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Predictors of Pain Outcomes in Patients with Chronic Musculoskeletal Pain Co-morbid with Depression: Results from a Randomized Controlled Trial

Dennis C. Ang, MD, MS,* Matthew J. Bair, MD, MS,†‡ Teresa M. Damush, PhD,† Jingwei Wu, MS,§ Wanzhu Tu, PhD,§ and Kurt Kroenke, MD‡

*Division of Rheumatology, Department of Medicine, Indiana University School of Medicine,

†VA Health Services Research & Development Center of Excellence on Implementing Evidence-Based Practice, Roudebush VA Medical Center,

‡Regenstrief Institute, Inc. and Division of General Internal Medicine and Geriatrics, Indiana University School of Medicine, and

§Division of Biostatistics, Department of Medicine, Indiana University School of Medicine, Indianapolis, Indiana, USA

Reprint requests to: Dennis C. Ang, MD, MS, Assistant Professor of Medicine, Department of Medicine, 1110 West Michigan St. Room 545, Indianapolis, IN 46202, USA. Tel: 317-278-6880; Fax: 317-274-7792; E-mail: dang@iupui.edu.

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Abstract

Objective. The combination of chronic musculoskeletal pain and depression is associated with worse clinical outcomes than either condition alone. In this study, we report the predictors of pain intensity and activity interference in primary care patients with co-morbid pain and depression.

Methods. This is a secondary data analysis of the 250 persons who participated in a randomized clinical trial designed to test the effectiveness of 12 weeks of optimized antidepressant therapy for both depression and pain. Using multivariate linear regression analysis, we assessed the predictive value of baseline self-efficacy, fear of movement, pain beliefs, and demographic and clinical factors on 3-month Graded Chronic Pain Scale pain intensity and activity interference outcomes.

Results. In the full model, significant sociodemographic predictors of less activity interference included being non-white (β –5.8, $P = 0.04$) and being employed (β –13.3, $P < 0.0001$). The latter was also predictive of less pain intensity (β –5.6, $P = 0.01$). As expected, the optimized antidepressant treatment arm was associated with improved outcomes (pain intensity: β –3.7, $P = 0.0005$ and activity interference: β –6.4, $P = 0.01$). Whereas stronger perceived pain control (β 3.6, $P = 0.01$) was associated with greater activity interference, higher degree of fear of movement (or fear avoidance) predicted greater pain intensity (β 0.46, $P = 0.04$) and activity interference (β 0.57, $P = 0.05$). Neither the location (low back vs hip/knee) nor duration of pain were predictive of pain intensity or interference outcomes.

Conclusion. The findings are consistent with a biopsychosocial model, implicating the need to consider the impact of sociodemographic variables and pain-related beliefs and cognition on pain-related outcomes for patients with co-morbid musculoskeletal pain and depression.

Key Words. Chronic pain; Depression; Primary Care

Introduction

Musculoskeletal pain is the most common symptom reported in both the general population and in primary care [1–6]. In the United States, pain complaints account for over half of all outpatient visits for somatic symptoms, including an estimated 25 million visits alone each year for back pain and 12.7 million visits for knee or hip pain [7]. In the United States, pain costs over $100 billion each year in health care and lost productivity [8].

Chronic musculoskeletal pain (CMP) co-morbid with depression is particularly common [9–12]. Pain is a strong predictor of both the onset and persistence of depression [13–16], and depression is likewise a powerful predictor of pain, particularly persistent pain [17–19]. Concurrent pain and depression have a much greater impact than either disorder alone on multiple domains of functional status as well as health care utilization [18]. Consequently, a treatment model that incorporates assessment and treatment of both pain and depression seems necessary for more optimal outcomes [20].

Despite the availability of medications and other therapies for managing co-morbid pain and depression, undertreatment of these co-existing illnesses persists throughout the world [21–26]. Hence, it is important to identify risk factors associated with persistent problems after treatment. For researchers, this knowledge might be used to create more tailored and effective study interventions. For clinicians, it is essential to identify predictive factors for poor outcome and address these factors during treatment in order to choose the most effective treatment for individual patients.

