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Anxiety but not Social Stressors Predict 12-Month Depression and Pain Severity

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Abstract

OBJECTIVES—To determine whether baseline anxiety and social stressors as well their early change (first 3 months) predict 12 month depression and pain severity.

METHODS—We analyzed data from the Stepped Care for Affective Disorders and Musculoskeletal Pain study, a randomized clinical trial of a combined medication-behavioral intervention for primary care patients with chronic musculoskeletal pain and depression. Using multivariable linear regression modeling, we examined the independent association of baseline anxiety and social stressors with depression and pain severity at 12 months. Additionally, we modeled whether changes in anxiety and social stressors predicted 12 month depression and pain severity.

RESULTS—Overall, the sample (N = 250) was 52.8% women with a mean age of 55.5 years, and a racial distribution of 60.4% White, 36.4% Black, and 3.2% other. Depression and pain were moderately severe at baseline (mean SCL-20 depression = 1.9 and BPI pain severity = 6.15) and similar across intervention and usual care arms. Baseline anxiety symptoms predicted both depression (t score = 2.13, p = 0.034) and pain severity (t score = 2.75, p = 0.007) at 12 months. Also, early change in anxiety predicted 12-month depression (t score = −2.47, p = .014), but not pain. Neither baseline nor early change in social stressors predicted depression or pain severity.

CONCLUSIONS—Anxiety, but not social stressors predict 12 month depression and pain severity. The presence of comorbid anxiety should be considered in the assessment and treatment of patients with musculoskeletal pain and depression, particularly as a factor that may adversely affect treatment response.

Keywords

Depression; pain; anxiety; stress; primary care

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INTRODUCTION

Chronic pain is frequently accompanied by psychiatric comorbidity, especially depression and anxiety disorders. Reviews have reported a 30% to 60% co-occurrence rate for chronic pain and depression.[1,2] In a national sample, McWilliams et al. found an anxiety disorder was present in 35% of persons with chronic pain versus 18% of the general population.[3] Other studies have shown that anxiety and depression frequently coexist in patients with chronic pain.[4-6] Chronic pain is associated with increased stress and an impaired ability to cope effectively with stressful life events.[7] Patients with concomitant pain, anxiety, and social stressors are more likely to report greater depressive symptoms. Similarly, the likelihood of an anxiety disorder increases among individuals who experience pain and are also faced with social stressors.[8]

Several biological, cognitive, behavioral, and social/environmental factors are thought to play a role in linking anxiety, depression, and chronic pain. These factors help explain why and how psychological symptoms frequently coexist and intensify an individual's pain experience (i.e. increased pain severity and longer duration). Neurobiological studies have demonstrated common neuroanatomical structures and pathways. For example, the subgenual anterior cingulate cortex and the medial prefrontal cortex are involved in both emotional processing and pain expression.[9]

Functional MRI studies have mapped common areas of activation (e.g. amygdala, hippocampus, and frontal cortex) for anxiety and pain.[10,11] In addition, common neurotransmitters and neuropeptides (monoamines, GABA, glutamate), endocannabinoids, hormones, neurotrophins (e.g. nerve growth factor), and pro-inflammatory cytokines have been found to either mediate or modulate anxiety and pain.[12] Genetic markers related to the serotonin and norephinephrine systems have been postulated to predispose persons to develop anxiety and pain symptoms.[13] Physiologically, anxiety is associated with arousal and activation of the sympathetic nervous system. Activation of the sympathetic nervous system can lead to lowered nociceptive (pain) thresholds, hypersensitivity to pain signals, and increased activity of nociceptors (pain receptors): processes associated with increased pain.[13,14]

Cognitive factors such as patients' vigilant attention to various physical stimuli or negative attributions of the cause of their pain may serve a role in amplifying the pain experience.[15] For example, persons with anxiety are frequently more attentive to painful stimuli. As a result, these persons are bothered more by their pain and its adverse physical, psychological, and social consequences. Those with anxiety often exhibit greater illness worry, believe that their pain is especially harmful, and interpret their pain more negatively (i.e. catastrophize) than persons without anxiety.

