

Psychological approaches to understanding and treating arthritis pain

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Abstract | Arthritis pain has traditionally been evaluated from a biomedical perspective, but there is increasing evidence that psychological factors have an important role in patients' adjustment to arthritis pain. The evolution of pain theories has led to the development of models, such as the cognitive-behavioral model, which recognize the potential involvement of psychological factors in pain. Emotional, cognitive, behavioral and social context variables are useful in understanding pain in patients with arthritis, and have led to the development of psychological approaches for treating arthritis pain. These include pain coping skills training, interventions that include patients' partners, and emotional disclosure strategies.

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Introduction

Over the past 25 years, novel psychological approaches have been developed to understand and treat arthritis pain. This Review provides an update on research in this area, focusing on two painful and often disabling forms of arthritis: osteoarthritis (OA) and rheumatoid arthritis (RA). The first section provides an overview of theoretical perspectives on pain, with a particular emphasis on how they address psychological factors. The second section highlights recent studies on psychological factors that are useful in understanding arthritis pain, and the third section describes the reported efficacy of psychological interventions in patients with arthritis pain.

Theoretical perspectives on pain

Evolution of pain theories

Pain has traditionally been evaluated from a biomedical perspective that views pain as a symptom of underlying disease activity (Box 1). This perspective draws attention, for example, to the changes in inflammation and joint damage that can cause arthritis pain. Medical treatments (pharmacological or surgical) designed to correct underlying tissue damage clearly benefit many patients with arthritis. Clinical observations, however, reveal several weaknesses of the biomedical model, including the fact that reports of pain often differ dramatically between patients with similar degrees of joint damage, that patients with similar disease activity might respond quite differently to the same treatment (for example, joint replacement), and the fact that this model does not address the role of psychological factors (such as depression) in the pain experience.

In 1965, Melzack and Wall's¹ gate control theory introduced the notion of a gating mechanism in the spinal cord that could be opened or closed based on input from

higher brain centers responsible for psychological processes, such as cognitions (thoughts, beliefs and expectations) and emotions (such as anxiety and depression). The gate control theory stimulated heightened interest in interdisciplinary pain research. Results of brain imaging and other neuroscience studies led Melzack² to propose the neuromatrix theory of pain. This theory maintains that pain is caused by the synthesis and processing of inputs from a widely distributed network of brain neurons, and also draws attention to the fact that pain is a major psychological stressor that alters homeostasis and triggers stress regulatory processes that, in turn, can further influence pain. With their emphasis on the role of cognitions, emotions, and stress, the gate control and neuromatrix theories have generated considerable interest in psychological perspectives on pain.

Psychological perspectives on pain

The most influential current psychological perspective on pain—the cognitive-behavioral model—emerged in the 1970s.³ This perspective acknowledges the importance of underlying tissue pathology as a source of pain, but further highlights the important role that cognitive factors (such as beliefs about pain control and feelings of helplessness), emotional factors (such as anxiety and depression), and behavioral factors (such as pain-related social interactions and social support) have in influencing pain reporting and how one adjusts to pain. This theory stimulated considerable research, and led to the development of pain coping interventions based on the cognitive-behavioral model. These interventions teach patients pain coping skills designed to alter their pain-related cognitions, emotions, and behaviors. The 1990s saw a growing recognition of the role that social context can have in adjustment to persistent pain conditions, such as arthritis.^{4–6} For example, when partners responded to pain in an overly solicitous or critical

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Competing interests

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fashion,⁷ patients often experienced increased pain, psychological distress, and physical disability.^{8–12} Such findings have led cognitive–behavioral pain researchers and practitioners to increasingly emphasize the importance of involving significant others in pain coping skills training (PCST) protocols to manage persistent pain.

