

# Behavioral and Cognitive-Behavioral Approaches to Chronic Pain: Recent Advances and Future Directions

Francis J. Keefe  
Pain Management Program,  
Duke University Medical School

Julie Dunsmore and Rachel Burnett  
Duke University

Behavioral and cognitive-behavioral approaches to chronic pain are receiving increasing attention from researchers and clinicians. This article reviews and highlights recent research advances and future research directions. Assessment research reviewed includes studies examining the social context of pain, the relationship of chronic pain to depression, cognitive variables affecting pain, and comprehensive assessment measures. Treatment outcome studies reviewed are those evaluating the effects of behavioral and cognitive-behavioral treatments for chronic pain. These studies focus on comparisons of behavioral treatment with control conditions, comparisons of two behavioral treatments, and prevention of chronic pain. Future directions for assessment and treatment research are outlined.

Two major approaches to the assessment and treatment of chronic pain have evolved within the field of behavioral medicine over the past 15 years (Turner & Clancy, 1988). The first is a behavioral approach based on operant conditioning principles (Fordyce, 1976). This approach is designed to modify maladaptive pain behaviors (e.g., excessive dependence on bed rest, family members, or medications) by analyzing and changing their social and environmental contingencies. The second is a cognitive-behavioral approach that is based on recent theoretical developments in the cognitive and behavioral therapies (Turk, Meichenbaum, & Genest, 1983). The cognitive-behavioral approach focuses not only on behavior but also on cognitive and affective components of the pain experience. Cognitive-behavioral therapy is designed (a) to teach patients about the relation of pain to cognitive, affective, and physiological variables in order to help them reconceptualize their ability to control pain and (b) to teach patients skills that enable them to change the way they cope with pain.

Behavioral and cognitive-behavioral methods are increasingly viewed as important in the management of chronic pain. Physicians and health professionals find that behavioral and cognitive-behavioral assessments help them understand individual differences in how patients adjust to chronic pain. One result is that chronic pain patients who are poor candidates for conventional medical and surgical treatment are now being referred to specialized programs that emphasize the use of behavioral or cognitive-behavioral interventions (Osterweis, Kleinman, & Mechanic, 1987). Treatment methods such as social reinforcement, time-contingent medications, relaxation training, and instruction in imagery or distraction methods have

enabled many chronic pain patients to regain a more independent lifestyle. These methods are now being incorporated into many comprehensive treatment programs for chronic pain (Keefe, Gil, & Rose, 1986).

Behavioral and cognitive-behavioral perspectives on chronic pain not only have had a major impact on the clinical management of pain but also have stimulated a great deal of research (Keefe & Williams, 1989). This research has advanced our understanding of pain and enhanced our ability to effectively treat patients suffering from chronic pain. This article reviews some of the most important recent advances in the assessment and treatment of chronic pain. It concludes with recommendations for future research.

## Advances in Chronic Pain Assessment

Research on the assessment of behavioral and cognitive-behavioral factors affecting chronic pain has grown rapidly over the past 10 years. Four areas of assessment research are particularly important because of their implications for treatment. These are (a) the social context of pain, (b) the relationship of chronic pain to depression, (c) cognitive variables affecting the pain experience, and (d) comprehensive assessment measures.

## *Social Context of Chronic Pain*

A major tenet of the behavioral approach to chronic pain is that pain occurs in a social context (Fordyce, 1976). The behavior of a chronic pain patient not only is reinforced and shaped by others but also influences and shapes the behavior of others. Because of the reciprocal nature of these influences, behavior therapists have long advocated involving spouse and family members in treatment. Teaching these individuals to prompt and reinforce adaptive "well" behaviors while minimizing at-

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Correspondence concerning this article should be addressed to Francis J. Keefe, Pain Management Program, Box 3159, Duke University Medical Center, Durham, North Carolina 27710.

tention to pain behavior is a major goal of behavioral programs for chronic pain.

*Research findings.* Recent studies underscore the importance of the social environment in understanding chronic pain. These studies have used several different research strategies. One strategy has been to focus on perceptions of social support. Some studies (e.g., Jamison & Virts, 1990) have found that chronic pain patients who report high levels of social support adapt to pain effectively in that they are more active and have lower levels of psychological distress and pain medication. Other studies, in contrast, have found that chronic pain patients who are highly satisfied with their social support do not appear to be functioning well in that they show high levels of pain behavior when asked to perform simple daily tasks such as sitting, walking, or reclining (Gil, Keefe, Crisson, & Van Dalfsen, 1987). A second research strategy for studying the social context of chronic pain has been to ask patients and/or their spouses about their marital relationship. Chronic pain patients and their spouses generally rate their marital satisfaction as low (Flor, Turk, & Scholz, 1987). Those patients who do report being satisfied with their marital relationship have lower levels of depressive symptoms (Kerns, Haythornthwaite, Southwick, & Giller, 1990).

