

Psychological Aspects of Persistent Pain: Current State of the Science

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Abstract: This article provides an overview of current research on psychological aspects of persistent pain. It is divided into 3 sections. In section 1, recent studies are reviewed that provide evidence that psychological factors are related to adjustment to persistent pain. This section addresses research on factors associated with increased pain and poorer adjustment to pain (ie, pain catastrophizing, pain-related anxiety and fear of pain, and helplessness) and factors associated with decreased pain and improved adjustment to pain (ie, self-efficacy, pain coping strategies, readiness to change, and acceptance). In section 2, we review recent research on behavioral and psychosocial interventions for patients with persistent pain. Topics addressed include early intervention, tailoring treatment, telephone/Internet-based treatment, caregiver-assisted treatment, and exposure-based protocols. In section 3, we conclude with a general discussion that highlights steps needed to advance this area of research including developing more comprehensive and integrative conceptual models, increasing attention to the social context of pain, examining the link of psychological factors to pain-related brain activation patterns, and investigating the mechanisms underlying the efficacy of psychological treatments for pain.

Perspective: This is one of several invited commentaries to appear in *The Journal of Pain* in recognition of *The Decade of Pain Research*. This article provides an overview of current research on psychological aspects of persistent pain, and highlights steps needed to advance this area of research.

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Key words: Persistent pain, psychological factors, adjustment, behavioral intervention, psychological intervention.

The Decade of Pain Control and Research provides a particularly appropriate time at which to reflect on the status of psychological aspects of persistent pain. During the past 30 years it has become increasingly clear that psychological factors play an important role in the experience of persistent pain.^{17,28,132} Pain clinicians are now able to incorporate well-validated psychological assessment methods as part of the process of multidisciplinary pain evaluation. Clinicians and researchers also

have developed and refined behavioral and psychosocial protocols that can significantly improve how individuals adjust to persistent pain.^{124,132,147} There is growing interest in the role that such interventions can play in preventing and managing the behavioral and psychological problems caused by persistent pain.^{21,61,62,64,134}

The purpose of this article is to highlight and critically evaluate current research on psychological aspects of persistent pain. The article is divided into 3 sections. In

Editor's note: This commentary by Francis J. Keefe et al, entitled "Psychological Aspects of Persistent Pain: Current State of the Science," provides an in-depth look at psychological facets of unrelenting pain. This is one of several invited commentaries that will appear in *The Journal of Pain*, each addressing research needs in different disciplines of American Pain Society membership. These commentaries were invited from leading figures in the American Pain Society in observance of The Decade of Pain Control and Research, declared by Congress beginning January 1, 2001. Authors were asked to critically evaluate the status of pain research and to identify areas that need more focus, as well as areas that offer significant promise. Keefe et al note the need for more research that focuses on persistent pain, such as investigating mechanisms that regulate the efficacy of psychological treatments for pain, examining the link of psychological factors to pain-related brain activation patterns, and developing better conceptual models to help broaden this field. It is hoped that this and other commentaries to follow will promote research with a focus

on improving care, enhancing professional awareness, and influencing federal policy.

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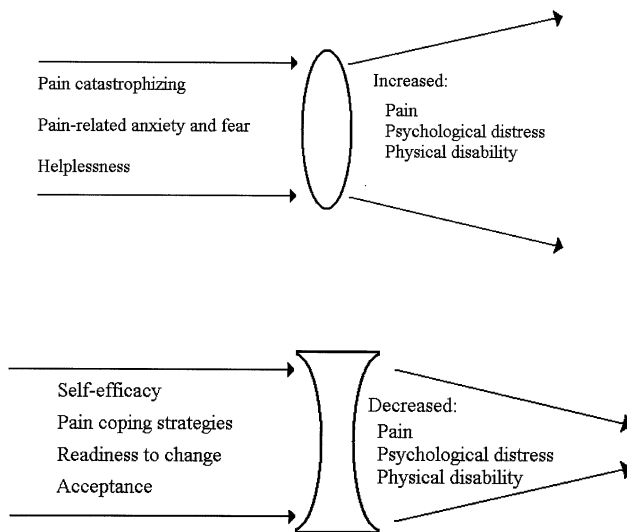


Figure 1. Psychological factors associated with adjustment to persistent pain.

section 1, we will discuss psychological factors that have been associated with adjustment to persistent pain. In section 2, we will review studies of behavioral and psychosocial interventions for patients with persistent pain. In section 3, we conclude with a general discussion that highlights steps that are needed to advance this area of research.

Psychological Factors and Adjustment to Persistent Pain

A review of the status of all of psychological factors that might be relevant to understanding persistent pain is beyond the focus of this article. Instead, we focus on key factors that have received a considerable amount of recent research attention and have important clinical implications for the management of pain. As shown in Fig 1, psychological factors related to the adjustment to persistent pain can be grouped into 2 broad categories. One category includes factors that are associated with increased pain, psychological distress, and physical disability, such as pain catastrophizing, pain-related anxiety/fear, and helplessness. The other category includes factors that are associated with decreased pain, psychological distress, and physical disability such as self-efficacy, pain coping strategies, readiness to change, and acceptance.

Factors Associated With Poor Adjustment to Pain

Pain Catastrophizing

Pain catastrophizing, the tendency to focus on pain and negatively evaluate one's ability to deal with pain, has emerged as one of the most important predictors of pain, accounting for 7% to 31% of the variance in pain ratings.^{27,119} There is growing evidence that catastrophizing is not only related to the report of pain but also to other important pain-related behaviors. For example,

studies have shown that patients who catastrophize have higher levels of disability,⁷¹ higher rates of health care usage,²⁸ longer hospitalizations,²⁹ increased pain medication usage,³⁸ and higher levels of motor pain behaviors,⁴⁸ and they take longer to reach rehabilitation milestones during surgical recovery.⁵³

Most of the findings regarding catastrophizing have been obtained in samples of patients with persistent pain drawn from pain clinics, specialized pain treatment programs, or medical/surgical clinics. Is pain catastrophizing a useful concept in understanding pain in individuals drawn from the general population? Along these lines, several recent studies have investigated catastrophizing in community samples of individuals reporting pain. Severijns et al¹⁰⁴ examined pain catastrophizing in a large community sample of individuals ($N = 2789$) with musculoskeletal pain. Catastrophizing was significantly related to a number of negative outcomes including higher levels of depression and nervousness, more negative general health status, greater limitations in social activities, and lower energy level.

In another recent study, Turner et al¹³⁵ investigated pain catastrophizing in a community sample of 174 individuals with pain caused by a spinal cord injury. All participants completed measures of pain catastrophizing as well as measures of pain intensity, psychological distress, and pain-related disability. Data analyses showed that individuals who engaged in higher levels of pain catastrophizing had significantly higher levels of psychological distress and pain-related disability. This study, like that of Severijns et al,¹⁰⁴ was rigorous in that it controlled for variables (eg, pain intensity, age, and gender) that could have explained the relationship of catastrophizing to negative pain-related outcomes. Taken together, the findings of these studies suggest that catastrophizing is important in understanding pain, not only in samples of patients seen in medical settings but also in samples of individuals recruited from the general community.^{104,135}

Comment

There are several strengths in the research on pain catastrophizing. First, this area has advanced in part because of the availability of several reliable and valid measures of pain catastrophizing (eg, the Pain Catastrophizing Scale¹¹⁶ and the Catastrophizing Scale of the Coping Strategies Questionnaire¹⁰²). Second, studies of catastrophizing have been conducted in diverse clinical samples of adults and children¹⁸ as well as community samples. Third, although catastrophizing is related to pain, it continues to be significantly related to other measures of adjustment after one controls for pain level. Fourth, although it has been suggested that the effects of catastrophizing might simply be due to underlying depression,¹¹⁷ evidence indicates that pain catastrophizing is an important predictor of pain outcomes even after controlling for depression.^{27,30,42,48,118} Finally, there is evidence that catastrophizing can be changed over the course of psychosocial interventions, and that these

changes are related to long-term improvements in pain, psychological functioning, and physical disability.