Anxiety is associated with maladaptive beliefs such as the fear of movement[16] and the fear of movement has been shown to be an independent predictor of pain severity and disability among those with musculoskeletal pain.[16,17] Fear of movement can then lead to unhelpful behaviors such as prolonged bed rest and inactivity resulting in deconditioning, functional limitations, and worsening of pain.[18]

Patients with anxiety may also manifest a vulnerability to stressful life events or experience stressful events such as being victimized, abused, or suffer traumatic injuries more frequently. This vulnerability to stressful life events may be a factor in increasing an individual's pain. Pre-clinical, experimental studies have shown that stress increases pain sensitivity and can exacerbate clinical pain conditions.[13] A prospective cohort study

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conducted by Leino et al found a reciprocal relationship between stress and musculoskeletal disorders (low back pain, neck and shoulder pain) among metal industry employees.[19]

The Stepped Care for Affective Disorders and Musculoskeletal Pain (SCAMP) trial demonstrated the effectiveness of a stepped-care intervention for primary care patients with comorbid chronic musculoskeletal pain and depression.[20] We conducted a secondary analysis of SCAMP baseline data that showed a high prevalence of both anxiety symptoms and social stressors (e.g. financial problems, health worries, stress at work, marital problems, and the stress related to care-giving of children or aging parents).[21] Additionally, those with comorbid depression and pain reported significantly more severe anxiety and social stressors than a cohort of patients with pain only (i.e., no depression).[21] In another study, we examined the reciprocal relationship between depression and pain and found the change in pain was a strong predictor of subsequent depression severity. Likewise, change in depression severity was an equally strong predictor of subsequent pain severity.[22]

Although a large body of literature has established the central role psychological and social factors play in the etiology and persistence of chronic pain[17] much less is known about how these factors may influence outcomes. An improved understanding of what factors predict pain and depression outcomes may guide the development of future interventions and clinical programs for patients with psychiatric comorbidity and chronic pain. To better understand what may predict pain and depression severity and expand upon earlier studies, we asked two study questions:

- What is the longitudinal association of baseline anxiety symptoms and social stressors with 12-month depression and pain severity?
- What is the longitudinal association of changes (baseline to 3 months) in anxiety symptoms and social stressors with depression and pain severity at 12 months?

We hypothesized that anxiety and social stressors at baseline would predict worse depression and pain severity at 12 months among primary care patients with comorbid depression and chronic musculoskeletal pain enrolled in the SCAMP trial.[23] In addition, we postulated that improvement in anxiety symptoms and social stress at earlier time point would be associated with less severe depression and pain at 12 months. Lastly, we tested the interaction between anxiety and social stress, hypothesizing that different levels of anxiety and social stress would have a differential effect on pain/depression severity.

MATERIALS and METHODS

Study Design

We analyzed data from the SCAMP randomized clinical trial, which demonstrated the effectiveness of a combined medication and behavioral intervention for primary care patients with chronic musculoskeletal pain and depression.[23] The intervention consisted of 12 weeks of optimized antidepressant therapy; followed by a 6 session pain self-management program delivered over 12 additional weeks. Thus the trial involved a 6 month intervention phase and a 6 month follow-up period. Nurse care managers (supervised by two study physicians) delivered all aspects of the intervention. The SCAMP study design, key hypotheses, intervention details, and sampling frame have been described elsewhere.[23] Main results of the SCAMP trial have been previously reported as well. In summary, compared to those randomized to usual care, patients randomized to the intervention experienced large decrements in depression symptoms and moderate relief of their pain.[20]

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Eligibility Criteria

To be included in the trial, patients had musculoskeletal pain of the low back, hip, or knee. Their pain had to be: persistent for ≥ 3 months despite previous analgesic treatment (i.e., prior use of at least two different analgesics); and of at least moderate severity, defined as a Brief Pain Inventory (BPI) score of ≥ 5.[24] In addition to chronic musculoskeletal pain, patients enrolled met criteria for comorbid clinical depression, defined as a Patient Health Questionnaire-9 (PHQ-9)[25] score of ≥ 10 and endorsement of depressed mood or anhedonia (i.e., cardinal symptoms of depression). PHQ-9 scores of ≥ 10 equate to at least moderately severe depression. Kroenke et al. have demonstrated that > 90% of patients fulfilling this PHQ-9 criterion have major depression or dysthymia, and the remaining patients have clinically significant depression with substantial functional impairment.[25,26]

Excluded individuals were those who: 1) did not speak English; 2) had moderately severe cognitive impairment[27] 3) had bipolar disorder or schizophrenia; 4) had a current disability claim for a pain condition being actively adjudicated; 5) had a positive screen for alcohol or drug dependence; 6) were currently pregnant or planning to become pregnant during the 12 months of the study; and 7) had an anticipated life expectancy of < 12 months.

