Cognitive-Behavioral Therapy for Individuals With Chronic Pain

Efficacy, Innovations, and Directions for Research

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Over the past three decades, cognitive-behavioral therapy (CBT) has become a first-line psychosocial treatment for individuals with chronic pain. Evidence for efficacy in improving pain and pain-related problems across a wide spectrum of chronic pain syndromes has come from multiple randomized controlled trials. CBT has been tailored to, and found beneficial for, special populations with chronic pain, including children and older adults. Innovations in CBT delivery formats (e.g., Web-based, telephone-delivered) and treatments based on CBT principles that are delivered by health professionals other than psychologists show promise for chronic pain problems. This article reviews (a) the evidence base for CBT as applied to chronic pain, (b) recent innovations in target populations and delivery methods that expand the application of CBT to underserved populations, (c) current limitations and knowledge gaps, and (d) promising directions for improving CBT efficacy and access for people living with chronic pain.

Keywords: chronic pain, cognitive-behavioral therapy

An estimated 100 million U.S. adults suffer from chronic pain (Institute of Medicine, 2011), a condition influenced by biological, psychological, and social factors and optimally managed by treatments that address not only its biological causes but also its psychological and social influences and consequences. Over the past 60 years, parallel advances in the scientific understanding of pain and the development of cognitive and behavioral therapies have led to the widespread application of cognitive-behavioral therapy (CBT) to chronic pain problems. Indeed, CBT is now a mainstream treatment, alone or in conjunction with medical or interdisciplinary rehabilitation treatments, for individuals with chronic pain problems of all types.

Arguably, the start of this modern era in chronic pain treatment began with the publication of the gate control theory of pain (Melzack & Wall, 1965), which emphasized the importance of cognitive and affective, as well as sensory, influences on pain. In the following decade, the understanding and treatment of chronic pain made another leap forward with psychologist Wilbert Fordyce's application of learning theory and operant behavioral principles to pain behaviors (Fordyce, 1976), which, like any behavior, can be elicited and shaped by social and environmental stimuli and consequences. The repertoire of chronic pain treatments expanded to include behavioral treatments that aimed to decrease patients' pain behaviors (e.g., limping, guarding) and increase "well" behaviors (e.g., participation in customary activities). Also in the 1970s, Aaron Beck developed cognitive therapy for depression (Beck, Rush, Shaw, & Emery, 1979). The increased attention to the role of cognitions in mood, anxiety, and other psychological disorders sparked interest in incorporating cognitive therapy techniques into behavioral therapies for chronic pain (Turk, Meichenbaum, & Genest, 1983; Turner & Romano, 2001).

Over the three decades since the initial applications of CBT to chronic pain, a vast body of research has established the importance of cognitive and behavioral processes in how individuals adapt to chronic pain. As postulated by learning theory (Fordyce, 1976), social and environmental variables (e.g., responses from family) have been shown to be associated with pain behaviors and disability levels (Flor & Turk, 2011). Numerous studies have also documented the associations of pain-related beliefs and appraisals with pain intensity and related problems, including depression, physical disability, and activity and social role limitations (Gatchel, Peng, Peters, Fuchs, & Turk, 2007). In particular, pain catastrophizing (magnification of the threat of, rumination about, and perceived inability to cope with pain) has consistently been found to be associated with greater physical and psychosocial dysfunction, even after controlling for pain and depression levels (Edwards, Cahalan, Mensing, Smith, & Haythornthwaite, 2011; Quartana,

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Campbell, & Edwards, 2009). Fear-avoidance (activity avoidance due to fear of increased pain or bodily harm) has also been shown to be important in pain and physical and psychosocial function (Gatchel et al., 2007; Leeuw et al., 2007). Currently, CBT is the prevailing psychological treatment for individuals with chronic pain conditions such as low back pain, headaches, arthritis, orofacial pain, and fibromyalgia. CBT has also been applied to pain associated with cancer and its treatment. The goals of CBT for pain are to reduce pain and psychological distress and to improve physical and role function by helping individuals decrease maladaptive behaviors, increase adaptive behaviors, identify and correct maladaptive thoughts and beliefs, and increase self-efficacy for pain management (Turner & Romano, 2001). Many individuals with chronic pain have mood, anxiety, and sleep disorders (Alsaadi, McAuley, Hush, & Maher, 2011; Demyttenaere et al., 2007; Gore, Sadosky, Stacey, Tai, & Leslie, 2012; Tsang et al., 2008), and CBT is also used to treat these conditions.

There is no standard CBT protocol; CBT as conducted in research and clinical practice varies in number of sessions and specific techniques. Techniques often used for pain include relaxation training, setting and working toward behavioral goals (typically including systematic increases in exercise and other activities), behavioral activation, guidance in activity pacing, problem-solving training, and cognitive restructuring (Thorn, 2004; Turner & Romano, 2001). CBT typically includes between-session activities to practice and apply new skills (e.g., completion of thought records, relaxation practice, work toward behavioral goals).

The efficacy of CBT for individuals with chronic pain has been evaluated in randomized controlled trials (RCTs) for over three decades, primarily in samples of adults with chronic back pain, headaches, orofacial pain, or arthritis-related pain. More recently, CBT has been evaluated in other chronic pain populations and using novel delivery formats; CBT-based treatments have also been applied by a wider range of health professionals. This article on CBT for chronic pain reviews (a) its evidence base, (b) recent innovations in target populations and delivery methods, (c) current limitations and knowledge gaps, and (d) promising directions for increasing efficacy and access. This is not a systematic review, and we note the potential for bias or omission of important articles. We conducted a comprehensive literature review and based this article primarily on the conclusions of systematic reviews and meta-analyses. We describe some individual studies to illustrate promising areas for further research and clinical applications. Most articles reported study results only in terms of statistical significance. Therefore, our review largely focuses on statistical significance, but we also provide information on clinical significance when available.

