

# Acceptance-based therapies for treatment of chronic pain: A systematic review

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## **Abstract**

Acceptance-based therapies as Mindfulness-Based Stress Reduction (MBSR), Mindfulness-Based Cognitive Therapy (MBCT) and Acceptance and Commitment Therapy (ACT) are alternative treatments for Cognitive Behavioral Therapy (CBT) for chronic pain. The objective of this review was to evaluate the effectiveness of acceptance-based therapies on the outcome measures quality of life, depression and anxiety of chronic pain patients. A systematic review was conducted of randomized controlled trials (RCT's) and clinical controlled trials (CCT's) from three databases. Twenty-six studies (22 RCT's and 4 CCT's) met the inclusion criteria. In total, 1747 chronic pain patients were included. This review reported evidence for the effectiveness of acceptance-based therapies. Acceptance-based interventions are effective for the treatment of chronic pain but seem not superior to active treatments like CBT. MBSR seems to have an inferior effect on depression compared to ACT or MBCT. In addition, ACT may have a superior effect to MBSR and MBCT on anxiety. Only few studies reported significant follow-up effects. It seems that the pre-post effects are not preserved. A meta-analysis to compare the quantitative results of studies would be more validated. In addition, more insight in the factors that create positive long-term effects is required.

## Samenvatting

De op acceptatie-gebaseerde interventies, zoals Mindfulness-Based Stress Reduction (MBSR), Mindfulness-Based Cognitive Therapy (MBCT) en Acceptance and Commitment Therapy (ACT) zijn alternatieve interventies voor de Cognitieve Gedragstherapie (CBT) als behandeling van chronische pijn. Het doel van deze review was het evalueren van de effectiviteit van acceptatie-gebaseerde interventies op de uitkomstmaten kwaliteit van leven, depressie en angst bij chronische pijnpatiënten. Een systematische review van gerandomiseerde, gecontroleerde onderzoeken (RCT) en klinisch gecontroleerde onderzoeken (CCT) is uitgevoerd. Zesentwintig onderzoeken (22 RCT's & 4 CCT's) voldeden aan de inclusiecriteria. In totaal zijn 1747 chronische pijnpatiënten geïncludeerd. Deze systematische review rapporteert bewijs voor de effectiviteit van de op acceptatie-gebaseerde interventies. De acceptatie-gebaseerde interventies zijn effectief voor de behandeling van chronische pijn maar lijken niet superieur aan actieve interventies zoals CBT. MBSR lijkt minder effect op depressie te hebben dan ACT of MBCT. Bovendien lijkt het alsof ACT een groter effect heeft op angst vergeleken met MBSR en MBCT. Slechts enkele studies rapporteerden significante follow-up effecten. Het lijkt erop dat de pre-post effecten niet gehandhaafd worden. Een meta-analyse voor het vergelijken van kwantitatieve resultaten van studies zal een meer gevalideerd resultaat geven. Bovendien is meer inzicht nodig in de factoren die leiden tot positieve effecten op lange termijn.

**Table of content**

<b>1. Introduction</b>	<b>04</b>
<b>2. Methods</b>	<b>08</b>
2.1. Literature research	08
2.2. Selection of studies	08
2.3. Outcome measures	11
2.4. Data extraction and quality assessment	11
<b>3. Results</b>	<b>11</b>
3.1. Characteristics of included studies	11
3.2. Quality of life	
3.2.1. Post-intervention	15
3.2.2. Follow-up	16
3.3. Depression	
3.3.1. Post-intervention	17
3.3.2. Follow-up	18
3.4. Anxiety	
3.4.1. Post-intervention	18
3.4.2. Follow-up	19
<b>4. Discussion</b>	<b>19</b>
4.1. Main findings	19
4.2. Strengths and limitations	22
4.3. Conclusions and implications	24
<b>References</b>	<b>25</b>
<b>Appendix</b>	<b>32</b>
I. Table 6. Inclusion and exclusion criteria	
II. Table 7. Quality assessment of the included studies	
III. Table 8. Excluded studies	

## 1. Introduction

Pain can be defined as an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage (International Association for the Science of Pain (IASP), 1986). The IASP (1986) showed the importance of psychological factors in their definition. The association also mentioned that tissue damage may be the cause of pain. However, most chronic pain patients suffer from pain without clear tissue damage (van Wilgen en Keizer, 2004). Chronic pain can be defined as pain lasting longer than three to six months or beyond the expected period of healing of tissue pathology (Debono, Hoeksema & Hobbs, 2013).