Research on the associations among stress and emotional factors and pain has burgeoned over the past decade, and there is heightened interest in the stress and emotion perspective on chronically painful diseases. Although studies in the last several years have not supported early psychosomatic views that interpersonal conflicts and the inhibition of angry feelings can cause painful arthritic disorders such as RA,¹³ there is evidence that RA patients are psychologically and physiologically reactive to interpersonal stress,^{14–17} and that stress exacerbates their pain, physical dysfunction and mood.^{1,18–23} A key contributor to the experience and prolongation of stress in patients with arthritis is the avoidance or inhibition of stress-related negative emotions and memories. Increased stress and negative emotion can increase pain through a variety of mechanisms, including heightened somatosensory awareness, increased muscle tension, entrenched maladaptive behaviors (for example, avoiding daily activities or social isolation), and decreased activity in neural pain inhibitory pathways.^{24,25} The emergence of the stress and emotion perspective on pain has been accompanied by increased interest in the value of emotional disclosure interventions—that is, psychological treatments that seek to reverse the effects of avoided or inhibited stress reactions by actively encouraging the disclosure of these experiences and associated emotions through repeatedly writing or talking about them.

Psychological influences on arthritis pain

Research over the last decade has focused on the role of psychological factors in arthritis pain and pain-related disability. Examining pain-related disability is important because, in some cases, it can become the dominant clinical problem in pain management.³ The research on psychological factors has focused on three broad areas: emotional variables, cognitive variables, and social context variables (Box 2).

Emotional variables

Depression is related to pain in patients with arthritis. Small-scale ($n = 134$)²⁶ and large-scale ($n = 22,131$) studies²⁷ have found that pain is one of the strongest predictors of depression in RA patients. In a nationally representative sample of Canadians who self-reported arthritis (most of whom probably had OA), individuals with pain were more likely to meet criteria for major depression.²⁸

Interest in the links between depression, inflammation and pain is also growing. In a study of 218 patients with RA, Kojima *et al.*²⁹ found that, although depression and C-reactive protein (CRP) levels were correlated, each was an independent predictor of pain level. Low *et al.*³⁰ have reported that somatic depressive symptoms and CRP level are correlated in RA patients. This relationship was attenuated when adjusting for pain, underscoring the

Key points

- Theoretical perspectives on pain emphasize the critical role of psychological variables for understanding and treating arthritis pain and pain-related disability
- Psychological factors, including emotions, cognitions, and social context variables, are useful in understanding arthritis pain
- Psychological interventions, such as pain coping skills training, are useful for decreasing arthritis pain, psychological distress, and arthritis-related disability
- Continuing efforts are needed to heighten rheumatologists' awareness of the psychological aspects of pain management

Box 1 | Models of pain and psychological perspectives

Models of pain

- Biomedical model: pain is a result of underlying disease activity
- Gate control theory: pain is influenced by higher brain centers responsible for cognitions and emotions
- Neuromatrix theory: pain is the result of synthesis and processing of inputs from a widely distributed network of brain neurons

Psychological perspectives on pain

- Cognitive–behavioral model: cognitive, emotional and behavioral factors can influence pain
- Stress and emotion perspective: increased stress and emotion can influence pain

importance of pain in understanding the link between depression and inflammation.

One of the most important reasons for studying emotional variables, such as depression, anxiety and psychological distress, is that they can influence treatment outcomes. In a study of 6,158 OA patients undergoing hip replacement surgery, Rolfson *et al.*³¹ found that higher preoperative scores on a psychological distress dimension was a significant predictor of pain relief and patient satisfaction 1 year postoperatively.

Longitudinal research is needed to examine the effects of emotion-related variables, such as mood disorders, on both the onset of painful arthritic disorders and the exacerbation of arthritis symptoms. Mood disorders are common in patients with arthritis, but whether they are a risk factor for the development of arthritis is not known. In an innovative study that analyzed retrospective data from the longitudinal World Mental Health Survey ($n = 18,309$), Von Korff *et al.*³² showed that individuals who had depressive or anxiety disorders during childhood were at substantially increased risk for adult-onset arthritis. Interestingly, these effects were maintained even after adjustment for the effects of childhood adversities, including childhood abuse, domestic violence, parental divorce and economic adversity.