The Efficacy of CBT for Chronic Pain

Multiple reviews and meta-analyses have evaluated the efficacy of CBT for chronic pain. A recent Cochrane review (A. C. Williams, Eccleston, & Morley, 2012) concluded that CBT, compared with treatment-as-usual or wait-list control conditions, had statistically significant but small effects on pain and disability, and moderate effects on mood and catastrophizing, posttreatment. By 6- to 12-month follow-up, however, the only significant effect was for mood. Compared with active control conditions, CBT was not superior for pain or mood outcomes. However, CBT showed small, statistically significant benefits for disability and catastrophizing posttreatment. At 6- to 12-month follow-up, benefits were found for disability only.

Other reviews have focused on CBT for specific types of chronic pain. For example, a meta-analysis of 22 RCTs of psychological treatments for chronic back pain indicated that psychological interventions, contrasted with various control conditions, had positive effects on pain, pain-related interference with activities, health-related quality of life, and depression (Hoffman, Papas, Chatkoff, & Kerns, 2007). CBT was found to be superior to wait-list controls for improving pain intensity posttreatment but not for health-related quality of life or depression. More recently, a Cochrane review of behavioral treatments (including CBT) for chronic low back pain, which included 30 RCTs, concluded that behavioral treatments were more effective than usual care for pain posttreatment but not different in intermediate- to long-term effects on pain or functional status (Henschke et al., 2010). There was little or no difference between behavioral treatment and group exercise in improving pain and depressive symptoms over the intermediate to long term. However, for most of the comparisons there was only low- or very-low-quality evidence, and there was no high-quality evidence for any comparison. Furthermore, variability in outcome measures greatly limited ability to compare across studies.

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A review of behavioral treatments for headaches (Andrasik, 2007) described CBT-based interventions (relaxation, biofeedback, and cognitive therapy) as reducing headache activity 30%–60% on average across studies. These effects surpassed those of various control conditions and were typically sustained over time, including years after treatment. Biofeedback interventions are commonly used in treating chronic headaches, either as a stand-alone treatment or in conjunction with other CBT techniques (Turk, Swanson, & Tunks, 2008). Meta-analyses provide evidence of medium to large effects of biofeedback on improving migraine and tension-type headaches, including the frequency and duration of headaches, when compared with a variety of control (wait-list, placebo, pseudofeedback) conditions (Nestoriuc & Martin, 2007; Nestoriuc, Martin, Rief, & Andrasik, 2008; Nestoriuc, Rief, & Martin, 2008). Biofeedback was comparable to relaxation training for migraine headaches (Nestoriuc & Martin, 2007) and superior to it for tension-type headaches (Nestoriuc, Martin, et al., 2008; Nestoriuc, Rief, & Martin, 2008).

A Cochrane review of psychosocial interventions for chronic orofacial pain (Aggarwal et al., 2011) concluded that CBT, either alone or with biofeedback, resulted in long-term (more than three months) improvements in pain intensity, depression, and pain-related activity interference; however, the authors called for more rigorous studies to substantiate these conclusions. Other meta-analyses have supported the efficacy of psychological treatments, including CBT, in reducing arthritis pain (Astin, Beckner, Soeken, Hochberg, & Berman, 2002; Knittle, Maes, & de Gucht, 2010) and fibromyalgia pain (Glombiewski et al., 2010). Most of the studies in these reviews compared interventions with varied CBT techniques to usual care or wait-list controls. A few studies included active control conditions, such as exercise, physical therapy, or medication.

Taken together, these reviews support the efficacy of CBT, as compared with usual care and wait-list conditions, for pain-related problems, with small to medium effects on pain intensity, catastrophizing, and mood and small effects on pain-related disability and activity interference. Fewer studies have compared CBT with other active treatments. The most recent Cochrane review found CBT to have statistically significant (but small) effects relative to other active treatments on disability and catastrophizing at posttreatment and on disability at 6- to 12-month follow-up but no effects on pain and mood at posttreatment or follow-up (A. C. Williams et al., 2012). A. C. Williams et al. suggested that because the efficacy of CBT for chronic pain is well-established, there is no need for further trials comparing the effects of CBT versus other treatments on pain-related problems; rather, it would be more productive to focus on elucidating the moderators and mechanisms of CBT effects. However, significant limitations in the existing literature provide context for the findings of modest efficacy of CBT and suggest other research needs; we return to these later.

Innovative Applications of CBT to Chronic Pain

Special Populations

Recent innovations offer promise in expanding access and tailoring CBT to special and underserved populations, including children/adolescents, older adults, adults with comorbid neurological disorders, low-literacy adults in rural areas, and adults with acute or subacute pain who are at risk for chronic pain. The next sections describe recent studies in these areas.