Chronic pain of moderate to severe intensity occurs in 19 percent of adult Europeans and seriously affects the quality of life (Breivik, Collet, Ventafridda, Cohen and Gallacher, 2006). The prevalence in the Netherlands is almost as high. Breivik et al. (2006) reported a prevalence of 18%. Thus, chronic pain is a pervasive health care issue affecting about two million Dutch people. Chronic pain is a major health issue that causes functional incapacity and influences an individuals' economic, affective and social life (Castro, Daltro, Kraychete & Lopes, 2012).

Breivik et al. (2006) pointed out that 61% of chronic pain patients in Europe were less able or unable to work outside home, 19% lost their job and 13% changed their job because of their chronic pain. In addition, 60% visited their doctor about their pain 2-9 times in the last six months. Chronic pain causes health-care costs and indirect costs by lost productivity and absenteeism. The costs of chronic low back pain patients are more than 3,5 billion Euro annually (Lambeek et al., 2011).

Comorbidity with depression and the influence of psychological factors make chronic pain a particularly difficult problem (Fishbain, 1999, Moussavi et al., 2007). Breivik et al. (2006) showed that 21 percent of the respondents had ever been diagnosed with depression because of their pain. In addition, most people were less able or unable to sleep, had difficulties to participate or were unable to participate in social activities (Breivik et al., 2006).

Turk, Wilson and Cahana (2011) reported an overview of current treatments for chronic pain. Medication, interventional treatments, psychological and physical approaches are mentioned. The traditional medical treatments concentrated on decreasing pain sensations with anti-inflammatory medicines, opioids and anti-depressivants (Fishbain, Lewis & Gao, 2011; Turk et al., 2011). The interventional treatments are concentrated on decreasing pain with injection therapy or implantable devices and the physical approaches used exercise to decrease the pain (Turk et al., 2011). The psychological treatments are merely based on cognitive therapy and focus on coping and self-management of chronic pain patients rather than the elimination of physical causes of pain per se (Turk et al., 2011). The effectiveness of medical, interventional and physical treatments remains inconsistent and fairly poor (Turk et al., 2011). The available medical and physical treatments effectively reduce chronic pain (Turk et al., 2011), but the effects are modest (Breivik et al., 2006; Hoffman, Papas, Chatkoff & Kerns, 2007; Henschke, Ostelo & van Tulder, 2010; Morley, Eccleston & Williams, 1999). In addition, the medical and physical treatments often do not produce improvements in physical and emotional functioning and overall health-related quality of life

(Martin et al., 2008). The effects of psychological treatment on chronic pain seemed similar to traditional pharmacological and physical treatment (Verhaak, Kerssens, Dekker, Sorbi & Bensing, 1998; Williams, Eccleston & Morley, 2012). However, Turk et al. (2011) suggested that psychological treatment provides, besides modest improvements in chronic pain, also modest benefits in physical and emotional functioning.

Overall, currently available medical and physical treatments provide modest improvements in pain and minimum improvements in physical and emotional functioning, while psychological treatments provide modest improvements in pain and modest improvements in physical and emotional functioning (Turk et al., 2011). The role of psychological factors and emotional functioning can be underestimated in the medical and physical treatments. There is a crucial need to clarify the role of these psychological factors. Flor and Turk (2011) already reported that chronic pain can be explained as a complex interaction of five factors: the physical, cognitive, emotional, social and environmental factors. There is a need for treatment that focuses on daily functioning with integration of the five factors and treatment of chronic pain patients should not be merely focused on pain reduction (Turk et al., 2011). Because the traditional medical and physical treatments showed their limitations (Breivik et al., 2006) and the important role of psychological factors has not been given sufficient consideration, the researchers were interested in psychological treatments.

Cognitive Behavior Therapy (CBT) became the new standard treatment for chronic pain (Williams et al., 2012). CBT consists of three generations. The first generation is the traditional Behavior Therapy (Lindsley, Skinner & Solomon, 1953). The principles of Behavior Therapy are based on the classical conditioning and the operant conditioning. Because this first generation did not investigate thoughts and emotions, the principles needed to expand (Bandura, 1968). This insight becomes the core of the second generation of traditional cognitive therapy (Beck, Rush, Shaw & Emery, 1979). This second generation is focused on human cognitive processes and behavior (Castro et al., 2012).