Sample and Recruitment

Study participants were enrolled from several clinics within two different healthcare systems in Indianapolis, Indiana: 1) the Indiana University (IU) Medical Group Primary Care clinics and 2) the Richard L. Roudebush Veterans Administration (VA) Medical Center general medicine clinics. Recruitment occurred from December 2005 until June 2007. Participants were identified through queries of the computerized medical record system using International Statistical Classification of Diseases and Related Health Problems, 9th Edition (ICD-9) diagnoses of low back pain, osteoarthritis, knee pain, hip pain, or leg pain and had at least one primary care visit within the preceding 12 months. Study enrollment occurred either during scheduled clinic visits or telephone contact 2 weeks after a mailed study letter.

Patients (N = 250) were randomized to the intervention arm (combined medication-behavioral intervention) or the usual care (control) arm with randomization stratified by pain location (back vs. hip/knee) and clinic site (University vs. Veterans Affairs). A research assistant blinded to randomization assignment obtained informed consent and conducted all baseline and follow-up outcome assessments. Patients were compensated $25 each for the baseline and subsequent follow-up interviews at 1, 3, 6, and 12 months. For this study, we analyzed baseline, 3 month, and 12 month data.

The Institutional Review Boards of Indiana University and the Research and Development Committee of Roudebush VA Medical Center approved the study. All participants provided written informed consent.

Outcome Variables

We examined whether baseline anxiety symptoms and social stressors as well as early change in these 2 variables predicted depression and pain severity at 12 months. *Depression severity* was assessed by the Hopkins Symptom Checklist 20-item depression scale (HSCL-20). This scale has been used extensively to assess depression outcomes in primary care trials.[28,29] The 20 items are scored and averaged to provide a measure of overall depression severity from 0 to 4, with higher scores representing more severe depression.

Pain severity was assessed with the Brief Pain Inventory (BPI) severity scale which is the average of four items asking about worst, least, and average pain in the past week, and current pain. Each item is scored from 0 (no pain) to 10 (worst imaginable pain). The BPI

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has proven valid in numerous types of pain conditions including arthritis and other types of musculoskeletal pain.[24,30] BPI pain severity served as our primary outcome for four reasons. First, by convention, pain severity is frequently the primary outcome measure in pain clinical trials. Second, pain severity and depression severity are more conceptually similar than pain interference and depression severity. Third, in an earlier analysis,[6] we examined the relationship between depression and anxiety comorbidity on pain intensity, pain interference, and health-related quality of life (HRQL). We found a similar relationship between depression and anxiety comorbidity on both pain severity and pain interference[6] and therefore decided to only focus on pain and depression severity as outcomes. Fourth, by testing two additional models of pain interference (as the dependent variable) would increase the problem of multiple comparisons.

Predictor Variables

Anxiety was assessed with the Generalized Anxiety Disorder 7-item scale (GAD-7), a screening and severity measure validated for the most common anxiety disorders seen in primary care—generalized anxiety, panic attacks, social anxiety, and posttraumatic stress disorder.[31,32] The GAD-7 has demonstrated reliability (alpha = 0.89) and validity (criterion, construct, factorial, and procedural) in general population and primary care samples.[31,32] The seven items of the GAD-7 are based on *Diagnostic and Statistical Manual-IV* criteria for anxiety and scores range from 0 to 21, with higher scores representing more severe anxiety. Clinical anxiety was defined as a GAD-7 score of > 10, a cut point validated in previous studies.[31,32]

