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A randomized, controlled trial of acceptance and commitment therapy and cognitive-behavioral therapy for chronic pain

Julie Loebach Wetherell [a,b,*], Niloofar Afari [a,b], Thomas Rutledge [a,b], John T. Sorrell [c], Jill A. Stoddard [d], Andrew J. Petkus [e], Brittany C. Solomon [f], David H. Lehman [a,b], Lin Liu [b], Ariel J. Lang [b], J. Hampton Atkinson [a,b]

[a] VA San Diego Healthcare System, 3350 La Jolla Village Drive, Dept. 111N-1, San Diego, CA 92161, USA
[b] Department of Psychiatry, University of California, San Diego, 9500 Gilman Dr., Dept. 9111N-1, La Jolla, CA 92093-9111, USA
[c] Stanford University Medical Center, Department of Anesthesia, Division of Pain Management, 430 Broadway St., Pavilion C, MC 6343, Redwood City, CA 94063-3132, USA
[d] Alliant International University, 10455 Pomerado Rd., San Diego, CA, 92131, USA
[e] SDSU/UCSD Joint Doctoral Program in Clinical Psychology, 6363 Alvarado Ct., Suite 103, San Diego, CA 92120-4913 USA
[f] Washington University, Department of Psychology, Campus Box 1125, One Brookings Drive, St. Louis, MO 63130-4899, USA

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ABSTRACT

Individuals reporting chronic, nonmalignant pain for at least 6 months (N = 114) were randomly assigned to 8 weekly group sessions of acceptance and commitment therapy (ACT) or cognitive-behavioral therapy (CBT) after a 4–6 week pretreatment period and were assessed after treatment and at 6-month follow-up. The protocols were designed for use in a primary care rather than specialty pain clinic setting. All participants remained stable on other pain and mood treatments over the course of the intervention. ACT participants improved on pain interference, depression, and pain-related anxiety; there were no significant differences in improvement between the treatment conditions on any outcome variables. Although there were no differences in attrition between the groups, ACT participants who completed treatment reported significantly higher levels of satisfaction than did CBT participants. These findings suggest that ACT is an effective and acceptable adjunct intervention for patients with chronic pain.

1. Introduction

Cognitive-behavioral therapy (CBT) has strong support as an intervention for chronic pain [3,14,15,40,49,59,62,63]. Treatment typically focuses on reducing pain and distress through modifying physical sensations, catastrophic thinking, and maladaptive behaviors. Not all patients respond to CBT, however, and its effects on disability may be limited [15,40]. Moreover, research on mechanisms underlying the effects of CBT could ultimately help to improve interventions.

In contrast to CBT and other models focused on reducing pain severity, the acceptance and commitment therapy (ACT) model is based on the theory that attempts to change certain aversive internal experiences, such as chronic pain, are likely to be futile at best, and at worst may contribute to increased distress and interference [35,56]. The ACT treatment model consists of awareness and nonjudgmental acceptance of all experiences, both negative and positive; identification of valued life directions; and appropriate action toward goals that support those values [23]. The objective is to improve functioning and decrease interference of pain with value-driven action; the mechanism is presumed to be acceptance, in contrast to control-oriented treatments such as CBT[21].

Evidence from the literature on thought and emotion suppression, coping styles, and clinical disorders and psychotherapy processes supports the theoretical underpinnings of ACT [58,60,71]. Moreover, the results of laboratory pain induction tests with normal control subjects [32,46,52] and individuals with chronic pain [55,68] have demonstrated that acceptance is associated with increased pain tolerance and decreased recovery time, relative to distraction or control strategies. Cross-sectional as well as longitudinal investigations have found that acceptance is associated with better emotional, social, and physical functioning among patients with chronic pain [16,17,19,33,37,42,64,67]. Comparisons of acceptance- and control-based strategies have shown that the former are associated with better functioning in chronic pain patients [37,45].

ACT has empirical support for several mental and physical health problems, and support for the use of ACT in chronic pain

* Corresponding author at: Department of Psychiatry, University of California, San Diego, 9500 Gilman Dr., Dept. 9111N-1, La Jolla, CA 92093-9111, USA. Tel.: +1 858 552 8585x2752; fax: +1 858 552 4321.
E-mail address: jwetherell@ucsd.edu (J.L. Wetherell).

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is growing [3,11,20,22,25,28,31,54,69,72,73]. Division 12 (Clinical Psychology) of the American Psychological Association cites "modest" support for ACT as an empirically supported treatment for chronic pain (http://www.div12.org/PsychologicalTreatments/treatments/chronicpain_act.html), and the Substance Abuse and Mental Health Services Administration lists ACT on its National Registry of Evidence-based Programs and Practices (http://nrepp.samhsa.gov/ViewIntervention.aspx?id=191). The 2 largest investigations of ACT for chronic pain found strong effects on measures of physical and psychosocial disability, mood, and 2 physical performance measures in patients undergoing a group-based, intensive, interdisciplinary 3- or 4-week program [44,65]. Pilot work suggested that ACT may produce superior outcomes to CBT for chronic pain [69].

The primary aim of this study was to examine the efficacy of an ACT protocol designed for an outpatient primary care setting and compare it with CBT in individuals with diverse chronic pain conditions. Hypotheses were: (1) ACT will produce improvements in pain interference and also in pain severity, emotional distress, activity levels, and quality of life for patients with chronic benign pain conditions relative to a baseline treatment-as-usual period; (2) ACT will produce significantly greater improvements in these outcomes and higher levels of satisfaction with treatment than CBT; and (3) pain acceptance will mediate treatment response in ACT, and perceived pain control will mediate treatment response in CBT.

2. Methods

2.1. Participants

Participants were 114 individuals, 18 to 89 years old, reporting chronic nonmalignant pain of any type for at least 6 months, with pain severity and interference ratings of at least 5/10 on a numerical rating scale. They were recruited through VA San Diego Healthcare System primary care clinics (38.6%), advertisements (19.3%), a letter to the editor published in the San Diego *Union-Tribune* newspaper (18.4%), pain support groups (10.5%), other studies (5.3%), referrals from other participants (4.4%), and UCSD clinics (3.5%). Participants were excluded if they had a history of psychotic illness or manic episode, or a substance use disorder within the 6 months before recruitment, ascertained using the Structured Clinical Interview for DSM-IV (SCID) [18]; were currently participating in psychotherapy for pain; or had serious medical conditions that could interfere with participation.

In addition, participants were required to be stable on all pain or mood treatments for at least 2 months before enrolling onto the study and to remain stable on such treatments over the course of participation unless medically necessary, in order to rule out explanations for changes in pain or mood external to the study treatments. Participants for whom changes were ordered (n = 4 before starting study treatment; n = 5 after starting treatment) received a final assessment and were withdrawn from the study. The study was approved by the University of California, San Diego Institutional Review Board and the VA San Diego Healthcare System Research and Development Committee. All participants gave written informed consent.

2.2. Procedures

Methods and procedures were consistent with CONSORT guidelines for conducting and reporting randomized clinical trials [48]. Fig. 1 depicts the flow of participants through the study. After a baseline assessment that included a medical evaluation by a study physician as well as the SCID psychiatric diagnostic interview, participants were randomly assigned in small groups to receive either ACT or CBT. Groups rather than individuals were randomized in order to minimize delays between recruitment and group-administered treatment. Twenty groups were conducted; typically 6 participants were assigned to each group, but a few groups were formed with 4 or 5 participants out of consideration for limiting the waiting time for participants who had been recruited earlier. The group randomization table was generated by a computer before recruitment and was held by one of the study therapists. The principal investigator, research assistants, and the other study therapist did not have access to this information, and the therapist holding the list did not have any pretreatment contact with participants or access to information about which participants were assigned to a particular group. Similarly, participants were not aware of their assignment until their first session.