Cognitive and behavioral therapy (CBT) approaches have been used as chronic pain interventions for many years (Flor, Fydrich & Turk, 1992). CBT tend to be somewhat effective in the self-efficacy and pain-beliefs of chronic pain patients, but the effects are moderate (Turner, Sears & Loeser, 2007). Several patients fail to benefit from Cognitive Behavioral Therapy (Turk, Meichenbaum & Genest, 1983; Turk, 2005), so alternative therapies are needed.

In the last years, the third generation of CBT has developed. This third generation presents the acceptance-based therapies. These therapies focus on learning to deal with complaints. The intention is to accept the pain and accept the aversive internal experiences: that is an openness to experience distressing thoughts, images, feelings and sensations without attempting to avoid them (Cordova, 2001). Hanh (2006) had an important role in developing acceptance-based therapies in the Western world. He introduced the concept mindfulness in the late 60s. Mindfulness can alter attitude or relation to thoughts, such that they are less likely to influence feelings and behaviors (Hanh, 2006). In contrast, traditional CBT involves the restructuring of cognitions and beliefs toward more functional ways of viewing the world (Ciarrochi & Bailey, 2008; Dahl, Wilson & Nilsson, 2004).

Kabat-Zinn defines mindfulness as non-judgemental awareness in the present moment (Kabat-Zinn, 2004). Kabat-Zinn made mindfulness appropriate by developing the first acceptance-based intervention: Mindfulness Based Stress Reduction (MBSR) (Kabat-Zinn, 1982). The MBSR- programme consists of eight weekly group sessions of two and a half hour. MBSR consists of different forms of meditation practise, mindfulness exercises, relaxation techniques and yoga (Kabat-Zinn, 2004). An important aim of the program is to manage the inevitable stress of society (Kabat-Zinn, 2004).

Segal, Williams and Teasdale (2002) developed a later programme based on MBSR, but combined with components of cognitive therapy. This therapy is called Mindfulness Based Cognitive Therapy (MBCT). In the first place this therapy is designed to prevent depressive relapse (Segal et al., 2002). The exercises in this therapy are much like the exercises in MBSR. The main difference between MBSR en MBCT is that the MBCT focuses more on observation of thoughts (Hulsbergen, 2009).

Another acceptance-based therapy is the Acceptance and Commitment Therapy (ACT). Hayes, Strosahl & Wilson (1999) developed this therapy. The therapy is based on the Relational Frame Theory (RFT). This is a theory that explains how the human language ability can lead to cognitions, feelings and behavior (Hayes et al., 1999). The RFT explains that behavior is influenced by cognition and that the environment influences the cognitions (Hayes, Luoma, Bond, Masuda & Lillis, 2006).

ACT targets each problem with the general goal of increasing psychological flexibility to adapt to changes in the environment (Hayes et al., 2006). Psychological flexibility refers to the ability to adopt an awareness of the present moment while concurrently adapting this awareness in light of meeting valued goals (Hayes et al., 2006). Thus, ACT increases the ability to act on values rather than act on thoughts or feelings.

To increase psychological flexibility, ACT interventions focuses on ineffective control strategies and experiential avoidance (Hayes et al., 2006). Psychological flexibility is established through six core ACT processes that should not be seen as separate or sequential processes: acceptance, cognitive defusion, being present, self as context, values, and committed action (Hayes et al., 2006; Harris, 2009). By encouraging patients to embrace negative thoughts and feelings, such as anxiety and pain, rather than attempting to change them, patients begin to learn that acceptance can be an important alternative to experiential avoidance (Hayes, Masuda, Bisset, Luoma & Guerrero, 2004). In order to gain acceptance, individuals become skilled at practicing cognitive defusion, which is a strategy used to target experiential avoidance by giving up a persons' control over thoughts and feelings (Hoffman, Sawyer and Fang, 2010). Being present means that ACT promotes non-judgmental contact with psychological and environmental events as they occur. The goal is to have clients experience the world more directly, so that their behavior is more flexible and thus their actions more consistent with the values that they hold (Hayes et al., 2006). Self as a context means that one can be aware of one's own flow of experiences without attachment to them or an investment in which particular experiences occur (Hayes et al., 2006). In the process values, the ACT uses a variety of exercises to help a client choose life directions in various domains while undermining verbal processes that might lead to choices based on avoidance (Hayes et al., 2006). At last, in the process committed action, ACT encourages the development of larger patterns of effective action linked to chosen values (Hayes et al., 2006).