Children and adolescents. CBT has been used to treat children and adolescents with chronic and recurrent pain problems, which are very common in this age group (King et al., 2011). Frequently applied techniques include relaxation training, parental operant behavioral strategies, and biofeedback; a few studies have also included cognitive techniques (Palermo, Eccleston, Lewandowski, Williams, & Morley, 2010). Meta-analyses support the efficacy of psychosocial treatments in reducing pain in children, with most studies focused on headaches (Eccleston, Morley, Williams, Yorke, & Mastroyannopoulou, 2002; Eccleston, Palermo, Williams, Lewandowski, & Morley, 2009; Palermo et al., 2010; Trautmann, Lackschewitz, & Kroner-Herwig, 2006). A meta-analysis of psychological therapies (Palermo et al., 2010) found that, compared with no-treatment controls, CBT-based interventions resulted in clinically significant ($>$ 50%) improvement in pain posttreatment, with improvement generally maintained three months posttreatment. However, among studies with measures of pain-related disability and emotional functioning, CBT-based interventions did not result in significant improvement in these variables.

Older adults. The prevalence of chronic pain conditions in adults increases across the life span, with

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rates of approximately 47%–63% among adults over the age of 65 years in developed countries (Tsang et al., 2008). Despite the personal and public health importance of chronic pain among older adults, there is a paucity of rigorous research concerning the effectiveness of different chronic pain treatments in this group (Park & Hughes, 2012). Therapies based on cognitive-behavioral principles hold much appeal in older adults given their favorable safety profile (minimal risks, especially compared with the well-established risks of alternative pain therapies such as opioid medication and nonsteroidal anti-inflammatory drugs; Barkin et al., 2010; Solomon, Rassen, Glynn, Garneau, et al., 2010; Solomon, Rassen, Glynn, Lee, et al., 2010) and emphasis on self-management skills. Furthermore, CBT skills for improving ability to manage pain and reduce emotional distress may well have benefits for common comorbid conditions such as diabetes and cardiovascular disease.

This dearth of research also applies to knowledge concerning the efficacy of CBT for chronic pain in older adults. A 2009 meta-analysis (Lunde, Nordhus, & Pallesen, 2009) identified only 12 such studies, five of which were uncontrolled. This review concluded that CBT was efficacious for pain, with effect sizes comparable to those reported in other meta-analyses of CBT for pain. A small effect was found for physical functioning, but there were no statistically significant effects for depressive symptoms or medication use. Lunde et al. raised methodological concerns pertaining to trial quality, measurement, heterogeneity of treatment components, and inadequate reporting of treatment procedures and content across these studies.

A recent study (Nicholas et al., 2013) found that an outpatient pain self-management program involving CBT and exercises had benefits for adults ages 65 and older with chronic pain. The program was superior to an exercise/attention control condition on posttreatment measures of disability, pain-related distress, depressive symptoms, fear-avoidance beliefs, catastrophizing, self-efficacy for managing pain, and functional reach. Most of these benefits were maintained one month later. Importantly, twice as many pain self-management group participants (44%) as exercise/attention control (22%) and waiting list control (20%) group participants made clinically meaningful improvement at one month posttreatment in pain-related disability. Results were not reported from longer term follow-ups; a question of critical importance is the impact over longer periods of time.

Arthritis pain self-management interventions, which share some similarities with CBT, have been evaluated more extensively. Typically, they are delivered in community settings by lay leaders and include group education and training in relaxation, cognitive coping, problem solving, and communication skills. A systematic review (Reid et al., 2008) provided support for the efficacy of the Arthritis Foundation Self-Management Program (Lorig, Ritter, & Plant, 2005) and similar programs in reducing pain.

Other innovations in intervention delivery methods include a group pain self-management intervention delivered by a nurse or psychologist in retirement facilities where the participants lived (Ersek, Turner, Cain, & Kemp, 2008). However, there were no differences between this group and the control condition group, which was given a pain self-help book, over the one-year study period. Another RCT (Green, Hadjistavropoulos, Hadjistavropoulos, Martin, & Sharpe, 2009) involving a CBT-based pain intervention for older adults that was delivered in participants' homes or senior residence buildings showed that CBT was comparable to the wait-list control posttreatment in improving pain but superior to it in increasing use of relaxation skills and decreasing maladaptive pain beliefs.

Individuals with neurological conditions. Chronic pain is common among individuals with neurological conditions such as traumatic brain injury (TBI), spinal cord injury, multiple sclerosis, neuromuscular disease, stroke, or HIV/AIDS and typically results in additional disability (Ehde et al., 2003; Klit, Finnerup, & Jensen, 2009; Solano, Gomes, & Higginson, 2006). Among the few studies of CBT for pain associated with such conditions, most have focused on spinal cord injury (Ehde & Jensen, 2004; Heutink et al., 2012; Perry, Nicholas, & Middleton, 2010) and multiple sclerosis (Ehde & Jensen, 2004; Jensen et al., 2011). These studies support the feasibility and potential efficacy of such treatments, but larger, more rigorous trials are needed.

The problem of concomitant chronic pain and TBI has become prominent due to its high prevalence among soldiers returning from Iraq and Afghanistan (Gironda et al., 2009). Chronic pain is also common among the 1.4 million civilian Americans who sustain TBIs annually (Langlois, Rutland-Brown, & Thomas, 2004; Nampiaparampil, 2008). A review of 23 studies on chronic pain after TBI that included both civilians and combatants (Nampiaparampil, 2008) suggested a point prevalence of 57.8% for chronic

headaches among individuals with TBI. Also commonly associated with TBI are pain due to spasticity, peripheral nerve injury, reflex sympathetic dystrophy, contracture, and heterotopic ossification (Bell, Pepping, & Dikmen, 2005). To date, no RCTs have evaluated CBT for pain in individuals with brain injury (Dobscha, Clark, et al., 2009). Such research will need to consider the heterogeneity and complexity of this population, as many have suffered both polytrauma and psychological trauma (Gironda et al., 2009), as well as other potential barriers to treatment success such as cognitive dysfunction, high rates of posttraumatic stress disorder, high rates of substance abuse, and communication challenges (Gironda et al., 2009).