Although patients' perceptions of their social or marital relationships are important, behavioral theorists maintain that an analysis of specific social interaction patterns is usually more revealing. Several investigators have studied how different types of spousal responses to pain behavior may relate to patients' pain and disability. Flor, Kerns, and Turk (1987) used a questionnaire to assess the degree to which spouses engaged in solicitous, distracting, critical, or punishing responses. Patients whose spouses ignored or responded negatively to their pain behaviors had higher activity levels. Patients whose spouses were overly solicitous had higher levels of pain and lower levels of activity. One of the most interesting findings emerging from this study concerns the emotional adjustment of spouses who were rated as solicitous. Although solicitous spouses reported the patients' pain interfered greatly with their own lives, they also reported more positive mood, greater perceived life control, and less distress.

A study by Flor, Turk, and Rudy (1989) suggests that the relationship of significant others' reinforcing behavior and patients' pain is complex and may be mediated by gender, marital status, and marital satisfaction. This study found a much stronger correlation between reinforcing responses and pain-related dysfunction in married than in unmarried men. The reverse was found for female patients. Flor et al. (1989) also found a much stronger correlation between reinforcing behaviors and pain-related dysfunction in individuals of both genders who reported high levels of marital satisfaction.

One of the most innovative strategies for studying the social context of chronic pain is an observational methodology developed by Romano and her colleagues (Romano, Turner, Friedman, et al., 1991). Videotaped behavior samples were obtained from chronic pain patients and their spouses ( $n = 50$  couples) as well as a group of healthy controls ( $n = 33$  couples). The behaviors of both partners were recorded as they performed a series of routine household activities: sweeping a floor, bundling newspapers, and changing a bed. The data supported an oper-

ant model of patient-spouse interaction in that (a) the chronic pain patients showed higher levels of verbal and nonverbal pain behavior than did the control subjects and (b) the spouses of chronic pain patients showed more solicitous behavior and lower levels of facilitative behavior (e.g., compliments, praise) than did the spouses of control subjects.

*Comment.* Analyzing the social context of chronic pain clearly can help clinicians better understand patients' adjustment. The recent development of a methodology to observe patient-spouse interactions is important. It will enable investigators to analyze sequences of behavior and establish whether there are functional relationships between pain behaviors and spousal solicitous or punishing responses. Additional research is needed to identify determinants of spousal responses to pain. Recent data by Ahern, Slater, Adams, and Follick (1991) suggests that spouses' personality traits predict treatment outcome. Patients whose spouses had elevations on the Hypochondriasis and Hysteria scales of the Minnesota Multiphasic Personality Inventory (MMPI; Dahlstrom, Welsh, & Dahlstrom, 1972) responded poorly to treatment. Incongruity between patient and spousal beliefs about chronic pain may also influence spouses' responses.

More research is needed to examine chronic pain's impact on children. Dura and Beck (1988) found that children of chronic pain patients tended to have lower social skills and more behavior problems, days absent from school, and days with illness complaints than did children of diabetic patients. In the future, behavioral programs may need to involve not only the spouses but also children of chronic pain patients. Another important area for research is the differential influence of spousal versus significant others' (such as adult children) responses to the patient's pain behavior.

### *Cognitive Variables and Chronic Pain*

The fastest growing area of research on the assessment of chronic pain deals with cognitive variables. The attention given to cognitive factors is probably not surprising given that recent surveys indicate that most practicing behavioral clinicians consider themselves to have a cognitive-behavioral orientation (Craighead, 1990). For a cognitive-behavioral therapist, an analysis of cognitive variables not only is important in understanding pain, affective distress, and behavior but also has important treatment implications. A careful assessment of cognitive responses to chronic pain can be used to identify targets for treatment, match cognitive interventions to the patients needs, and understand the cognitive mechanisms responsible for therapeutic improvement.