Findings from several systematic reviews have concluded that baseline pain intensity, work-related parameters (i.e., receiving compensation and work disability) and coping style at baseline consistently predicted future pain-related outcomes [27–32]. Interestingly, no consistent evidence was found for the predictive value of other sociodemographic and psychological variables. However, in almost all of the studies reviewed, only 40–50% of the participants had coexisting depression [18]. The greater majority had CMP only. Because most studies suggest that patients with pain and depression are less responsive to treatment than patients with pain only [33–36], there is a need to determine predictors of pain-related outcomes among individuals with co-morbid chronic pain and depression.

As it can guide rational approaches to treatment, the bio-psychosocial model is a particularly useful model for understanding chronic painful conditions. The bio-psychosocial model suggests that the experience of pain involves a complex interaction of biological factors (genetics), psychological factors (mood, thoughts, and beliefs) and the social context (interpersonal relationship) [37]. Using the bio-psychosocial theoretical approach, we sought to identify predictors of pain intensity and activity interference in patients with CMP with co-morbid depression. This report contains a secondary data analysis of Stepped Care for Affective Disorders and Musculoskeletal Pain (SCAMP)—a randomized controlled trial (RCT) comparing optimized antidepressant therapy vs usual care in improving the co-primary outcomes of depression and pain [38].

Methods

Details of the SCAMP trial design, treatment intervention, study population, and measures have been previously described [38]. Briefly, primary care patients with persistent musculoskeletal pain and co-morbid depression were enrolled in a two-step RCT, with the intervention group first receiving 12 weeks of optimized antidepressant therapy (step 1) followed by 12 weeks of a pain self-management program (step 2). The pain had to be: 1) located in the low back, hip or knee; 2) persistent for 3 months or longer despite conventional analgesic treatment, defined as prior use of at least two different analgesics; and 3) at least moderate in severity, defined as a Brief Pain Inventory score of 5 or greater [39,40]. The depression had to be of at least moderate severity, that is, a Patient Health Questionnaire-9 (PHQ-9) score $\geq$10 and endorsement of depressed mood and/or anhedonia. More than 90% of patients fulfilling this PHQ-9 criterion have major depression and/or dysthymia, and the remaining patients have clinically significant depression with substantial functional impairment [41,42]. Excluded were individuals with severe cognitive impairment, bipolar disorder, substance use disorder, schizophrenia, a pain-related disability claim currently under adjudication, plans to become pregnant in the next year, a life expectancy less than 12 months, or inability to speak English.

Participants in the active intervention group received six clinical contacts (baseline and 1, 3, 6, 9, and 12 weeks) with the study nurse care manager. Following a rational algorithmic approach to antidepressant selection and dosing, the study nurse care manager assessed antidepressant adherence, adverse effects, and depression response. Depression rather than pain response dictated antidepressant adjustments. Approximately two thirds of the study nurse care manager contacts with patients were by telephone. For those randomized to usual care, participants were informed that they had depressive symptoms and advised to seek advice from their primary care provider about treatment. There were no other attempts by study personnel to influence depression or pain management unless a psychiatric emergency (e.g., suicidal ideation) arose.

All baseline and 3-month outcome assessments were conducted by a research assistant blinded to treatment allocation and uninvolved in care management of subjects. This trial was approved by the Indiana University Institutional Review Board and was monitored by a local independent Data Safety Monitoring Committee.

