with Mardia's coefficient and was less than 2.0. After data screening, Mahalanobis distance indicated that there were no significant outliers.

Fit of the 3 measurement models was examined. The pain severity latent variable, composed of 4 indicators, was an excellent fit to the data [$\chi^2 (2) = .31, P = .86$; CFI = 1.00; RMSEA = .00 (CI = .00 to .09)]. The interference latent variable had 8 indicators and also fit well [$\chi^2 (18) = 16.33, P = .57$; CFI = 1.00; RMSEA = 0.00 (CI = 0.00 to 0.07)]. Finally, the depressed mood latent variable was formed by creating 5 random parcels from the 20-item scale and exhibited excellent fit [$\chi^2 (7) = 5.29, P = .63$; CFI = 1.00; RMSEA = .00 (CI = .00 to .09)].

To examine mediation as recommended,³ we first evaluated the direct association between pain severity and depressed mood, controlling for age and gender. The standardized regression coefficient associated with this path was significant ($\beta = .46, P = .001$), and the model was an excellent fit to the data [$\chi^2 (37) = 26.68, P = .90$; CFI = 1.00; RMSEA = .00 (CI = .00 to .03)]. Gender made no significant contribution to the model and was therefore dropped from further analyses. As illustrated in Fig 1, when interference was introduced into the model, the path from pain severity to depressed mood was substantially reduced ($\beta = .21, P = .13$) and no longer statistically significant, consistent with mediation.

To investigate whether current pain independently influenced these associations, we retested the model by using a 3-item latent pain variable with current pain as a separate predictor of depressed mood. The model did

not fit as well [$\chi^2 (29) = 46.01, P = .02$; CFI = .98; RMSEA = .06 (CI = .03 to .10)]. We therefore retained current pain as 1 of the 4 indicators of the pain severity latent variable.

We then dichotomized intrapersonal resources at the median to create groups "high" or "low" in intrapersonal resources. As shown in Table 2, people with low resources were younger, experienced greater pain and more interference with daily functioning, and were substantially more depressed.

To test for moderated mediation, associations between predictors and outcome variables were estimated separately for the high and low resource groups. We followed an organized procedure¹¹ by testing for invariance of each path in the structural model and then proceeded to test for invariance of factor loadings composing each subscale. Results indicated that the path from pain severity to interference was the source of variance. The standardized regression coefficient associated with this path for those with low intrapersonal resources was $\beta = .34, P < .05$ and for those with highest resources the coefficient was $\beta = .84, P < .001$. The χ^2 difference test was significant, indicating the existence of moderation [$\chi^2_{diff} = 4.42 (1), P = .05$].

Hierarchical Multiple Regression

The first set of regression analyses examined the prediction of depressed mood, using continuous variables. Interference ($\beta = .34, P < .001$) and intrapersonal re-

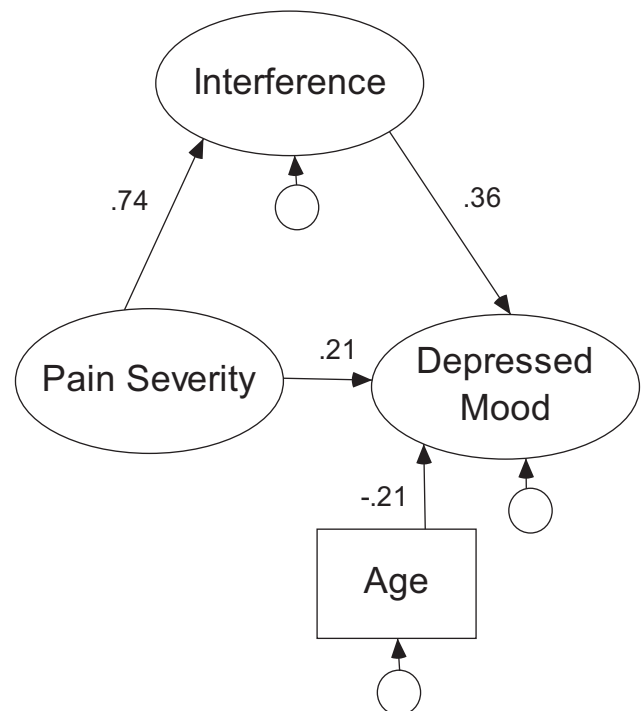


Figure 1. Structural equation model indicating that pain-related interference mediates the association between pain severity and depressed mood after controlling for age [$\chi^2 (133) = 147.00, P = .19, CFI = .99$; RMSEA = .03 (CI = .00 to .05)]. All paths are significant ($P < .05$). To simplify presentation, measured indicators are not displayed.