While CBT-interventions attempt to change the content of negative thoughts, ACT attempts to embrace and accept these thoughts (McCarberg, 1999). ACT consists of mindfulness exercises, but the difference between ACT interventions and other mindfulness-based therapies is that ACT-interventions are also focused on the clarification and achievement of personal values (Chiesa & Malinowsky, 2011).

A lot of research is conducted to evaluate the effectiveness of acceptance-based interventions since the introduction of mindfulness. The number of research is growing. Grossmann, Niemann, Schmidt & Walach (2004) reported in their meta-analysis that MBSR may be effective to help individuals to deal with clinical and non-clinical problems. Ledesma & Kumano (2009) conducted a meta-analysis and found that MBSR may improve cancer patients' psychosocial adjustment to their disease. MBSR had positive effects on stress reduction. The meta-analyses of Vittengl, Clark, Dunn & Jarret (2007) and Piet & Hougaard (2011) reported positive effects of MBCT on preventing depressive relapses. Also the amount of research of mindfulness-based interventions for chronic pain is growing.

Baer (2003) conducted a meta-analysis and found improvements of MBSR intervention on pain and depression in people with chronic pain. No effect sizes for specific symptomatology like depression or anxiety were reported. The meta-analysis of Bohlmeijer, Prenger, Taal & Cuijpers (2010) examined the effects of MBSR in people with chronic somatic diseases and reported small effects on depression, anxiety and psychological distress. According to the meta-analysis of Lakhan and Schofield (2013) mindfulness-based therapies like MBSR and MBCT have a small to moderate positive effect on anxiety, depression and quality of life in patients with fibromyalgia, chronic fatigue syndrome and irritable bowel syndrome.

Meta-analyses reported that ACT is effective for different diagnoses (Öst, 2008; Powers, Zum Vorde, Sive Vording & Emmelkamp, 2009; Ruiz, 2010). Ruiz (2010) showed the efficacy of ACT in a wide range of psychological problems, but not particular for chronic pain. Powers et al. (2009) conducted a meta-analytic review. They concluded that ACT is better than wait-lists or placebo-treatment, but ACT treatment has similar effects as established treatments. The authors included patients with different diagnoses (including chronic pain patients) and they reported the outcome measures depression and anxiety. Hayes et al. (2006) concluded in their review that ACT has little effects in the different outcome measures quality of life, depression and anxiety in comparison to traditional CBT.

The meta-analyses that were mentioned in the previous alineas reported the effects of different variants of acceptance-based therapies separately. Veehof, van Oskam, Schreurs & Bohlmeijer (2011) performed the first all-embracing meta-analysis of the effects of all the different forms of acceptance-based interventions in chronic pain patients. Nine of the 22 included studies were randomized controlled trials, 15 were controlled trials and 7 studies were uncontrolled studies. Two of the 9 randomized controlled trials and one of the clinical controlled trials reported the effects of ACT. The remaining studies examined MBSR interventions. No study measured the effects of MBCT intervention. The study reported small effects on depression and medium effects on anxiety and quality of life. The researchers noted that acceptance-based interventions are at least as effective as CBT for chronic pain patients (Veehof et al., 2011).

Veehof et al. (2011) included studies in their meta-analysis and systematic review that were published till January 2009. Until now, there is no up-to-date systematic review to evaluate the effects of acceptance-based therapies for treatment of chronic pain. On the basis of the fact that, in recent years many more controlled studies on acceptance-based therapies in chronic pain populations have been published, an updated systematic review of controlled studies is needed.

Veehof et al. (2011) reported the outcome measures quality of life, pain intensity, physical well-being, depression and anxiety. The aim of the present article is to conduct a systematic review of the effects of acceptance-based interventions in patients with chronic pain on the outcome measures quality of life, depression and anxiety. The second objective of this study is to review and compare the effectiveness of the different forms of acceptance-based therapies on the different outcome measures.

## 2. Methods

### 2.1. Literature research

A systematic literature research was undertaken by two independent reviewers (A.O.D and S.B.) using Pubmed, PsycInfo en the Cochrane Library Register of Controlled Trials. The search included original articles from January 2009 till Octobre 2013. The search strategy considered only articles published in English. The search terms were: “mindfulness” or “vipassana” or “meditation” or “MBSR” or “MBCT” or “acceptance-based” or “acceptance and commitment”; in combination with “chronic pain” or “fibromyalgia” or “chronic fatigue syndrome” or “chronic low back pain” or “whiplash associated disorder” or “RSI” or “repetitive strain injury” or “CANS” or “complaints arm neck shoulders”, “dystrophy” or “CRPS” or “chronic regional pain syndrome”.