Cognitive variables

An individual's cognitions, including their thoughts, beliefs, expectations and cognitive coping efforts, can influence their pain.^{33–35} One of the most consistent findings regarding how patients think about their pain is the importance of a patient's appraisal of their ability to cope

Box 2 | Psychological influences on pain**Emotional variables**

- Depression
- Anxiety
- Psychological distress

Cognitive variables

- Self-efficacy for pain control
- Helplessness
- Pain catastrophizing
- Pain acceptance
- Resilient coping

Social context variables

- Pain-related social interactions
- Pain communication
- Social support

with pain—that is, judgments of whether their coping efforts are likely to be effective or not. Self-efficacy, or the belief that one has the ability to manage their arthritis-related symptoms, is an example of a positive appraisal. In a study of community-living adults with persistent pain, Turner *et al.*³⁶ found that higher self-efficacy for pain control predicted the use of adaptive pain coping strategies, and was related to lower levels of disability and depression, even after adjustment for pain level. Pells *et al.*³⁷ found that self-efficacy predicted pain, disability, and eating behavior in a sample of overweight and obese OA patients.

Helplessness is an example of a negative appraisal of one's pain-coping abilities. Helplessness predicts work disability in patients with RA over the course of 7 years,³⁸ explains impaired quality of life (both physical and mental health aspects) in Taiwanese patients with RA,³⁹ and predicts the outcome of joint replacement surgery in patients with OA of the hip.⁴⁰ Interestingly, a 2005 study suggested that the administration of controlled-release oxycodone improved appraisals by both decreasing the feeling of helplessness and increasing perceptions of coping efficacy.⁴¹

Of all the cognitive variables that have been studied, pain catastrophizing seems to be one of the most important.⁴² Pain catastrophizing refers to the tendency to ruminate about pain and magnify it. Over the past 25 years, numerous studies have supported the importance of pain catastrophizing in predicting pain, disability, and psychological distress. In 2009, Somers *et al.*⁴³ reported that pain catastrophizing explained a considerable proportion of variance in measures of pain, psychological disability, physical disability, and gait velocity in overweight and obese patients with OA. Pain catastrophizing has also been found to predict acute perioperative pain in OA patients undergoing total knee arthroplasty⁴⁴ and pain relief at 6 weeks⁴⁵ and 1 year postoperatively.⁴⁶

An emerging area in the literature on cognitive pain coping is the importance of focusing on more-positive aspects of adjusting to pain. Kratz *et al.*⁴⁷ studied pain

acceptance—that is, the willingness to experience pain and engage in life pursuits despite it—in a mixed sample of OA and fibromyalgia patients. Those who reported high levels of pain acceptance had higher daily positive affect and were much less likely to show increases in negative affect during pain flares. Sinclair and Wallston⁴⁸ developed a measure of resilient coping (the tendency to cope with stress in a highly resilient manner), and found that it was related to enhanced pain coping and adjustment in patients with RA. Smith and Zautra⁴⁹ showed that higher resilience at baseline was associated with much higher levels of positive social interactions among patients with RA and OA. Finally, there is emerging evidence that the ability to regulate day-to-day affect predicts both daily pain⁵⁰ and the ability to recover emotionally from daily pain episodes.⁵¹

Social context variables

Arthritis pain can both influence and be influenced by its social context. Social support has been shown to be a critical factor in the adjustment to arthritis. Patients with arthritis might benefit from emotional social support, informational social support, and behavioral or tangible sources of social support.⁵² Arthritis pain can be especially challenging for patients' spouses or partners. For example, partners might have difficulty accurately judging how much pain the patient is experiencing. Martire *et al.*⁵³ had partners of OA patients watch a videotape in which the patient engaged in a challenging task (carrying small logs). Those partners who accurately judged the amount of pain the patient experienced were more likely to be effective in providing social support and less likely to respond to pain in negative ways. Partners who were accurate judges of pain also reported lower levels of stress associated with caregiving.