Social stress was evaluated with the Patient Health Questionnaire Psychosocial Stressor Scale, which assesses 9 common stressors (marital or relationship problems, financial problems, worry about health, lack of social support, work problems, care-giving responsibilities, stress at work, and recent stressful life events) that may have occurred in the last month. Each item is rated from 0 (not bothered at all) to 2 (bothered a lot) and summed for a stressor severity score ranging from 0 to 18. This scale was developed and validated in two large primary care studies.[33,34]

Covariates

Covariates entered in the multivariable models included trial group assignment (intervention or usual care), age (analyzed as a continuous variable); sex; race/ethnicity (black or white/other); educational level (≤ high school versus or > high school); income (comfortable/just enough or not enough to make ends meet); employment (employed or. unemployed/disabled or retired); pain location (back or knee/hip); clinic site (University or VA); and medical comorbidity (presence or absence of nine common medical conditions scored from 0 to 9). Medical comorbidity was assessed using a previously validated checklist developed by Charlson et al.[35] This measure employs a simple count of 9 comorbid chronic conditions (1) asthma, emphysema, or chronic bronchitis; 2) high blood pressure or hypertension; 3) high blood sugar or diabetes; 4) arthritis or rheumatism; 5) angina, heart failure, or other types of heart disease; 6) stroke, seizures, Parkinson's disease, or another neurological condition; 7) liver disease; 8) kidney or renal disease; and/or 9) cancer diagnosed or treated in the last 3 years) and has been shown to predict hospitalization, costs, and mortality.[36]

Analysis

Descriptive summary statistics (mean, standard deviation, frequency, percentage) were used to describe study patients by randomization status. Multivariable linear regression modeling was used to assess the independent associations of baseline anxiety and social stress on pain and depression severity. The dependent variable was HSCL-20 depression severity at 12 months in one model and BPI pain severity at 12 months in a separate model. The predictor

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(independent) variables tested were baseline anxiety (according to GAD-7) and social stress (according to Psychosocial Stressor Scale) scores.

To better understand whether improvements in mood and pain change in parallel or change independently of each other, we also assessed whether the early change in anxiety symptoms and stressors predicted 12 month depression and pain severity. Early change in anxiety and stressors was defined as the difference in these symptoms from baseline to 3 months. We also tested for an anxiety and social stressor interaction.

From these models, β-coefficients and their standardized t-values were estimated controlling for trial group assignment, age, sex, race/ethnicity, education, income, employment, pain location, clinic site, and medical comorbidity. Baseline depression (SCL-20 score) and pain (BPI severity score) were also included as covariates because their importance in predicting 12 month depression and pain severity.[22] The final models contained all these variables. All hypothesis testing was conducted at the 0.05 significance level (two-tailed). Data were analyzed, using SAS version 9.1 (SAS Institute, Cary, North Carolina).

We analyzed whether patients lost to follow-up during the 12 months of the SCAMP trial differed systematically from those with data available at 12 months. A logistic regression analysis was performed to identify those variables significantly associated with loss to follow-up. There was no difference in the amount of missing data between treatment groups at 12 months and no differences observed in terms of age, sex, pain location, and severity of pain or depression.

RESULTS

Overall Sample Characteristics

As shown in Table 1**,** there were no significant baseline differences between the intervention and usual care arms on sociodemographic and clinical variables including both predictor and dependent variables. Overall, the sample (N = 250; n = 123 intervention patients and n = 127 usual care patients) was 52.8% women with a mean age of 55.5 years, and a racial distribution of 60.4% White, 36.4% Black, and 3.2% other. Participants' work status was 42.8% retired, 31.6% unemployed or unable to work, and 25.6% employed. Back pain was present in 60.4% and hip or knee pain in 39.6%. Participants had pain for a medium of 9 years. Fifty-nine percent of participants were enrolled from the University primary care clinics and 41% from the VA medicine clinics. Depression and pain were moderately severe at baseline (mean SCL-20 depression = 1.9 and BPI pain severity = 6.15).