After randomization but before starting the intervention, participants were monitored over a 4–6 week waiting period to ensure stability of existing pain treatments and evaluate change over time during a pretreatment baseline during which they received their usual care. They were administered the primary outcome measure weekly by telephone during the pretreatment and intervention periods.

Participants completed a second assessment immediately before starting treatment, a third assessment after completion of 8 sessions of weekly treatment, and a fourth assessment 6 months after completion of treatment. Assessments were conducted by research assistants (RAs) blind to treatment condition. Blindness was evaluated by having the RAs guess each participant's assignment; these guesses were no more accurate than chance (percentage agreement = 50.6%, kappa = 0.01). Participants who dropped out during either the pretreatment phase (n = 15) or after starting treatment (n = 14) were requested to complete a final assessment. Ten individuals who dropped out during the pretreatment phase and 4 who dropped out during treatment did so. Participants were compensated for their participation. A total of 57 participants were randomized to ACT and 57 to CBT; 49 participants attended at least 1 ACT session and 43 completed at least 6 sessions of ACT treatment. Fifty participants attended at least 1 CBT session and 42 completed at least 6 sessions of CBT treatment.

2.3. Measures

Assessments included measures of pain interference, pain severity, emotional distress, physical activity, quality of life, and treatment satisfaction. Outcome measures were chosen with regard to VA recommendations [50] as well as recommendations from the Initiative on Methods, Measurement, and Pain Assessment in Clinical Trials (IMMPACT) [13]. In order to examine the mechanisms of action of both treatments, measures of pain control and pain acceptance were included as potential mediators.

2.3.1. Primary outcome

The primary outcome was the Brief Pain Inventory Short Form Interference subscale (BPI) [10]. This 9-item subscale, recommended by the IMMPACT group as a measure of functioning [13], measures the degree to which pain interferes with various aspects of life, including mobility and social activities. The BPI also includes a 4-item subscale for pain severity. Both subscales show high internal consistency and are sensitive to treatment change [61]. Cronbach's alpha coefficients were .88 for the Interference and .80 for the Severity subscales in the study. This instrument was administered weekly during both the pretreatment and treatment phases as well as at posttreatment and 6-month follow-up.

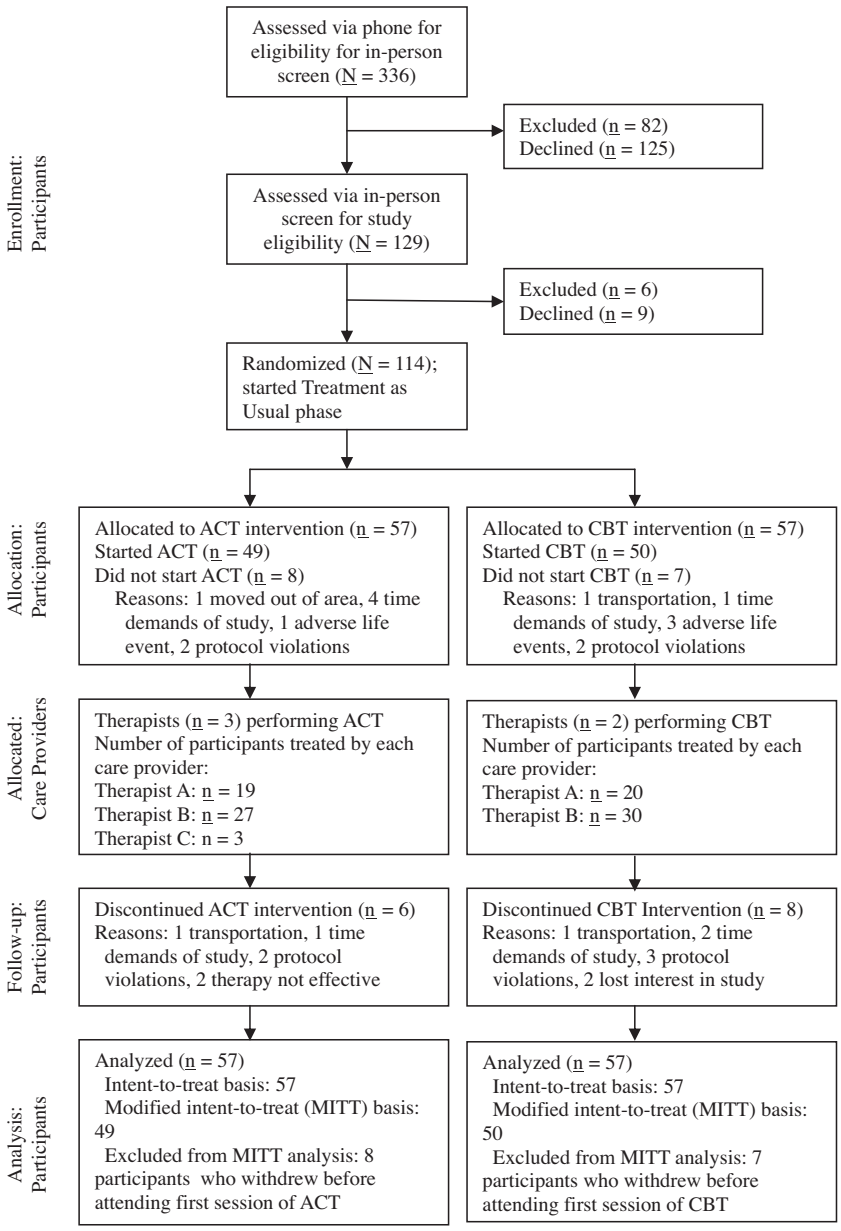

Fig. 1. Patient flow in a randomized, controlled trial of acceptance and commitment therapy (ACT) and cognitive-behavioral therapy (CBT) for chronic pain.

2.3.2. Secondary outcomes

Mental and physical health-related quality of life were measured using the Medical Outcomes Study 12-Item Short Form Health Survey (SF-12) [70]. This measure is widely used with populations with chronic disease. The Physical and Mental Component Summary (PCS; MCS) scores correlate .91 and .92 with the corresponding scores derived from the SF-36, and 2-week test–retest reliability correlations were .89 and .76 [70]. The Short Form Health Survey is recommended by the IMMPACT group [13].

The West Haven-Yale Multidimensional Pain Inventory (MPI) [29] is recommended by both the IMMPACT group and the VA as a multidimensional measure of disability, functioning, and pain outcomes [13,50]. This widely used measure contains 12 subscales, has been used extensively in outcome research with heterogeneous samples of chronic pain patients, and has demonstrated sensitivity to treatment change [2,47]. For this study, we used only the General Activity subscale, which includes items assessing various types of activities. Cronbach's alpha for this scale in our sample was .96.

Depressive symptoms were measured with the Beck Depression Inventory-II (BDI-II) [5]. The BDI-II is scored by summing the highest ratings for each of 21 symptoms, each of which is rated on a 4-point scale ranging from 0 to 3. The measure has good internal consistency and is recommended for use as an outcome measure in treatment studies of chronic pain [6,13,50]. Cronbach's alpha in the present sample was .93.

Anxiety was assessed with the 20-item Pain Anxiety Symptoms Scale-Short Form (PASS) [36]. Pain anxiety captures fears participants associate with their symptoms, which are typically associated with the belief that their pain signals harm. High levels of pain anxiety compromise activity levels, participation in rehabilitation, and performance on functional tests. The instrument is a valid and reliable measure of anxiety symptoms in pain populations [39,57]. The PASS items are scored on a 6-point Likert scale and assess cognitive, escape/avoidance, fear, and physiological anxiety dimensions. Cronbach's alpha in the present sample was .93.