Pain catastrophizing research also has some limitations. First, this research has been empirical and not based on a systematic theory of pain catastrophizing. Fortunately, Sullivan et al¹¹⁹ recently proposed a communal model of pain catastrophizing that represents a significant theoretical contribution. This model asserts that catastrophizing is a coping response designed to deal with the negative emotions caused by persistent pain by eliciting proximity to and support from others. Second, much of the research on catastrophizing is correlational and cross-sectional, making it difficult to determine whether catastrophizing leads to poorer adjustment to pain or vice versa. Recent longitudinal studies, done in the context of ongoing treatment programs, have shown that decreases in catastrophizing that occur early in treatment predict decreases in pain and pain-related outcomes later in treatment.^{14,15} Along these lines, studies that systematically manipulate catastrophizing and observe the resulting effects are sorely needed. Thorn et al¹²⁸ recently described an innovative treatment protocol specifically designed to decrease pain catastrophizing. This protocol teaches patients how to reduce catastrophizing by using self-control techniques drawn from stress management training, cognitive therapy for depression, assertiveness training, and the communal coping model. A clinical trial testing the efficacy of this protocol would represent an important next step in establishing causal relations between catastrophizing and clinical outcomes.

Pain-Related Anxiety and Fear of Pain

Patients who have persistent pain can become quite anxious about their pain and engage in fear avoidance behaviors.¹⁴⁵ Both clinical and experimental studies suggest that pain-related anxiety and fear are important predictors of how patients adapt to persistent pain.¹⁴⁵

Clinical studies of pain-related anxiety and fear have primarily been conducted in populations of patients with persistent musculoskeletal pain and have relied on 1 of 2 measures: (1) the Pain Anxiety Symptoms Scale (PASS),⁷⁶ a 40-item measure that assesses pain-specific anxiety symptoms in 4 domains: cognitive anxiety responses, escape and avoidance, fearful appraisals, and physiologic anxiety responses; and (2) the Tampa Scale for Kinesiophobia (TSK),⁵⁷ a 13-item measure that assesses fear of (re)injury due to movement.

Findings from clinical studies have shown that patients scoring high on pain-related anxiety and fear measures report high levels of attention to pain sensations^{18,72} and overpredict the amount of pain they will experience during a physical examination.⁷⁵ They also score higher on self-report measures of disability and depression,⁷⁶ pain behavior and help-seeking,⁷³ and lower on measures of pain coping.⁷⁴ Pain-related anxiety and fear, however, are not only related to self-reports but also to physical performance. 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 anxiety and fear do so much more slowly.¹⁴⁴

Swinkels-Meewisse et al¹²⁰ recently conducted a study of fear of pain in 615 individuals from a primary care setting, each of whom was having an acute episode of back pain. Data analyses showed a pattern of findings that was very consistent with that seen in patients with chronic pain, ie, patients with acute low back pain who reported a high fear of pain were significantly more likely to experience high levels of disability and to avoid participation in a range of home, work, social, and leisure activities.

Picavet et al⁹¹ have conducted one of the few longitudinal studies examining fear of pain in the general population. In this study, a population-based cohort of the Dutch population (N = 1845) completed a measure of fear of pain at baseline along with a 6-month follow-up survey assessing back pain and disability. Results showed that individuals' fear of pain at baseline was a significant predictor of severe low back pain, chronic low back pain, and back pain-related disability at follow-up. These results held up even after adjusting for important background and medical history variables such as pain duration, pain severity, and disability at baseline.

Comment

Overall, it seems fair to conclude that pain-related anxiety and fear appear to be important in understanding pain. The association between fear of pain and adjustment to pain is evident in research conducted in persons with chronic pain and in the general population. Findings regarding adjustment to pain are not only apparent on self-report measures but also on physical performance measures. The concept of fear of pain also appears to have predictive validity in that baseline levels of fear of pain predicted pain 6 months later.⁹¹ A major strength of the concept of pain-related anxiety and fear is that it links logically to treatment interventions. As we shall see later in this review, psychological treatments designed to reduce fear of pain, eg, through exposure to fear-producing stimuli, could potentially be quite useful in decreasing pain and disability.^{18,91,120,145}

To date, most of the research on pain-related anxiety and fear has been done in patients with musculoskeletal pain conditions. However, these concepts are also applicable to patients with disease-related pain. Future studies are needed to examine the utility of pain-related anxiety and fear in understanding disability and functional limitations in patients with diseases such as rheumatoid arthritis or cancer.

Another concern is that the focus of studies in this area has been almost exclusively on pain-related anxiety and fear experienced by the patient, despite the fact that individuals in contact with the patient (eg, a spouse, family members, coworkers, and health care providers) might have pain beliefs and fears that can have unintentional negative effects on the person with pain. The impact of health care provider beliefs has been studied. Linton et al⁶⁵ surveyed 60 general practitioners and 71 physical therapists regarding their fear-avoidance be-

liefs. The health care providers in this study completed a measure of fear avoidance beliefs that was a slightly modified version of the measure typically given to patients with chronic pain. Results indicated that a number of practitioners had beliefs consistent with fear avoidance. More than two thirds of the practitioners reported that they would recommend that a patient avoid painful movements. Furthermore, those scoring high on fear avoidance beliefs were much more likely to report that sick leave was a good treatment for pain. Taken together, these findings suggest that health care providers might have pain-related fears that affect the way that they practice and respond to patients with back pain. Future studies are needed to replicate and extend these findings.

Helplessness

Helplessness is a concept that is increasingly being used to understand adjustment to painful rheumatic diseases.⁵¹ Nicassio et al⁸⁵ adapted this concept from learned helplessness theory¹ to explain why the unsuccessful coping efforts of some patients with rheumatic disease led them to view pain and other negative disease outcomes as inevitable and led them to discontinue attempts to manage their disease. During the past decade, a number of cross-sectional and longitudinal studies have shown that patients scoring high on helplessness report higher levels of pain, depression, and disability and have much poorer medical therapy outcomes.^{35,84,86,107,108}

Because of the consistency with which helplessness is related to negative outcomes in rheumatic disease populations, the question arises: Does helplessness mediate the relationship between disease status and key symptoms? Tayer et al¹²⁵ conducted a longitudinal study that examined whether helplessness mediated the relationship of disease status to fatigue in 81 patients with systemic lupus erythematosus. At baseline, a clinical rheumatologist evaluated disease status, and patients completed measures assessing helplessness and fatigue. These measures were collected again 3 months later. Cross-sectional analyses of the baseline data showed that the relationship between disease status and fatigue was partially mediated by helplessness. In other words, the effect of disease severity on fatigue ratings could be explained by the helplessness experienced by these patients. Longitudinal analyses, however, failed to indicate that helplessness was a mediator. The longitudinal analyses, in fact, showed that only disease status and not helplessness predicted fatigue at follow-up.