### 2.2. Selection of studies

The search contained 931 hits (Pubmed: 727, PsycInfo: 144 and the Cochrane Library Register of Controlled Trials: 60 hits). The selection procedure consisted of six steps, shown in Figure 1.

The first step of the search was to clarify the inclusion and exclusion criteria (Table 6; Appendix I). The included studies should investigate the efficacy of an acceptance- or mindfulness based treatment program in patients with chronic pain. Controlled studies like Randomized Controlled Trials (RCT) and Clinical Controlled Trials (CCT) were included. Meta-analyses and systematic reviews were also included for suitable studies. Published studies were investigated and dissertations or books were excluded. Articles were excluded if mindfulness or acceptance was just one part of therapy and not seen as one modality. Also articles based only on CBT-interventions were excluded. Articles that presented a single treatment session or articles without the availability of a full-text were also excluded. Reviews and articles were excluded when the research sample did not contain adults.

In the second base of search, the two evaluators selected articles from the first hundred articles of Pubmed on basis of title and abstract, guided by the inclusion criteria. The

purpose of this step was to make the selection criteria clear in practise. The two evaluators compared the results and discussed about the selection criteria when there was uncertainty: studies that reported mind-body therapies were excluded because they did not met the criteria of an acceptance-based intervention. The discussion led to an agreement of inclusion criteria.

The next step was selecting the hits 101 until 300 from Pubmed based on title and abstract, guided by the inclusion criteria. The inter-rater reliability was calculated with SPSS. This reliability was 78%. This score was good enough to split up the rest of the hits (Cicchetti, 1994). Disagreements were resolved for complete consensus.

During step 4, one evaluator selected articles from half of the remaining hits from Pubmed and half of the hits of PsycInfo and the Cochrane Library. The other evaluator selected the remaining parts. The reviewers selected 106 articles based on title and abstract.

During the fifth base of the selection procedure, the full-texts of the articles were obtained. Also the articles of the preliminary study of Veehof et al. (2011) were obtained. The evaluators evaluated each half of the full-texts. In this step, 31 articles were selected based on full-text. The studies were included when they reported at least one outcome measure. The excluded studies are presented in the appendix. The reasons for exclusion are mentioned.

During the sixth step, the reviewers evaluated the 31 articles guided by different hypotheses. The outcome measures of the other reviewer (S.B.) were quality of life, physical well-being and pain intensity (S.B.). This review (Reviewer A.O.D.) was focused on the outcome measures quality of life, depressive symptoms and anxiety. These outcome measures are reported in the 26 selected articles.

**Table 1.**

Methodological quality criteria	Score
1. Allocation to condition was based on randomization according to the text.	1/0
2. The randomization scheme was described and appropriate	1/0
3. A dropout analysis was conducted, or there were no drop-outs	1
Reasons of attrition were reported, but no analysis was conducted	0
4. Intention to treat analysis (ITT) was performed, or there were no dropouts	1/0
5. At least one of the trainers was experienced or trained in teaching mindfulness or ACT	1
Specific experience or training was not reported	0
6. Patient's pain was diagnosed by a physician or rheumatologist, or patients were referred from a pain clinic where diagnosis is prior to admission	1
Recruitment through media, or diagnosis based on a scale and self-report, or diagnosis not mentioned	0
7. The study had a minimal level of statistical power to find significant effects of the treatment, and included 50 or more persons in the comparison between treatment and control group (this allows the study to find standardized effect sizes of 0.80 and larger, assuming a statistical power of 0.80 and alpha of 0.50)	1
Sample smaller than 50, or the total sample was bigger than 50, but the results were only reported divided by different studies	0
8. Treatment integrity was checked during the study by supervision of the therapists during treatment, or by recording the treatment sessions, or by systematic screening of protocol adherence by a standardized measurement instrument	1
Treatment integrity was not checked, or integrity was supervised by one of the therapists, or they tried to keep the intervention sound by intensive consultation	0

