Can We Improve Cognitive–Behavioral Therapy for Chronic Back Pain Treatment Engagement and Adherence? A Controlled Trial of Tailored Versus Standard Therapy

Robert D. Kerns
VA Connecticut Healthcare System, West Haven, Connecticut, and Yale University

John W. Burns
Rush University Medical Center

Marc Shulman
Northport VA Medical Center, Northport, NY

Mark P. Jensen
University of Washington

Warren R. Nielson
St. Joseph’s Health Care London, London, Ontario, Canada, and University of Western Ontario

Rebecca Czlapinski and Mary I. Dallas
VA Connecticut Healthcare System, West Haven, Connecticut

David Chatkoff
University of Michigan – Dearborn

John Sellinger, Alicia Heapy, and Patricia Rosenberger
VA Connecticut Healthcare System, West Haven, Connecticut, and Yale University School of Medicine

Objective: This study evaluated whether tailored cognitive–behavioral therapy (TCBT) that incorporated preferences for learning specific cognitive and/or behavioral skills and used motivational enhancement strategies would improve treatment engagement and participation compared with standard CBT (SCBT). We hypothesized that participants receiving TCBT would show a lower dropout rate, attend more sessions, and report more frequent intersession pain coping skill practice than those receiving SCBT. We also hypothesized that indices of engagement and adherence would correlate with pre- to posttreatment changes in outcome factors. Method: One hundred twenty-eight of 161 consenting persons with chronic back pain who completed baseline measures were allocated to either TCBT or SCBT using a modified randomization procedure. Participants completed daily ratings of pain coping skill practice and goal accomplishment during treatment, as well as measures of pain severity, disability, and other key outcomes at the end of treatment. Results: No significant differences between treatment groups were noted on measures of treatment engagement or adherence. However, these factors were significantly related to some pre- to posttreatment improvements in outcomes, regardless of treatment condition. Conclusions: Participants in this study evidenced a high degree of participation and adherence, but treatment tailored to take into account participant preferences, and that employed motivational enhance-
ment strategies, failed to increase treatment participation over and above SCBT for chronic back pain. Evidence that participation and adherence were associated with positive outcomes supports continued clinical and research efforts focusing on these therapeutic processes.

Keywords: pain management, chronic pain, cognitive-behavioral therapy, clinical trial, psychological treatment

Psychological interventions for chronic back pain are commonly provided in concert with medical and rehabilitation therapies. A particularly effective approach is cognitive–behavioral therapy (CBT; Turk, Meichenbaum, & Genest, 1983), which promotes personal control and self-management strategies, and use of structured techniques, to modify cognition and behavior. CBT has been shown to significantly reduce pain severity, disability, distress, and health care use (Hoffman, Papas, Chatkoff, & Kerns, 2007; Kerns, Sellinger, & Goodin, 2011). However, treatment refusal and dropout are challenges (Turk & Rudy, 1991), and many patients do not adhere to pain management skill practice (Jensen, 2002).

The complexity of therapist recommendations and the sheer number of skills that patients are expected to acquire may contribute to patient dropout and poor adherence (Jensen, Nielson, Romano, Hill, & Turner, 2000). An approach that encourages patient choice among fewer treatment components to reduce the effort needed to learn new skills and that embraces collaboration between patient and therapist in developing treatment goals (Turk et al., 1983) may enhance participation. The benefits of this approach were documented in a sample of rheumatoid arthritis patients who received two of four possible CBT modules, based on their stated priorities relative to a group that received standard medical care (Evers, Kraaimaat, van Riel, & de Jong, 2002).

Individual differences in readiness to adopt a chronic pain self-management approach may also affect dropout and adherence (Jensen et al., 2000; Kerns, Rosenberg, Jamison, Caudill, & Haythornthwaite, 1997). Many patients with chronic pain referred for CBT are not prepared to engage in this kind of treatment (Kerns & Habib, 2004; Jensen, Nielson, Turner, Romano, & Hill, 2004). Jensen and colleagues (Jensen, 2002; Kerns, Jensen, & Nielson, 2006) have proposed that motivational interviewing (MI; Miller & Rollnick, 2002) may be applied to promote engagement in, and adherence to, pain treatment. Evidence supports the efficacy of MI for influencing health behavior change in different patient populations (e.g., Martins & McNeil, 2009), and one recent study in patients with low back pain demonstrated that adding Motivational Enhancement Therapy (a manualized MI intervention) to physical therapy resulted in better lifting capacity and exercise compliance, relative to a group of patients who received physical therapy alone (Vong, Cheing, Chan, So, & Chan, 2011).

The current study evaluated a CBT “package” that featured a reduced breadth of treatment components, a procedure to allow patients to select a subset of cognitive and/or behavioral skill components (e.g., relaxation, cognitive coping), and MI strategies to encourage engagement and participation. We labeled this treatment approach Tailored CBT (TCBT) to capture the essence of a modified CBT approach that is “tailored” to patient preferences and that employed a largely reflective, patient-centered, and motivating therapeutic style.

The primary purpose of this study was to test the hypothesis that patients assigned to the TCBT protocol would show evidence of greater treatment engagement and adherence relative to those assigned to a standard CBT (SCBT) condition. In addition, the study design allowed us to test the hypothesis that our measures of treatment adherence and engagement were significantly positively related to pre- to posttreatment improvements in outcomes.

Method

Participants

Participants were 161 persons who met eligibility criteria (described below) and provided written informed consent. Inclusion criteria were constant back pain of at least six months in duration and documentation of “significant physical findings” at the pain site by a study physician or nurse practitioner using a standardized electronic record review (Rudy, Turk, Brenna, Stieg, & Brody, 1990). During an interview conducted by the research assistant (RA), participants had to report 4 or greater in average level of pain over the past week (0 [no pain] to 10 [worst pain imaginable]). Participants were required to have a touch-tone telephone to use for daily adherence ratings. Based on participant report and review of the electronic health record, those with life threatening or acute physical illnesses, current alcohol or substance use disorders, current psychosis or suicidal ideation, and individuals seeking pain treatment other than CBT were excluded. Participants were discouraged from receiving additional therapies for pain to maintain integrity and to minimize treatment heterogeneity.