Other longitudinal studies have shown that helplessness is related to important disease-related outcomes in patients with rheumatic disease. Early death is a major problem in some painful, rheumatic diseases such as rheumatoid arthritis.⁶ This problem has been linked to attainment of a lower level formal education (ie, lower number of years of schooling completed).⁹² Callahan et al¹⁶ examined whether helplessness acts as mediator that might explain the relationship of formal education to increased early death in individuals with rheumatoid arthritis. In that study 1416 patients with rheumatoid

arthritis completed measures assessing helplessness, education, and disease activity at baseline and were then followed for 5 years. As expected, the results revealed that individuals with low formal education and higher levels of disease activity had a significantly higher risk for early death. However, when helplessness was entered into a model predicting mortality, education level was no longer found to be a significant predictor. These results suggest that helplessness might actually explain why persons with limited formal education and rheumatoid arthritis die earlier, and they are potentially quite important from a clinical perspective. They suggest that clinicians working with patients with rheumatoid arthritis should attend more closely to helplessness in the patients they treat. They also suggest that interventions designed to reduce helplessness might be useful in reducing early death in patients with rheumatoid arthritis.

Comment

The findings reviewed above suggest that helplessness is a very important construct in understanding pain and disability in patients with rheumatic disease. Interestingly, rheumatology practitioners have become quite interested in helplessness and its link to disability, and some have begun to routinely include assessments of helplessness in their ongoing management of patients with rheumatic disease.^{25,93,136} However, to date, interventions to decrease helplessness have not been reimbursed and thus are not being widely used in the medical management of rheumatic pain conditions.¹⁶

Particularly interesting is the link that has been identified between helplessness and early death. To our knowledge, this result has been reported in only one study,¹⁶ and future studies are needed to replicate this finding. These studies should also explore potential mechanisms by which helplessness might influence early death. Helplessness might affect mortality through behavioral mechanisms (eg, poor self-care habits, delayed identification of and response to symptoms, and poor compliance with medication regimens) or through biological mechanisms (eg, increased stress reactivity or physical exhaustion.)

One limitation of the helplessness concept is that it has not been widely applied outside of rheumatic disorders. There might be overlap between helplessness and other concepts used in the chronic pain literature. For example, Sullivan et al¹¹⁶ proposed a 3-factor model of catastrophizing that included helplessness as one of those factors. Future studies should test the relative utility of helplessness versus related constructs in understanding adjustment to pain in populations of patients with persistent, nonrheumatic pain.

Factors Associated With Improved Adjustment to Persistent Pain

Self-Efficacy

Self-efficacy refers to a person's confidence in their ability to engage in a course of action sufficient to accomplish a desired outcome, such as control of his or her

pain.⁵ The importance of self-efficacy in understanding how individuals adjust to a variety of pain conditions has been documented by both cross-sectional and longitudinal studies of individuals with persistent pain. These studies demonstrate that (1) patients vary considerably in their self-efficacy and (2) patients reporting higher levels of self-efficacy have lower levels of pain as well as lower levels of psychological distress and negative medical outcomes.^{11,12,49,66,87} Furthermore, there is growing evidence that improvements in self-efficacy are related to positive short- and long-term outcomes of pain coping skills training and educational self-help interventions.^{46,47,68,106}

Self-efficacy is typically assessed by using a questionnaire method that is collected at one point in time (eg, during a clinic visit). Are ratings of self-efficacy collected in such a cross-sectional fashion meaningfully related to daily pain, mood, and pain coping? Lefebvre et al⁵⁸ addressed this question in a study of 128 patients with persistent pain caused by rheumatoid arthritis. All patients completed diaries for 30 days in which they provided daily ratings of pain, mood, pain coping strategies, and coping efficacy. They then participated in a clinical evaluation session during which a measure of self-efficacy (the Arthritis Self-Efficacy Scale⁶⁶) and measures of demographic and medical status variables were collected. Regression analyses revealed that self-efficacy, as measured in the clinical evaluation session, was significantly related to daily ratings of pain, mood, coping, and coping efficacy, even after taking into account the effects of important demographic and medical status variables. These results suggest that self-efficacy ratings collected from patients with arthritis at the time of an evaluation session are meaningfully related to recent experiences of daily pain and mood, as well as to the daily use and perceived effectiveness of pain coping strategies. Taken together, they support the validity of questionnaire measures of self-efficacy and support their use as an efficient method of gathering data in clinical settings.

Do reports of self-efficacy for clinical pain relate to how patients judge laboratory pain stimuli? We examined this possibility in a study of 40 patients with persistent osteoarthritic knee pain.⁴⁹ All patients provided reports of their self-efficacy for controlling arthritis pain and then participated in an experimental session in which their threshold and tolerance for thermal pain were assessed along with ratings of the intensity and unpleasantness of a range of discrete thermal stimuli. Results showed that, when tested in the laboratory setting, patients who had rated their self-efficacy for managing their clinical pain as high exhibited significantly higher pain thresholds and pain tolerance than patients who rated their self-efficacy for controlling clinical pain as low. Those scoring high on self-efficacy for clinical pain also rated the laboratory thermal pain stimuli as significantly less unpleasant.

Patients' perceptions of their self-efficacy in managing pain might not be shared by their caregivers.⁹⁶ When caregivers overestimate the patients' self-efficacy in pain control, they might fail to provide necessary emotional

or physical assistance. On the other hand, when caregivers underestimate the patient's self-efficacy in pain control, they might respond in a solicitous fashion that fosters an overly dependent adjustment to pain. Porter et al⁹⁶ recently conducted a study of 30 patients with lung cancer in which they systematically assessed the degree of correspondence between patients with lung cancer and their family caregivers in their perceptions of the patients' self-efficacy for managing pain and other symptoms. The results revealed that there was considerable discordance between ratings of patient self-efficacy provided by patients and those provided by caregivers. When caregivers overestimated the patient's self-efficacy, the caregiver reported much higher caregiver strain, and the patient was much more likely to report high levels of pain, other symptoms, and a poorer quality of relationship with the caregiver. These results suggest that patients' perceptions of their own self-efficacy in pain management might not always be shared by others, and that when there is a large discordance between patient and caregiver perceptions about the patient's self-efficacy, both patient and caregiver might be coping more poorly.

Comment

On the whole, recent evidence provides strong support for the importance of self-efficacy in understanding pain. The consistency of effects across a broad range of populations is impressive. Also noteworthy is that investigators have begun to address the social context of self-efficacy, ie, how self-efficacy of the patient relates to ratings of the patient's self-efficacy provided by significant others. From a clinical perspective, self-efficacy is a particularly appealing psychological concept for several reasons. First, it draws attention more to a patient's strengths than to his or her weaknesses or pathologic condition. Second, self-efficacy can be enhanced by using specific techniques drawn from social cognitive theory.⁴ These include modeling, mastery experiences, and social reinforcement.