Outcome Measures

The *Graded Chronic Pain Scale* (GCPS) at 3 months assessed pain intensity and interference with usual daily activities [43–45]. The GCPS pain intensity was calculated by averaging 0–10 ratings of “current pain” and “average” and “worst pain” in the past month. The GCPS activity interference was calculated by averaging 0–10 ratings of pain interference with “daily activities,” “work/housework activities,” and “recreational/social activities” in the past month. The GCPS pain intensity and activity interference mean scores were each multiplied by 10 to yield a score range of 0–100, with higher scores indicating worse outcome. The GCPS pain intensity and activity interference scores have good internal consistency, test–retest

reliability, and validity [44,45]. Compared with the usual care group, the active intervention group in the original SCAMP study had significantly lower 3-month GCPS pain intensity (absolute between-group difference of –7.19; standardized effect size of 0.43) and GCPS activity interference (absolute between-group difference of –8.73; standardized effect size of 0.35) scores [46].

Baseline Covariates

Depression

The SCL-20 is a modified subscale of the Hopkins Symptom Checklist (SCL-90) that has demonstrated sensitivity to detect differences in depression severity change between treatment groups [41,47,48]. The 20 items are scored from 0 to 4 and averaged to provide a measure of overall severity from 0 to 4, with higher scores representing more severe depression.

Self Efficacy

Self-efficacy to manage symptoms of pain was assessed with the 6-item Arthritis Self-Efficacy Subscale. This subscale has good internal consistency and associated with measures of health status [49,50]. For each item, patients reported their degree of certainty to manage symptoms at the present time on a scale ranging from 1 (very uncertain) to 10 (very certain). The total score was calculated as the mean of the summed responses and ranged from 1 to 10, with higher scores indicating greater self-efficacy.

Kinesiophobia

The modified 10-item Tampa Scale for Kinesiophobia was used as a measure of fear of movement/(re)injury. Internal consistency and concurrent criterion validity have been established in different pain conditions [51–54]. Each item (e.g., I'm afraid that I might injure myself if I exercise) is scored on a 4-point Likert scale with scores ranging from 1 "strongly disagree" to 4 "strongly agree." The total score can range from 10 to 40, with higher scores indicating a higher degree of kinesiophobia (i.e., greater fear that movement will exacerbate pain).

Pain Beliefs and Attitudes

The eight-item Survey of Pain Attitudes (SOPA), derived from the original 57-item SOPA, assesses a patient's attitudes and beliefs about pain. This eight-item SOPA, with its four subscales, is reliable and strongly associated with their parent subscales and also with measures of pain, psychological dysfunction, and disability [55–57]. The four subscales are as follows: 1) emotion (i.e., "There is a connection between my emotions and my pain level" and "Stress in my life increases the pain I feel"); 2) solicitude (i.e., "When I am hurting, I deserve to be treated with care and concern" and "When I hurt, I want my family to treat me better"); 3) medical cures (i.e., "I trust that doctors can cure my pain" and "I do not expect a medical cure for my pain"); and 4) pain control (i.e., "I have learned to control my pain" and "There is little I can do to ease my pain"). Study participants were asked to indicate how much they agreed with each item, using a scale of 0 = "this is very untrue for me" to 4 = "this is very true for me." Reverse scoring was used for one item in Medical Cures ("I do not expect a medical cure for my pain") and one in Pain Control ("There is little I can do to ease my pain"). Scores on each subscale were calculated as the mean of the summed responses and thus can range from 0 to 4, with higher scores indicating greater agreement with the belief.

The 12-item Pain Stages of Change questionnaire (PSOC) was used to provide a "snapshot" of readiness to change at baseline [58]. The PSOC was designed to operationalize readiness to adopt a self-management approach to chronic pain. The reliability and criterion, discriminant and predictive validity of the PSCO has now been replicated in several studies [58–61]. PSOC is comprised of four distinct scales with three items each. Each item is scored on a 5-point Likert scale with scores ranging from 1 "strongly disagree" to 5 "strongly agree." Scores on each scale were calculated as the mean of the summed responses and thus can range from 1 to 5. High scores on the precontemplation scale characterize a person with little perceived responsibility for pain control and little interest in implementing behavioral changes. High contemplation scores represent a consideration of behavioral changes, along with an increasing awareness of personal responsibility for controlling pain. The action scale assesses the degree to which someone is actively involved in learning self-management strategies, whereas the maintenance scale addresses the extent to which these changes have been incorporated into daily life, along with a strong sense of personal responsibility for pain control.