Both partners and patients may lack confidence that they can communicate effectively about pain, and hold back from discussing pain-related topics with each other.⁵⁴ Partners who hold back on discussing pain (a form of emotional support) exhibit much higher levels of caregiver strain, and their patient partners report much higher levels of psychological disability and pain catastrophizing.⁵⁴

Partners who are depressed may have difficulties coping with a chronic illness such as arthritis, and this in turn can affect the patient. High levels of spousal depressive symptoms, for example, predict worsening RA patient disability and disease activity over a 1-year period.⁵⁵

Social contexts that provide arthritis patients with support can help individuals adjust better to painful arthritic disorders. Li *et al.*⁵⁶ studied workplace support in a mixed sample of 336 arthritis patients, most of whom had OA or RA. Patients who reported low workplace support were much more likely to develop depressive symptoms 18 months later.

Psychological treatments

A number of psychological treatments have been developed to improve OA and RA patients' adjustment to persistent pain (Figure 1). These treatments are designed

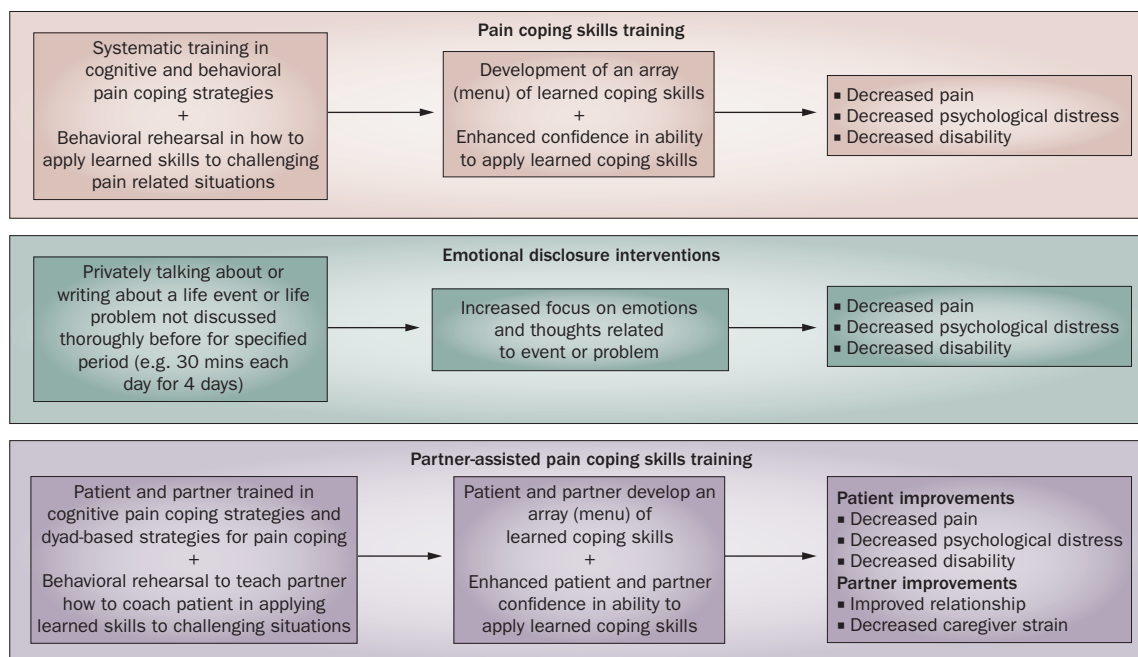


Figure 1 | Psychological approaches to pain management. A number of psychological treatments have been developed to improve the adjustment to persistent pain in patients with osteoarthritis or rheumatoid arthritis. This figure presents three major psychological treatment approaches that have been designed to both decrease pain and reduce pain-related physical and psychological disability.

to both decrease pain and reduce pain-related disability (psychological and physical disability).