Low-literacy and rural samples. A notable gap is the lack of RCTs of CBT tailored to adults characterized by low literacy, rural residence, or racial/ethnic minority status (Campbell, 2011). One exception (Thorn et al., 2011) compared CBT with pain education in a sample of primarily African American women of low literacy in the rural American South with various chronic pain problems (primarily low back and arthritis-related pain). The interventions and study methods were tailored to be culturally sensitive and suitable for those with low literacy. The two groups did not differ significantly posttreatment on measures of pain intensity, activity interference, physical disability, or quality of life. Treatment completers in both groups showed small improvements, on average, in pain intensity and pain interference with activities that were sustained through six months.

Thorn et al. (2011) found that low literacy and related variables still posed potential barriers to participation despite the authors' efforts to reduce these barriers. Among study participants, 26.5% did not complete treatment. Individuals with lower education and reading levels were less likely to begin treatment, and participants with lower education and income were less likely to complete treatment. Written homework, common in CBT, may pose challenges for some individuals, even when adapted for lower literacy (Campbell, 2011). Further research is needed to develop and test strategies for improving CBT participation and efficacy for individuals with low literacy or education.

Individuals with acute and subacute pain. Although no universally accepted definitions exist, chronic pain is often defined as pain that has persisted for three months or longer (International Association for the Study of Pain Task Force on Taxonomy, 1994), whereas acute pain is often considered to be pain of less than 7 weeks' duration and subacute pain is considered to be pain that has lasted between approximately 7 and 12 weeks (Goertz et al., 2012). Most studies of CBT have focused on chronic pain. However, given the refractoriness of pain once it is chronic, evidence that risk factors for progression of acute/subacute pain to chronic pain include patient psychosocial characteristics (Chou & Shekelle, 2010; Mallen, Peat, Thomas, Dunn, & Croft, 2007; Ramond et al., 2011), and the secondary prevention potential for psychosocial interventions, there has been increasing interest in the application of CBT to acute and subacute pain. Indeed, the Institute of Medicine (2011) report on pain called for providing people with pain education about self-management and the role of biological and psychosocial factors early in the process to prevent pain from becoming chronic.

Some secondary prevention efforts have included CBT techniques such as graded increases in activity, activity scheduling, relaxation training, and cognitive therapy for individuals with acute or subacute back or neck pain (e.g., Linton & Andersson, 2000; Linton & Ryberg, 2001; Slater et al., 2009; Sullivan, Adams, Rhodenizer, & Stanish, 2006; Sullivan & Stanish, 2003). Despite the appeal of secondary prevention with CBT and a few studies with promising results (e.g., Slater et al., 2009; Sullivan et al., 2006), a 2011 review concluded that there was insufficient evidence that psychological interventions for patients with acute and subacute back pain are effective in preventing chronic pain (Nicholas, Linton, Watson, Main, & "Decade of the Flags" Working Group, 2011). Larger studies with adequate statistical power are needed. Because many patients with acute and subacute pain will improve over time regardless of treatment, large samples may be needed to demonstrate benefits of CBT or to identify patient subgroups for which CBT is most effective. Patients at high risk for chronic pain due to factors not targeted by CBT (e.g., medical issues) may be less responsive to CBT than patients at high risk due to psychological factors such as depression, catastrophizing, and fear-avoidance. CBT effectiveness may be increased by targeting specific psychosocial risk factors (Nicholas et al., 2011).

Recently, there has been a surge of interest in using brief risk screening tools that include assessment of psychosocial factors to identify individuals at high risk for persistent clinically important pain and to stratify treatment based on risk (Beneciuk et al., 2013; Hill, Vohora, Dunn, Main, & Hay, 2010). In a large RCT (Hill et al., 2011) of risk-stratified primary care for back pain (of any duration), intervention patients with low risk of an unfavorable outcome were reassured and encouraged to resume normal activities, whereas medium- and high-risk intervention patients received standardized physiotherapy to improve symptoms and function. For high-risk patients, physiotherapy also addressed psychosocial obstacles to recovery. Intervention patients had improved physical disability outcomes and lower costs of care relative to usual-care physiotherapy control patients.

Although CBT aimed at preventing acute/subacute pain from becoming chronic could potentially apply to any type of pain, most studies have focused on back pain, likely because of its prevalence. One RCT evaluated the efficacy of cognitive-behavioral skills training and biofeedback, compared with a no-intervention group, for patients classified as at high risk for transitioning from acute to chronic temporomandibular disorder (TMD) pain (Gatchel, Stowell, Wildenstein, Riggs, & Ellis, 2006). At a one-year follow-up, participants who received the intervention, compared with those who did not receive any intervention, had significantly lower levels of pain, depressive symptoms, health care utilization, and jaw-related health care expenditures; higher rates of improved coping; and lower rates of *DSM-IV* (*Diagnostic and Statistical Manual of Mental Dis-*

orders, 4th edition; American Psychiatric Association, 2000) Axis I diagnoses (Gatchel et al., 2006; Stowell, Gatchel, & Wildenstein, 2007). The inclusion of CBT in secondary prevention efforts in other populations at high risk for developing chronic disabling pain, such as those with spinal cord injury, is intriguing and merits future research.