Critics of self-efficacy measures have raised the possibility that the relationship between self-report measures of self-efficacy and pain might simply reflect within-subject general self-reporting similarities. As noted earlier, however, there is evidence that self-efficacy not only relates to self-reported measures of pain but also to more objective measures, such as observed pain behavior and the perception of controlled, thermal laboratory pain stimuli.^{12,13,49,87}

There are several important directions for future research on self-efficacy. First, there is a need to develop treatment protocols specifically designed to enhance self-efficacy in patients whose motivation for managing pain is low because they lack confidence about their abilities. Jensen et al⁴¹ have recently described a number of motivation enhancement interventions that might be particularly beneficial for patients with low self-efficacy for control of pain. Second, self-efficacy might have an important impact on how patients cope with their pain. Future studies need to examine the relationship of self-

efficacy to the use and perceived effectiveness of a variety of cognitive and behavioral pain coping strategies.

Pain Coping Strategies

During the past 2 decades, one of the most active areas of psychosocial research has been studies of pain coping strategies.^{32,33,58} Faced with persistent pain, individuals learn and utilize a variety of strategies to help them cope or deal with the pain.¹⁰² A variety of measures have been developed or adapted to assess pain coping strategies. These include the Coping Strategies Questionnaire (CSQ),^{40,102} Vanderbilt Multidimensional Pain Coping Inventory,¹⁰⁹ and the Ways of Coping Inventory.²³ Numerous studies have been conducted with these measures, and their results support several conclusions: (1) pain coping strategies can be reliably assessed, (2) patients vary considerably in the use and perceived effectiveness of their pain coping efforts, and (3) variations in pain coping are significantly related to pain, psychological distress, physical function, and pain behavior.^{42,59,123}

Most research on pain coping has relied on cross-sectional measures of pain coping. These measures require patients to provide retrospective reports on their pain coping and might fail to capture important day-to-day variations in coping processes. A major thrust in recent coping studies has been to examine coping by using diary records collected on a daily basis. Several recent studies in the pain coping area have used the Daily Coping Inventory,^{43,114} a measure specifically designed for capturing daily assessments of a number of commonly used coping strategies: pain reduction effort, relaxation, distraction, redefinition, venting emotions, seeking emotional support, and seeking spiritual comfort. This measure has been used to obtain pain coping reports at the end of the day³ and up to 7 times per day.¹⁹ In one of the first pain coping studies using this measure, Affleck et al³ reported that patients with rheumatoid arthritis complied quite well with the requirement of completing each diary daily and mailing it in daily during a 75-day period. Substantial variations in daily coping were evident, with those showing the highest level of coping effort exhibiting a pattern of decreasing pain during the recording period.

One advantage of daily diary recording is that one can use sophisticated within-subjects analyses to examine how coping on one day affects pain and mood on the next day. Along these lines, Keefe et al⁴³ found that patients with rheumatoid arthritis who reported high coping efficacy on one day reported much lower levels of pain the next day. In a study of patients with osteoarthritis and rheumatoid arthritis, Affleck et al² found gender differences in lagged effects of coping; after a day of intense pain, men were much more likely to report an increase in negative mood than women. Daily assessments of pain coping need not be restricted to the range of coping strategies assessed by the Daily Coping Inventory. A recent study conducted in our laboratory used a daily diary methodology to

assess the use of positive and negative religious and spiritual pain coping strategies.⁴⁴

Comment

Coping has received much attention in the pain literature because of this concept's potential link to the psychological management of pain. Whereas earlier studies tended to assess coping by using cross-sectional questionnaire methods, there is a clear trend toward the use of daily diary methods that enable one to better capture the dynamic process of pain coping. A number of pain coping studies are now underway that are using Ecological Momentary Assessments (EMA) collected by using handheld personal data assistants (PDAs). This methodology helps enhance compliance and provides precise information on time and date of diary entries.^{8,113,115} To date, studies of coping have focused on a relatively limited range of cognitive and behavioral pain coping strategies. The work of Stanton et al^{111,112} on emotion-focused coping and breast cancer adjustment has shown that past coping scales measuring emotion-focused coping have been confounded by negative emotion-focused coping items, and that assessing emotion-focused coping by using items that do not include these confounds can lead to new insights about coping and adjustment to chronic disease.

Readiness to Change

A hallmark of psychosocial treatment programs for persistent pain is their insistence that patients need to take an active role in learning to manage their pain. Clinical observations, however, suggest that although some patients might be ready to engage in self-management efforts, others are not.⁴¹ The transtheoretical model developed by Prochaska et al⁹⁷ is a stage model that can be used to describe where individuals are in terms of their readiness to change their behavior. The model proposes that an individual can be at 1 of 5 stages: (1) precontemplation, not intending to change; (2) contemplation, intending to change in the foreseeable future; (3) preparation, intending to change in the immediate future; (4) action, making overt efforts to change; or (5) maintenance, working to stabilize behavior change.

Several recent studies have applied the transtheoretical model to patients with persistent pain. Kerns et al⁵⁵ were the first to develop and validate a questionnaire measure (the Pain Stages of Change Questionnaire [PSOCQ]) specifically designed to assess readiness to adopt a self-management approach to pain. Factor analysis of PSOCQ data collected from 269 patients with chronic pain revealed 4 factors consistent with the transtheoretical model (precontemplation, contemplation, action, and maintenance). Each of these factors was internally consistent and showed good stability over time. Scores on the PSOCQ scales were also found to relate to measures of coping, control, and a staging checklist in a manner predicted by the transtheoretical model.

Several studies have examined the degree to which readiness to change is related to treatment engagement

and outcome. With the PSOCQ, Biller et al⁷ found they could predict enrollment and completion in a 10-session cognitive-behavioral treatment program based on patients' scores on the precontemplation scale. Patients who scored low on this scale were significantly less likely to complete treatment, and scores on this measure correctly identified 61% of patients who completed treatment. Kerns and Rosenberg⁵⁴ also reported that the PSOCQ could predict treatment dropout and outcome in 109 patients with chronic pain treated in a behaviorally oriented outpatient treatment program. Patients who completed treatment scored significantly higher on the contemplation scale and significantly lower on the precontemplation scale of the PSOCQ than those who did not. This suggests that those who were actively contemplating a self-management approach were much more likely to complete a psychological treatment program. Although pretreatment scores on the PSOCQ did not predict treatment outcome, increases in scores on the Action and Maintenance scales of this instrument occurring during the course of treatment were significantly related to outcome. This suggests that patients who, as a result of treatment, became actively engaged in self-management efforts were much more likely to show improvements than those who did not.

In a study of 74 patients with osteoarthritis and 103 patients with rheumatoid arthritis,⁴⁸ we used cluster analysis to identify homogeneous subgroups of patients with persistent arthritis pain based on their responses to a readiness to change questionnaire. Data analysis showed that there were 5 distinct and replicable subgroups: (1) precontemplation, 44% of the sample; (2) contemplation, 11% of the sample; (3) preparation, 22% of the sample; (4) unprepared action, 6% of the sample; and (5) prepared maintenance, 17% of the sample. These findings are potentially important because the arthritis patients in different subgroups might require different approaches to training in pain coping and self-management techniques.