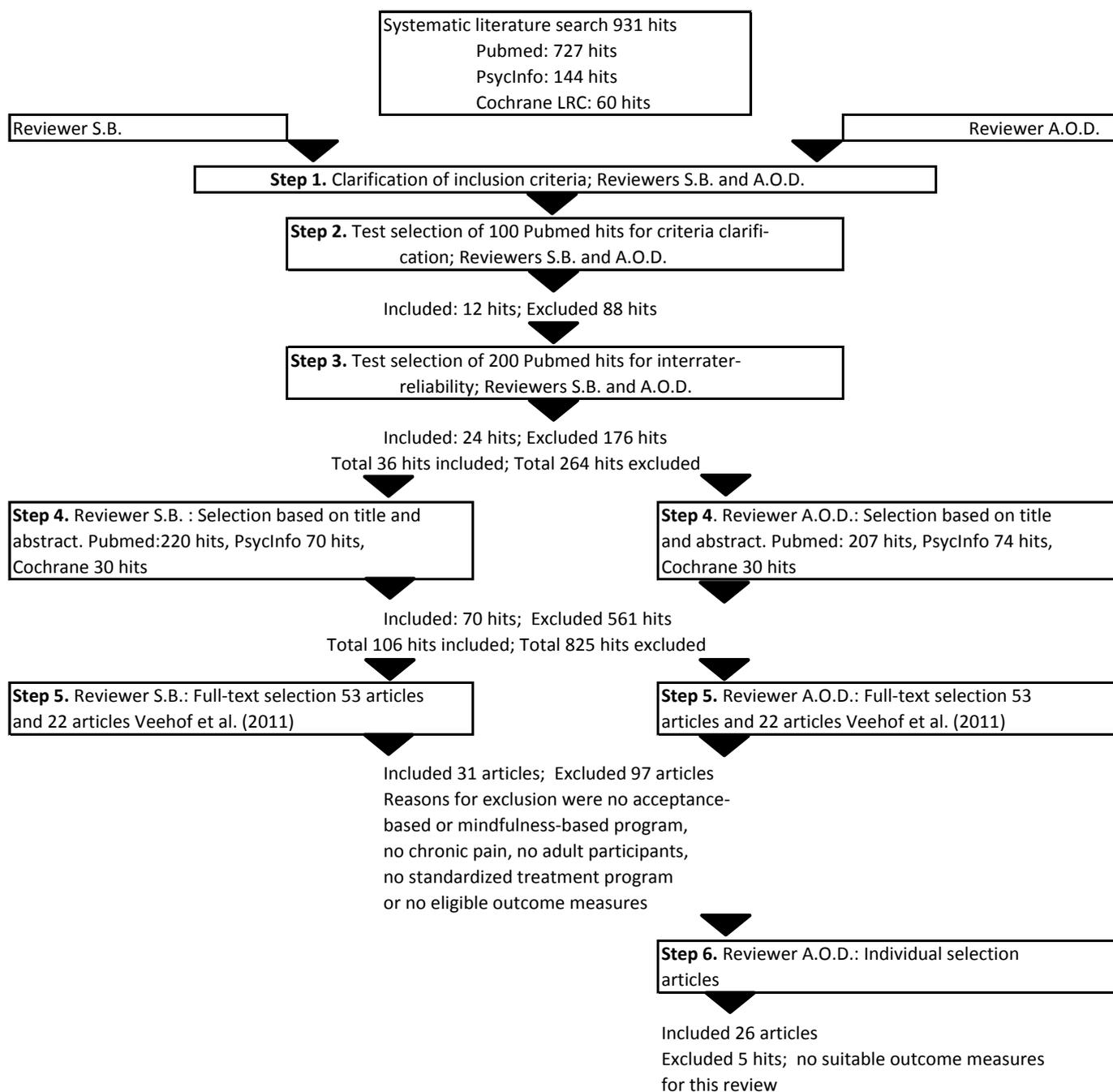


Figure 1. Selection procedure.

### 2.3. Outcome measures

In this review the primary outcome was quality of life and the secondary outcome measures were depression and anxiety.