Delivery Innovations to Address Access Barriers

The Institute of Medicine (2011) report on pain recommended developing strategies for reducing barriers to pain care, especially for populations disproportionately affected by and undertreated for pain. Pain is inadequately treated in primary, secondary, and tertiary care settings (Mularski et al., 2006), and psychosocial interventions in particular are underutilized (Keefe, Abernethy, & Campbell, 2005). A variety of factors likely account for underutilization of CBT for pain, including financial (e.g., lack of sufficient insurance coverage), environmental (e.g., lack of affordable transportation, no providers in the geographic region), patient attitude-related (e.g., stigma associated with psychological care, belief that pain can only be improved by medical or surgical interventions), and health care system barriers (e.g., providers unfamiliar with CBT for pain or having insufficient time and skills to enhance patient motivation for CBT, no existing referral system to psychologists). Treatment disparities based on patient age or racial/ethnic group, lack of culturally appropriate care, and patient language differences, communication difficulties, and cognitive impairments may also pose barriers to adequate care.

The underutilization of CBT is likely also related to how it is commonly delivered: via individual or group psychotherapy by a psychologist trained in CBT for pain in a private practice or pain clinic setting. The limited access to mental health treatment has been attributed not only to a lack of trained providers but also to the current delivery model of individual psychotherapy for the majority of psychological services (Kazdin & Blase, 2011). Kazdin and Blase recommended development of a "portfolio" of service delivery models (e.g., Web, video call, and telephone technologies; service provision in community settings; use of nonprofessionals) to meet the demand for mental health care. In the following section, we review several innovations in methods of delivery of CBT for pain, including technology methodologies, use of other professionals to deliver care, and collaborative care models.

Technology. Advances in technology have been paralleled by efforts to use technology to expand the reach of chronic pain interventions (Keogh, Rosser, & Eccleston, 2010). A range of pain interventions, including CBT-based ones, have been delivered with technological assistance, including telephone-delivered treatment (McBeth et al., 2012), use of interactive voice response technology (Lieberman & Naylor, 2012), video conferencing (Gardner-Nix, Backman, Barbati, & Grummitt, 2008), and Web-based programs (Ruehlman, Karoly, & Enders, 2012). A meta-analysis of RCTs of Web-based CBT for chronic pain ($N = 11$), including two studies with children, concluded that Web-based CBT (with or without therapist contact), relative to wait-list control conditions, produced greater improvements in pain across studies and greater improvement in some studies for other outcomes, such as mood, physical activity, work productivity, medication use, and physician visits (Macea, Gajos, Daglia Calil, & Fregni, 2010). However, these studies had methodological problems, including only wait-list control comparisons and small sample sizes. Another meta-analysis (Palermo et al., 2010) suggested that computer-based CBT interventions for chronic pain may be as effective in improving pain as face-to-face delivery of CBT, but more research is needed to verify this.

This area is ripe for further research to refine and evaluate technology-assisted CBT interventions for chronic pain. Questions remain regarding the importance of therapist contact in Web-based treatments and regarding the efficacy, effectiveness, and cost-effectiveness of Web-based and telephone- or video-call-delivered treatment relative to in-person treatment. Potential advantages of technology-assisted CBT include improved access and a reduction of stigma that might prevent some individuals from seeking psychological care. Web-based programs and smartphone or tablet applications also hold great potential for enhancing CBT. For example, such technologies could provide easy and instant access to a variety of educational materials, guided relaxation exercises, tools for tracking activities and progress toward behavioral goals, and tailored feedback and suggestions. Also promising is the application of interactive voice response technology to monitor pain and behaviors and to provide reminders and skills practice sessions during or following CBT (Lieberman & Naylor, 2012). Medico-legal barriers to cross-state telephone and video conference delivery of CBT will need to be addressed for such interventions to be feasible outside of research settings.

Use of professionals other than psychologists to deliver treatments based on CBT principles and strategies. A number of studies have evaluated the efficacy of treatments for pain, based on CBT principles and including some CBT strategies, which are delivered by individuals who are not doctoral-level psychologists. For example, brief CBT-based self-management interventions for TMD pain delivered by dental hygienists who were trained and supervised by clinical psychologists were found efficacious compared with usual TMD care (S. F. Dworkin et al., 2002) and compared with continuous oral contraceptive therapy (used to reduce hormonal fluctuations associated with TMD pain in women) in a sample of women (Turner et al., 2011). CBT-based interventions delivered by trained nurses have produced improvements in important pain outcomes (Dalton, Keefe, Carlson, & Youngblood, 2004; Dysvik, Kvaloy, & Natvig, 2012; Wells-Federman, Arnstein, & Caudill, 2002), although some of these studies had no comparison or control groups and only one (Dalton et al., 2004) was an RCT.

Many physical therapists are interested in working with patients with chronic musculoskeletal pain in accor-

dance with behavioral principles (Beissner et al., 2009; Main & George, 2011). A telephone survey of physical therapists found high rates of reported use of instruction in activity pacing (81%) and pleasurable activity scheduling (39%), but relaxation training and cognitive restructuring were rarely utilized (Beissner et al., 2009). Although most of those surveyed expressed interest in using CBT-informed techniques, they described a number of barriers, including lack of knowledge about CBT, reimbursement problems, time constraints, and patient reluctance to try the techniques. Several studies suggest physical therapy that incorporates fear-reducing and activating techniques can produce positive outcomes; this work also supports the value of assessing and addressing fear-avoidance and other psychosocial risk factors (K. R. Archer et al., 2013; George, Fritz, Bialosky, & Donald, 2003; Hill et al., 2011; Sullivan & Adams, 2010; Sullivan et al., 2006; Von Korff, et al., 2005).