*Research findings.* A thorough review of the cognitive assessment research on chronic pain is beyond the scope of this article. To illustrate developments in this area we will highlight several research topics. One topic of great current interest is patient beliefs about pain. Chronic pain patients often come into treatment with erroneous beliefs about the cause and future course of their pain symptoms. Until recently, methods for assessing pain beliefs were lacking. Questionnaire measures, such as the Pain Beliefs and Perceptions Inventory (Williams & Thorn, 1989) and the Survey of Pain Attitudes (Jensen, Karoly, & Huger, 1987), now permit one to reliably assess a broad range

of patient beliefs about pain. Schwartz, DeGood, and Shutty (1985) also have devised an assessment protocol that uses a videotape to present information about pain management and assesses patients' beliefs about the usefulness of a variety of common pain management techniques. One reason for assessing pain beliefs is that they may predict response to treatment. Williams and Thorn (1989) found that patients who believed that their pain was likely to be a chronic condition failed to comply with physical therapy or behavioral therapy assignments.

Self-efficacy, or "people's judgments of their capabilities to execute given levels of performance and to exercise control over events" (Bandura, O'Leary, Taylor, Gauthier, & Gossard, 1987, p. 563), appears to be quite important in understanding acute and chronic pain. Bandura et al. (1987) found that individuals scoring high on a self-efficacy measure had a high tolerance for pain and also showed evidence of increased endogenous opioid activation when confronted with a painful stimulus. Studies of chronic pain patients have found that self-efficacy can predict the performance of physical movements such as leg raises (Council, Ahern, Follick, & Kline, 1988) and treatment outcome (Kores, Murphy, Rosenthal, Elias, & Rosenthal, 1985).

Locus of control is a cognitive variable that is receiving a great deal of research attention. Chronic pain patients differ in the degree to which they view themselves as having control over pain (internal control) versus other external factors having control over pain (e.g., chance or powerful others). Studies have found that chronic pain patients who score high on measures of internal locus of control orientation report lower levels of pain (Toomey, Mann, Abashian, & Thompson-Pope, 1991). In an interesting paper, Sternbach (1986) analyzed data on locus of control gathered through the Nuprin Pain Report, a survey designed to allow projections to the adult population of the United States. Individuals who scored high on internal health locus of control were less likely to have pain and, when they did have pain, reported their pain was not as severe as that reported by individuals scoring low on internal locus of control.

Coping is another variable that has received research attention. Most of the studies on coping in chronic pain patients have used one of three measures. The first, the Coping Strategies Questionnaire (Rosenstiel & Keefe, 1983), assesses the use and perceived effectiveness of a variety of strategies that chronic pain patients use to cope with pain. The second, the Vanderbilt Pain Management Inventory (Brown & Nicassio, 1987), assesses patients' use of active versus passive coping strategies. The third measure, the Ways of Coping Checklist (Folkman & Lazarus, 1980), asks patients to identify a specific pain or nonpain stressor and indicate their use of problem-focused or emotion-focused coping strategies. Turner (1991) and Zautra and Manne (1991) have recently written comprehensive reviews of the literature on coping with chronic pain. Turner's review offers two major conclusions. First, chronic pain patients who remain passive or who use catastrophizing, ignoring and reinterpreting, attention diversion, and praying and hoping as coping strategies typically have high levels of physical and psychological disability. Second, patients who rate their perceived control as high or who rely on active or attentional coping function much more effectively. As Turner notes, however, the data on coping are mostly correlational, making it difficult to deter-

mine whether coping alters pain and disability or vice versa. Zautra and Manne's critique of the coping literature highlights the need for additional research designed to refine the concept of coping and methods for assessing coping.

*Comment.* Researchers have developed a number of questionnaires that enable one to assess cognitive variables in chronic pain patients. Although these new methods of assessing cognitions are potentially quite valuable, they do have limitations. One limitation is that the constructs being measured (e.g., self-efficacy, locus of control, or beliefs in coping strategy effectiveness) are often interrelated. Research needs to identify which constructs are most useful in understanding pain and disability. Another limitation is the absence of causal modeling in this area. Sophisticated statistical modeling techniques may enable researchers to determine whether changes in cognitions are a cause or a consequence of changes in chronic pain.

### *Relationship of Chronic Pain to Depression*

In the early 1980s there was a great deal of controversy about the relationship of chronic pain and depression (Romano & Turner, 1985). Some argued that chronic pain is simply a variant of depressive disorder (Blumer & Heilbronn, 1981) or that both chronic pain and major depression are caused by a common underlying affective spectrum disorder (Hudson & Pope, 1989). This view maintains that most patients seen in pain clinics are depressed and likely to need antidepressant medications. Others maintained that only a small subgroup of chronic pain patients is depressed and in need of treatment (Pilowsky, Chapman, & Bonica, 1977). The controversy about chronic pain and depression has prompted researchers to pursue several lines of inquiry.