Participants were recruited from the VA Connecticut Healthcare System (VACHS) and the greater Yale–New Haven community via advertisements and referrals from health care providers. Recruitment occurred between January 2004 and February 2009. Both veterans and nonveterans were eligible, and 377 individuals expressed interest in the study. Of these, 277 persons met inclusion and exclusion criteria. The most common reasons for exclusion were active substance abuse or dependence (n = 39), absence of back pain (n = 26), and active psychosis judged to preclude reliable participation (n = 10). Of the 161 participants who provided written informed consent, 128 persons completed the pre-randomization, baseline evaluation. After baseline procedures were completed, the remaining 128 participants (46.2% of those eligible; women: n = 22, 17.2%) were allocated to either TCBT (n = 68) or SCBT (n = 60) using a modified randomized procedure. Figure 1 presents a flow diagram of participants’ progress through the phases of the study.

Participants who completed at least three treatment sessions were considered to have received at least a minimum treatment dose (n = 114). Separate examination of the group who received this minimum level of treatment was considered to be consistent
with our focus on treatment engagement and participation, and the potential that closer inspection of participation and adherence of those who provided evidence of initial engagement in treatment might be particularly valuable. Three sessions was identified as a threshold to indicate at least initial engagement and the potential for receipt of treatment benefit, as this session would encompass the first full week of reporting on intersession adherence to recommendations for pain coping skill practice and completion of one of the four treatment modules. Participants who attended at least three sessions, including those who discontinued participation in the study at some later point, completed an average of 8.96 of 10 possible sessions ($SD = 2.2$).

**Measures**

**Indices of engagement in treatment and adherence.**

**Adherence/goal accomplishment.** At the end of each treatment session, beginning with the second session for both conditions, participant and therapist agreed on between two and five treatment or homework goals for the next week (e.g., walk 1 mile/day, practice relaxation skills 20 min/day). Participants then provided daily adherence ratings for these goals via an interactive voice response (IVR) system. Using the touch-tone telephone keypad, they provided ratings on a scale from 0 (not at all accomplished) to 10 (completely accomplished). They continued daily ratings throughout treatment (total = 56 daily ratings). The RA monitored IVR data collection. When two or more days of data were missing, the RA called the participant to gain ratings. If this was unsuccessful, the therapist asked participants to give ratings retrospectively for the past week. On average, 13% of IVR entries were recorded retrospectively during each of 8 weeks of IVR assessment. IVR ratings comprised our primary outcome measure.

**Treatment “dose.”** The number of sessions attended was used as an index of “dose” of treatment received.

**Treatment engagement.** When sessions were canceled or otherwise missed, patient and therapist rescheduled them. The number

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**Figure 1.** Consolidated Standards of Reporting Trials (CONSORT) Flowchart. This figure depicts the passage of participants through the clinical trial.
of sessions missed and rescheduled was our index of treatment engagement. Adverse events. Adverse events were identified by patient report and/or by review of their electronic health record.

Treatment outcome variables. Several measures were administered at pretreatment and posttreatment to assess key domains of the chronic pain experience. All measures had substantial evidence of reliability and validity, as well as evidence of responsiveness to treatment effects, and most were selected based on the recommendations of the Initiative on Methods, Measurement, and Pain Assessment in Clinical Trials (IMMPACT; Dworkin et al., 2005).

Physical functioning. Physical functioning was assessed by the Interference and Activity subscales of the West Haven–Yale Multidimensional Pain Inventory (MPI-I and MPI-A; Kerns, Turk & Rudy, 1985), and by the Roland-Morris Disability Questionnaire (RMDQ; Roland & Morris, 1983). The MPI-I consists of nine items (7-point scales) reflecting current interference with physical and social role functioning. The MPI-A consists of a list of 30 items (7-point scales) tapping participation in domestic activities, household chores, and social and recreational activities. Higher scores on the MPI-I and MPI-A indicate greater pain interference and higher levels of activity, respectively. The RMPDQ consists of 24 statements tapping pain-related disability, and scores range from 0 to 24, with higher total scores indicating higher levels of disability. Choice of these measures was based on their excellent psychometric qualities.

Pain behaviors. Pain behaviors were assessed by the Pain Behavior Checklist (PBCL; Kerns, Haythornthwaite, Southwick, Giller, & Jacob, 1991). The PBCL is comprised of 25 behaviors tapping distorted ambulation, affective distress, facial/audible expressions of pain, and seeking help. Respondents respond to the question “How often do you do each of the following?” on a scale from 0 (never) to 6 (very often), and the total score is the average of responses ranging from 0 to 6, with higher scores indicating higher frequency of pain behaviors. Estimates of internal consistency (0.85) and stability (0.80) are good to very good, and evidence of validity, including correlations with observed pain behaviors, is also adequate (Kerns et al., 1991).

Depressive symptom severity. Depressive symptom severity was assessed by the Beck Depression Inventory (BDI; Beck, Ward, Mendelsohn, Mock, & Erbaugh, 1961). The BDI consists of 21 items measuring current symptoms of depressive disorders, with total scores ranging from 0 to 63. The BDI is one of the most widely used measures of this construct, and an extensive literature review reveals substantial evidence of internal consistency, stability, and convergent validity, and responsiveness to change in pain clinical trials (Dworkin et al., 2005).