The degree to which the training, experience, expertise, and interpersonal qualities of the CBT interventionist affect CBT outcomes is unclear. In mental health treatment, there is no evidence that therapists with a doctoral degree in psychology are more effective than therapists with less training (Kazdin & Blase, 2011). This issue has received minimal investigation in the pain literature. In their review of secondary prevention interventions for people with recent onset of low back pain, Nicholas et al. (2011) hypothesized that the expertise of the interventionist may be relevant because among the studies in which the psychological treatments were not superior to usual care, none used a psychologist to deliver the treatment. Conversely, the majority of studies in which the psychological treatment was delivered by a psychologist demonstrated a benefit above usual care. Nonetheless, it remains an empirical question as to whether a certain type of professional degree, level of training, or expertise is required to deliver efficacious CBT to patients with chronic pain. Consideration must be given to what CBT techniques can be applied naturally as part of that provider's usual care (e.g., physical therapists using graded activity techniques for back pain, nurses offering instruction in relaxation techniques) and what CBT techniques, such as cognitive restructuring, may require the education and experience of a psychologist and may be less appropriate for delivery by others.

Collaborative care models. There is increasing interest in applying collaborative care models, demonstrated as effective in improving depression and anxiety outcomes in primary care settings (J. Archer et al., 2012), to chronic pain, which is also largely treated in primary care. Collaborative care for depression involves systematic care management by a nurse, social worker, or other trained clinical staff person to facilitate case identification, coordinate a guideline-based treatment plan (with consultation from a mental health expert and regular communication with the patient's primary care provider), provide proactive follow-up, monitor treatment adherence and response, and modify treatment as needed (Unützer, Schoenbaum, Druss, & Katon, 2006). Other key elements include measurement-based care, incremental increases in treatment for those whose symptoms persist (i.e., stepped care), and decision support to treating providers (Katon, Unützer, Wells, & Jones, 2010). Collaborative care may reduce disparities in care for individuals from ethnic/racial minority groups, who often have low rates of appropriate mental health care (Unützer et al., 2006).

Dobscha and colleagues (Dobscha, Corson, Leibowitz, Sullivan, & Gerrity, 2008; Dobscha, Corson, et al., 2009) conducted an RCT evaluating a collaborative care intervention for veterans with musculoskeletal pain in primary care clinics in a Veterans Affairs Medical Center. In the collaborative care intervention, all patients were followed by a care team that included an internist and a psychologist care manager, who had limited formal training in treating chronic pain before the study began but received training in and ongoing supervision of care management and chronic pain treatment. Study participants received assessment, monitoring, and care management, including components of CBT for pain. For patients whose pain and/or depression did not respond to treatment, care was stepped up (e.g., more contacts with the care manager, referral to a specialty pain clinic, mental health care, or substance use treatment). Care was delivered in a variety of formats, including in person, by telephone, and by video conferencing; patients were also encouraged to attend a four-session behavioral skills training workshop. Compared with usual care, patients assigned to collaborative care demonstrated greater improvements in pain and disability, and for those who were depressed at baseline, greater improvements in depression. This study demonstrates the potential for collaborative care approaches to improve pain outcomes and to use physician and psychologist resources efficiently in primary care.

Future Directions for Improving the Efficacy and Dissemination of CBT for Chronic Pain

A considerable volume of research supports the efficacy of CBT in improving chronic pain and related outcomes across a wide variety of pain syndromes. However, its benefits are often modest on average. What can be done to improve outcomes of CBT for patients with chronic pain? How can progress be made in overcoming the underutilization of CBT for the many people living with chronic pain? Progress in answering these questions may come from addressing several gaps in the CBT literature.

Gaps in Knowledge of Optimal Treatment Content, Format, and Dose

CBT interventions evaluated in RCTs vary widely in their content, format (e.g., group vs. individual, in-person vs. Web), and dose. CBT for pain is typically a multicomponent treatment with no single standard treatment manual for either group or individual therapy. Among studies that use treatment manuals, many are developed by the investigators for the trial and are not published, making comparisons of specific CBT interventions across studies impossible. Research comparing differing treatment doses, formats,

and content is also lacking. We do not yet know what specific CBT components, delivery methods, or therapy dosages are optimally efficacious for individuals with chronic pain as a whole or for specific subgroups. Research is also needed to determine whether and how the use of booster sessions after initial treatment promotes sustenance of treatment effects as well as the optimal frequency, duration, and mode (e.g., in-person, telephone) of such sessions.

In an article on increasing dissemination and adoption of psychological therapies, Rotheram-Borus and colleagues (Rotheram-Borus, Swendeman, & Chorpita, 2012) proposed identifying effective elements of interventions, using these elements to develop treatment modules, and tailoring treatments to specific problems or patients using these modules. The use of module-based therapy in chronic pain is intriguing, as it might allow treatment to target and treat specific problems, such as depression, catastrophizing, inactivity, or fear-avoidance. Several promising module-based CBT treatments for pain have been developed for Web delivery (Ruehlman et al., 2012; D. A. Williams et al., 2010), but much work remains in determining how best to match patient characteristics to specific treatment modules and in evaluating tailored treatment as compared with traditional multimodal treatment packages.