Treatment satisfaction was measured with the Client Satisfaction Questionnaire (CSQ) [30]. Patient satisfaction is associated

with rehabilitation compliance in chronic pain participants, as well as being an important variable in its own right [24]. The CSQ, with 8 items rated on a 4-point Likert scale, is a widely used measure of satisfaction with health and mental health care treatment and has demonstrated adequate reliability and validity in various samples [1,9]. Cronbach's alpha in the present sample was .90.

2.3.3. Mediators

Pain acceptance was measured with the Chronic Pain Acceptance Questionnaire-Revised (CPAQ-R) [43]. Pain acceptance measures the degree to which patients have adjusted to pain as part of their identity and lifestyle. Low levels of pain acceptance predict poorer responses to rehabilitation programs [34]. The CPAQ-R consists of 20 items scored on a 7-point Likert scale and comprising 2 factors measuring the domains of activity engagement and pain willingness. Cronbach's alpha was .89.

The Survey of Pain Attitudes (SOPA) [26] Control subscale, with 10 items scored on a 5-point Likert scale, measures belief in one's personal control over pain. The alpha coefficient was .80 in this sample.

In addition to outcomes and mediators, participant expectancies were also assessed at the end of the first session using a 5-item questionnaire that has been developed for intervention research with chronic pain participants and has been shown to correlate with positive rehabilitation outcomes [7].

2.4. Interventions

All participants continued receiving their usual health care, including treatment for pain and other medical conditions such as hypertension and diabetes, during their participation in this study. ACT and CBT were each comprised of eight 90-min weekly group sessions. Group treatment was chosen because it can be a more cost-effective modality than is individual treatment, particularly in a primary care setting, and because there may be some benefit conferred by mutual support; groups have been used in previous studies of ACT in a specialty pain clinic [44,65]. Session-by-session outlines are presented in Table 1; patient workbooks and therapist manuals for each condition are available upon request from the first author.

The ACT protocol, which was based on an unpublished manual used in a previous study [69], focused on changing expectations from elimination of pain to living as well as possible with chronic pain. Discussions and experiential exercises were used to demonstrate the futility of control-oriented strategies such as thought suppression and attempts to eliminate pain, distress, and other negative experiences. Mindfulness strategies were taught in order to develop the skill of allowing negative experiences such as muscle tension or discomfort, negative thoughts, and emotional distress to pass through consciousness without requiring the expenditure of energy or psychological resources to control or alter them [35,56]. Participants were also encouraged to identify their personal values and set and pursue short- and long-term goals consistent with those values in order to achieve improved quality of life and functioning.

The CBT protocol, which was based on an unpublished manual already in use in the San Diego VA's primary care clinics and also in previous research [69], focused on training participants to manage their pain using a variety of techniques, including pain monitoring, pacing, increasing pleasant activities, progressive muscle relaxation, thought challenging, communication with health care providers, and problem solving skills training [62]. Both interventions stressed the importance of at-home practice assignments to develop skills taught in session [27].

Two therapists, one with a doctorate and another who received her doctorate over the course of the study, led most of the groups, trained and supervised by experts in ACT (NA) and CBT (TR). One additional licensed psychologist led one ACT group. In order to avoid confounding the effects of type of treatment with therapist skill in nonspecific elements of therapy, both therapists conducted both types of interventions. Supervision sessions met weekly for 1 h and included review of audiotapes. Experts in ACT and CBT rated a sample of 17 ACT and 16 CBT tapes, respectively, for competence and fidelity to the therapeutic model; ratings were made separately for various elements of treatment (eg, conducting mindfulness exercise, use of Socratic style) as well as for the session overall. Mean overall adherence scores ranged from 3.0 to 4.0 on a 5-point Likert scale (0–4) across therapists using ACT and from 3.5 to 3.8 across therapists using CBT. Competence scores ranged from 3.3 to 4.0 for ACT and from 3.8 to 4.0 for CBT.

2.5. Statistical analyses

All study data were electronically entered into a database and statistical analyses were performed using SPSS 17.0. Initial analyses examined the distribution of variables to assess their characteristics (means, standard deviations, skewness, and kurtosis). Independent sample t tests were used to compare participant expectancies and satisfaction between the 2 modalities. A series of t tests and chi-square tests were used to test the comparability of participants in the ACT and CBT interventions on baseline characteristics and clinical variables. A significance level of $P < .05$ was set for the hypotheses involving the BPI Interference subscale, which was our primary outcome measure. An alpha level of $P < .0071$ was set for the other comparisons based on Bonferroni correction (.05 divided by the other 7 outcome variables).

Table 1
Session outlines for acceptance and commitment therapy (ACT) and cognitive-behavioral therapy (CBT) group treatment protocols for chronic pain.

Session	ACT	CBT
1	The limits of control (short and long-term costs and benefits; finger traps), focus on experience (body scan)	Three-component CBT model (thoughts, feelings, behaviors), pain monitoring
2	Values (what you care about, how you want to live your life)	Relaxation training (diaphragmatic breathing, progressive muscle relaxation, guided imagery)
3	Cognitive defusion (observing thoughts without trying to evaluate or change them)	Pain-fatigue cycle, activity pacing, and pleasant event scheduling
4	Mindfulness (being in the moment, raisin exercise)	Identifying and challenging negative thoughts (Activity, Belief, Consequences, Dispute model)
5	Committed action (''road map'' connecting values, goals, actions, obstacles, and strategies)	Problem-solving skills training and assertive communication
6	Review and continued action in support of values	Review and practice
7	Review and continued action in support of values	Review and practice
8	Moving forward	Relapse prevention

Hypothesis 1 investigated whether there were significant changes in pain interference and other outcomes for ACT relative to a multiple-baseline pretreatment phase. Baseline values for these models were computed as the average of all available scores across the pretreatment period. Linear mixed models were used to evaluate change in the BPI-derived variables (interference and severity). Participants were nested within groups in order to control for the effects of group. Time, therapy group, and the intercept were examined as random effects in the model, and the log ratio test was used to study the significance of the random effects. Each model contained the main effect of time. For the secondary measures, paired *t* tests were conducted on pre- to posttreatment and post- to follow-up change scores. Although hypothesis 1 focused on outcomes from ACT, we performed the same set of analyses for the CBT group.

Hypothesis 2 investigated whether improvements and satisfaction in the ACT condition were greater than in CBT. For pain interference and severity, we examined random effects models including modality and the modality by time interaction. If the treatment by time interaction was not significant, it was removed from the model. We then assessed the main effect of time. The main effect of modality was examined to determine if there were significant differences between treatment modalities. Analyses of covariance were conducted to compare change scores during the treatment and follow-up phases for all secondary outcomes using treatment modality as a main effect with the mean pretreatment score as a covariate. Client satisfaction with treatment was compared across conditions using an independent sample *t* test for patients who completed treatment.

Hypothesis 3 investigated whether change in pain control mediated change in pain interference in CBT and change in acceptance mediated change in interference in ACT. Studies have identified difficulties in examining mediation when comparing 2 active treatments without a control group [12]. Because such was the case in the present study, we could only assess between-modality differences in mediation. A nonparametric, bootstrapping approach [53] was used to test whether acceptance and control mediated differences between treatments. In the bootstrapping method, 5000 random samples were drawn and a 95% confidence interval for the indirect effect was estimated for both control and acceptance. In these bootstrapping approaches, depression diagnosis and interference during the pretreatment period were controlled for by adding them to the models as covariates. In an attempt to examine each modality separately, we examined the correlation between change in outcome and change in mediator.