Pain coping skills training

PCST, based on the cognitive-behavioral model, teaches arthritis patients skills for managing pain. It has three basic components: first, a rationale (for example, gate control theory) for why coping skills might be beneficial; second, systematic training in cognitive and behavioral pain coping skills (such as relaxation, imagery, activity pacing, goal setting, cognitive restructuring and problem solving); and third, behavioral rehearsal (that is, role playing of skills applications with corrective therapist feedback) in how to apply pain coping skills to challenging pain-related situations.⁵⁷ Over the past few decades, a number of studies have demonstrated that PCST can decrease pain and disability in OA and RA patients.⁵⁸⁻⁶⁰ In 2006, Baird and Sands⁶¹ found that elderly (aged >65 years) female OA patients who underwent a simplified PCST protocol that provided training in two coping skills (guided imagery and relaxation) experienced notable improvements in pain, tension, physical function and mood compared to a control group who received biweekly calls to encourage continued participation in the study.

An important aspect of research in this field is comparing the efficacy of different types of coping skills training (CST) protocols. In a study of RA patients, Zautra *et al.*⁶² compared a conventional PCST protocol focused on pain control to a CST protocol focused on mindfulness meditation, designed to enhance emotional regulation and positive affect. Patients in both treatment groups demonstrated improvements in their coping ability

compared to an education-only control group. Patients who received conventional PCST also demonstrated significant improvements in pain control and biological markers of disease activity compared with patients in the other two groups. Interestingly, patients with a history of depression benefited most from the mindfulness-based intervention, showing improvements in positive and negative affect and joint tenderness.

A key challenge for the future is the development of ways to enhance the maintenance of CST and PCST effects. Carson *et al.*⁶³ tested the efficacy of a novel PCST protocol that included training in maintenance techniques, such as identification of early warning signs of relapse, cognitive and behavioral rehearsal of strategies for managing setbacks and relapses, and self-monitoring. The PCST protocol that included maintenance training was more effective in enhancing positive mood than was conventional PCST, although improvements in joint pain and coping efficacy were similar for both protocols. Naylor *et al.*⁶⁴ showed that a telephone-based interactive voice response system, which provided daily access to CST rationales, guided practice and tailored feedback from a therapist, was effective in enhancing the maintenance of CST treatment effects in a mixed chronic pain sample. To date, no studies have tested the efficacy of such a system in OA or RA patients.

Research is needed to test ways of disseminating PCST protocols into clinical settings. Our research team, in collaboration with Dr Joan Broderick at the State University of New York Stony Brook, is conducting an NIH-supported study to test the effectiveness of a PCST protocol for OA patients delivered by nurse practitioners (rather than by psychologists). In addition,

Dr Christine Rini at Mount Sinai Medical Center and our team are developing a study to test the efficacy of a web-based PCST protocol that is designed to be delivered to OA patients seen in the primary care setting.

The biological mechanisms underpinning the effects of CST also require further investigation. Emery *et al.*⁶⁵ conducted a study that used a nociceptive flexion reflex (NFR) threshold measure (an index of descending modulation of pain) to examine whether CST could alter pain responses at the level of the spinal cord. 62 patients with OA underwent an NFR and pain assessment before receiving a single session of PCST. Immediately after PCST, a second NFR and pain assessment was conducted. Results showed that the PCST markedly increased NFR thresholds and decreased pain ratings. To our knowledge, this is the first demonstration that PCST can alter descending inhibitory pathways as assessed at the spinal cord level in patients with OA.

Involving partners in coping skills training

The past decade has witnessed a growing interest in the role that partners can have in patients' adjustment to pain,^{66,67} particularly their involvement in PCST protocols. Systematically involving partners in PCST can increase social support and teach patients and partners how to improve maladaptive pain-related social interactions and communicate more effectively about pain. Psychosocial interventions that include both patients and their partners may also bolster emotional support by increasing affection or communication between partners, informational support by providing information and guidance, and/or behavioral support by providing tangible strategies for decreasing pain and disability (such as increasing the use of behavioral pain coping strategies).⁵³ Lankveld *et al.*⁶⁸ examined whether a PCST protocol for patients with RA and their spouses was more efficacious than the same treatment applied to the patient alone. Results showed that patients in both groups improved in terms of disease-related cognitions and behavioral coping. Contrary to expectations, there was no evidence of an additional benefit to the patient when their spouse participated in the PCST protocol. Other researchers have also found limited benefit for spousal inclusion in RA pain-coping interventions.⁶⁹