### 2.4. Data extraction and quality assessment

Each evaluator extracted the data guided by a standardized data abstraction form based on the form used in the study of Veehof et al. (2011). The data was extracted on publication date, study design, type of pain, mean age, gender, type of intervention, control group, attrition rate, outcome measures, intervention effects and effect-sizes. The effect of an intervention was positive or significant when the study reported a positive outcome of the intervention and a significant difference in effect between the intervention group and control group. The effect-sizes were evaluated. Some studies reported eta-squared ( $\eta^2$ ) or partial eta-squared (partial  $\eta^2$ ) but most studies reported Cohen's d (Cohen, 1992). The effect-size was small when  $\eta^2$  or partial  $\eta^2$  was 0,01 or Cohen's d ranged between 0,2 and 0,3. The effect-size was medium when  $\eta^2$  was 0,06, partial  $\eta^2$  was 0,09 or Cohen's d ranged between 0,5 and 0,8. The studies that reported large effect-sizes reported an  $\eta^2$  of 0,14 or higher, a partial  $\eta^2$  of 0,25 or higher or a Cohen's d of 0,8 or higher (Cohen, 1988; Lakens, 2013).

Each reviewer assessed the quality of half of the selected full-texts. The quality of the included studies was assessed using a validating 8 point quality scale based on the criteria by the Cochrane Collaboration (Higgins & Altman, 2008) and the Jadad scale (Jadad, 1996). These methodological quality criteria can be found in Table 1. The quality of the studies were high when the quality score was 7 or more, medium when the score was 4,5 or 6 and low when the article scored three or less points (Veehof et al., 2011). The scores were completed with the quality scores of the articles selected in the study of Veehof et al. (2011). The quality assessment of the studies can be found in Table 7 (Appendix II).

## 3. Results

### 3.1. Characteristics of included studies

The characteristics of the included studies are summarized in Table 2. The included studies are numbered in Table 2. This is done for oversight of the rest of this review.

In total, 26 studies are included. The included studies comprised 22 randomized controlled trials and 4 clinical controlled trials. Four studies had high scores on the quality assessment, 16 scored medium and 6 studies scored a low quality. The attrition rate varied from 0 to 62 % and five studies reported an attrition rate higher than 30%.

In total, 21 studies measured the outcome depression, 19 measured anxiety and 17 quality of life. The instruments that are used in the studies reported good psychometric properties. Eleven studies included patients with chronic pain, 7 included patients with fibromyalgia, 2 included chronic fatigue syndrome patients and 6 studies included different pain syndromes like bodily stress syndrome, chronic headache, failed back surgery, irritable bowel syndrome, whiplash associated disorder and rheumatoid arthritis.

Twenty-one interventions were group-based interventions and the group size of these interventions ranged from 6 to 20 participants. Two interventions were individual treatments, 2 were internet-based interventions and 2 were self-help manual interventions. The sample size ranged between 11 to 168 participants. Most of the participants were female, except the participants in the study of Vowles et al. (2009). The mean age of the participants ranged between 32 and 76 years.

Twelve studies reported effects after an ACT- intervention, 7 studies described MBSR-interventions, 2 described MBCT interventions and 5 studies described other mindfulness-based interventions. These other mindfulness-based interventions were Stress-Reduction CBT, Mindfulness Meditation and Emotion Regulation Therapy, Mindfulness-Based Chronic Pain Management, Breathworks MBPM and MBCBT. These interventions used components of MBCT, MBSR or ACT, but reported a different protocol. Most of the MBSR and MBCT interventions were 8 weekly sessions with a mean duration of 2,5 hours. The ACT-interventions were 4-12 weekly sessions with a mean duration of 1,5 hours. The five mindfulness-based interventions were 8-10 weekly sessions with a mean duration of 2,5 hours.

The control groups in the studies consisted of 18 treatments as usual (TAU, MTAU or waitlist), 5 active control groups (2 CBT control groups, 1 applied relaxation group, 1 progressive relaxation in combination with waitlist and 1 study CBT in combination with educational support) and 4 studies used an educational/attention control group (2 online discussion forums and 2 education programs).