Behavioral goal accomplishment. Prior to beginning treatment, participants developed between two and five quantifiable behavioral goals for treatment (e.g., decrease medication use, increase social activities; Kerns, Turk, Holzman, & Rudy, 1986). Participants rated their baseline status for each goal and their expectations for 50% and 100% goal attainment. At posttreatment, participants rated achievement for each of the goals using a 5-point scale ranging from −2 (100% decline) to 0 (no change) to +2 (100% improvement).

Patient satisfaction. Patient satisfaction was assessed by a modified version of the Veterans Health Administration (VHA) ambulatory care patient satisfaction survey. The measure assessed global perceptions of health care at VACHS and of the care delivered in the context of this study.

Treatment credibility. Treatment credibility was assessed at the end of the first and third sessions using a questionnaire adapted from Borkovec and Nau (1972). Participants rated how logical the treatment seemed, how confident they were that the treatment would be successful, how likely they would be to recommend the treatment to a friend, how willing they were to participate in treatment, and how successful they thought the program would be at helping them. Ratings for each item were made on 11-point scales, and a summary credibility score was the average of these ratings and ranged from 0 to 10.

Procedures

The study was approved by the institutional review boards of the VACHS and Yale University School of Medicine, and was conducted at the VACHS–West Haven campus. When potential participants were self-referred, the patient’s primary care provider was contacted to ensure that there were no clinical contraindications for participation, and medical records were obtained (for nonveterans).

Modified randomization procedure. Modified allocation procedures were used for the first 10 participants. Thereafter, participants were allocated to one of the two treatment conditions, TCBT or SCBT, following a randomized block design to control for sex of participants. Blocking was also used to develop a yoked control condition (SCBT). Given the low prevalence of women in the sample, as 22 women were recruited, they were randomly assigned to one of the two conditions. The study coordinator used a computerized random number generator for condition assignments, which left participants and the RA blind to treatment assignment.

As part of the initial assessment, all participants completed a questionnaire designed to assess preferences for learning the nine pain coping skills offered. Participants allocated to the TCBT condition received their four most highly preferred pain coping skill modules. A mathematical algorithm was used to assign pain coping skill modules in the SCBT condition based on (1) the preferences of a matched counterpart assigned to the TCBT condition and that (2) maximally mismatched the participant in the SCBT condition. This method of assigning pain coping skill modules was used to (a) optimize use of the preferences factor in distinguishing the two treatment conditions, and (b) ensure that any differences in adherence or outcomes between the two conditions could not be due to differences in the content of the pain coping skill modules, given that each pain coping skill module would be delivered in equal numbers in the two treatment conditions. This yoking procedure started by assigning the first 10 participants to receive TCBT (not randomized). Beginning with the eleventh participant, complete randomization was used. When a participant was allocated to the SCBT condition, the algorithm
identified the participant from the first 10 participants whose preferences were maximally dissimilar to the preferences of the SCBT participant. This “matched” TCBT participant was removed from the pool of eligible participants to be used in determining the assignment of pain coping skills to the next randomly assigned SCBT participant.

**Comprehensive evaluation and completion of measures.** First, the RA administered a semistructured interview and the questionnaire battery to participants. They also completed the pain coping skill preferences procedure. This procedure involved providing participants with brief descriptions of each of nine pain coping skill modules that were available as CBT components. The skill modules were exercise, body mechanics, pacing, relaxation, assertiveness, cognitive control, time contingent rest, task persistence, and avoiding asking for help. Participants then provided ratings of perceived importance, confidence, and interest in learning each skill. Ratings of perceived interest were used to determine the four pain coping skill modules that would be provided. When identical ratings were given, ratings of perceived importance of the module were used to break the tie. The modules with the four highest ratings comprised the TCBT condition for a given participant. For participants in the SCBT condition, ratings were used to identify a matched participant in the TCBT condition. Table 1 provides brief descriptions of the nine modules and the frequency that each module was delivered to the participants who actually received at least one session of a module ($n = 122$).

Second, participants were examined by a physical therapist, who provided participants with a tailored home exercise program and discussed with them the importance of appropriate body mechanics for restoring and maintaining a healthy back. However, it was emphasized that this information was expected to be implemented only if either the exercise or body mechanics coping skill module was selected (TCBT) or assigned (SCBT) during treatment.

Posttreatment assessments were completed at 15 weeks following completion of the baseline assessment. Posttreatment questionnaires were completed in person or via the mail. Efforts were made to obtain posttreatment questionnaire data from all participants, including those who discontinued treatment but agreed to continue