Baseline Anxiety and Social Stressor Severity as Predictors of 12-Month Depression and Pain Severity

Table 2 displays the results from the multivariable linear regression model, testing whether baseline anxiety (GAD-7 score) and social stressor (Psychosocial Stressor Scale score) severity predict 12 month depression (HSCL-20 score) and pain (BPI pain severity score) severity, controlling for trial group assignment, demographics (age, sex, race, education, income, and employment), pain location, clinic site, medical comorbidity, and baseline depression and pain severity. As hypothesized, baseline anxiety severity predicted both depression and pain severity at 12 months. While baseline social stressors were significantly associated with 12 month depression (but not pain) severity in bivariate comparisons, stressors were not significantly associated with either depression or pain severity in the multivariable models.

Covariates significantly associated with 12 month depression severity were being in the intervention arm of the trial, baseline depression severity and employment status. Of note,

baseline pain severity did not predict depression severity at 12 months. For pain severity at 12 months, significant covariates included being in the intervention arm of the trial, baseline pain severity, and baseline depression severity. Baseline anxiety and social stressors were moderately correlated (*r = 0.57)*. There was no significant nteraction between anxiety and social stressors in either model.

Change in Anxiety and Social Stressor Severity as Predictors of 12-Month Depression and Pain Severity

Table 3 summarizes the results from models testing whether early change (from baseline to 3 months) in anxiety and social stressor severity predicted 12 month depression and pain severity, controlling for covariates. In these models, the change in anxiety predicted depression but not pain severity. The change in social stressor severity was not associated with either depression or pain severity.

For 12 month depression severity, significant covariates included being in the intervention arm of the trial, baseline depression severity, employment status, and clinic site. Covariates significantly associated with pain severity at 12 months were being in the intervention arm of the trial and baseline pain severity. Change in anxiety was moderately correlated with change in social stressors ($r = 0.52$). There was no significant interaction between anxiety change and social stressor change in either model.

DISCUSSION

Our analysis revealed some important findings about the longitudinal relationships between anxiety, stress, depression, and pain. First, baseline anxiety severity predicts both depression and pain severity at 12 months among primary care patients with comorbid depression and chronic musculoskeletal pain. Second, a reduction in anxiety severity from baseline to 3-months predicts depression severity at 12 months, but not pain severity. Third, we did not observe a predictive relationship between either baseline social stressors or reduction in social stressors with subsequent depression and pain severity.

Our longitudinal study substantially strengthens findings from preceding studies which have been mainly cross-sectional or observational in nature. Our study is unique in that it examined the predictive role of anxiety and social stressors for both depression and chronic pain severity in the context of a randomized clinical trial. The main findings from the SCAMP trial showed that a combined medication-behavioral intervention was effective for primary care patients with concomitant depression and musculoskeletal pain.[20] This present analysis demonstrates the importance of comorbid anxiety as an independent predictor of depression and pain severity even after controlling for intervention effects, depression and pain severity, and other important covariates. Specifically, the severity of anxiety at baseline adversely affects both depression and pain severity at 12 months, whereas a reduction of anxiety in the first 3 months provides additional improvement in depression (but not pain).

A related study by Arnold et al[37] evaluated the effect of anxiety and depression on pain treatment response to pregabalin in patients with fibromyalgia. The authors concluded that pain relief occurred independently from depression symptom improvement and did not depend on baseline anxiety or depression status. Another study by Smith et al[38] examined the relationship between anxiety and depression on weekly pain reports in women with rheumatoid arthritis or osteoarthritis. The study's primary finding was that anxiety and depression were directly related to more severe "current" and next week's pain. Similar to our finding, interpersonal stress did not predict pain, suggesting that anxiety may be a more important prospective predictor of pain than stress in general.

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Our study findings are also consistent with two systematic reviews[17,39] on the relationship between psychological factors and musculoskeletal pain. Linton[17] evaluated 18 prospective studies and found that psychosocial variables such as depression, stress, anxiety, distress, cognitions, and pain behaviors are significantly associated with neck and back pain and that these factors influence the onset of pain and the transition from acute to chronic pain states. Similarly, Pincus et al[39] found that psychological distress, depression, and somatization played a significant role in the transition from acute to chronic low back pain in primary care, pain clinic, and workplace settings.