Gaps in Trial, Treatment, and Reporting Quality

Knowledge concerning the efficacy of CBT for pain is dependent upon the quality and reporting of the research. There is a need for standardization of measures across trials so that results can be combined for meta-analyses and for presentation of results in terms of clinical as well as statistical significance (R. H. Dworkin et al., 2005, 2008). It is important to report outcomes both immediately posttreatment and at longer term follow-ups (ideally, at least one year). Quality in trials of psychological interventions pertains not only to the study design and methods but also to the quality of the treatment and its delivery. Pain treatment quality indicators include manualization, adherence to the manual, therapist training, treatment content, treatment duration, and patient engagement in treatment (Yates, Morley, Eccleston, & Williams, 2005). Poor quality of study design and treatment is a recurring criticism in the systematic reviews of CBT for chronic pain (Aggarwal et al., 2011; Macea et al., 2010; Palermo et al., 2010; A. C. Williams et al., 2012). Yates et al. (2005) evaluated the strengths and weaknesses of 31 trials of CBT for pain published between 1982 and 2003 and found considerable variability in quality of treatment, study methodology, and reporting. Although most articles reported treatment content (98%), half or fewer reported on manualization, manual adherence, therapist training, and patient engagement. A. C. Williams and colleagues (2012) applied the Yates et al. quality rating scale in their meta-analysis of studies of psychological treatments for chronic pain published through 2011. They concluded that the quality and reporting of study methods and design had improved over time. However, they noted that the quality of the psychological treatments and/or reporting of information about the treatments had not improved, hindering the ability to replicate and extend findings in subsequent studies.

Gaps in Treatment Integrity, Including Therapist Competence

Confidence in the findings of CBT research is based on the assumption that the treatment was delivered as intended (treatment integrity: Perepletchikova, Treat, & Kazdin, 2007). Treatment integrity involves the therapist's adherence to prescribed treatment elements and avoidance of proscribed treatment elements, as well as the therapist's training and competence in delivering the intervention (Bellg et al., 2004; Perepletchikova et al., 2007). Competence includes both global competency and limited-domain competency (Barber, Sharpless, Klostermann, & McCarthy, 2007). Global competency includes generally strong "clinical acumen" and the ability to establish a therapeutic relationship, manage clinical concerns, implement treatments, and problem solve. Limited-domain competence involves the ability to provide a specific treatment (e.g., CBT) within the relevant context (e.g., chronic pain). A third relevant area, population-specific or cultural competency, concerns knowledge of, and competence in working with, a specific population (e.g., people from ethnic minority groups, people with neurologic disabilities; Sue, 2006).

Therapist competence has been unexplored in the CBT pain literature. In the depression psychotherapy literature, therapist competence appears to be positively associated with better patient outcomes for both cognitive therapy (Barber et al., 2007) and CBT (Simons et al., 2010). Despite challenges in its measurement, including identification of optimal assessment methods and of therapist behaviors most reflective of global and domain-specific competence (Muse & McManus, 2013; Strunk, Brotman, DeRubeis, & Hollon, 2010), assessment of therapist competence merits consideration in future studies of CBT for pain. Empirically informed therapist training strategies are also needed.

Attention to all dimensions of treatment integrity will be important in future studies of CBT for chronic pain. Three indicators of treatment integrity—manualization, manual adherence, and therapist training—are included in Yates et al.'s (2005) measure of trial quality. The Implementation of Treatment Integrity Procedures Scale (Perepletchikova et al., 2007), developed to rate the adequacy of treatment integrity procedures in psychotherapy research, and the National Institutes of Health Behavior Change Consortium's Best Practices and Recommendations for enhancing treatment fidelity (Bellg et al., 2004) may also be helpful in designing treatment integrity procedures in future trials.

Gaps in Participant Engagement in Treatment

Another significant challenge is obtaining sufficient engagement in treatment such that the patient not only attends sessions but also actively participates (e.g., completes homework, rehearses learned skills, applies skills in real-

life situations). In the psychotherapy literature, including studies of CBT for depression, greater homework adherence is associated with better outcomes (D. D. Burns & Spangler, 2000; Kazantzis & Lampropoulos, 2002). In studies of CBT for pain, homework adherence has rarely been examined closely, and little is known about patient engagement beyond rates of session attendance and study dropout. Research is needed to increase knowledge concerning ways to enhance patients' active participation in CBT as well as to develop measures that adequately capture such engagement.

Gaps in Understanding of Treatment Mechanisms and Moderators

Identification of specific cognitive and behavioral variables that mediate the effects of CBT on patient outcomes could facilitate the refinement of theoretical models and the development of more effective and efficient therapies. However, only a few studies have examined the mechanisms by which CBT treatments for pain work. Changes in specific pain-related beliefs and coping strategies pre- to post-CBT for pain have been found to be associated with concurrent improvements in symptoms and functioning (J. W. Burns, Johnson, Mahoney, Devine, & Pawl, 1998; Jensen, Turner, & Romano, 1994; Nielson & Jensen, 2004; Turner, Whitney, Dworkin, Massoth, & Wilson, 1995). Smeets, Vlaeyen, Kester, and Knottnerus (2006) reported that decreases in pain catastrophizing mediated the relationships between three treatments for chronic back pain (CBT, active physical treatment, and CBT plus active physical therapy) and improvements in disability, functional limitations, and pain. Spinhoven et al. (2004) reported that decreased pain catastrophizing and increased perceived personal control over pain mediated reduction in pain behavior and depression levels with operant-behavioral treatment plus either group discussion or cognitive coping skills training for chronic back pain. However, conclusions regarding causal and sequential relationships in these studies are precluded because outcome and process variables were assessed concurrently. Turner, Holtzman, and Mancl (2007), using a formal statistical test of mediation in an RCT of CBT for TMD pain, found that pre- to posttreatment changes in patient pain-related beliefs (control over pain, disability, and pain signals harm), catastrophizing, and self-efficacy for managing pain mediated the effects of CBT on pain, activity interference, and jaw use limitations at one year.