All analyses were conducted in 2 ways: on an intent-to-treat (ITT) basis with all 114 participants included, and on a modified ITT basis including only the 99 participants who attended at least one group session. Because we found no differences in results generated by these methods, the more conservative ITT results are presented. One participant randomized to the ACT condition was missing baseline data on secondary outcomes other than pain severity; thus, comparisons for these outcomes have an N = 113. Five participants did not provide any data after their baseline assessment (resulting in an n = 109 for pretreatment scores), 16 did not provide posttreatment data (n = 98), and 34 did not provide 6-month follow-up data (n = 80). Because we used random effects regression models to analyze the BPI variables, we did not impute missing data; for secondary outcomes we used last observation carried forward.

3. Results

3.1. Sample characteristics

Participants' average age was 54.9 (12.5) years; 11.4% were 18–40 years old, 70.2% were 41 to 64 years old, and 18.4% were 65–89 years old. Approximately half (50.9%) of the participants were women, 67.5% were white, 43.9% were married, and 44.7% had at least a bachelor's degree. In terms of employment, 47.4% reported that they were disabled, 17.5% working part time, 12.3% working full time, 12.3% retired, 9.6% unemployed, and one participant (0.9%) was a student. Fewer than one-third (28.1%) of participants reported an annual family income of $50,000 or greater, 33.3% reported income of $20,000–49,999, and 37.7% reported less than $20,000 per year. Forty-one percent were receiving compensation for a pain-related condition (eg, Social Security Disability Income, VA Service Connection).

The participants reported experiencing pain for an average of 15.0 (13.5) years. The most common pain conditions were osteoarthritis (33.3%), neuropathic pain (30.7%), and degenerative disc disease (28.9%). The most common pain locations were lower extremity (79.8%), low back (78.9%), and upper extremity (66.7%; participants could report more than one). Low back pain (34.2%) and lower extremity pain (21.9%) were reported to interfere most with functioning.

Only 5 participants (4.4%) took no pain medication; 53.5% were taking nonsteroidal anti-inflammatory drugs, 52.6% psychotropics, 41.2% opioids, and 19.3% muscle relaxants. Including medications for other conditions as well as pain, 38.0% of the sample were taking 6–10 medications and another 30.0% were taking 11 or more medications. Other than medications, the only professionally prescribed pain treatment used concurrently with the study intervention by more than 10% of participants was transcutaneous electrical nerve stimulation (TENS unit; 13.2%). Since the start of their condition, approximately half (51.3%) the participants had used at least 4 different classes of medications for pain, and most (58.7%) had tried at least 5 different types of treatments (eg, medications, physical therapy, chiropractic, acupuncture). Of the almost one-third (31.6%) who had had surgery, most (55.6%) had undergone more than one procedure. With respect to self-help treatments, 47.4% reported exercising, 44.7% engaged in stretching, and 40.4% used bedrest.

More than half of the participants (53.5%) had a current psychiatric disorder, with 28.1% reporting major depression and 16.7% reporting posttraumatic stress disorder. A higher proportion of participants in the ACT condition (38.6%) than in the CBT condition (17.5%) were experiencing a current major depressive episode. Because we anticipated that depression might play a role in treatment outcomes, we controlled for this variable in all analyses. Although the BDI-II did not differ significantly between the treatment conditions, we also ran models using the total BDI-II score and the BDI Somatic and Cognitive subscales as covariates; neither variable was statistically significant in any model. The only other statistically significant differences across the conditions were that a greater proportion of participants assigned to the ACT condition reported spinal stenosis (15.8% vs 1.8%), had received physical therapy (77.2% vs 57.9%), and met criteria for social phobia (14.0% vs 3.5%).

The groups did not differ on attrition. Comparison of the 29 individuals who withdrew prematurely, either during the pretreatment period (n = 15) or during active treatment (n = 14), with the 85 who completed treatment indicated that dropouts were on average younger, 48.1 (11.3) years vs 57.1 (12.1) years, $t(112) = 3.52$, $P = .001$, more likely to experience tension headaches, 10.3% vs 1.2%, $\chi^2(1) = 5.37$, $P = .02$, and more likely to carry a diagnosis of social phobia, 20.7% vs 4.7%, $\chi^2(1) = 6.90$, $P = .009$.

Mean scores for all outcomes, without imputation for missing values, at the 4 assessment time points are presented in Table 2. On average, patients improved in both pain interference, $\beta = -0.14$; SE = 0.04; $P < .001$, and severity, $\beta = -0.12$; SE = 0.03; $P < .001$, but experienced worsening depression, $t(112) = -3.42$, $P = .001$, over the pretreatment period, with no significant differences between the groups. No other outcome variables changed significantly during the pretreatment phase (*P* values .11 to .69).

Table 2
Mean baseline, pretreatment, posttreatment, and 6-month follow-up scores for 114 participants receiving group-administered acceptance and commitment therapy (ACT) or cognitive-behavioral therapy (CBT) for chronic pain.

Outcome	ACT				CBT			
	Baseline raw score, *M* (SD)	Pretreatment raw score, *M* (SD)	Posttreatment raw score, *M* (SD)	6-Month follow-up raw score, *M* (SD)	Baseline raw score, *M* (SD)	Pretreatment raw score, *M* (SD)	Posttreatment raw score, *M* (SD)	6-Month follow-up raw score, *M* (SD)
BPI interference	5.8 (2.0)	5.7 (2.3)	5.1 (2.4)	5.0 (2.5)	5.8 (2.1)	5.1 (2.2)	4.5 (2.7)	4.7 (2.7)
BPI severity	6.0 (1.2)	5.9 (1.5)	5.6 (1.8)	5.4 (1.7)	5.8 (1.4)	5.2 (1.6)	4.9 (1.9)	4.8 (1.7)
SF-12 PCS	29.1 (6.8)	29.2 (7.8)	31.2 (8.4)	30.2 (8.2)	31.5 (8.8)	32.0 (9.2)	33.0 (8.2)	34.2 (9.9)
SF-12 MCS	40.0 (12.0)	39.5 (12.4)	41.0 (13.6)	40.6 (13.1)	42.3 (11.6)	40.4 (12.0)	44.9 (12.1)	41.9 (11.8)
MPI	2.0 (1.0)	2.0 (0.9)	2.0 (0.8)	2.0 (0.9)	2.3 (0.9)	2.3 (0.9)	2.3 (0.8)	2.2 (0.8)
BDI	18.7 (12.8)	21.1 (12.7)	17.8 (12.2)	18.9 (14.1)	15.5 (10.3)	17.3 (11.2)	13.2 (11.1)	14.3 (12.0)
PASS	45.5 (22.8)	46.1 (22.5)	41.5 (23.4)	41.7 (24.5)	41.7 (20.8)	45.4 (21.3)	37.9 (20.7)	38.4 (21.8)
Mediators								
CPAQ	53.3 (20.5)	53.8 (20.9)	63.3 (18.5)	61.0 (23.2)	52.1 (18.6)	54.6 (17.9)	60.7 (18.6)	60.7 (18.6)
SOPA Control	1.8 (0.8)	1.7 (0.7)	2.1 (0.8)	1.9 (0.8)	1.8 (0.8)	1.9 (0.7)	2.4 (0.7)	2.3 (0.8)

Note. BPI = Brief Pain Inventory; SF-12 PCS = Medical Outcomes Study 12-Item Short Form Physical Component Summary; SF-12 MCS = Medical Outcomes Study 12-Item Short Form Mental Component Summary; MPI = Multidimensional Pain Inventory General Activity subscale; BDI = Beck Depression Inventory; PASS = Pain Anxiety Symptom Scale; CPAQ = Chronic Pain Acceptance Questionnaire; SOPA Control = Survey of Pain Attitudes Control subscale.

Hypothesis 1. ACT will produce improvements in pain interference and also in emotional distress, activity levels, and quality of life relative to a baseline treatment-as-usual period.