*Research findings.* One area of research interest has been to establish the prevalence of depression in chronic pain patients. Recent studies show that some but not all chronic pain patients are depressed. Atkinson, Ingram, Kremer, and Saccuzzo (1986), for example, used Research Diagnostic Criteria to diagnose depressive disorders in chronic low back pain patients. Forty-four percent of the patients were diagnosed with major depression, 19% with minor depression, and 37% with no depressive disorder. Using *Diagnostic and Statistical Manual of Mental Disorders* (American Psychiatric Association, 1980) criteria for diagnosing depression, Turner and Romano (1984) found 30% of their sample of chronic pain patients were depressed. They also found the incidence of depression in chronic pain patients varies with age; younger patients are more likely to be depressed.

Most findings on chronic pain and depression have been based on data from chronic pain patients recruited in pain clinics. Until recently, the degree to which these data were representative of the general population was not examined. Magni, Caldieron, Rigatti-Luchini, and Merskey (1990), however, have presented data on chronic pain and depression gathered from a large-scale population-based survey, the first National Health and Nutrition Examination Survey (NHANES I). A total of 14.4% of the individuals in the NHANES I survey had chronic musculoskeletal pain. Of those having chronic pain, 23.6% were identified as depressed, using the standard cutoff for depression on the Center for Epidemiological Studies Depression

Scale (CES-D), and 18.3% were classified as depressed and at risk of needing intervention, using a more stringent cutoff. Although the proportion of chronic pain sufferers having depression was somewhat lower in the NHANES I sample than in pain clinic samples, the number of individuals reporting symptoms of both chronic pain and depression remains sizable and noteworthy.

Research has also examined whether there are differences in the report of pain or display of pain behavior on the basis of severity of depression. Studies have shown that chronic pain patients who are more depressed rate their pain as more severe (Parmelee, Katz, & Lawton, 1991) and exhibit more pain behavior during a physical examination (Keefe, Wilkins, Cook, Crisson, & Muhlbaier, 1986).

One major problem in research on the chronic pain–depression relationship is that almost all the studies are correlational. Two recent studies used innovative designs and statistical techniques to address this problem. Rudy, Kerns, and Turk (1988) used the LISREL-V (Jöreskog & Sörbom, 1981) program to model pathways between pain severity, life interference due to pain, self-control, and depression measures taken from their sample of chronic pain outpatients. Rudy et al. found that there was not a direct path between pain and depression. However, increases in pain severity predicted increases in life interference and decreases in self-control, which together predicted increases in depression. Thus, the results support a model with life interference and self-control as mediators between pain and depression. Brown (1990) collected data on pain and depression from rheumatoid arthritis patients every 6 months for 3½ years. He found that, across time, pain and depression did predict themselves, but that the best model for the data was one of pain intensity predicting future depression levels. The study by Brown is one of the first to directly examine the temporal relationship between pain and depression, and its results imply that chronic pain is a cause rather than a consequence of depression.

*Comment.* Recent research has clarified some aspects of the chronic pain–depression controversy. We now know there is a subgroup of chronic pain patients who are depressed and have severe pain and functional limitations. What is not understood is why some patients are depressed and others are not. Studies showing that antidepressants can reduce pain even without a corresponding decrease in depression suggest that there may be a biological mechanism linking chronic pain and depression, most likely involving biogenic amines such as norepinephrine or serotonin (France, Houpt, & Ellinwood, 1984).

### *Comprehensive Assessment Measures*

With recognition of the complex nature of chronic pain and need for multimodal pain treatment has come increased interest in questionnaires that assess a broad range of pain-related cognitive, affective, and behavioral variables. Three comprehensive questionnaires appear to be particularly promising. The first is the Sickness Impact Profile (SIP; Bergner et al., 1976). The SIP is a behaviorally based measure designed to assess dysfunctional behavior related to illness. The SIP has 12 scales measuring a variety of physical (e.g., ambulation, body care and movement, and mobility) and psychosocial (e.g., emotional behavior, social interaction) dysfunctions. Because of its

focus on behavior, the SIP is a particularly appropriate outcome measure for behavioral treatment studies. Concerns have been raised about the SIP's length and its sensitivity to change (Deyo & Centor, 1986; Romano, Turner, & Jensen, 1991).