Comment

The studies reviewed above suggest that the readiness to change concept shows promise as a way to understand engagement in and response to psychosocial interventions. Readiness to change is based on a comprehensive theory of behavior change, is appealing from a clinical perspective, and appears to be amenable to assessment in a reliable and valid fashion. However, several recent studies have raised questions about the utility of this concept when applied to patients with persistent pain. Jensen et al⁴¹ conducted a study of 119 patients with fibromyalgia that provided support for the reliability of the PSOCQ, but it failed to find evidence that the instrument could classify patients into distinct stages. Contrary to prediction, the stages of change groups identified did not differ significantly on several of the PSOCQ scales and on measures of beliefs and pain coping. Habib et al³¹ reported similar findings in a recent study of 90 patients with pain drawn from a primary care clinic. This study reported unexpected findings such as (1) individuals in

the action stage used daily analgesics as their primary coping strategy and (2) 27% of those in the maintenance stage had further surgery planned, 37% used narcotics as their primary coping strategy, and 16% used marijuana to manage their pain. Taken together, these findings raise questions about the clinical utility of readiness to change measures such as the PCOQ, particularly with regard to treatment planning. One problem these authors^{31,41} and others²⁰ have mentioned is that the items on this instrument are not specific enough with regard to the type of self-management that patients are willing to undertake. When completing such an instrument, patients might be responding in terms of their readiness to take medication, whereas those administering the measure might be interpreting the responses in terms of readiness to engage in more psychologically oriented treatment approaches (eg, engaging in behavioral activation or cognitive pain coping strategies). In the future, researchers need to give further thought to the meaning of the readiness to change concept as applied to persistent pain and develop and validate measures accordingly.

Acceptance

Although pain coping strategies can be helpful in patients with persistent pain, clinical observations and research findings suggest that in some cases patients' lives become dominated by unsuccessful efforts to cope with and control pain.⁸⁸ The struggle to control persistent pain can become so all encompassing that patients neglect other valued aspects of their lives such as family, friends, work, and leisure. In such instances, a balance of change and acceptance efforts might be particularly useful; change is used where it is likely to work, and acceptance is used when change efforts are not likely to succeed. In the context of persistent pain, acceptance has been defined as "an active willingness to engage in meaningful activities in life regardless of the experience of pain-related sensations, thoughts, and related feelings that might otherwise hinder such engagement." (McCracken et al, unpublished data).

Recent studies by McCracken and his colleagues suggest that acceptance of pain is related to improved adjustment to persistent pain. With the Chronic Pain Acceptance Questionnaire (CPAQ),⁷⁷ they assessed acceptance of pain in a sample of 160 patients with persistent pain. Regression analyses showed that even after controlling for current pain intensity, patients scoring high on acceptance reported significantly lower levels of pain-related anxiety and avoidance, depression, and physical and psychosocial disability and higher levels of daily time up and out of work and better work status. A later study of 190 patients with persistent pain⁷⁹ found that acceptance, as measured by the CPAQ, successfully discriminated patients classified on the basis of their Multidimensional Pain Inventory profiles as "dysfunctional" versus "adaptive copers." These findings regarding acceptance are particularly noteworthy because they were obtained even after controlling for pain intensity and depression. In another recent study by this group, McCracken and

Eccleston⁷⁸ compared the predictive utility of a measure of acceptance of pain (the CPAQ) and a measure of pain coping (the Coping Strategies Questionnaire¹⁰²) in a sample of 230 patients recruited from a university-based pain management program. Correlational analyses showed that both the acceptance and coping measures were related to pain and measures of adjustment (depression, physical disability, psychosocial disability, pain-related anxiety). Two sets of regression analyses were then conducted, one in which the coping variables were entered before the acceptance variables and another in which acceptance variables were entered first. When the coping variables were entered first, coping explained an average of 15% of the variance in measures of adjustment, and acceptance explained an average of 13% of the variance. When the acceptance variables were entered first, however, acceptance was found to explain much more variance in measures of adjustment (average, 24%) than coping (average, 4.6%). It should be noted, however, that this study failed to include the catastrophizing scale of the Coping Strategies Questionnaire in the predictive analyses. This is unfortunate, because catastrophizing is one of the scales that is most highly and consistently predictive of adjustment, and it is a variable that might explain some of the same variance in outcome that is explained by acceptance. Finally, McCracken et al (unpublished data) have reported that acceptance of pain is also related to important health care utilization outcomes including fewer visits to health care providers for pain and fewer analgesic medications.

Comment

The systematic study of acceptance of pain is a relatively recent development fueled in part by the development and validation of a pain acceptance measure (the CPAQ⁷⁷). The findings reported by McCracken and his colleagues, as well as those of other recent studies,¹³⁸ underscore the potential importance of acceptance in understanding how individuals adjust to pain. An impressive aspect of these findings is that they are not explained by pain intensity. One might expect that pain that is less severe is easy to accept, and that as a result, the ability to accept pain might simply be a reflection of pain intensity. The findings, however, suggest that even when pain intensity is controlled for, acceptance remains an important predictor of depression, pain-related anxiety, physical disability, and psychosocial disability.

From a clinical perspective, there are certain potential pitfalls to the use of the term *acceptance* in understanding persistent pain. Patients might misinterpret this term to mean that they simply have to resign themselves to pain. Acceptance, however, is not appropriate when pain is controllable, but rather it is useful in situations in which pain cannot be easily controlled and in which repeated struggles to free oneself from pain interfere with the process of adjustment. Clinicians also need to be cautious in assuming that acceptance is a stage that a patient either has reached or has not. Acceptance is a dynamic, moment-to-moment process that might be more evident at some times than at others.

Recent theoretical and clinical developments^{32,60,127} have led to increasing interest in the use of acceptance-based interventions for patients with persistent pain. Kabat-Zinn and his colleagues have conducted several uncontrolled studies that suggest that a meditation-based protocol designed to enhance acceptance can produce significant short-term improvements in pain, as well as short- and long-term improvements in activity level, mood, body image, and medication. To our knowledge, no well-controlled studies of acceptance-based interventions have been conducted for patients with persistent pain, although randomized, controlled studies have shown that these interventions are helpful for patients with cancer,¹¹⁰ depression,¹²⁶ and marital distress.³⁷ Acceptance-based methods are increasingly being incorporated into pain management programs, and future studies are needed both to test the efficacy of these methods and to identify those patients who are most likely to benefit from them.

Behavioral and Psychosocial Interventions for Chronic Pain

During the past 20 years, numerous studies have demonstrated that behavioral and psychosocial protocols can benefit patients with persistent pain. Systematic reviews and meta-analyses support the efficacy of these protocols in improving the management of low back pain,¹³⁷ arthritis pain,^{51,88} cancer pain,^{121,150} tension headache and migraine headache,³⁴ and mixed chronic pain syndromes.⁸² Building on this foundation, researchers have begun to address important new areas of treatment research including early intervention, tailoring treatment, telephone/Internet-based interventions, caregiver-assisted treatment, and exposure-based protocols.

Early Intervention

All too often, patients who are referred for pain management have long histories of pain and entrenched, maladaptive patterns of pain coping. Recently, there has been growing recognition of the importance of early identification and treatment of patients who are at risk for chronic pain. Is there evidence that early intervention is effective? Marhold et al⁷⁰ conducted a study in which they examined the efficacy of cognitive-behavioral intervention for women who had been out of work because of musculoskeletal pain either for a short time period (2 to 6 months) or long time period (more than 12 months). The treatment protocol included educational information about pain, training in pain coping skills such as relaxation, graded activation, and pacing, and training in methods for generalizing these skills to challenging occupational tasks. Data analyses showed that, for women who had been out of work for a short period of time, the cognitive-behavioral intervention was significantly more effective than a control condition in reducing days of sick leave, improving activity level, and enhancing coping. However, the same cognitive-behavioral intervention had no significant effect for women who had been out of work for a long time period. These findings support the notion that intervening

early in the course of musculoskeletal pain is more likely to be effective than intervening late.