The log-likelihood test indicated that nesting individuals within groups did not significantly improve the models, so a random effect for therapy group was not necessary. Results from the random effects regressions examining change in the ACT group over the treatment period relative to the average scores during the pretreatment period found a significant main effect of time on interference, $\beta = -0.06$; SE = 0.02; $P = .02$. Improvements were also significant for depression, $\Delta M = -2.32$, $t(56) = -2.98$, $P = .004$, and pain-related anxiety, $\Delta M = -4.51$, $t(56) = -3.74$, $P < .001$ (Table 3). Results were not significant for pain severity, $\beta = -0.02$; SE = 0.02; $P = .53$, mental health–related quality of life, $\Delta M = 1.43$, $t(56) = 1.45$, $P = .15$, activity, $\Delta M = 0.04$, $t(56) = 0.64$, $P = .53$, or physical health-related quality of life after Bonferroni correction, $\Delta M = 2.05$, $t(56) = 2.45$, $P = .02$. There were no significant changes between posttreatment and 6-month follow-up (Table 4).

The CBT group also improved on pain interference, $\beta = -0.09$; SE = 0.02; $P < .001$, depression, $\Delta M = -3.18$, $t(56) = -3.73$, $P < .001$, and pain-related anxiety, $\Delta M = -5.63$, $t(56) = -3.02$, $P = .004$ (Table 3). Results were not significant for physical

Table 3
Change during treatment on secondary outcomes for 114 participants receiving group-administered acceptance and commitment therapy (ACT) or cognitive-behavioral therapy (CBT) for chronic pain.

Variable	Within-group change, ACT (n = 57)			Within-group change, CBT (n = 57)			Between-group change	
	Change score, *M* (SD)	*t*	*P*	Change score, *M* (SD)	*t*	*P*	*F*	*P*
SF-12 PCS	2.05 (6.33)	2.45	.02	1.20 (6.41)	1.41	.16	0.82	.37
SF-12 MCS	1.43 (7.47)	1.45	.15	3.52 (9.20)	2.89	.006	2.36	.13
MPI	0.04 (0.53)	0.64	.53	0.03 (0.61)	0.35	.73	0.02	.90
BDI	−2.32 (5.87)	−2.98	.004	−3.18 (6.45)	−3.73	.0005	1.31	.26
PASS	−4.51 (9.09)	−3.74	.0004	−5.63 (14.08)	−3.02	.004	0.02	.90
CPAQ	9.94 (12.15)	6.17	<.0001	9.32 (13.45)	5.23	<.0001	0.30	.58
SOPA Control	0.32 (0.62)	3.90	.0003	0.58 (0.68)	6.45	<.0001	3.62	.06

Note. SF-12 PCS = Medical Outcomes Study 12-Item Short Form Physical Component Summary; SF-12 MCS = Medical Outcomes Study 12-Item Short Form Mental Component Summary; MPI = Multidimensional Pain Inventory General Activity subscale; BDI = Beck Depression Inventory; PASS = Pain Anxiety Symptom Scale; CPAQ = Chronic Pain Acceptance Questionnaire; SOPA Control = Survey of Pain Attitudes Control subscale.

Table 4
Change between end of treatment and 6-month follow-up on secondary outcomes for 114 participants receiving group-administered acceptance and commitment therapy (ACT) or cognitive-behavioral therapy (CBT) for chronic pain.

Variable	Within-group change, ACT			Within-group change, CBT			Between-group change	
	Change score, *M* (SD)	*t*	*P*	Change score, *M* (SD)	*t*	*P*	*F*	*P*
SF-12 PCS	−0.99 (5.73)	−1.30	.20	1.18 (6.22)	1.42	.16	3.12	.08
SF-12 MCS	−0.42 (6.68)	−0.48	.63	−2.73 (9.63)	−2.12	.04	1.75	.19
MPI	−0.03 (0.58)	−0.38	.71	−0.13 (0.69)	−1.48	.14	0.29	.59
BDI	1.09 (5.66)	1.45	.15	1.06 (7.07)	1.13	.26	0.01	.92
PASS	0.26 (10.25)	0.19	.85	0.49 (13.81)	0.27	.79	0.12	.73
CPAQ	−2.21 (9.94)	−1.68	.10	−1.95 (12.28)	−1.20	.24	0.01	.97
SOPA Control	−0.16 (0.61)	−1.93	.06	−0.11 (0.41)	−1.93	.06	0.34	.56

Note. SF-12 PCS = Medical Outcomes Study 12-Item Short Form Physical Component Summary; SF-12 MCS = Medical Outcomes Study 12-Item Short Form Mental Component Summary; MPI = Multidimensional Pain Inventory General Activity subscale; BDI = Beck Depression Inventory; PASS = Pain Anxiety Symptom Scale; CPAQ = Chronic Pain Acceptance Questionnaire; SOPA Control = Survey of Pain Attitudes Control subscale.

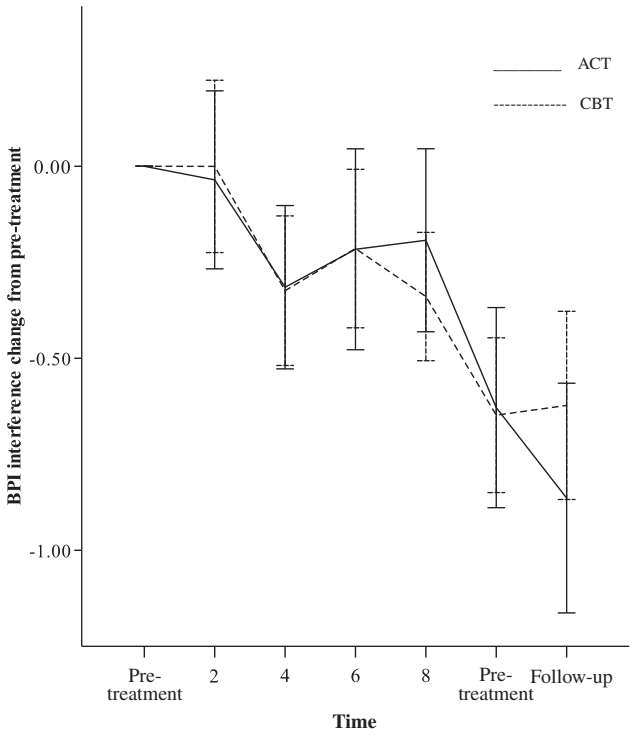

Fig. 2. Change in pain interference during treatment and at 6-month follow-up for 114 patients receiving group-administered acceptance and commitment therapy (ACT) or cognitive-behavioral therapy (CBT) for chronic pain.

health-related quality of life, $\Delta M = 1.20$, $t(56) = 1.421$, $P = .16$, activity, $\Delta M = 0.03$, $t(56) = 0.35$, $P = .73$, or for pain severity, $\beta = -0.07$; SE = 0.02, or mental health–related quality of life, $\Delta M = 3.52$, $t(56) = 2.89$, $P = .006$, and no statistically significant change occurred during follow-up after Bonferroni correction (Table 4).

Hypothesis 2. ACT will produce significantly greater improvements in outcomes and higher levels of satisfaction with treatment than CBT.

Results of the log-likelihood ratio test suggested the need for a random effect for time for models investigating all variables other than activity. As above, nesting individuals within groups did not significantly improve the models. Results from the random effects regressions found that the modality by time interaction was not significant for any outcome variable: pain interference, $\beta = -0.04$; SE = 0.03; $P = .27$, pain severity, $\beta = -0.05$; SE = 0.03; $P = .14$, or for any of the secondary outcome measures at posttreatment (Table 3) or follow-up (Table 4). A graphic depiction of the change over time on pain interference in both groups is presented in Fig. 2. Although participants assigned to the CBT condition rated their treatment as more credible than did those in the ACT condition at the outset, 32.0 (6.5) vs 28.8 (7.2), $t(95) = -2.34$, $P = .02$, ACT participants reported higher levels of satisfaction after treatment, 13.0 (8.7) vs 8.6 (6.5), $P = .007$.