The Chronic Illness Problem Inventory (CIPI; Kames, Naliboff, Heinrich, & Coscarelli Schag, 1984) is a second questionnaire that has been used to assess functional deficits due to chronic pain. The CIPI is shorter than the SIP and contains 65 items, divided into 19 subscales. The subscales assess specific deficits across many areas including Activities of Daily Living, Social Activity, Sexual Function, Medical Interaction, Cognitive Status, Interpersonal Relations, and Employment. The concurrent validity of the CIPI has been supported by research comparing CIPI profiles with data from traditional psychological evaluation (Kames et al., 1984).

Romano et al. (1991) carried out a study comparing the CIPI and SIP. Although the two instruments were significantly correlated, there was substantial unshared variance. Romano et al. concluded that the instruments measure similar but somewhat different aspects of dysfunction. They also questioned the large number of scales on the CIPI and raised the possibility that factor analysis could identify a smaller number of CIPI scales. Shoptaw, Naliboff, and Kames (1991) recently conducted a factor analysis of the CIPI and found five factors describing broad deficit areas.

The West Haven-Yale Multidimensional Pain Inventory (MPI; Kerns, Turk, & Rudy, 1985) is specifically designed to assess chronic pain from a cognitive-behavioral perspective. The MPI contains 52 items and has 13 empirically derived scales arranged in three parts. Part 1 is designed to assess perceptions of pain severity, interference, social support, life control, and affective distress. Part 2 assesses the patient's perceptions of responses by significant others to displays of pain behavior. Part 3 consists of a general activity scale. Kerns et al. (1985) have presented strong evidence supporting the reliability and validity of the MPI. In the past 5 years, the MPI has become one of the most widely used measures in chronic pain assessment.

Turk and Rudy (1988) used cluster analysis to determine whether homogeneous subgroups of chronic pain patients could be identified on the basis of MPI responses. Three subgroups of patients were identified. The first, labeled the *dysfunctional* group, had high scores on pain severity, interference in their lives due to pain, and psychological distress and lower perceptions of control and engagement in daily activities. The second subgroup, the *interpersonally distressed*, viewed their family and significant others as not supportive. The third subgroup, the *minimizers/adaptive copers*, reported lower ratings of pain severity, pain interference in their lives, and affective distress and higher levels of activity and perceptions of life control. The three subgroups were externally validated by comparing their MPI scores with those obtained from self-report and behavioral measures. Turk and Rudy (1990) found the same three patient subgroups in a replication study involving samples of chronic low-back pain, headache, and temporomandibular disorder patients. Interestingly, even though mean scale scores and the proportion of patients in each subgroup varied across different pain conditions, the MPI profile patterns for the subgroups were similar. Patients in MPI profile subgroups demon-

strate similar responses to their pain and may benefit from similar interventions despite their differences in medical diagnosis.

### Advances in Chronic Pain Treatment

Over the past decade, outcome studies evaluating behavioral and cognitive-behavioral interventions have had three basic goals: (a) to compare behavioral treatment to control conditions, (b) to test the relative efficacy of two behavioral treatments, and (c) to determine whether behavioral treatments can prevent chronic pain.

#### *Behavioral Treatment Versus Control Conditions*

An important step in evaluating any new treatment for managing chronic pain is to compare the treatment with appropriate control conditions. Several recent studies have compared behavioral treatments for chronic pain with waiting-list control conditions. Phillips (1987), for example, tested the efficacy of a cognitive-behavioral treatment package (relaxation, exercise, activity pacing, and cognitive interventions) by comparing it with a waiting-list control condition. Over the study period, no changes occurred in the waiting-list control patients. The patients receiving cognitive-behavioral treatment, however, showed highly significant changes in mood, affective reactions to pain, self-efficacy, avoidance behavior, drug intake, and exercise capacity. The treatment gains achieved by the cognitive-behavioral group were not only maintained at 12-month follow-up, they were actually stronger for most outcome variables.

The effectiveness of a new medication for pain is always tested by comparing it with placebo. Engstrom (1983) has compared a cognitive-behavioral treatment package with a placebo medication condition. Chronic low back pain patients who received cognitive-behavioral treatment had significant reductions in pain and increases in internal locus of control. The patients receiving placebo medication, in contrast, failed to show any treatment gains during the study period.