**Table 1**

*Treatment Module Descriptions and Frequency of Delivery*

<table>
<thead>
<tr>
<th>Module description</th>
<th>Frequency ($n = 122$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exercise module</td>
<td>For some people, inactivity contributes to increased pain and difficulty performing everyday activities. This module will explain how you can gradually increase your flexibility and physical activity level, and you will use this information to get stronger so you can do more, and hurt less. 79</td>
</tr>
<tr>
<td>Relaxation module</td>
<td>This module focuses on using a variety of techniques that are designed to help you relax and decrease your tension. You will learn how to use visual imagery, deep breathing, and muscle relaxation as tools to help you reduce your pain. 78</td>
</tr>
<tr>
<td>Cognitive control module</td>
<td>Learn how to manage your emotional reactions so that emotional distress and tension have less impact on your pain. This module will help you to develop mental strategies to cope with your pain more effectively. You will learn how to refocus your attention and thoughts away from the pain, and to think more positively about your ability to manage the pain. 78</td>
</tr>
<tr>
<td>Body mechanics module</td>
<td>For some people, poor posture and body mechanics can make pain worse. This module will explain the proper body mechanics for everyday activities like driving, sleeping, and standing. You will learn how to use proper posture when you move and lift as a way to reduce pain and prevent future pain flare-ups. 67</td>
</tr>
<tr>
<td>Pacing module</td>
<td>This module will help you pace your activities so that your pain is less likely to “flare-up” and prevent you from remaining active. You will learn how to break up your activities so that you don’t “overdo” it, and develop alternative activities that you enjoy and can implement into your weekly routine. 62</td>
</tr>
<tr>
<td>Task persistence module</td>
<td>Sometimes people begin to feel discouraged or fearful when they have ongoing pain and give up before they need to. This module helps you to identify the areas in your life where you have a tendency to “give up” before you achieve your goals. You will learn to develop a realistic plan for following through on tasks and to be more persevering in the face of self-doubt. 45</td>
</tr>
<tr>
<td>Assertiveness module</td>
<td>Some people find that their communications with others become more difficult and awkward when they have chronic pain. Distress from relationship problems can make their pain worse. In particular, it can be hard to be assertive about wants and needs. This module teaches you skills to help you become assertive, including strategies for learning to be assertive during difficult situations (such as during acute exacerbations of pain). 28</td>
</tr>
<tr>
<td>Time contingent pacing module</td>
<td>Some people find that if they spend too much time lying down or resting, their pain actually gets worse. This module will assist you with “breaking out” of the pattern of resting only after you experience pain. You will learn how to develop a routine that allows you to take breaks at different times throughout the day and reduce the likelihood of experiencing intense periods of pain. 26</td>
</tr>
<tr>
<td>Avoiding asking for help module</td>
<td>Although sometimes we all need help from others, some people find that they become overly dependent upon others when they have chronic pain. Other times, it’s best for your overall quality of life and self-esteem to learn how to do tasks independently despite your pain. This module helps you identify your limitations and develop skills for doing as much as you can before asking others for help. 25</td>
</tr>
</tbody>
</table>

**Note.** These data report on the sample ($n = 122$) that actually received at least one session of a module. For each module, participants were asked to rate the following questions on a scale of 0 (*not at all*) to 10 (*extremely*): (1) How important do you think ___ (module skill) ___ is in terms of your ultimate goal of reducing pain or improving function? (2) How confident are you in your ability to learn and use ___ (module skill) ___ as a technique for reducing pain or improving function? (3) How interested are you in learning about ___ (module skill) ___ as a technique for reducing pain or improving functioning?
participation in the study. Once participants withdrew from the study, none were contacted to provide additional assessments. An additional five participants in each condition decided not to continue treatment after having received at least three treatment sessions but agreed to continue participating in the study, and follow-up assessments were obtained. Six-month follow-up assessments were also conducted for the purposes of examining maintenance of treatment effects on outcomes, but these data and analyses are not reported, given the focus of this report on engagement and adherence.

**Treatment conditions.** Both CBT conditions involved 10 weekly, individual, 60-min outpatient sessions. A 14-week window for completion of the 10 sessions allowed for flexibility in scheduling. All treatment was provided by doctoral-level clinical psychologists. A therapist manual for CBT conditions included outlines for each of the pain coping skills modules (and MI strategies for the TCBT condition). The majority (n = 52) of participants received treatment from one of the study authors (Marc Shulman), and the remaining 12 study therapists (who provided treatment to a range of 1 to 8 participants) met weekly with this researcher for clinical supervision. All therapists had prior experience in delivering CBT for chronic pain, and all received specific training in MI as a component of their training as a therapist for this study.

Both CBT conditions consisted of an introductory session, followed by four consecutive two-session pain coping skills modules, and concluded with a tenth session emphasizing skill consolidation and relapse prevention. The first session included a brief overview of the goals of CBT, an introduction to the self-management approach to chronic pain, and a more detailed account of the structure of CBT. Weekly identification of intersession goals and homework assignments, importance of home practice of pain coping skills, and use of the IVR system for the daily ratings of adherence was explained near the end of each session. The first session of each module involved the introduction of the new skill. The second session aimed to reinforce skill practice and use in “real life” situations. During the tenth session, skills learned during treatment and their continued practice and application were discussed. Areas of poor adherence to skill practice and application were addressed, as were relapse concerns.

**TCBT versus SCBT.** In the TCBT condition, MI strategies were used to foster motivation for skill learning and practice. Motivational enhancement strategies included developing discrepancies through observations and feedback regarding incongruence between beliefs and actions or among different beliefs, guided reflection of distorted beliefs and maladaptive behaviors, and supporting self-efficacy (Miller & Rollnick, 2002). Intersession goals were established via a collaborative discussion involving the therapist and patient.

In the SCBT condition, module outlines were followed, but motivational enhancement strategies were not used. Behavioral change strategies such as contingency management, self-reinforcement, and stimulus control techniques, typically featured in CBT, were emphasized. Therapeutic strategies included instruction and lecturing, directed corrective feedback regarding discrepancies among beliefs or between beliefs and behaviors, and addressing resistance with advice giving and confrontation. Intersession goals were assigned by the therapist.

**Treatment integrity.** Treatment integrity was assessed by RA and student raters who rated audiotapes of 30% of the TCBT and SCBT sessions to assure that key components of manuals for each coping skill module were covered in session and to ensure that sessions could be distinguished as either TCBT or SCBT based on the use of MI. Attention was paid to the types of cognitive and behavioral processes of change and MI techniques that were used. Coding sheets provided bullet points to classify each treatment session. Raters listened to at least 10 min of each tape to clarify that the appropriate skill modules was delivered, and to categorize the session as either TCBT or SCBT with a certainty rating of 8 or greater on a 0 (not at all certain) to 10 (absolutely certain) scale. Using this method, 100% of sessions were correctly classified.