In an earlier study,[21] we found a high baseline prevalence of social stressors and these stressors were associated with greater depression and pain severity. However, in the current study we did not find a longitudinal relationship between stress and outcomes as hypothesized. An interesting study by Keeley et al.[40] may help explain our findings. Keeley and colleagues[40] found that social stressors specific to back pain (e.g. unemployment due to back pain) predicted worse health related quality of life and greater healthcare utilization, but stress unrelated to back pain (e.g. death of a close relative) was not associated with study outcomes. Thus, there are at least two potential explanations for these varied findings among studies. One potential explanation is that anxiety is a much stronger predictor of depression and pain severity that obscures the potential, yet weaker relationship between stress and depression/pain severity. Another potential explanation is that we assessed nine general social stressors,[34] rather than stress specific to pain itself.

Some study limitations deserve mention. Because we assessed overall anxiety symptom severity, rather than specific diagnoses within the anxiety disorder spectrum, we were unable to determine which specific anxiety disorder may have the strongest relationship with pain and depression severity. However, the GAD-7 [31] is well designed to diagnose and characterize the severity of generalized anxiety disorder; the most common anxiety disorder in patients with pain.[3] Moreover, the GAD-7 tends to be a reasonable marker for other common anxiety disorders such as panic disorder, posttraumatic stress disorder, and social anxiety disorder.[32] While it is known that patients with greater pain-specific anxiety or fear of movement have more pain and worse quality of life,[16] we did not assess for these specific constructs in this analysis. Lastly, we did not assess patients for traumatic events, such as childhood abuse which are associated with anxiety disorders, psychological distress, and chronic pain.[13] Further research is needed to understand the most important factors that mediate anxiety's negative effect on pain and depression treatment response.

Despite these limitations, the clinical implications of our study are noteworthy. The high comorbidity between psychological disorders and chronic pain and management challenges inherent to these conditions pose is well known, especially depression and pain.[1] Further, anxiety infrequently exists in isolation from other psychological conditions. Löwe et al.[42] found that depression and anxiety frequently overlapped and the comorbidity was associated with additive impairments of patients' ability to perform important daily activities. By examining the anxiety and stressors, our findings suggest the negative role anxiety may play in a patient's response to a combined medication-behavioral intervention for primary care patients with comorbid depression and pain. Clinical managers and providers should be aware that anxiety is an important predictor of depression and pain severity. While depression screening and assessment has become an established care process in numerous clinical settings, screening for anxiety is not yet routine, despite its high prevalence and associated adverse effects. However, with the advent of brief and well validated measures,[31] implementation of routine anxiety screening and symptom monitoring longitudinally, especially for patients with chronic pain seems feasible, efficient, and clinically useful.

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These implications extend to the area of treatment since similar approaches have been found to be effective to treat these conditions. Interventions that lessen anxiety symptoms may relieve pain and depression in an individual whose pain is amplified by anxiety or when depression and anxiety coexist. Likewise pain treatments may lessen anxiety that is amplified by pain. Medications such as tricyclic antidepressants and the serotonin-norepinephrine re-uptake inhibitors have been found to be effective for chronic pain and depression[43,44] and when depression and anxiety overlap.[44] Behavioral and cognitive treatments such as relaxation techniques (e.g. progressive muscle relaxation, deep breathing exercises),[45] cognitive behavioral therapy,[46-48] problem solving therapy,[49] mindfulness based meditation,[50] attention diversion,[16] hypnosis,[51] acceptance and commitment therapy,[52] interpersonal psychotherapy[53,54] all have evidence for their effectiveness for managing the constellation of symptoms often seen in patients with chronic pain.

In summary, we found that baseline anxiety severity as well as early improvement in anxiety was independent predictors of depression and pain severity at 12-months. Recognition of comorbid anxiety may be important, particularly in patients whose pain and/or depression are not improving with treatment.