The most rigorous test of a behavioral intervention for pain is to compare it with an alternative, active treatment regimen. In a study of chronic back pain patients, Heinrich, Cohen, Naliboff, Collins, and Bonebakker (1985) compared behavior therapy with physical therapy. Both treatment approaches produced improvements in pain and psychological and psychosocial functioning. Two differences in outcome were noted: (a) physical therapy improved back protection and back control skills more than did behavior therapy and (b) behavior therapy demonstrated an advantage over physical therapy in reducing psychological distress.

Interventions that provide patients with educational information about the etiology of their disease and its treatment are increasingly available to individuals suffering from chronic illnesses. In a study of osteoarthritis patients, we compared the efficacy of a cognitive-behavioral pain coping skills training program with such an educational/informational intervention (Keefe, Caldwell, Williams, et al., 1990a). After 10 weeks of treatment, patients receiving the cognitive-behavioral intervention had significantly lower levels of pain and physical disability than did patients receiving the educational intervention.

Data from a 6-month follow-up study (Keefe, Caldwell, Williams, et al., 1990b) revealed that although patients in the cognitive-behavioral condition failed to maintain improvements in pain, they were able to maintain improvements in psychological disability and showed a strong trend ( $p = .051$ ) toward improvements in physical disability over time.

#### *Comparisons of Two Behavioral Treatments*

Three recent studies have compared operant and cognitive-behavioral treatments for chronic pain. The first study (Kerns, Turk, Holzman, & Rudy, 1986) compared an operant treatment that emphasized weekly behavioral contracting with a cognitive-behavioral intervention that emphasized training in coping skills. Both treatments significantly reduced health care use when compared with a waiting-list control condition. Only the patients receiving cognitive-behavioral treatment, however, showed improvement on self-report measures of pain, psychological distress, instrumental activities, and dependency.

Nicholas, Wilson, and Goyen (1991) found patients exposed to either an operant or cognitive-behavioral intervention showed initial improvements in pain, pain-related cognitive distortions, and functional impairment. The operant group showed more initial improvement in functional impairment than did the cognitive-behavioral group. Patients in both groups were generally unable to maintain initial treatment gains at 6- and 12-month follow-ups. The failure to find long-term effects may have been due to the small study sample; 58 subjects started treatment, and only 39 were available at 12-month follow-up.

Turner and Clancy (1988) carried out the most rigorous comparison of operant and cognitive-behavioral treatments for chronic low back pain. Their study had several important design features including a relatively large subject sample ( $n = 81$ ), use of a videotaped observation method to record changes in pain behavior, and 12-month follow-up. The operant protocol was carefully designed and had an aerobic exercise and a spouse-training component. Posttreatment data revealed that patients in both treatment conditions showed significant decreases in physical and psychosocial disability. At 12-month follow-up patients in both groups maintained their improvements. Although there were no significant differences in the outcome of operant and cognitive-behavioral treatments at 12-month follow-up, the rate at which patients improved differed. The operant group showed greater initial improvement, whereas the cognitive-behavioral group showed steady improvements over the 12-month follow-up period.

Turner, Clancy, McQuade, and Cardenas (1990) conducted a component analysis of operant treatment designed to evaluate the contribution of aerobic exercise. Low back pain patients ( $n = 96$ ) were assigned to one of four groups: (a) aerobic exercise only, (b) operant treatment without aerobic exercise, (c) operant treatment plus aerobic exercise, or (d) waiting-list control. At the end of treatment, the operant plus aerobic exercise group was the only group that showed significant improvement relative to the waiting-list control condition. At 6- and 12-month follow-ups, however, patients in all three treatment groups had improved significantly from pretreatment with no significant differences among the three treatment groups.

### *Behavioral Treatment to Prevent Chronic Pain*

**Research findings.** Recent studies suggest that behavioral and cognitive-behavioral treatment can play an important role in preventing chronic pain. Fordyce, Brockway, Bergman, and Spengler (1986) assigned acute back pain patients to either a traditional or behavioral treatment program. Patients in the traditional program were told to let pain be their guide in using four treatments (analgesics, instructions in activation, exercise, and return visits). Patients in the behavioral regimen received the same treatments but on a time-contingent basis: Analgesics were taken at fixed intervals, activity limits were time-specified, and the number of exercises and return visits was set. At 1-year follow-up the behavioral group had returned to pre-injury levels of functioning, whereas the traditional treatment group had significant increases in claimed physical impairment.