**Data Analytic Plan**

The study was powered to detect a difference in adherence ratings to recommendations for intersession practice rather than to detect differences in outcome measures. Based on our prior findings, we used an estimate of a 25% difference between TCBT and SCBT adherence ratings in order to estimate the sample size. To obtain 80% power to detect a between group difference at p < .05, a sample of 72 patients per group (N = 144) was required. A dropout rate of 20% was expected; thus, we aimed to recruit 90 patients per condition (N = 180). In fact, we fell short of this goal (161 persons gave written informed consent, 128 participants were randomized to the two treatment conditions, and 112 of them gave IVR ratings of intersession adherence), thus reducing our ability to detect differences in adherence ratings.

Credibility ratings were examined first, because disparity in credibility could account for treatment condition differences in engagement and adherence apart from the actual effects of the treatments. ANOVAs were used to compare TCBT and SCBT on treatment credibility at 1 and 3 weeks. Next, ANOVAs and chi-square analyses were used to compare TCBT and SCBT on frequency of treatment dropout, number of sessions attended, and average number of cancelled or rescheduled sessions. ANOVA was also used to examine treatment group differences in adherence to recommendations for intersession practice of pain coping skills. The IVR intersession adherence ratings—the primary outcome measure—were aggregated across all goals and all days during treatment to create a single composite index of adherence.

As a precursor to examining the associations between treatment adherence and engagement measures and treatment outcome, we first sought to identify the outcome measures that changed with one or both treatments. To achieve this, we conducted mixed-design—2 (treatment: TCBT, SCBT) × 2 (period: pre, post)—for each outcome measure. One-way ANOVAs were also used to compare TCBT and SCBT on goal accomplishment and treatment satisfaction. If significant Treatment × Period interactions emerged (indicating differences between the treatment conditions on outcome), ANCOVAs were planned to determine whether the engagement and/or adherence measures accounted for group differences in pre- to posttreatment changes on outcomes. If significant period main effects emerged without a significant Treatment × Period interaction (indicating significant changes over time with treatment, but no significant treatment differences in outcome), we planned to collapse across treatment conditions and compute Pearson correlations between measures of engagement and adherence.
and pre- to posttreatment resedualized change scores for outcomes, and post-only ratings of goal attainment and treatment satisfaction. Eta squared ($\eta^2$) was used as an index of the strength of the association between the treatment group and dependent variables.

Conventional intent-to-treat (ITT) analyses were used to evaluate treatment efficacy. However, two of our key measures of engagement—number of sessions attended and number of sessions rescheduled—were not amenable to ITT procedures, and thus the 114 participants who participated in at least three treatment sessions comprised the target sample. For ITT procedures, pretreatment values on outcome measures were carried forward to represent posttreatment values for the 14 participants who did not complete at least three sessions. The 128 participants allocated to treatment condition provided relevant data. Similar analyses were performed on participants who completed at least three sessions ($n = 114$).

**Results**

**Sample Characteristics**

Characteristics of the sample are presented in Table 2. Participants assigned to TCBT and SCBT conditions did not differ significantly on demographic and pain-relevant descriptive characteristics, although they did significantly differ on several of the outcome measures. All participants reported presence of back pain, and a large majority reported back pain as their primary complaint among multiple other sites of pain, especially hip, knee, neck, and arm pain.

**Adverse Events**

During the study, 61 unrelated adverse events and one related adverse event were reported (i.e., soreness following physical therapy evaluation). No serious adverse events were reported.

**Treatment Group Differences in Perceptions of Treatment Credibility**

Perceived treatment credibility at the end of the first week of treatment did not differ significantly between TCBT ($M = 8.3$, $SD = 1.5$) and SCBT ($M = 8.3$, $SD = 1.2$), $F < 1$, nor did the TCBT ($M = 8.3$, $SD = 1.5$) and SCBT ($M = 8.2$, $SD = 1.4$) groups differ significantly on credibility after 3 weeks of treatment, $F < 1$.

**Treatment Group Differences in Indices of Treatment Engagement and Adherence**

The number of participants who discontinued treatment prior to completing three sessions did not differ significantly between TCBT ($n = 7$) and SCBT ($n = 7$) conditions, $\chi^2 (1; n = 128) = 1.19, p > .10$. Similarly, the number of participants who completed at least three sessions did not differ between TCBT ($n = 61$) and SCBT ($n = 53$) conditions, $\chi^2 (1, n = 128) = .10, p > .10$. For participants who received at least three sessions, the average number of sessions attended did not differ significantly between TCBT ($M = 8.9$, $SD = 2.3$) and SCBT ($M = 9.1$, $SD = 2.1$) participants, $F(1, 112) < 1$. Nor did TCBT ($M = .8$, $SD = 1.2$) differ significantly from SCBT ($M = 1.2$, $SD = 1.6$) on average number of cancelled or rescheduled sessions, $F = 2.3, p > .10$.

A mean value of daily adherence ratings averaged over the 8 weeks of IVR assessments was computed. Of the 128 people who comprised the ITT sample, 16 did not provide any IVR ratings. Thus, an ITT sample for IVR ratings was 112, and all analyses involving IVR ratings use these 112 people. For those receiving at least three sessions of treatment, only 111 provided IVR ratings. It is important to note that 70% of participants ($n = 80$) provided at least 80% of the 56 daily ratings that were requested. For the ITT sample, results of a one-way ANOVA, with treatment (TCBT, SCBT) as the between-subjects factors, showed that the TCBT group ($M = 6.87$, $SD = 1.8$) did not differ significantly from the SCBT group ($M = 6.77$, $SD = 1.9$) on adherence ratings, $F(1, 111) = 0.3, p = .56$.