Keefe *et al.*⁷⁰ examined the separate and combined effects of spouse-assisted PCST and exercise training in OA patients. 72 patients and their spouses were randomized to receive spouse-assisted PCST plus exercise, spouse-assisted PCST only, exercise training alone, or standard care, which consisted of doing what they would normally do for care. Spouse-assisted PCST, either alone or combined with exercise, produced notable improvements in pain coping and self-efficacy. Exercise training (with or without spouse-assisted PCST) produced improvements in physical fitness and muscle strength. These results suggest that when the primary goal of treatment is to improve patients' self-efficacy and pain coping, spouse-assisted PCST is particularly important, and when the goal is to improve physical fitness and muscle strength, exercise is particularly important. The

combination of both interventions provided improvements across a broader range of outcomes than either intervention alone. Interestingly, spouses who participated in the combined spouse-assisted PCST plus exercise intervention reported that their partners had higher levels of self-efficacy for coping with OA.

Couples experience many challenges when one of them suffers from a painful arthritic disorder. Evidence that patients and partners have difficulty communicating about pain⁵⁵ has led us to develop a communication skills training protocol that educates couples about pain and pain communication, provides a rationale regarding the potential benefits of couple-based training in pain communication, and trains couples in specific communication skills, such as skills for sharing thoughts and feelings and problem solving skills. Pilot testing is underway to examine the feasibility and efficacy of this protocol. Enhancing the effectiveness of pain communication could not only have benefits for patients, but also for their partners, and for the couples' relationship.

Emotional disclosure

Although emotions such as depression and anxiety can increase pain, many arthritis patients are reluctant to disclose their emotions to others.⁵¹ Evidence that individuals who engage in the disclosure of emotionally difficult events can experience health benefits has led to the development of emotional disclosure protocols for individuals with persistent pain.^{71,72} Emotional disclosure protocols require participants to write or talk privately in detail about their thoughts and feelings related to a life event or problem they have not fully disclosed to others over a series of sessions (often three or four half-hour sessions). Although an early study suggested that emotional disclosure could produce substantial improvements in affect and physical functioning in RA patients,⁷³ more-recent studies have failed to show consistent benefits.⁷⁴⁻⁷⁶

Conclusions

Research conducted over the past 5 years continues to support the notions that psychological factors can influence the experience of arthritis pain, and that psychological treatments can be useful in helping arthritis patients better adjust to pain. Pain appraisals and pain catastrophizing seem to be among the most consistent psychological predictors of arthritis pain: future studies need to explore how these variables are related to novel psychological constructs, such as pain acceptance and emotion regulation. Evidence regarding the efficacy of PCST protocols is accumulating; however, there is a need to find ways to boost both the short-term and long-term effects of these treatments and to disseminate these protocols into clinical practice. Although initially promising, emotional disclosure protocols are now yielding mixed findings with regard to arthritis pain management.

Further research is needed to understand how to tailor psychological interventions to make them most effective for patients from low socioeconomic or

minority backgrounds.^{77,78} Continuing efforts are needed to heighten rheumatologists' awareness of the psychological aspects of pain management, for example through presentations or workshops at professional meetings (such as the American College of Rheumatology) or by the inclusion of psychological approaches within treatment guideline documents for patients with arthritis.

Finally, ongoing studies are examining ways to incorporate psychological approaches for managing arthritis pain into clinical practice more effectively, such as the use of nursing practitioners to deliver psychological interventions and the employment of telephone-based or internet-based protocols that can reach patients in their homes.

Review criteria

References for this Review were identified by conducting a PubMed search for English-language, full-text papers using the keyword "arthritis" combined with "anxiety", "depression", "cognitive coping", "behavioral coping", "emotion focused coping", "problem focused coping", "religious coping", "spiritual coping", "active coping", "passive coping", "pain catastrophizing", "pain acceptance", "self-efficacy", "helplessness", "social support", "pain communication", "pain coping skills training", "emotional disclosure" and "mindfulness". Given the large number of publications identified and space restrictions of this article, only a subset of representative articles are included in this Review.

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