Linton, Bradley, Jensen, Spangfort, and Sundell (1989) tested the efficacy of a secondary prevention program for 66 nurses having back pain who were at risk for chronic pain. The preventive program included: (a) physical therapy to improve conditioning and body awareness, (b) training in cognitive-behavioral strategies for managing pain and maintaining healthy habits, and (c) training in ways to avoid reinjury. Patients receiving the prevention program showed significant improvements relative to a waiting-list group in pain, pain behavior, psychological distress, and fatigue. The prevention program also produced a significant change in patients' trend towards increasing work absenteeism.

**Comment.** Over the past 10 years, the quality of outcome research on behavioral and cognitive-behavioral treatments has improved markedly. In general, controlled group studies have found that behavioral interventions are superior to control conditions on outcome measures of pain and/or disability. Although studies evaluating operant-behavioral and cognitive-behavioral interventions suggest these treatments are effective, neither treatment approach appears to have a consistent advantage over the other. Studies to evaluate the efficacy of behavioral techniques as a measure for preventing chronic pain are a relatively new development. Although the rationale for early intervention is quite plausible, further work is needed to evaluate whether this approach represents a cost-effective alternative for the very large population of individuals having acute pain conditions.

### **Future Directions for Chronic Pain Research**

#### *Assessment Research*

In the past decade, many advances have been made in methods for assessing chronic pain. Future advances are likely to come from research focusing on several important topics. One topic needing attention is a method for quantifying biomedical data and integrating it with behavioral and psychological data. Evidence of organic dysfunction underlying pain complaints varies greatly in chronic pain patients. Rudy, Turk, and Brena (1988) recently devised a reliable index of organic dysfunction that quantifies medical data using a consensus weighting of medical and physical findings. Turk and Rudy (1987) combined data from this index with information on patients' MPI

responses and attempted to identify patient subgroups. Cluster analysis revealed the same three subgroups found in earlier MPI research (dysfunctional, interpersonally distressed, and minimizers/adaptive copers) along with a new patient subgroup that had high levels of psychosocial dysfunction and a high degree of physical pathology. Turk and Rudy suggest that classifying patients on the basis of biomedical and psychosocial data may prove useful in prescribing treatment interventions and predicting treatment outcome.

Quantifying patient's reports about their pain is a difficult assessment task. In the past 10 years, studies of the McGill Pain Questionnaire (MPQ; Melzack, 1975), the most widely used self-report measure of pain, have described an alternative scoring method (Melzack, Katz, & Jeans, 1985) and an MPQ short form (Melzack, 1987). Recently developed psychophysical methods deserve more attention from behavioral researchers because they appear to offer a reliable and valid means of quantifying pain report. Gracely, Lota, Walter, and Dubner (1988) devised a multiple random staircase method of presenting pain stimuli that is quite sensitive to narcotic analgesic manipulations. This staircase methodology could prove useful in laboratory studies evaluating the effects of behavioral or psychological interventions. Clark (1987) has developed and refined multidimensional scaling methods that can be applied to psychophysical data in order to identify basic dimensions subjects use to describe pain.

Another topic for future research is analyzing daily variations in pain and behavior patterns. Although diary records are used in pain assessment, they are rarely analyzed intensively. Affleck, Tennen, Urrows, and Higgins (1991) have carried out research that demonstrates how pain diary data can be analyzed using sophisticated path analysis and statistical techniques that control for autocorrelation.

Observation has much to offer future behavioral assessment research. Observational methods for recording motor pain behaviors (Keefe & Block, 1982) have been recently extended to cancer patients (Ahles et al., 1990). Careful observations of facial expressions have also been used to assess pain in infants (Grunau & Craig, 1990) and facial pain patients (LeResche & Dworkin, 1988). Novel applications of direct observation are beginning to appear. Craig, Hyde, and Patrick (1991) used observation to study genuine, suppressed, and faked facial behavior in low back pain patients. Wilkie, Keefe, Dodd, and Copp (1991) obtained videotaped samples of behavior from cancer pain patients and asked patients to indicate whether specific behaviors were performed to control pain. Cluster analysis also has been used to identify whether there are homogeneous subgroups of low back pain patients who differ in the pain behaviors they display (Keefe, Bradley, & Crisson, 1990).