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Table 1

Baseline Characteristics of the 250 Participants in the SCAMP Trial

Baseline Patient Characteristic	Intervention Group (N=123)	Usual Care Group (N=127)	*P* Value
Mean (SD) **age**, yr	55.2 (12.6)	55.8 (11.1)	.70
Women, n (%)	69 (56)	63 (50)	.30
Race, n (%)			
White	75 (61)	76 (60)	.29
Black	42 (34)	49 (39)	
Other	6 (5)	2 (2)	
Education, n (%)			
Less than High school	2 (2)	7 (6)	.19
High school	80 (65)	73 (58)	
At least some college or trade school	41 (33)	46 (37)	
Married, n (%)	48 (39)	44 (35)	.47
Employment status, n (%)			
Employed	36 (29)	28 (22)	.35
Unemployed or unable to work	39 (32)	40 (32)	
Retired	48 (39)	59 (47)	
Pain location, n (%)			
Back	76 (62)	75 (59)	.66
Hip or knee	47 (38)	52 (41)	
Clinical site, n (%)			
Veteran administration (VA)	50 (41)	52 (41)	.96
University clinics	73 (59)	75 (59)	
Mean (SD) number of **medical diseases**	2.7 (1.6)	2.7 (1.4)	.62
Baseline **GAD-7 anxiety**	8.7 (4.5)	9.1 (4.4)	0.48
Baseline **Stressors** (range, 0-18)	8.1 (3.8)	7.9 (3.9)	0.51
Baseline **SCL-20 depression** (range, 0-4)	1.83 (0.66)	1.94 (0.65)	0.20
Baseline **BPI pain severity** (range, 0-10)	6.16 (1.76)	6.14 (1.78)	0.92

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Table 2

Baseline Anxiety and Social Stressor Severity as Predictors of Depression and Pain Severity at 12 Months *

	12-month HSCL-20 depression			12 month BPI pain severity		
	Beta	**t value**	**P**	**Beta**	**t value**	**P**
Predictors						
Baseline anxiety (GAD-7) severity	**.0318**	**2.13**	**.034**	**.1308**	**2.75**	**.007**
Baseline stressor severity	−.0107	−0.64	.52	−.0098	−0.19	.85
Significant Covariates †						
Baseline BPI pain severity	.0240	0.82	.41	**.6840**	**7.43**	**<.0001**
Baseline depression (HSCL-20) severity	**.3434**	**3.33**	**.001**	**−.6727**	**−2.08**	**.039**
Intervention group	**−.5008**	**− 5.46**	**< .0001**	**−1.1655**	**− 4.06**	**< .0001**
Employed	**−.2721**	**− 2.79**	**.006**	−.3822	−1.25	.21

*Models included the 203 clinical trial participants for whom there were 12-month outcome data.

†Other covariates that were not significant in either multivariable model included pain location, clinic site, sex, race, age, and medical comorbidity

A positive coefficient means that a higher value of the predictor variable (e.g. anxiety) is associated with greater severity of the outcome variables (depression and pain severity), while a negative coefficient means that a covariate (e.g. intervention, employment) is associated with lesser severity of the outcome variables.

Bold values represent model variables that are statistically significant.

BPI indicates Brief Pain Inventory; GAD-7, Generalized Anxiety Disorder 7-item; HSCL-20, Hopkins Sympton Checklist 20-item depression scale.

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Table 3

Change in Anxiety and Social Stressor Severity as Predictors of Depression and Pain Severity at 12 months*

	12-month HSCL-20 depression severity			12 month BPI pain severity		
	Beta	**t value**	**P**	**Beta**	**t value**	**P**
Predictors						
GAD anxiety severity reduction (baseline to 3 months)	**−.0288**	**− 2.47**	**.014**	.0405	−1.06	.29
Stressor severity reduction (baseline to 3 months)	−.0231	−1.63	.104	−.0295	0.63	.53
Significant Covariates †						
Baseline HSCL-20 depression severity	**.4993**	**6.40**	**< .0001**	n/a	n/a	n/a
Baseline BPI pain severity	n/a	n/a	n/a	**.6237**	**6.76**	**<.0001**
Intervention group	**−.4005**	**− 4.38**	**< .0001**	**−1.0916**	**−3.69**	**.0003**
Employed (yes)	**−.2708**	**− 2.86**	**.005**	−.4261	−1.37	.17
University clinic site (vs. VA)	**.3256**	**2.22**	**.027**	−.1654	−0.33	.74

Models included the 203 clinical trial participants for whom there was 12-month outcome data.

† Other covariates that were not significant in either multivariable model included pain location, sex, race, age, and medical comorbidity

A negative coefficient means that improvement of the predictor variable (e.g. change in anxiety) is associated with reduction of the outcome variables (depression and pain severity).