Hypothesis 3. Pain acceptance will mediate treatment response in ACT, and perceived pain control will mediate treatment response in CBT.

There were no between-group differences in change in pain interference, acceptance, or control between modalities. Thus, according to the guidelines of Baron and Kenny [4], control and acceptance did not mediate differences between the treatment modalities on interference. Models were run to examine the indirect effect of modality on interference as mediated by acceptance and control, while statistically controlling for depression and interference during the pretreatment period. Results suggest that the indirect effect of modality on interference through control was estimated to lie between −0.38 and 0.02, and for acceptance, −0.10 and 0.14, with a 95% confidence interval, indicating no mediation through either control or acceptance.

Because both groups received treatment, correlations between change in mediators and change in interference were examined for each group separately. The correlation between changes in pain interference and perceived pain control in the ACT condition was significant, $r = -.43$, $P = .001$, but the corresponding correlation with pain acceptance was not, $r = -.12$, $P = .39$. Similarly, in the CBT condition, the correlation between changes in interference and control was significant, $r = -.35$, $P = .008$, but the correlation with acceptance was not, $r = -.103$, $P = .45$.

4. Discussion

To our knowledge, this is the largest randomized, controlled trial of ACT for chronic pain in a treatment-seeking sample. The results suggest that when added to usual care, both ACT and CBT can improve pain interference, depression, and pain-related anxiety in individuals with chronic pain. Given that participants in this study had an average of 15 years of pain, an extensive history of treatment, and high rates of disability status and prevalence of psychiatric comorbidity, the fact that behavioral treatments were effective was very encouraging.

Outcomes from ACT and CBT were equivalent despite the fact that participants found the CBT rationale more credible and had higher expectations for improvement at the outset. The finding that ACT was rated more satisfactory than was CBT is important; patients are more likely to remain engaged in a treatment they find enjoyable.

Before obtaining study treatment, participants improved over an average of 4–6 weeks of usual care (primarily medications) on measures of pain interference and severity. This suggests the possibility that repeated assessments may themselves confer some benefit, perhaps because participants interpreted them as a sign of caring and concern or felt hopeful about receiving treatment in the near future. Participants got slightly more depressed over the pretreatment period, however, and did not change on any other measures, suggesting that repeated measurement is not sufficient to ameliorate all the domains affected by chronic pain.

Improvements were maintained over a 6-month follow-up period. This finding is consistent with other investigations of acceptance-based pain treatments that have examined maintenance of gains over periods of 3 [65] to 7 [72] months. These results suggest that a brief course of acceptance-based treatment can have long-lasting impact, even among individuals with an extensive history of pain.

Overall, participants in the present study reported less improvement than have patients in other ACT for pain investigations [11,44,65,72,73]. This study differed from other investigations of chronic pain treatment, including those involving ACT, in several ways that may have weakened the outcomes. The intervention was not offered as part of an interdisciplinary integrated pain rehabilitation program; rather, it was designed to be appropriate for use in primary care. As such, it was much less intensive than the intervention used in some investigations (eg, 12 h total over 8 weeks vs 7.5 h per day over a 3- to 4-week period; [65]). Moreover, most participants were self-referred rather than recruited through medical settings, none were referred through specialty pain clinics, and all received compensation for their participation. Thus, their baseline pain severity, disability, and motivation for participation may have differed from those of pain clinic patients. The plurality of participants were receiving care through the Veterans Health Administration; veterans likely differ from non-Veteran

samples in several important ways, including higher levels of medical and psychiatric comorbidity and lower socioeconomic status. Participants were taking a very high number of medications, on average. Almost 1 in 5 participants were older adults, for whom chronic pain may be a normative experience and activity-related variables less relevant than for younger individuals. These differences limit the comparability of the results to those of other studies.

It is also possible that outcomes would have been stronger had the protocol focused more heavily upon different elements of ACT. Some investigators have emphasized the role of psychological flexibility, defined as the ability to adapt behavior to the situation and one's goals and values, in response to pain [41,66]. Components of psychological flexibility, as described in the ACT literature, include acceptance, "defusion" of thoughts and actions, and contact with the present moment. The present study protocol, by contrast, may have placed more emphasis on the role of values relative to other ACT components, particularly acceptance, which may have diluted the impact of the intervention. Although results from another investigation suggest that the values component of ACT may be more important than acceptance, this was a laboratory study of pain induction in undergraduates rather than a treatment study in a sample of individuals reporting chronic pain [8].

Unlike Vowles and McCracken [65], who observed significant improvement on physical performance measures after an ACT intervention, neither treatment improved activity levels in the current study. The most straightforward interpretation of this difference is that the current study relied upon self-reported activity levels vs the objective 5-min walk and sit-to-stand tests used in the former study. It is also possible that strategies designed to improve activity specifically should be integrated into treatment.

With respect to mechanism, contrary to our hypothesis, the mediation analyses suggested that an increase in perceived control over pain rather than increased acceptance of pain was driving reductions in pain interference across both conditions. This finding contrasts with other research on the importance of acceptance relative to control-oriented strategies [32,38,45,46,68], including the role of acceptance in CBT [59]. These studies, however, were either laboratory pain induction interventions or comparisons based on correlations in samples of patients who were not randomized to alternative pain treatments. The findings of the present study suggest that interventions that include behavioral strategies may simultaneously increase subjective sense of control over pain as well as reduced disability. Future research should focus on better understanding the mechanisms underlying treatment effects; findings could both improve clinical interventions as well as contribute to a stronger scientific understanding of chronic pain.

Limitations of the study, in addition to those described above, include the fact that all measures were self reported. Objective outcomes such as return to work and reduction of sick days clearly have a high public health impact and may be of more importance than self-rated interference of pain with daily life. Other performance-based measures such as sit-to-stand time may also be better indices of function, although these outcomes are not as likely to change in a stand-alone pain group as in an interdisciplinary rehabilitation program including physical therapy. Moreover, treatment in this study used group rather than individual format. Within many primary care settings, group therapy is more commonly used than is individual therapy; however, individual therapy may have produced stronger results.

Several methodological features of this study are noteworthy. Reviews of previous ACT intervention studies have identified serious shortcomings in many [51], including small sample sizes, lack of medical and psychiatric diagnostic evaluations, nonmanualized treatment components, and no control for possible therapist effects. The current study was designed to improve upon these previous efforts by including a medical examination and SCID interview as part of study enrollment, recruiting a large and diverse chronic pain sample, applying manualized therapies implemented by a limited number of closely supervised staff with expertise in ACT and CBT, and including rigorous controls such as an extended baseline period and careful tracking of all medically prescribed treatments for pain. We believe these design elements make the current findings a distinctive and important progression in understanding the benefits of ACT treatments for chronic pain against a "gold standard" behavioral treatment.

The primary clinical implication of the study is the demonstration that a brief psychotherapy intervention may be useful as an augmentation to medical pain treatment in reducing pain interference; such an intervention could be relatively easily implemented in a primary care setting, perhaps as part of a stepped care approach. Patients who do not respond to such an intervention could then receive more intensive individual therapy. More research is needed to examine the effects of this intervention as a component of such an approach.