Further research is needed on psychophysiological assessments for analyzing muscular responses that may contribute to chronic pain. Flor, Turk, and Birbaumer (1985) found that chronic low back pain patients showed increased muscle activity and delayed return to baseline only in the paraspinal muscles and only when discussing personally relevant stress. Ahern, Follick, Council, Laser-Wolston, and Lichtman (1988) found that although chronic low back pain patients and pain-free control subjects did not differ in their paraspinal muscle

activity during quiet standing, significant differences in muscle activity were found during dynamic postures.

It is only recently that psychosocial aspects of chronic pain have been studied using epidemiologic data. Von Korff, Dworkin, and LeResche (1990) found that epidemiologic data could be used to develop a classification of pain. The chronic pain status of 1,016 enrollees in a health maintenance organization could be reliably graded using three axes: time, severity, and behavioral impact. Epidemiologic research can provide new insights on the natural history of chronic pain conditions, particularly in revealing how biological, behavioral, and social factors interact over time.

### Treatment Research

Recent studies suggest that behavioral and cognitive-behavioral treatments can be useful in managing chronic pain. Future research on these treatments needs to address a number of important issues. First, the active ingredients of treatment packages need to be identified. The studies comparing operant and cognitive-behavioral intervention represent a step in this direction. These studies, however, suffer from a problem plaguing most research comparing two different behavioral interventions: relatively small subject samples. Larger scale studies are needed to test the relative efficacy of common treatment techniques such as relaxation training, activation, cognitive restructuring, and training in attention diversion methods. Component analysis could enable one to streamline treatment and make it much more cost-effective. Second, research needs to identify the mechanisms by which behavioral and cognitive-behavioral interventions influence pain and pain behavior. Behavioral interventions may alter pain by changing the way a spouse responds to the patient's pain behavior. Cognitive interventions may work by altering biological mechanisms (e.g., endogenous opioid activation) that underlie pain perception. To identify mechanisms, behavioral researchers need to incorporate a broader range of behavioral, perceptual, and biological measures into their studies.

Methods for enhancing maintenance of treatment effects also need further study. Only a few controlled studies have evaluated whether the effects of behavioral interventions for chronic pain can be maintained for periods longer than 1 year. Long-term follow-up data, however, have been collected in multidisciplinary programs that combine behavioral methods with other modalities (e.g., physical therapy or medications). In a review of this literature, Turk and Rudy (1991) found that 30–60% of chronic patients who were successfully treated subsequently relapsed. The variability in outcome appears to be related to a high degree of noncompliance. Turk and Rudy suggest that treatment programs use booster sessions, self-monitoring, and self-reinforcement to enhance maintenance.

One of the most controversial issues in behavioral approaches to pain management is the role of medications. Some believe that medications are incompatible with behavioral treatment goals such as increasing self-control and decreasing reliance on somatic therapies. Others such as Melzack (1988) have argued that denying chronic pain patients medications only contributes to needless suffering and pain. Much of the controversy stems from concern about long-term use of nar-

cotic drugs and potential for side effects such as habituation, changes in cognitive functioning, and addiction. Whether narcotic medications can improve behavioral treatment outcomes without causing iatrogenic problems remains to be determined. Researchers have started to study whether sedative-hypnotic or psychotropic medications can enhance the effects of psychological interventions for clinical pain. Jay, Elliott, Woody, and Siegel (1991) found that oral Valium failed to enhance the efficacy of a behavioral treatment for children undergoing painful bone marrow aspirations or lumbar punctures. Pilowsky and Barrow (1990) found that a treatment program that combined psychotherapy and amitriptyline had both positive (increased productivity) and negative (less improvement in activity) effects in chronic pain patients. As these authors note, although psychotropic medications may permit severely impaired patients to participate in treatment, they may also lower chronic pain patients' expectations about the value of therapy and their motivation for treatment. Similar concerns about decreased motivation for behavioral or cognitive-behavioral intervention can be raised with respect to long-term use of narcotic medications.

Most treatment studies in the chronic pain literature have relied on samples of low back pain patients recruited from pain clinics located in urban areas. Behavioral and cognitive-behavioral treatment methods, however, potentially can help patients having pain due to cancer, arthritis, sickle cell disease, and other disorders. They can also benefit individuals who do not have easy access to pain programs located in urban centers. In the future, efforts should be directed toward the development of models for delivering pain management services in community hospital and home-based programs. By extending behavioral interventions to an even broader range of patients and treatment settings, behavioral scientists may have a greater impact on pain and suffering and may help a larger number of individuals lead a more active and productive life.

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