There is growing recognition that early intervention might be especially important in the treatment of medical disorders that are painful.^{62,98} The medical management of rheumatoid arthritis, for example, now emphasizes early and aggressive management of the disease so as to prevent joint destruction.^{26,105} Behavioral and psychosocial interventions for disease-related pain, however, are often turned to as a last resort. A recent, well-controlled study examined whether early cognitive-behavioral intervention could be helpful in patients with recent-onset rheumatoid arthritis. In this study, Sharpe et al¹⁰⁵ randomized 53 patients with rheumatoid arthritis whose disease was less than 2 years in duration to a cognitive-behavioral therapy protocol focused on training in coping skills plus usual medical care or a usual medical care alone condition. Data analysis showed that, relative to the usual medical care alone condition, patients in the coping skills training condition showed significant improvements in depressive symptomatology and joint involvement. These patients also showed a reduction in C-reactive protein levels after treatment, indicating an improvement in their inflammatory status. These findings suggest that early cognitive-behavioral intervention can produce improvements in psychological and physical outcome above and beyond what can be achieved by medical care alone.

Comment

Early intervention has the potential to prevent the suffering and psychological distress associated with persistent pain. The study by Marhold et al⁷⁰ reviewed above is noteworthy in that it suggests that timing is important. Interventions delivered during the first few months after pain onset are more effective than those delivered much later. The fact that early intervention has now been shown to help not only patients with musculoskeletal pain but also patients with rheumatoid arthritis¹⁰⁵ is interesting. What is the impact of early intervention on the underlying biological course of a painful disease? How does early intervention alter the responses of significant others and health care professionals to the person experiencing pain? Future studies need to address these questions.

One of the most challenging aspects of early intervention is having this service reimbursed. At this point, insurance reimbursement for psychological treatments for pain is limited and, when available, primarily provided to those whose pain is long-standing and disabling. It might be more cost-effective, however, to intervene much earlier in the course of a pain condition. Who is likely to benefit from or need such early intervention? Waddell¹⁴⁶ described a series of “yellow flags,” or warning signs, that indicate patients might be prone to developing maladaptive responses to persistent pain. Included among the comprehensive list of yellow flags are attitudes and beliefs (ie, catastrophizing, believing that all pain must be gone before returning to work, having a passive attitude to rehabilitation, and believing that

pain is harmful), behaviors (poor sleep quality, avoiding normal activity, disproportionate amount of downtime, smoking, high alcohol intake, and extreme pain reports), emotions (feelings of helplessness, uselessness, anxiety, and fear of increased pain), and family responses (overprotective family members or lack of social support). The yellow flag approach to identifying at-risk patients has received a great deal of attention internationally, and its efficacy is currently being tested in prevention trials being conducted in several countries.

Tailoring Behavioral and Psychosocial Treatments

As discussed in the first section of this article, there is substantial evidence to support the notion there are individual differences in how patients cope with and adjust to persistent pain. Along these lines, research studies have shown that homogeneous and replicable subgroups of patients can be identified within heterogeneous populations of persons with persistent pain. Researchers have identified patient subgroups based on personality factors⁹ and pain behaviors.⁴⁵ Recognition of individual differences in how patients respond to pain has increased interest in designing treatments to best match patients' needs.

Much of the research on patient subgroups has been based on the West Haven–Yale Multidimensional Pain Inventory (MPI⁵⁶). In one of the first studies with this instrument, Turk and Rudy¹³³ identified 3 subgroups based on patients' responses to the MPI: (1) a dysfunctional group (DYS) made up of patients who reported higher levels of pain severity, pain interference, and psychological distress and lower levels of activity; (2) an interpersonally distressed group (ID) made up of patients who reported low levels of social support; and (3) an adaptive copier group (AC) made up of patients who reported lower levels of pain and pain interference and higher levels of social support and activity. As noted in a recent review,¹³¹ these 3 subgroups of patients now have been replicated in patient samples with a wide array of persistent pain conditions.^{39,69,122}

Several studies have shown that the MPI subgroups identified by Turk and others do predict how patients with persistent pain respond to treatment. Rudy et al¹⁰³ examined the degree to which MPI subgroup membership predicted the response of patients with temporomandibular disorder to a treatment protocol involving biofeedback, stress management, and an intraoral appliance. Data analyses showed that, when compared to patients in the AC and ID groups, patients in the DYS group showed significant decreases in pain, pain interference, and depression during the course of treatment. In a study of patients with fibromyalgia, Turk et al¹³⁰ also found that MPI subgroup membership predicted response to a multidisciplinary pain treatment. As in the earlier study, patients in the DYS group showed the best outcomes, whereas those in the ID and AC groups showed few improvements during the course of treatment. These findings, along with those of other re-

searchers,¹³² provide strong empirical support for the notion that treatment protocols might not be uniformly effective for all patients and suggest that psychosocial treatments that are tailored to address specific needs of a particular patient subgroup (eg, high levels of dysfunction) might be particularly effective for patients in that subgroup.

Another approach to tailoring treatment is to base components of a psychosocial or behavioral treatment protocol on patient's priorities and preferences. Evers et al²² tested the effects of such a tailored approach in a study of 64 patients with early rheumatoid arthritis (less than 2 years since diagnosis). Patients in this study were randomly assigned to either a tailored cognitive-behavioral therapy protocol or standard medical care. Patients assigned to the tailored cognitive-behavioral therapy condition had the opportunity to tailor their treatment by indicating which 2 of 4 possible training modules they wanted to focus on (pain and functional disability, fatigue, negative mood, social relationships). Patients in the standard medical care condition continued with their routine medical care. Data analyses showed that the tailored cognitive-behavioral therapy group had a number of significant short- and long-term benefits when compared to standard medical care. Specifically, patients receiving the tailored treatment reported significantly lower levels of fatigue, depression, and helplessness and higher levels of active coping, social support, and compliance with medication. These results suggest that tailoring a psychosocial intervention on the basis of patient choices might be effective. A limitation of this study, however, is that it did not include a group of patients who were assigned to receive standard cognitive-behavioral therapy against which one could compare the effects of tailored cognitive-behavioral therapy.

Comment

Although research identifying subgroups of pain patients has been conducted for some time,^{10,45,131} less research has been done applying this knowledge to clinical practice. To date, treatments have been tailored primarily on the basis of MPI subgroups or patient preferences/priorities. Treatment protocols, however, potentially can be tailored on the basis of a number of factors including demographic factors (eg, age, gender, race/ethnicity), medical factors (disease stage, duration of pain), or any of the psychological factors discussed in the first part of this article. The idea of treatment tailoring has clinical appeal and could result in reduced costs. Given the initial positive findings reviewed above, future studies should investigate the efficacy of a much broader range of tailored treatment protocols.

Telephone and Internet-Based Treatment

One active area of research is developing alternatives to the traditional face-to-face format of delivering treatment. Many patients lack access to the tertiary care centers in which most psychosocial treatments are delivered. The need to attend multiple treatment sessions, limited

mobility of patients with pain, distances required to travel, and costs of treatment prevent many individuals from seeking psychosocial treatment.