In conclusion, this randomized, controlled trial comparing ACT and CBT interventions in an adult sample with chronic nonmalignant pain found evidence of benefits on measures of pain interference and mood in both conditions compared to treatment as usual. In contrast, we observed no evidence of differences between the ACT and CBT treatments on any outcome measure, and participants rated CBT as more credible but ACT as more satisfactory. Our findings suggest that both ACT and CBT are efficacious treatments for chronic pain that can augment standard medical management. Future research may help to identify common features of ACT and CBT that promote pain-related improvements and patient characteristics that predict better compatibility with specific treatment approaches.

Conflict of interest statement

No conflicts of interest to report.

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References

[1] Aharony L, Strasser S. Patient satisfaction: what we know about and what we still need to explore. Med Care Rev 1993;50:49–79.
[2] Altmaier EM, Lehmann TR, Russell DW, Weinstein JN, Kao CF. The effectiveness of psychological interventions for the rehabilitation of low back pain: a randomized controlled trial evaluation. Pain 1992;49:329–35.
[3] Bailey KM, Carleton RN, Vlaeyen JW, Asmundson GJG. Treatments addressing pain-related fear and anxiety in patients with chronic musculoskeletal pain: a preliminary review. Cogn Behav Ther 2010;39:46–63.
[4] Baron RM, Kenny DA. The moderator-mediator variable distinction in social psychological research: conceptual, strategic, and statistical considerations. J Pers Soc Psychol 1986;51(6):1173–82.
[5] Beck AT, Steer RA, Brown GK. Manual for beck depression inventory-II. San Antonio, TX: Psychological Corporation; 1996.
[6] Beck AT, Steer RA, Ball R, Ranieri WF. Comparison of the Beck Depression Inventories-IA and -II in psychiatric outpatients. J Pers Assess 1996;67:588–97.
[7] Borkovec TD, Nau SD. Credibility of analogue therapy rationales. J Behav Ther Exp Psychiatry 1972;3:257–60.
[8] Branstetter-Rost A, Cushing C, Douleh T. Personal values and pain tolerance. does a values intervention add to acceptance? J Pain 2009;10:887–92.
[9] Carr-Hill RA. The measurement of patient satisfaction. J Public Health Med 1992;14:236–49.
[10] Cleeland CS, Ryan KM. Pain assessment: global use of the Brief Pain Inventory. Ann Acad Med 1994;23:129–38.