Pain Characteristics and Demographics

Pain location (back pain vs leg pain), pain duration (number of years), treatment arm (optimized antidepressant treatment vs usual care) and baseline GCPS pain intensity and activity interference were the four clinical factors considered. For demographic variables, we collected gender, age, marital status (married vs not married), education (≤high school graduate vs >high school), employment status (employed vs not employed) and race (non-whites vs whites).

Statistical Analysis

Mean values and standard deviation, frequencies and percentages were calculated for continuous and categorical variables. The two dependent variables were the GCPS pain intensity and GCPS activity interference at the 3-month outcome assessment. Controlling for baseline GCPS pain intensity or GCPS activity interference, univariate linear regression was conducted to estimate the effects of baseline covariates on each of the dependent variables. Variables that reached a P value ≤ 0.2 were entered into the multivariate linear regression model. Interaction terms between treatment arm and each baseline variable with P value ≤ 0.05 were assessed for statistical significance.

Twenty-four (9.6%) of the 250 enrolled subjects were lost to follow-up at the 3-month assessment. Compared with the 226 remaining subjects, the 24 participants who were lost to follow-up did not differ in terms of gender, age, marital status, employment status, ethnic affiliation, pain location, baseline GCPS pain intensity and activity interference, and treatment arms.

Results

Baseline Characteristics

Overall, the mean age of the 250 participants was 55.5 years; 52.8% were women; 39.6% were non-white and 60.4% white. Fifty-two per cent reported their highest level of education to be high school graduate or less. Work status was 25.6% employed and 74.4% unemployed or unable to work or retired. The site of pain was the back in 60.4% of subjects and the hip or knee in 39.6%. The median duration of pain at baseline was 9 years.

In terms of depression severity, the mean SCL-20 score was 1.89 representing moderately severe depressive symptoms. For pain severity, the mean GCPS pain intensity and activity interference scores were 72.7 and 69.0, respectively. Both of these scores represent moderately severe pain.

Univariate Predictors of 3-month Pain Intensity and Activity Interference

Table 1 shows the univariate associations between baseline variables and pain intensity and activity interference, controlling for their baseline value. Current employment and assignment to the intervention arm (i.e., optimized antidepressant therapy) predicted lower 3-month GCPS pain intensity and activity interference, whereas greater baseline depression severity, and kinesiophobia (i.e., more fearful of movement) predicted worse pain outcomes. Non-white participants had less activity interference at follow-up, whereas those with back pain (vs leg pain) had greater activity interference. Age, gender, marital status, education, pain duration, self-efficacy, SOPA (pain attitudes), and PSOC (readiness to change) measures were not related with either of the pain outcome measures.

Multivariate Predictors of 3-month Pain Intensity and Activity Interference

To identify factors that were independent predictors of 3-month pain intensity and activity interference, variables with a $P \leq 0.2$ in the univariate models were entered into a multivariate linear regression model. Table 2 shows that employment status, treatment arm, and kinesiophobia remained significant predictors of GCPS pain intensity and activity interference. Specifically, current employment and assignment to the intervention arm predicted lower 3-month GCPS pain intensity and activity interference, and greater fear that movement will exacerbate pain predicted worse pain outcomes. High baseline SOPA-pain control predicted higher (worse) GCPS activity interference at 3 months, whereas being non-white predicted lower activity interference. Severity of depression, location and duration of pain, self-efficacy, and other SOPA and PSOC measures were not significant predictors. Finally, there were no significant interactions between treatment arm and any of the significant predictors in the model.