Weinberger et al¹⁴⁸ were among the first to explore the benefits of telephone-based interventions for patients with pain. In this uncontrolled study they found that a 6-month series of biweekly telephone calls focused on a review of pain symptoms, medication, and educational information produced significant improvements in functional status that persisted up to 6 months after the calls ceased. A subsequent randomized study compared the efficacy of delivering a similar intervention by telephone versus in an office setting. Data analyses showed that at 1 year, patients receiving the telephone-based intervention exhibited significant improvements in physical disability and pain and a trend toward improvement in psychological disability, whereas patients receiving the office-based intervention showed none of these improvements.^{101,149}

The Internet provides another vehicle that can increase patients' access to psychosocial intervention. Lorig et al⁶⁷ conducted a randomized study testing the efficacy of a moderated, e-mail discussion group in the management of chronic low back pain. Participants in the e-mail discussion group received all e-mail messages sent by group members along with periodic postings by experts in back pain (a physician, physical therapist, and psychologist). They also received a copy of a back pain self-help book and videotape about back pain. Data analyses showed that participants in the e-mail discussion group exhibited significant improvements in pain, disability, role function, and health distress as well as a downward trend in physician visits.

Comment

Available evidence suggests that telephone- and Internet-based interventions can be effective. Significant short- and long-term effects have been reported. These interventions offer flexibility and ease of patient access. However, the number of randomized studies testing the efficacy of these interventions in individuals with persistent pain is limited. Future studies need to include a wider range of interventions and study populations. In the absence of face-to-face interaction, it might be challenging to teach patients certain psychological interventions by telephone or Internet (eg, social skills training or relaxation training). Nevertheless, given the growing popularity of telemedicine approaches, there is a clear need to develop and test novel telephone and Internet approaches for delivering psychological interventions.

Caregiver-Assisted Treatment

On the basis of the notion that pain is not only a problem for patients but also for their spouses/partners or caregivers, we have conducted several studies testing the efficacy of spouse- or partner-assisted training in pain coping skills. In one study,^{46,47} we compared the effects of a spouse-assisted pain coping skills protocol with a more conventional (patient only) coping skills training

protocol and an arthritis education–spousal support condition. Patients in both coping skills interventions had significant immediate improvements in pain, psychological disability, self-efficacy, and marital satisfaction. The general pattern of findings supported the superiority of spouse-assisted training, with patients in this group showing the best outcomes, those in the conventional coping skills training the next best outcomes, and those in the arthritis education–spousal support condition the poorest outcomes. This pattern of findings was generally supported at 6-month and 12-month follow-up.

We have recently completed a study testing the efficacy of a partner-guided cancer pain management protocol for patients who are at end of life (unpublished data). In this study, 78 patients with advanced cancer meeting criteria for hospice eligibility and their caregivers were randomly assigned to usual care or a caregiver-guided pain management training intervention that provided educational information about cancer pain and systematic training in cognitive and behavioral pain coping skills. The caregiver-guided pain management intervention produced significant increases in caregivers' ratings of their self-efficacy for helping the patient control pain and their self-efficacy for helping the patient control other symptoms. Caregivers receiving this intervention also tended to report reductions in their levels of caregiver strain. Overall, the results of this preliminary study suggest that a caregiver-guided pain management protocol might have benefits in helping caregivers cope with cancer pain at end of life.

Comment

Caregiver-assisted psychological interventions have several potential strengths. First, they attempt to address how the social context can influence pain and pain management. Second, they have the potential of not only benefiting the patient but also the caregiver. Relatively few well-controlled studies have been conducted. There is a need to test the efficacy of caregiver-assisted interventions in a broader range of pain conditions. Another important direction for future research is identifying those dyads who are most likely to benefit from such intervention. Couples who prefer a communal style of coping with pain might be particularly likely to benefit from such a dyadic approach to treatment. Those with a poor relationship and poor communication skills, in contrast, might not respond as well.

Exposure-Based Protocols

Evidence that pain might lead to patterns of behavioral and cognitive avoidance^{18,91,120,145} has led to interest in exposure-based protocols. These protocols encourage patients with persistent pain to confront and expose themselves to behaviors, thoughts, or feelings that they typically avoid. The basic notion is that with exposure comes a reduction in fear and emotional distress with a resulting improvement in pain and disability.

Two novel, exposure-based protocols have been developed and tested during the past 10 years. The first pro-

tol, graded exposure in vivo, involves having patients intentionally expose themselves to physical movements that they avoid because of fear of pain.¹⁴³ This protocol is quite detailed and involves (1) questionnaire assessments of pain-related anxiety and fear, (2) an intensive interview to identify specific negative thoughts contributing to fears, (3) the use of photographs of daily activities to develop fear hierarchies, (4) physician education including a detailed review of diagnostic test results, and (5) exposure sessions in which the patient engages in feared activities, starting with those that are least anxiety provoking and proceeding to those that are most anxiety provoking.

The efficacy of graded in vivo exposure in the treatment of chronic low back pain has been tested in a series of studies conducted by Vlaeyen and his colleagues. Two studies used single case crossover designs in which baseline performance was compared to performance during a graded exposure intervention and an activation intervention designed to increase overall level of activity.^{140,141} The order of the 2 interventions was randomized across patients. All 10 patients with chronic low back pain who participated in these studies exhibited very high levels of fear of movement and reinjury before intervention. Results indicated that whenever graded exposure was introduced, patients exhibited substantial improvements in pain-related fear, disability, and activity level. These results were maintained during the activation intervention. Similar effects have been reported in 2 case studies each involving 2 patients with chronic musculoskeletal pain.^{63,142} Taken together, these results are quite impressive and support the need for future randomized, controlled studies of graded exposure in vivo.

A second exposure-based protocol, emotional disclosure,⁵² seeks to have patients disclose and talk about their thoughts and feelings regarding particularly difficult and traumatic events that they avoid thinking about and have not discussed with others. The disclosure sessions are self-directed, so that patients can choose to focus on any topic they wish. The disclosure sessions are also done in private. The sessions usually last for 30 minutes and are conducted during a series of 4 days. During the sessions, the patient engages in disclosure by talking into a tape recorder or by writing. Kelley et al⁵² were among the first to test the effects of such a protocol in patients with persistent pain caused by rheumatoid arthritis. Results obtained at 3-month follow-up indicated that, compared to a control group, patients who had received the emotional disclosure intervention showed significant improvements in physical dysfunction and affective disturbance. Furthermore, patients who exhibited the largest increases in negative mood during their initial disclosure session (ie, for whom the task was particularly emotionally demanding) showed the best long-term outcomes in terms of improvement in joint function.

Comment

Exposure-based protocols are relatively new and have not been as thoroughly evaluated as other psychological treatments for pain. The graded in vivo exposure proto-

col developed by Vlaeyen and Linton¹⁴⁵ is developed from a theoretical model and has shown promising results in early studies with patients with musculoskeletal pain. Randomized clinical trials are needed to test this intervention more definitively and to determine its applicability to a broader range of pain conditions. The emotional disclosure protocol used by Kelley et al⁵² is also grounded in a conceptual model. Early results are consistent with those that have been achieved in laboratory studies and in clinical studies of other pain-free clinical populations.⁹⁰ Future research is needed to determine the degree to which such an emotional disclosure protocol can influence pain perception.