### Table 2

**Intent-To-Treat Sample ($n = 128$) Demographics and Pretreatment Values**

<table>
<thead>
<tr>
<th>Variable</th>
<th>TCBT ($n = 68$)</th>
<th>SCBT ($n = 60$)</th>
<th>$p$ value</th>
<th>$\eta^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (yr)</td>
<td>55.5 (13.1)</td>
<td>55.0 (10.0)</td>
<td>$&gt; .10$</td>
<td>.00</td>
</tr>
<tr>
<td>Education (yr)</td>
<td>14.5 (14.5)</td>
<td>13.7 (2.9)</td>
<td>$&lt; .10$</td>
<td>.02</td>
</tr>
<tr>
<td>Sex (n; % women)</td>
<td>15; 12%</td>
<td>7; 55%</td>
<td>$&gt; .10$</td>
<td>.02</td>
</tr>
<tr>
<td>Veterans (n; % veterans)</td>
<td>58; 43.5%</td>
<td>56; 43.8%</td>
<td>$&gt; .10$</td>
<td>.02</td>
</tr>
<tr>
<td>Duration of pain (current episode in months)</td>
<td>137.8 (121.3)</td>
<td>139.4 (121.4)</td>
<td>$&gt; .10$</td>
<td>.00</td>
</tr>
<tr>
<td>Number of surgeries for pain ($M$ [$SD$])</td>
<td>2.2 (6.1)</td>
<td>2.2 (3.3)</td>
<td>$&gt; .10$</td>
<td>.00</td>
</tr>
<tr>
<td>Low back pain primary complaint (n; %)</td>
<td>54; 42%</td>
<td>52; 41%</td>
<td>$&gt; .10$</td>
<td>.01</td>
</tr>
<tr>
<td>NRS Pain Intensity ($M$ [$SD$])</td>
<td>6.4 (1.6)</td>
<td>6.7 (1.7)</td>
<td>$&gt; .10$</td>
<td>.01</td>
</tr>
<tr>
<td>MPI Pain Interference ($M$ [$SD$])</td>
<td>4.4 (1.1)</td>
<td>4.6 (1.8)</td>
<td>$&lt; .01$</td>
<td>.05</td>
</tr>
<tr>
<td>MPI Activity ($M$ [$SD$])</td>
<td>2.4 (1.0)</td>
<td>2.0 (1.8)</td>
<td>$&lt; .01$</td>
<td>.06</td>
</tr>
<tr>
<td>BDI ($M$ [$SD$])</td>
<td>16.8 (9.4)</td>
<td>19.9 (10.5)</td>
<td>$&lt; .08$</td>
<td>.03</td>
</tr>
<tr>
<td>PBCL ($M$ [$SD$])</td>
<td>2.9 (1.0)</td>
<td>3.4 (1.1)</td>
<td>$&lt; .02$</td>
<td>.04</td>
</tr>
<tr>
<td>RMDQ ($M$ [$SD$])</td>
<td>13.3 (4.6)</td>
<td>15.5 (4.7)</td>
<td>$&lt; .01$</td>
<td>.05</td>
</tr>
</tbody>
</table>

Note. TCBT = tailored cognitive–behavioral therapy; SCBT = standard cognitive–behavioral therapy; NRS Pain Intensity = numeric rating scale of average pain; MPI Pain Interference = West Haven–Yale Multidimensional Pain Inventory (WHYMPI) Interference scale; MPI Activity = WHYMPI Activity scale; BDI = Beck Depression Inventory; PBCL = Pain Behavior Checklist; RMDQ = Roland Morris Disability Questionnaire. For tests of sex, veterans, and “low back pain primary complaint” frequency differences, statistic was chi square. For others, $F$ tests were used.
Treatment Group Comparisons on Pre- to Posttreatment Changes for the ITT Sample (N = 128)

Although the TCBT and SCBT groups did not differ significantly on indices of treatment engagement or adherence, and so any group differences on pre- to posttreatment changes in outcomes or post-only ratings that emerged could not be explained by differences in engagement and adherence, we still conducted pre-planned tests of group differences in outcomes.

Prior to examining these relationships, as depicted in Table 2, the TCBT and SCBT groups did not differ significantly on pre-treatment NRS or BDI scores, but did differ significantly on MPI-I, MPI-A, RMDQ, and PBCL scores. Participants allocated to the SCBT group reported greater pain interference, disability, pain behaviors, and lower activity than those allocated to TCBT prior to treatment. Thus, all analyses were conducted adjusting for these pre-treatment differences. For instance, analysis of pre- to posttreatment changes in MPI-A was conducted by controlling for pretreatment values in MPI-I, RMDQ, and PBCL scores.

In order to determine whether the treatment groups changed differently on outcomes, 2 (treatment: TCBT, SCBT) × 2 (period: pretreatment, posttreatment) mixed-design ANOVAs were performed. Means and standard deviations appear in Table 3. Treatment × Period interactions for outcome variables were nonsignificant, F(1, 120) < 1. Period effects were significant for NRS (F[1, 120] = 10.22, p < .01, η² = .05), MPI-I (F[1, 120] = 32.50, p < .01, η² = .21), BDI (F[1, 120] = 21.47, p < .01, η² = .15), PBCL (F[1, 120] = 17.01, p < .01, η² = .12), and RMDQ (F[1, 120] = 9.85, p < .01, η² = .07) in directions indicating that participants improved significantly from pre- to posttreatment on these measures, irrespective of treatment.

Treatment Group Comparisons in Goal Attainment and Treatment Satisfaction Among Those Completing at Least Three Sessions (n = 114)

For self-reported attainment of participants’ primary and secondary treatment goals, TCBT did not differ significantly from SCBT, F(1,94) < 1.70, ps > .10. It should be noted that 77.9% of participants (collapsed across treatment condition; n = 74) reported moderately (+1 on the behavioral goal accomplishment scale) or completely (+2 on the behavioral goal accomplishment scale) attaining their primary treatment goal, and 76.3% reported positive scores for attaining their secondary goal for treatment. On ratings of treatment satisfaction, the TCBT (M = 5.5, SD = .6) and SCBT (M = 5.4, SD = .7) groups did not differ significantly, F < 1.