Discussion

We have previously reported the effectiveness of 12-weeks of optimized antidepressant therapy in improving both depression and pain among patients with moderately severe CMP and co-morbid depression [46]. Our multivariate modeling of 3-month pain outcomes reveals several important findings. First, optimized antidepressant therapy proved beneficial for chronic musculoskeletal pain co-morbid with depression, controlling for age, gender, severity of baseline depression, duration or location of the pain, self-efficacy, and pain stage of change. Second, several nonmodifiable and modifiable factors predicted short-term outcomes. Specifically, participants who were unemployed as well as those with greater baseline pain and higher kinesiophobia (i.e., fear of movement) had worse pain intensity and activity interference at 3 months. Also, white race and those with a stronger belief that pain is under their own control had worse activity interference at 3 months.

The significant benefits of the intervention that were demonstrated in our models is likely a combination of both a specific effect (i.e., optimized antidepressant therapy) as well as a nonspecific "attention" effect of care manager contacts. This is true of all effectiveness trials where a care management intervention is compared with a treatment-as-usual control group. However, both the specific and nonspecific effects of the intervention are accounted for by entering treatment group (intervention vs usual care) in our multivariable model. Thus, controlling for this "bundled" intervention effect allows us to draw valid conclusions about the independent effects of other predictors.

The predictive value of baseline pain intensity or interference shown in this study has been reported by other authors [27,31,62,63]. Not only is higher pain intensity related with worse outcome [27,63], but higher interference of pain with activities is also associated with reduced treatment success [27,62,64]. One implication is that patients with depression co-morbid with moderate to severe pain may require co-management with antidepressants and optimized analgesics or other nonpharmacological treatments directed at pain. Regarding work-related parameters, prior studies have also demonstrated that employment status or the ability to work, predicted better outcome [32,63,65]. Our finding regarding the beneficial relationship between employment and better pain outcomes is not likely due to preselecting patients who were *less* disabled because: 1) our entry criteria did *not* include a specific GCPS pain interference cutoff score; 2) a greater majority (74.4%) of our subjects were unemployed or unable to work; and 3) the mean

Table 1 Predictors of pain intensity and activity interference for patients with chronic musculoskeletal pain and co-morbid depression on bivariate analysis

	3-month GCPS Pain Intensity		3-month GCPS Activity Interference	
Baseline Variables	Beta Coefficient	*P*-value	Beta Coefficient	*P*-value
Demographics				
Age (in years)	–0.06 (0.10)	0.5	–0.10 (0.13)	0.4
Female (vs male)	–0.45 (2.37)	0.8	0.58 (2.99)	0.8
Marital status				
Married (vs unmarried)	–0.18 (2.39)	0.9	0.56 (3.07)	0.8
Education				
≤high school (vs >high school)	–0.85 (2.48)	0.7	0.14 (3.14)	0.9
Non-whites (vs whites)	–0.06 (2.38)	1.0	–5.75 (2.99)	0.06
Employed (vs not employed)	–6.78 (2.28)	0.003	–13.15 (2.92)	<0.0001
Treatment arm				
Stepped care (vs usual care)	–8.34 (2.21)	0.0002	–8.31 (2.89)	0.004
Severity of depression	3.57 (1.85)	0.05	5.09 (2.34)	0.03
Pain location				
Back pain (vs leg pain)	1.51 (2.32)	0.5	6.28 (2.97)	0.03
Pain duration (in years)	–0.01 (0.08)	0.9	0.08 (0.11)	0.4
Baseline pain				
GCPS pain intensity	0.58 (0.06)	<0.0001	—	—
GCPS activity interference	—	—	0.66 (0.05)	<0.0001
Pain-related cognitions				
ASES				
Self-efficacy	–0.79 (0.57)	0.16	–0.56 (0.81)	0.4
TSK				
Kinesiophobia	0.56 (0.21)	0.007	0.68 (0.29)	0.01
SOPA				
Pain control	–0.66 (1.15)	0.5	2.37 (1.45)	0.1
Emotion	0.45 (0.99)	0.6	2.09 (1.29)	0.1
Solicitude	0.42 (0.93)	0.6	0.64 (1.21)	0.5
Medical cure	0.18 (0.98)	0.8	–1.20 (1.24)	0.3
PSOC				
Pre-contemplation	1.80 (1.34)	0.1	2.66 (1.72)	0.1
Contemplation	–0.57 (1.54)	0.7	1.45 (1.99)	0.4
Action	–1.08 (1.40)	0.4	1.93 (1.76)	0.3
Maintenance	–0.52 (1.40)	0.7	2.08 (1.85)	0.3

ASES = Arthritis Self-Efficacy Scale; TSK = Tampa Scale for Kinesiophobia; SOPA = Survey of Pain Attitudes; PSOC = Pain Stages of Change.