General Discussion

As we have seen, recent studies clearly indicate that there are a number of psychological factors that are associated with good and poor adjustment to persistent pain. The consistency of research findings for a number of the psychological factors depicted in Fig 1 is impressive. In particular, there is strong evidence from multiple studies to support the conclusion that pain catastrophizing and pain-related anxiety and fear are related to poor adjustment to pain and that higher self-efficacy and adaptive pain coping are related to improved adjustment to pain.

The studies cited in this article also clearly document that psychological treatment interventions can reduce pain and improve functioning in patients with persistent pain. Programmatic research testing the efficacy of psychological interventions is being carried out by a number of research groups. Increasingly, treatment outcome studies incorporate methodologic refinements including random assignment to treatment and control conditions, the use of psychometrically strong measures, assessments across important domains of adjustment (eg, pain, psychological distress, and physical disability), and sophisticated data analytic methods.

What is needed to advance this field? First, there is clear need to develop new conceptual models that attempt to integrate findings from studies in this area into a more comprehensive theory of adjustment to pain. There appears to be overlap among a number of the psychological concepts that are the focal points of current research. For example, patients who engage in pain catastrophizing might exhibit high levels of pain-related anxiety and fear and also report low self-efficacy and few coping efforts. In a given patient (or a given research study), which of these factors is likely to be most important? What is the temporal relationship among these factors? New theoretical models could guide clinicians and researchers in answering these questions. To our knowledge, several theorists and research programs are currently working on such models, and their efforts could be especially helpful in integrating knowledge in this area. In the interim, researchers need to be careful to provide a clear conceptual rationale for the concepts they are examining. Furthermore, whenever possible, investigators should measure potential overlapping psychological factors to determine the unique explanatory nature of the target factor they are studying.

Second, to foster better communication there is a need to develop clear and understandable definitions of psychological concepts. We recommend that a task force or working group be convened by one or more of the major scientific organizations to develop a taxonomy of commonly used psychological concepts such as catastrophizing, fear of pain, anxiety, and neuroticism. Such a taxonomy would have several benefits. First, it would foster the use of a common language among pain researchers and clinicians from varied disciplines. Second, it would improve understanding of psychological concepts and theories among nonpsychologists. Finally, it could encourage greater collaboration between psychologists and other pain specialists.

A third strategy for advancing this field is to conduct more research examining how psychological factors relate to the social context of persistent pain. Given the importance of the social context in behavioral²⁴ and psychological theories of pain,^{80,81} it is surprising that this area has received relatively little research attention. There is growing evidence that social factors can influence and be influenced by pain. Paulsen and Altmaier⁸⁹ examined the relationship of social support to pain behavior in patients with chronic lower back pain. Contrary to social support theory, but consistent with operant behavioral theory, they found that patients who reported that their spouses provided higher levels of social support displayed more pain behaviors while completing assigned tasks than did those patients reporting lower social support. These findings suggest that, in some patients, spousal social support might reinforce the display of pain behavior. The broader social context of pain, including cultural perceptions and assumptions about the pain experience, is also receiving increased research attention. Ng et al⁸³ investigated the relationship between a person's ethnicity and the prescribing of patient-controlled analgesia for postoperative pain. Data analyses showed that ethnic background was significantly related to the amount of medication prescribed, with physicians prescribing significantly higher levels of narcotic for blacks than Hispanics and significantly higher levels for whites than Hispanics. It is interesting that ethnic background related to physician prescribing of analgesic but not to the total amount of narcotic that was actually self-administered.

There is also evidence that psychological factors known to be important in understanding pain might be linked to social factors. For example, does pain catastrophizing have important interpersonal correlates? We examined this possibility in a recent study of 70 patients with pain caused by gastrointestinal cancer.⁵⁰ Data analyses showed that there was a significant relationship between pain catastrophizing and patients' ratings of instrumental support. Specifically, patients who engaged in higher levels of pain catastrophizing reported higher levels of instrumental support from their caregivers. These findings fit with a communal model of catastrophizing that maintains that catastrophizing represents an interpersonal form of coping whose aim is to maintain proximity to and support from others.¹¹⁹ Interestingly,

although patients who catastrophized reported higher instrumental support, they also experienced higher pain, and their caregivers reported higher levels of caregiver strain. This suggests that, although catastrophizing is a coping strategy that might address certain social needs, it is related to negative outcomes for both patients and their caregivers.

A fourth way to advance the field is to examine how psychological factors important in understanding persistent pain are linked to biological processes such as pain-related brain activation patterns. Developments in neuroimaging methodology have enabled researchers to study how cognitive factors such as attention and mood are related to neural activation.^{99,139} Neural imaging has also been used to study the anticipation of pain. Porro et al⁹⁵ conducted a functional magnetic resonance imaging study that showed that both pain and the anticipation of pain produced changes in a number of brain areas including the contralateral S1 and bilaterally in the anterior cingulate cortex (ACC), anterior insula, and medial prefrontal cortex. The changes in brain activation were similar for both pain and pain anticipation, except that the magnitude of changes was 30% to 40% lower during the anticipation of pain. Hsieh et al³⁶ have reported that brain activation during the anticipation of pain might depend on experience. Subjects who had participated in multiple practice sessions in which a pain stimulus was delivered showed decreased activity in the caudal ACC and subgenual ACC while waiting to receive the stimulus, whereas those who had not had this experience showed increased activity in the same areas. Emotional states such as anxiety can increase pain. Is the effect of anxiety on pain evident in different patterns of brain activation? Ploghaus et al⁹⁴ used functional magnetic resonance imaging to investigate brain activation responses to pain experiences that were increased by an anxiety manipulation (warning of a highly noxious stimulus). Results indicated that activation in the entorhinal cortex of the hippocampal formation differed depending on whether pain intensity was increased by the anxiety manipulation. Given evidence that cognitive and emotional factors can influence neural brain activation,

it is likely that neural imaging techniques can be used to study the influence of psychological factors such as pain catastrophizing or self-efficacy.

One of the most important avenues for neural imaging research is to examine the effects of psychological interventions on brain activation. Rainville et al¹⁰⁰ conducted an interesting neural imaging study in which they used hypnotic suggestions to selectively reduce the unpleasantness of pain, but not its sensory intensity. Results indicated that the hypnotic intervention altered activity in the ACC, suggesting that this brain area might be particularly important in influencing the emotional component of pain.

A final way to advance this field is to conduct more research on the mechanisms underlying the efficacy of psychological treatments for persistent pain. At this point there is evidence that psychological interventions can be effective, but why they work is not fully understood. Many of these treatments target the psychological factors listed in Fig 1. More research needs to be done to analyze how changes in these factors occurring during the course of psychological treatments are related to short- and long-term outcomes. Changes in certain psychological factors (eg, self-efficacy) could be much more important than changes in other factors (eg, acceptance.) This information is important because it could be used to tailor treatments so as to address more directly the key psychological changes that underlie treatment improvements. Psychological treatments for persistent pain also might work via behavioral mechanisms (eg, increasing activity level or changing interaction patterns between individuals and their social environment) or biological mechanisms (eg, altering descending pain control pathways). If we are to better understand how psychological treatments work, attention needs to be given not only to underlying psychological mechanisms but also to underlying behavioral and biological mechanisms.^{27,33,40,43,88}

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