Table 2. Mean Age, Pain Severity, Interference, and Depressed Mood (With Standard Deviations) for Study Participants With Low and High Levels of Intrapersonal Resources

	AGE	PAIN SEVERITY	INTERFERENCE	DEPRESSED MOOD
Low intrapersonal resources	44 (7.3)	4.9 (0.8)	4.5 (0.9)	31.8 (11.0)
High intrapersonal resources	47 (8.7)	4.4 (1.2)	3.9 (1.4)	17.0 (9.9)
	$F = 4.4, P < .05$	$F = 9.6, P < .01$	$F = 9.0, P < .01$	$F = 70.3, P < .001$

sources ($\beta = -.61, P < .001$) were significant predictors of depressed mood ($F [3, 137] = 69.43, P < .001$). Confirming SEM findings, no other study variables, including interaction terms, were significant predictors of depressed mood.

Moderation analyses were conducted next. The first set of analyses examining predictors of interference confirmed that pain severity ($\beta = .35, P < .001$) and intrapersonal resources ($\beta = -.20, P < .01$) predicted interference and that resources moderated the association between pain severity and interference ($\beta = .28, P < .001, t [3, 137] = 3.84, P < .001$). The association between pain severity and interference was greater with increasing levels of intrapersonal resources. The effect size associated with the interaction term ($\Delta R^2 = .07$) was of a magnitude similar to most interactions.^{12,20} Neither gender, age, nor other variables, including interaction terms, predicted interference, corroborating SEM findings.

Discussion

Pain severity was strongly associated in this study with depressed mood. As in prior research,^{14,28,39,49} this association was largely explained by pain-related interference that chronic pain sufferers experience in multiple areas of their life. Quantitatively, approximately 80% of the association between pain severity and depressed mood was explained by interference (based on a reduction from .46² to .21², using standardized scores).

A primary aim of this study was to examine intrapersonal coping resources—namely, self-esteem and optimism—that might benefit people with chronic pain or alternatively, burden them. We found several benefits of these coping resources. Chronic pain patients with greater resources experienced less severe pain, less interference in their daily functioning, and were less depressed than those with fewer coping resources. Intrapersonal resources were also associated with age: Older patients were more optimistic and had higher self-esteem than younger pain patients.

Results also illustrate a potential disadvantage of high optimism and high self-esteem in the face of chronic pain. Pain severity was more strongly associated with interference among people with highest intrapersonal coping resources. Consistent with research indicating that people with high optimism respond poorly to chronic stress^{13,35,44} and that those with high self-esteem have strong reactions when their expectations are disconfirmed,^{6,9} the present findings suggest that people possessing greatest self-regard and a positive outlook might be most burdened by pain because it conflicts with

their expectations. Such individuals' investment in enjoyable activities may be more deeply affected by their pain than sufferers whose unfavorable expectations are confirmed by their daily experience.

The pattern of results that emerged from this study illustrates that intrapersonal coping resources may affect chronic pain patients through a variety of differentiated mechanisms. Pain severity appears to have greater adverse impact on the activity of people who possess highly positive self-views and outlook, but these resources are also associated with better emotional status. However, we cannot establish that these were causal relations. For example, associations between pain severity and depressed mood may be bi-directional and dynamic.^{10,25,27} That is, just as severe pain may erode emotional well-being and influence behaviors and perceptions, it is also the case that emotions, perceptions, and behavior can exacerbate pain.^{24,27} We did test alternative models and found, however, that depressed mood was not a significant predictor of interference with daily activities in this sample.

A limitation of this study is its reliance on self-report. Nevertheless, such methods are vital for the assessment of perceptions and emotional state. To overcome some of the disadvantages of these methods, we used measures with strong psychometric properties and administered them to a large, heterogeneous sample. The validity of these self-report measures has been well established by prior research with chronic pain patients.^{22,45}

Identifying factors that affect the association between chronic pain and emotional distress, and the particular mechanisms that explain this association, offers valuable insights for the development of interventions. For example, pain-related interference may be more amenable to change than pain itself. To alleviate depressed mood, it may be possible to design interventions that reduce the impact of pain on a person's daily activities and social relationships. Similarly, understanding factors that may contribute to the impact of chronic pain on emotional distress enables clinicians to target the most vulnerable groups and to determine whether particular methods of treatment may have more success for some people than others. Results of the present study suggest that chronic pain sufferers with few intrapersonal coping resources may require different interventions than those who possess more positive views of themselves and the world around them. Nevertheless, these findings require replication before they can be confidently used to develop interventions.

People care deeply about their ability to be active, involved, and to go on with their lives despite chronic pain.

This was illustrated not only by the data provided by participants in this study but also by their willingness to participate in research even while experiencing serious discomfort. This ability helps protect people from the harmful emotional consequences of unremitting pain. These findings confirm the value of treating both the physical and psychological needs of chronic pain patients.

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