GCPS activity interference score was 69, which indicates that the cohort had a moderate to severe level of physical impairment at study entry. Certainly, our findings combined with previous research suggest that maximizing employability and work rehabilitation should be a priority.

Our finding of the association between race/ethnicity and pain-related activity interference is consistent with some previous studies but differs from others [66–71]. Disparate results related to race/ethnicity may partly depend on differences in study settings, sample characteristics, and different pain measures assessed across studies. For example, Edwards et al. previously reported no significant ethnic group differences on the Multidimensional Pain Inventory measures of pain-related disability, while administration of the Oswestry Disability Questionnaire produced significantly greater ratings of disability among African Americans [66]. However, a review of the literature suggests that African Americans with chronic pain report more pain severity and disability due to pain than non-Hispanic Whites with chronic pain [72].

The result that baseline depression severity was not predictive of pain-related outcomes was surprising given the finding that depression in patients with pain is associated with more pain complaints and greater impairment [18]. Also, observational studies have suggested that the presence of depression adversely affects pain outcomes [18,73]. One possible explanation for this finding is that the predictive value of baseline depression severity was

Table 2 Multivariate predictors of pain intensity and activity interference in patients with chronic musculoskeletal pain and co-morbid depression

	3-month GCPS Pain Intensity		3-month GCPS Activity Interference	
Baseline Variables	Beta Coefficient	*P*-value	B Coefficient	*P*-value
Demographics				
Non-whites (vs whites)	—	—	–5.83 (2.85)	0.04
Employed (vs not employed)	–5.61 (2.24)	0.01	–13.38 (2.85)	<0.0001
Treatment arm				
Stepped care (vs usual care)	–3.73 (2.19)	0.0005	–6.40 (2.70)	0.01
Severity of depression	2.92 (1.85)	0.1	3.77 (2.39)	0.1
Pain location				
Back pain (vs leg pain)	—	—	4.69 (2.76)	0.09
Baseline pain				
GCPS pain intensity	0.48 (0.07)	<0.0001	—	—
GCPS activity interference	—	—	0.51 (0.07)	<0.0001
Pain-related cognitions				
ASES				
Self-efficacy	–0.12 (0.58)	0.8	—	—
TSK				
Kinesiophobia	0.46 (0.23)	0.04	0.57 (0.29)	0.05
SOPA				
Pain control	—	—	3.64 (1.48)	0.01
Emotion	—	—	1.32 (1.28)	0.3
PSOC				
Pre-contemplation	0.10 (1.42)	0.9	2.85 (1.76)	0.1

ASES = Arthritis Self-Efficacy Scale; TSK = Tampa Scale for Kinesiophobia; SOPA = Survey of Pain Attitudes; PSOC = Pain Stages of Change.

reduced or washed out by including in the model treatment arm which itself was highly predictive. Of note, baseline depression severity was predictive at the univariate level. Our study suggests that optimized antidepressant therapy may be effective in improving pain outcomes in patients with a spectrum of depression severity.

Psychosocial factors play a major role in the maintenance and progression of chronic disability in musculoskeletal disorders. One variable that has attracted increasing theoretical and empirical interest is pain-related fear [74,75]. Fear of movement and injury (or kinesiophobia) has been shown to be a robust predictor of disability in patients with acute and chronic low back pain [51–53,76], fibromyalgia [52], neck pain [77], and osteoarthritis [54]. In our study, we confirmed the association of fear of movement and activity interference—a surrogate marker of disability. Additionally, our analysis showed that kinesiophobia is a predictor of pain intensity. Thus, fear of movement may be an important target for psychologically-based interventions.