Relationships Among Indices of Engagement and Adherence and Pre- to Posttreatment Residualized Change Scores and Post-Only Ratings for the Sample Completing at Least Three Sessions (ns = 112 and 114)

Given that treatments did not differ significantly on pre- to posttreatment effects on outcomes, but significant pre- to posttreatment improvements emerged for all outcomes, further analyses focused on changes collapsed across treatments. The significant pre- to posttreatment effects indicated that variance in residualized change scores reflected significant change. Thus, analyses were performed to determine whether dose, number of rescheduled sessions, and IVR ratings were related significantly to pre- to posttreatment outcome changes and post-only ratings (goal attainment, treatment satisfaction) collapsed across treatment group.

Residualized change scores were computed for the outcome factors by regressing pretreatment scores on posttreatment scores. Pearson correlations were generated among the engagement and adherence indices and outcome variable change scores (see Table 4). Results indicated that the greater intersession adherence to skills practice and the more therapy sessions attended, the more likely participants were to endorse meeting primary and secondary treatment goals and to indicate treatment satisfaction. Number of therapy sessions attended was also significantly related to decreases in pain interference, pain behaviors, and perceived disability.

Discussion

Results did not support the hypothesis that a tailored approach to CBT would enhance engagement and participation in treatment in the patients treated in this study. Participants in the TCBT condition, relative to those assigned to SCBT, were not more likely to attend a greater number of sessions, report greater adherence to therapist recommendations for intersession pain coping skill practice or behavioral goal accomplishment, or be less likely to drop

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Table 3

Pretreatment, and Posttreatment Means and Standard Deviations for the ITT Sample (n = 128)

<table>
<thead>
<tr>
<th>Group and variable</th>
<th>Pretreatment</th>
<th>Posttreatment</th>
<th>p value</th>
<th>η²</th>
</tr>
</thead>
<tbody>
<tr>
<td>TCBT</td>
<td>6.4 (1.6)</td>
<td>5.9 (1.8)</td>
<td>&gt;.10</td>
<td>.002</td>
</tr>
<tr>
<td>NRS pain</td>
<td>6.7 (1.7)</td>
<td>6.3 (2.0)</td>
<td>&gt;.10</td>
<td>.007</td>
</tr>
<tr>
<td>SCBT</td>
<td>4.4 (1.1)</td>
<td>4.0 (1.2)</td>
<td>&gt;.10</td>
<td>.007</td>
</tr>
<tr>
<td>MPI-I</td>
<td>4.8 (.9)</td>
<td>4.3 (1.3)</td>
<td>&gt;.10</td>
<td>.007</td>
</tr>
<tr>
<td>TCBT</td>
<td>2.4 (1.5)</td>
<td>2.5 (1.0)</td>
<td>&lt;.08</td>
<td>.030</td>
</tr>
<tr>
<td>MPI-A</td>
<td>2.0 (.8)</td>
<td>2.3 (1.1)</td>
<td>&gt;.10</td>
<td>.001</td>
</tr>
<tr>
<td>SCBT</td>
<td>16.8 (9.4)</td>
<td>14.2 (10.3)</td>
<td>&gt;.10</td>
<td>.001</td>
</tr>
<tr>
<td>TCBT</td>
<td>19.9 (10.5)</td>
<td>16.9 (11.1)</td>
<td>&gt;.10</td>
<td>.000</td>
</tr>
<tr>
<td>TCBT</td>
<td>2.9 (1.0)</td>
<td>2.7 (1.2)</td>
<td>&gt;.10</td>
<td>.000</td>
</tr>
<tr>
<td>SCBT</td>
<td>3.4 (1.0)</td>
<td>3.1 (1.0)</td>
<td>&gt;.10</td>
<td>.012</td>
</tr>
<tr>
<td>TCBT</td>
<td>13.3 (4.6)</td>
<td>12.6 (5.7)</td>
<td>&gt;.10</td>
<td>.012</td>
</tr>
</tbody>
</table>

Note. p and η² values refer to tests of the Treatment Group × Period interactions. ITT = intent-to-treat; TCBT = tailored cognitive–behavioral therapy; SCBT = standard cognitive–behavioral therapy; NRS pain = numeric rating scale of average pain; MPI-I = West Haven–Yale Multidimensional Pain Inventory – Interference; MPI-A = West Haven–Yale Multidimensional Pain Inventory – Activity; BDI = Beck Depression Inventory; PBCL = Pain Behavior Checklist; RMDQ = Roland Morris Disability Questionnaire.
out of treatment. Again, it is important to note that failure to find a significant difference between groups on IVR ratings appears to be less a matter of inadequate power than a truly small effect without clinical significance. With power at .80 and alpha at \( p < .05 \), we would need 5,373 participants in each group to find a significant difference between groups for even a small effect size of \( \eta^2 = .01 \). In summary, the results indicate that, contrary to expectations, patients receiving TCBT enhanced with module choice and MI did not demonstrate greater treatment engagement and adherence. A close inspection and consideration of the results may provide insights into these unexpected findings.

Of the 128 participants who completed baseline evaluation and who were allocated to receive treatment, 114, or 84%, received at least a minimum “dose” of either treatment (defined as having attended at least three treatment sessions). On average, those who received this minimum dose of either treatment attended approximately nine of 10 scheduled sessions. These participants rated both treatments as highly credible, and, on average, rated daily goal accomplishment and adherence to skill practice recommendations as greater than 6 on a 10-point scale over the 10 weeks of treatment. Taken together, these measures suggest that, even early in treatment, and regardless of treatment condition, participants perceived CBT as credible and potentially useful in relieving pain and in helping achieve individual goals, and that they remained active participants throughout treatment. It may have been the case that high rates of participation among the individuals enrolled in the study and who received SCBT left little room for treatment enhancement. One possible explanation for this “ceiling effect” is that it may reflect a motivational bias associated with the participation in the study itself. That is, lesser motivated people may not comprise the final group of participants. Recall that only 46.2% of eligible individuals participated in this clinical trial. Patients who might have benefited the most from the tailored approach—those who might have been most ambivalent about CBT treatment—already screened themselves out of participation before they attended the first session. Alternatively, it is plausible that the tailored intervention—featuring choice of modules and motivational techniques—was not powerful enough to affect a difference in treatment adherence.