Increased knowledge concerning patient characteristics associated with response to CBT (i.e., treatment effect moderators) could help direct limited resources to those most likely to benefit, match patients with the most appropriate treatments, and tailor interventions to patient characteristics. Minimal research has been conducted in this area, which has been highlighted as one of the most important directions for future chronic pain intervention research (Jensen, 2011; Thorn & Burns, 2011). In their RCT of CBT versus education for chronic TMD pain, Turner et al. (2007) found that patients who reported more pain sites, depressive symptoms, nonspecific physical problems, rumination, catastrophizing, and stress before treatment had worse outcomes at one year regardless of treatment. The effects of CBT generally did not vary according to patient baseline characteristics. A meta-analysis of psychological interventions for chronic back pain (Hoffman et al., 2007) also did not find much evidence that CBT effects vary by patient characteristics. However, the paucity of studies, the small numbers of participants from racial and ethnic minority groups or other groups typically underrepresented in RCTs, and the low statistical power of existing studies to detect moderating effects leave open the question of moderators.

More research is needed to advance the field from the question "Does it work?" to the question "Why, for whom, and under what circumstances does it work?" Increased knowledge of mediators, moderators, therapist characteristics, and specific and nonspecific (e.g., therapeutic alliance) therapeutic ingredients most important for specific outcomes can help guide the development of more efficacious treatments. Furthermore, most research has consisted of efficacy studies; more effectiveness, comparative effectiveness, and cost-effectiveness studies are needed to increase knowledge about CBT as applied in actual practice.

Gaps in Knowledge Translation

A significant knowledge translation gap exists between research and widespread adoption of evidence-based CBT interventions for pain in the community. Rotheram-Borus et al. (2012) suggested using marketing research and strategies to understand and respond to consumer needs in order to promote adoption of psychological treatments in general; such strategies merit consideration in efforts to increase the use of CBT for chronic pain. Community-based participatory research (CBPR) approaches are another promising avenue for bridging the gap between science and practice, particularly in underserved communities where health and social inequities are prominent. CBPR has been defined (Agency for Healthcare Research and Quality, 2004) as "a collaborative research approach that is designed to ensure and establish structures for participation by communities affected by the issue being studied, representatives of organizations, and researchers in all aspects of the research process to improve health and well-being through taking action, including social change" (p. 3). CBPR is thought to overcome some of the common health care translational challenges, including external validity, resource constraints, historical distrust between researchers and underrepresented communities, and sustainability (Jones & Wells, 2007; Wallerstein & Duran, 2010). Standards and principles for CBPR (Israel, Schulz, Parker, & Becker, 1998; Jones & Wells, 2007) may be helpful in developing, disseminating, and sustaining CBT interventions for pain in the community.

Conclusions

CBT is the "gold standard" psychological treatment for individuals with a wide range of pain problems. The efficacy of CBT for reducing pain, distress, pain interference with activities, and disability has been established in systematic reviews and meta-analyses. Although average effect sizes are small to moderate across pain outcomes, CBT

lacks the risks associated with chronic pain medications, surgeries, and interventional procedures. Furthermore, CBT may well have benefits for common comorbid conditions such as diabetes and cardiovascular disease. Research is needed to develop CBT interventions that have stronger beneficial effects, with attention to whether tailoring therapy to specific patient subgroups or problems enhances outcomes. Increased understanding of the most effective ingredients of CBT for specific subgroups is integral to treatment improvement and patient–treatment matching.

Unfortunately, most individuals with chronic pain never receive CBT. Integration of CBT into medical settings where individuals with chronic pain are commonly seen, especially primary care settings, offers much promise in both expanding application of CBT and improving outcomes, but such approaches are only beginning to be studied. Use of collaborative care models, delivery of first-line care through nurses and other health professionals trained in CBT principles and behavioral self-management skills (perhaps with supervision by an experienced pain psychologist), further development of Web-based programs and mobile phone and tablet applications, regular measurement of important outcomes, and tailoring care based on patient characteristics and treatment response as assessed by validated outcome measures offer considerable promise in improving patient care and outcomes at a population level. Increased knowledge about optimal CBT content, format, and dose can help guide these efforts. Refinement and use of accurate prognostic tools, with care stratified on the basis of psychosocial risk factors, also hold much promise. Research on strategies for enhancing patient receptiveness to, engagement in, and adherence to treatment is needed.

Over the past 40 years, psychologists have played essential roles in the development and evaluation of interventions for reducing pain, suffering, and activity limitations among individuals with chronic pain. The current climate of increased interest in accountable care organizations (DeVore & Champion, 2011), patient-centered medical home models (Grumbach & Grundy, 2010; Sia, Tonniges, Osterhus, & Taba, 2004), and rewarding health systems for patient outcomes instead of procedures may provide exciting new opportunities for translating empirically proven CBT interventions for pain into the primary care settings where most patients with chronic pain are seen. Any such efforts need to integrate monitoring, evaluation, and continuous quality improvement into the design and dissemination of CBT-based programs, tasks in which psychologists may excel. Going forward in the continuously evolving health care environment, psychologists can contribute by engaging in efforts to integrate psychosocial interventions, not only for chronic pain but across the spectrum of health problems, into routine health care. Furthermore, psychologists are well poised to play central roles in health care teams and organizations confronting the problem of chronic pain, as clinicians, researchers, administrators, and policymakers.

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