Previous research has often shown that the stronger the belief in one's personal control over pain (SOPA-pain control), the better the outcome [78–80]. Surprisingly, we found the opposite, that is, the stronger the belief in control over pain at baseline, the greater the pain activity interference was at follow-up. We initially thought that subjects got confused with the reverse worded item, "There is little I can do to ease my pain" and the response options of "very untrue" to "very true." However, our correlation analysis table (data not shown) demonstrated that the relationships between SOPA-pain control with depression, pain intensity, activity interference and other measures of disability were in the expected direction confirming previous reports. One potential explanation for our unexpected finding is that all of the patients in our trial had co-morbid depression, which may have influenced the degree or directionality of pain beliefs as a predictor. Second, because the SOPA questionnaire was interviewer-administered, the participants may have provided answers that would be viewed as more socially acceptable, which in this case, a more adaptive style of coping with pain. If such was the case, high SOPA-pain control at baseline would be associated with greater activity interference at follow-up. A third possibility may be regression to the mean. Specifically, subjects scoring high on SOPA-pain control at baseline may be more likely to regress to the mean at follow-up. And if lower SOPA-pain control at 3 months is associated with greater activity interference at this time point, high SOPA-pain control at study entry might predict greater activity interference at follow-up. Unfortunately, we did not collect SOPA-pain

control at the 3-month time point; hence, we cannot verify the validity of this hypothesis. Finally, recent data have suggested the apparently "unhelpful" role of pain control in relation to future physical functioning. In a prospective investigation of acceptance and control-oriented coping among chronic pain sufferers, McCraken et al. have reported that attempting to control pain was associated with relatively worse functioning over time [81]. Certainly, using pain medication to control pain can be quite adaptive response on some occasions. On other occasions it may serve as part of a pattern of avoidance of pain, a pattern that could constrict daily functioning. In other words, attempts to control pain, which on the surface might look like adaptive ways of coping, appear less useful than responses that engender more acceptance of pain. At least 15 laboratory and clinical studies make the growing case for the role of acceptance in improved functioning of people with chronic pain [82].

The pain stages of change construct is a psychologic construct that maps the process of behavior change [60]. In our study, the pain stages of change did not predict 3-month outcomes. Although the pain stages of change model is intuitively plausible and has the potential to increase the effectiveness of the practitioners' counseling, a recent review of eight studies has concluded that the pain stages of change model is in its infancy and its predictive validity should be proven first before it is applied clinically [83].

Several potential limitations of the study warrant consideration. First, the use of self-reported data may introduce potential biases. However, self-reported pain-related fear has not only been associated with self-reported outcomes but also to physical performance [84–87]. For example, when faced with performing physical tasks such as lifting an arm weight or engaging in trunk extension and flexion exercises, patients scoring high on pain-related fear perform these tasks significantly slower [84]. Second, 3 months is a relatively short follow-up period for painful syndromes that often last many years. However, most of our findings are consistent with prior research in chronic pain with longer follow-up periods.

Conclusion

To our knowledge, this is the first study to identify prognostic factors of pain intensity and activity interference for patients with both CMP and depression. In addition to employment status and race serving as predictors of pain-related outcomes, a clinically relevant finding of our study is that kinesiophobia predicts greater pain intensity and activity interference. One wonders whether the combined use of medications to reduce pain, and psychological-based therapy to reduce kinesiophobia would enhance treatment outcomes. Given that mono-therapies (pharmacologic or psychologically based therapies) produce only modest reductions in pain, it may be time to consider more careful study of treatment components that are designed to complement each other such as exercise, cognitive behavioral therapy, pain self-management programs, and other types of nonpharmacological interventions [88]. Given the strength of "employment" status we may also want to consider interventions in the workplace or incorporate a vocational rehabilitation component.

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