Indeed, recent systematic reviews and meta-analyses of the efficacy of psychological interventions for chronic back pain have generally failed to document incremental effectiveness of any psychological intervention relative to other active comparison conditions (e.g., Hoffman et al., 2007). Given these previous findings, it is perhaps not surprising that differences in even key targets of the tailored and enhanced intervention—engagement and adherence—were not observed in the current study. Note as well that, although participants reported significant pre- to postimprovements on all outcome indexes, the TCBT and SCBT treatment conditions did not differ significantly on the magnitude of these changes.

The study was also designed to assess the role of “dose” of treatment received and adherence to recommendations to practice pain coping skills as mediators of treatment outcomes. Because significant treatment group differences were not observed in these factors or on outcome indices, mediation could not be examined. Instead, analyses demonstrated that the number of sessions attended, number of rescheduled sessions, and the extent to which participants reported practicing skills and accomplished the specified intersession behavioral goals were all significantly related to treatment gains and satisfaction with their pain care on key indices for participants in both treatment conditions. Although there is evidence that session attendance and adherence to therapist recommendations for adaptive coping skill practice is associated with improved health outcomes in other areas, the results of this study are some of the first to document a link between the specific process targets of CBT for pain, namely, development of, and adherence to, adaptive pain coping skills, and outcomes of the intervention. Closer examination of these important processes of change is vital for us to better understand mechanisms through which CBT exerts beneficial effects on patient adjustment to chronically painful conditions.

A primary limitation of the study was that participants did not necessarily represent the population of all individuals with low back pain or other chronic pain conditions. The study sample was comprised mostly of male veterans of the U.S. military. They had a mean age of 55.1 years, and a majority were not presently married or working. These characteristics may both undermine the generalizability of the study to other populations and serve to further limit the magnitude of the beneficial effects of treatment. The fact that both treatment protocols were viewed as highly credible, and that participation and engagement in treatment protocols was high for both conditions, also limited our ability to detect potential differences in adherence between them. Future studies seeking to examine the efficacy of motivational enhancement approaches should make an effort to recruit participants who have more ambivalence about CBT treatment than those recruited into this study—for example, by providing stronger incentives for participation or providing motivational enhancement interventions as a part of recruitment efforts—to determine if the procedures designed to enhance engagement in the TCBT condition might be more effective in such patient populations.

In sum, the findings from this study suggest that tailored CBT provided with motivational enhancement procedures do not contribute to adherence and positive outcome over and above more tradi-

### Table 4

<table>
<thead>
<tr>
<th></th>
<th>IVR ratings ((n = 112))</th>
<th>Dose ((n = 114))</th>
<th># of reschedules ((n = 114))</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain severity, pre–post change</td>
<td>-0.09</td>
<td>-0.15</td>
<td>0.02</td>
</tr>
<tr>
<td>MPI-Interference, pre–post change</td>
<td>-0.16</td>
<td>-0.20*</td>
<td>0.06</td>
</tr>
<tr>
<td>MPI-General Activity, pre–post change</td>
<td>0.11</td>
<td>0.06</td>
<td>-1.0</td>
</tr>
<tr>
<td>BDI, pre–post change</td>
<td>0.01</td>
<td>-0.16</td>
<td>0.06</td>
</tr>
<tr>
<td>PBCL, pre–post change</td>
<td>-0.17</td>
<td>-0.26*</td>
<td>0.05</td>
</tr>
<tr>
<td>RMDQ, pre–post change</td>
<td>-0.21*</td>
<td>-0.20*</td>
<td>-0.02</td>
</tr>
<tr>
<td>Primary goal, post</td>
<td>0.21*</td>
<td>0.32</td>
<td>-1.1</td>
</tr>
<tr>
<td>Secondary goal, post</td>
<td>0.29*</td>
<td>0.33*</td>
<td>-1.1</td>
</tr>
<tr>
<td>Satisfaction, post</td>
<td>0.28*</td>
<td>0.29*</td>
<td>-0.25</td>
</tr>
</tbody>
</table>

**Note.** IVR = interactive voice response; Dose = number of treatment sessions attended; MPI = West Haven–Yale Multidimensional Pain Inventory; BDI = Beck Depression Inventory; PBCL = Pain Behavior Checklist; RMDQ = Roland Morris Disability Questionnaire. * \( p < .05 \).
tional CBT, at least in patients who may be already motivated to participate in CBT treatment. Nonetheless, findings indicate that, regardless of CBT type (tailored or standard), measures of adherence to skills practice and number of therapy sessions attended were significantly associated with many pre- to posttreatment gains in outcome measures. Results underscore the value of participant engagement in psychosocial treatment for chronic pain, and adherence to the typical CBT regimen of intersession homework assignments to practice skills learned in session. Here, we (Eccleston, Williams, & Morley, 2009) hypothesized that MI would be one therapeutic technique needed to enhance engagement and adherence, but results suggest that deliberate therapist attention devoted to increasing motivation may not have been necessary to affect these factors. Thus, investigation of the precise therapeutic processes that do indeed enhance participant engagement and adherence is needed so that we may then develop techniques and procedures that actually do augment process factors and produce better outcomes.

References


Eccleston, C., Williams, A., & Morley, S. (2009, April 15). Psychological techniques and procedures that actually do augment process factors and adherence is needed so that we may then develop techniques and procedures that actually do augment process factors and produce better outcomes.


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