[11] Dahl JC, Wilson KG, Nilsson A. Acceptance and commitment therapy and the treatment for persons at risk for long-term disability resulting from stress and pain symptoms: a preliminary randomized trial. Behav Ther 2004;35:785–801.
[12] Doss BD, Atkins DC. Investigating treatment mediators when simple random assignment to a control group is not possible. Clin Psychol Sci Prac 2006;13:321–36.
[13] Dworkin RH, Turk DC, Farrar JT, Haythornthwaite JA, Jensen MP, Katz NP, Kerns RD, Stucki G, Allen RR, Bellamy N, Carr DB, Chandler J, Cowan P, Dionne R, Galer BS, Hertz S, Jadad AR, Kramer LD, Manning DC, Martin S, McCormick CG, McDermott MP, McGrath P, Quessy S, Rappaport BA, Robbins W, Robinson JP, Rothman M, Royal MA, Simon L, Stauffer JW, Stein W, Tollett J, Wernicke J, Witter J. Core outcome measures for chronic pain clinical trials: IMMPACT recommendations. Pain 2005;113:9–19.
[14] Dysvik E, Kvaloy JT, Stokkeland R, Natvig GK. The effectiveness of a multidisciplinary pain management programme managing chronic pain on pain perceptions, health-related quality of life and stages of change—a non-randomized controlled study. Int J Nurs Stud 2010;47:826–35.
[15] Eccleston C, Williams AC, Morley S. Psychological therapies for the management of chronic pain (excluding headache) in adults. Cochrane Database Syst Rev 2009:CD007407.
[16] Elander J, Robinson G, Mitchell K, Morris J. An assessment of the relative influence of pain coping, negative thoughts about pain, and pain acceptance on health-related quality of life among people with hemophilia. Pain 2009;145:169–75.
[17] Esteve R, Ramírez-Maestre C, López-Marínez AE. Adjustment to chronic pain: the role of pain acceptance, coping strategies, and pain-related cognitions. Ann Behav Med 2007;33:179–88.
[18] First MB, Spitzer RL, Gibbon M, Williams JBW. Structured clinical interview for DSM-IV. New York: New York State Psychiatric Institute; 1995.
[19] Gauthier LR, Rodin G, Zimmermann C, Warr D, Moore M, Shepherd F, Gagliese L. Acceptance of pain: a study in patients with advanced cancer. Pain 2009;143:147–54.
[20] Gregg JA, Callaghan GM, Hayes SC, Glenn-Lawson JL. Improving diabetes self-management through acceptance, mindfulness, and values: a randomized controlled trial. J Consult Clin Psychol 2007;75:336–43.
[21] Hayes SC, Duckworth MP. Acceptance and commitment therapy and traditional cognitive behavior therapy approaches to pain. Cogn Behav Prac 2006;13:185–7.
[22] Hayes SC, Masuda A, Bissett R, Luoma J, Guerrero LF. DBT, FAP, and ACT: how empirically oriented are the new behavior therapy technologies? Behav Ther 2004;35:35–54.
[23] Hayes SC, Strosahl K, Wilson KG. Acceptance and commitment therapy: an experiential approach to behavior change. New York: Guilford; 1999.
[24] Hirsch AT, Atchison JW, Berger JJ, Waxenberg LB, Lafayette-Lucey A, Bulcorf BB, Robinson ME. Patient satisfaction with treatment for chronic pain: predictors and relationship to compliance. Clin J Pain 2005;21:302–10.
[25] Ilgen MA, Haas E, Czyz E, Webster L, Sorrell JT, Chermack S. Treating chronic pain in veterans presenting to an addictions treatment program. Cogn Behav Prac, in press.
[26] Jensen MP, Turner JA, Romano JM, Lawler BK. Relationship of pain-specific beliefs to chronic pain adjustment. Pain 1994;57:301–9.
[27] Johnson MH, Kazantzis N. Cognitive behavioral therapy for chronic pain: strategies for the successful use of homework assignments. J Ration Emot Cogn Behav Ther 2004;22:189–218.
[28] Johnston M, Foster M, Shennan J, Starkey NJ, Johnson A. The effectiveness of an acceptance and commitment therapy self-help intervention for chronic pain. Clin J Pain 2010;26:393–402.
[29] Kerns RD, Turk DC, Rudy TE. The West Haven–Yale Multidimensional Pain Inventory (WHYMPI). Pain 1985;23:345–56.
[30] Larsen DL, Attkisson CC, Hargreaves WA, Nguyen TD. Assessment of client/patient satisfaction: development of a general scale. Eval Prog Plan 1979;2:197–207.
[31] Lundgren T, Dahl J, Yardi N, Melin L. Acceptance and commitment therapy and yoga for drug-refractory epilepsy: a randomized controlled trial. Epilepsy Behav 2008;13:102–8.
[32] Masedo AI, Esteve R. Effects of suppression, acceptance and spontaneous coping on pain tolerance, pain intensity and distress. Behav Res Ther 2007;45:199–209.
[33] Mason VL, Mathias B, Skevington SM. Accepting low back pain: is it related to a good quality of life? Clin J Pain 2008;24:22–9.
[34] McCracken LM. Behavioral constituents of chronic pain acceptance: results from factor analysis of the Chronic Pain Acceptance Questionnaire. J Back Musculoskelet Rehabil 1999;13:93–100.
[35] McCracken LM. Contextual cognitive-behavioral therapy for chronic pain. Progress in pain research and management, vol. 33. Seattle, WA: IASP Press; 2005.
[36] McCracken LM, Dhingra L. A short version of the Pain Anxiety Symptoms Scale (PASS-20): preliminary development and validity. Pain Res Manage 2002;7:45–50.
[37] McCracken LM, Eccleston C. A prospective study of acceptance of pain and patient functioning with chronic pain. Pain 2005;118:164–9.
[38] McCracken LM, Eccleston C. A comparison of the relative utility of coping and acceptance-based measures in a sample of chronic pain sufferers. Eur J Pain 2006;10:23–9.
[39] McCracken LM, Gross RT, Aikens J, Carnrike CLM. The assessment of anxiety and fear in persons with chronic pain: a comparison of instruments. Behav Res Ther 1996;34:927–33.
[40] McCracken LM, Turk DC. Behavioral and cognitive-behavioral treatment for chronic pain. Spine 2002;27:2564–73.
[41] McCracken LM, Velleman SC. Psychological flexibility in adults with chronic pain: a study of acceptance, mindfulness, and values-based action in primary care. Pain 2010;148:141–7.
[42] McCracken LM, Vowles KE. A prospective analysis of acceptance of pain and values-based action in patients with chronic pain. Health Psychol 2008;27:215–20.
[43] McCracken LM, Vowles KE, Eccleston C. Acceptance of chronic pain: component analysis and a revised assessment method. Pain 2004;107:159–66.
[44] McCracken LM, Vowles KE, Eccleston C. Acceptance-based treatment for persons with complex, long-standing chronic pain: a preliminary analysis of treatment outcome in comparison to a waiting phase. Behav Res Ther 2005;43:1335–46.
[45] McCracken LM, Vowles KE, Gauntlett-Gilbert J. A prospective investigation of acceptance and control-oriented coping with chronic pain. J Behav Med 2007;30:339–49.
[46] McMullen J, Barnes-Holmes D, Barnes-Holmes Y, Stewart I, Luciano C, Cochrane A. Acceptance versus distraction: brief instructions, metaphors and exercises in increasing tolerance for self-delivered electric shocks. Behav Res Ther 2008;46:122–9.
[47] Mikail SF, DuBreuil SC, D'Eon JL. A comparative analysis of measures used in the assessment of chronic pain patients. Psychol Assess 1993;5:117–20.
[48] Moher D, Schulz KF, Altman D. The CONSORT statement: revised recommendations for improving the quality of reports of parallel-group randomized trials. JAMA 2001;285:1987–91.
[49] Morley S, Eccleston C, Williams A. A systematic review and meta-analysis of randomized controlled trials of cognitive behaviour therapy and behaviour therapy for chronic pain in adults, excluding headache. Pain 1999;80:1–13.
[50] National VA Pain Outcomes Working Group, National VA Pain Management Coordinating Committee. VHA pain outcomes toolkit. Washington, DC, 2003.
[51] Ost LG. Efficacy of the third wave of behavioral therapies: a systematic review and meta-analysis. Behav Res Ther 2008;46:296–321.
[52] Páez-Blarrina M, Luciano C, Gutiérrez-Martínez O, Valdivia S, Rodríguez-Valverde M, Ortega J. Coping with pain in the motivational context of values: comparison between an acceptance-based and a cognitive control—based protocol. Behav Modification 2008;32:403–22.
[53] Preacher KJ, Hayes AF. SPSS and SAS procedures for estimating indirect effects in simple mediation models. Behav Res Methods Instruments Computers 2004;36:717–31.
[54] Pull CB. Current empirical status of acceptance and commitment therapy. Curr Opin Psychiatry 2009;22:55–60.
[55] Richardson EJ, Ness TJ, Doleys DM, Baños JH, Cianfrini L, Richards JS. Catastrophizing, acceptance, and interference. laboratory findings, subjective report, and pain willingness as a moderator. Health Psychol 2010;29:299–306.
[56] Robinson P, Wicksell RK, Olsson GL. ACT with chronic pain patients. In: Hayes SC, Strohsahl KD, editors. A practical guide to acceptance and commitment therapy. New York: Springer; 2004. p. 315–45.
[57] Roelofs J, McCracken L, Peters ML, Crombez G, van Breukelen G, Vlaeyen JWS. Psychometric evaluation of the Pain Anxiety Symptoms Scale (PASS) in chronic pain patients. J Behav Med 2004;27:167–83.
[58] Safran JD, Greenberg LS. The treatment of anxiety and depression: the process of affective change. In: Kendall P, Watson D, editors. Anxiety and depression: distinctive and overlapping features. Orlando, FL: Academic Press; 1989. p. 455–89.
[59] Samwel HJA, Kraaimaat F, Crul BJP, van Dongen RR, Evers AWM. Multidisciplinary allocation of pain treatment: long-term outcome and correlates of cognitive-behavioral processes. J Musculoskelet Pain 2009;17:26–36.
[60] Strohsahl K. Cognitive and behavioral treatment of the personality disordered patient. In: Austad C, Berman B, editors. Psychotherapy in managed health care: the optimal use of time and resources. Washington, DC: American Psychological Association; 1991. p. 185–201.
[61] Tan G, Jensen MP, Thornby JI, Shanti BF. Validation of the brief pain inventory for chronic nonmalignant pain. J Pain 2004;5:133–7.
[62] Turk DC. A cognitive-behavioral perspective on treatment of chronic pain patients. In: Turk DC, Gatchel RJ, editors. Psychological approaches to pain management: a practitioner's handbook. New York: Guilford; 2002. p. 138–58.
[63] Turk DC, Monarch ES. Biopsychosocial perspective on chronic pain. In: Turk DC, Gatchel RJ, editors. Psychological approaches to pain management: a practitioner's handbook. New York: Guilford; 2002. p. 3–29.
[64] van Koulil S, van Lankveld W, Kraaimaat FW, van Riel PLCM, Evers AWM. Risk factors for longer term psychological distress in well-functioning fibromyalgia patients: a prospective study into prognostic factors. Patient Educ Couns 2010;80:126–9.
[65] Vowles KE, McCracken LM. Acceptance and values-based action in chronic pain: a study of treatment effectiveness and process. J Consult Clin Psychol 2008;76:397–407.
[66] Vowles KE, McCracken LM. Comparing the role of psychological flexibility and traditional pain management coping strategies in chronic pain treatment outcomes. Behav Res Ther 2010;48:141–6.
[67] Vowles KE, McCracken LM, Eccleston C. Patient functioning and catastrophizing in chronic pain: the mediating effects of acceptance. Health Psychol 2008;27:S136–43.

[68] Vowles KE, McNeil DW, Gross RT, McDaniel ML, Mouse A, Bates M, Gallimore P, McCall C. Effects of pain acceptance and pain control strategies on physical impairment in individuals with chronic low back pain. Behav Ther 2007;38:412–25.
[69] Vowles KE, Wetherell JL, Sorrell JT. Targeting acceptance, mindfulness, and values-based action in chronic pain: findings of two preliminary trials of an outpatient group-based intervention. Cogn Behav Practice 2009;16:49–58.
[70] Ware JE, Kosinski MA, Keller SD. A 12-item short form health survey: construction of scales and preliminary tests of reliability and validity. Med Care 1994;34:220–33.
[71] Wegner D, Zanakos SI. Chronic thought suppression. J Personality 1994;62:615–40.
[72] Wicksell RK, Ahlqvist J, Bring A, Melin L, Olsson GL. Can exposure and acceptance strategies improve functioning and life satisfaction in people with chronic pain and whiplash-associated disorders (WAD)? A randomized controlled trial. Cogn Behav Ther 2008;37:169–82.
[73] Wicksell RK, Melin L, Lekander M, Olsson GL. Evaluating the effectiveness of exposure and acceptance strategies to improve functioning and quality of life in longstanding pediatric pain—a randomized controlled trial. Pain 2009;141:248–57.