## Acceptance-based therapies for treatment of chronic pain: A systematic review

**Table 2.**  
Characteristics of the included studies

Number of the study	Author	Publication date	Study design	Quality score	Pain	Mean age (SD or range)	Male, %	Intervention	Delivery format	Group size	Sessions (number, duration) (hours)	Control Group	n	Attrition rate (intervention), %	Outcome Measures	Outcome effect Post treatment (+ = positive, 0 = none)	Follow-up (duration; months), Outcome effect Post treatment (+ = positive, 0 = none)	Effectsize Post treatment (s=small, m=medium, l=large Outcome effect)
S1	Parra- Delgado & Latorre-Postigo	10/2013	RCT	5	Fibromyalgia	52,7 (10,1)	0	TAU + MBCT	Group-based	-	8, 2,5h	TAU	31	12	Depression:BDI	+	3m, +	partial $r^2=0,22$ (l)
S2	McCracken et al.	09/2013	RCT	6	Chronic pain	58 (12,8)	31	TAU + ACT	Group-based	12- 13	4, 4h	TAU	73	27	Depression:PHQ	+	3m, +	d=0,46 (s)
S3	Buhrman et al.	06/2013	RCT	5	Chronic pain	49,1 (10,3)	40	ACT	Internet-based	Individual	7	CG: Online discussion forum	76	62	Anxiety: HADS Depression: HADS QoL: QoL1	+	6m, 0 6m, 0 6m, 0	d=0,18 (s) d=0,44 (s) -
S4	Rimes & Wingrove	04/2013	RCT	5	Chronic fatigue syndrome	I: 41,4 (10,9) C: 45,2 (9,4)	I: 25 C: 10	MBCT	Group-based	-	8, 2,5h	Waitlist	35	11	Anxiety: HADS Depression: HADS	0 +	2m, 0 2m, 0	- partial $r^2 = 0,13$ (l)
S5	Wicknell et al.	04/2013	RCT	5	Fibromyalgia	45,1 (6,6)	0	ACT	Group-based	6	12, 1,5h	Waitlist	40	13	QoL: SF-36 Depression: BDI Anxiety: STAI-T and STAI-S	+	3m, + 3m, + 3m, + and +	d=0,84 (l) d=0,44 (m) d=0,71 and d=0,51 (m)
S6	Fjorback et al.	01/2013	RCT	6	Somatic syndromes; Bodily distress syndrome	I: 38 (9,0) C: 40 (8,0)	I: 20 C: 20	CBT + MBSR	Group-based	12	8, 3,5h	TAU	119	12	QoL: SF-36 Depression: SCL-8 Anxiety: SCL-8	+	15m, + 15m, 0 15m, 0	
S7	Mo'tamedi et al.	08/2012	RCT	5	Chronic headache	I: 34,2 (7,4) C: 37,9 (8,7)	0	MTAU + ACT	Group-based	-	8, 1,5h	MTAU	30	27	Anxiety: STAI-T	+		d=2,54 (l)
S8	Jensen et al.	07/2012	RCT	4	Fibromyalgia	45,6 (6,4)	0	ACT oriented CBT	Group-based	6	12, 1,5h	Waitlist	43	24	Depression: BDI Anxiety: STAI	+		
S9	Carbonell Baeza et al.	12/2011	CCT	2	Fibromyalgia	I: 50,0 (7,3) C: 51,4 (7,4)	0	MDC including ACT	Group-based	10-12	12, 1,5h	TAU	75	20	QoL: SF-36 Depression: HADS Anxiety: HADS	+		
S10	Wong et al.	10/2011	RCT	5	Chronic pain	I: 48,7 (7,8) C: 47,1 (7,8)	-	MBSR	Group-based	-	8, 2,5h	TAU	100	24	QoL: SF-12 Depression: CES-D Anxiety: STAI	0 0 0	3m, 0; 6m, 0 3m, 0; 6m, 0 3m, 0; 6m, 0	
S11	Thorsell et al.	10/2011	RCT	4	Chronic pain	46,0 (12,3)	36	ACT	Self-help manual	Individual	7	CG: Applied Relaxation	115	37	QoL: SWLS Depression: HADS Anxiety: HADS	0 0 0	6m, 0; 12m, 0 6m, 0; 12m, 0 6m, 0; 12m, 0	
S12	Wetherell et al.	09/2011	RCT	7	Chronic pain	54,9 (12,5)	49	TAU + ACT	Group-based	4- 6	8, 1,5h	CBT	99	12	QoL: SF-12 Depression: BDI-II Anxiety: PASS	0 0 0	6m, 0 6m, 0 6m, 0	
S13	Schmidt et al.	02/2011	RCT	7	Fibromyalgia	52,5 (9,6)	0	MBSR	Group-based	12	8, 2,5h	Waitlist CG: Progressive Relaxation	168	17	QoL: HRQoL (PLC) Depression: CES-D Anxiety: STAI	0 0 0	2m, 0 2m, 0 2m, 0	
S14	Esmer et al.	10/2010	RCT	4	Failed back surgery syndrome	I: 55,2 (11,2) C: 54,9 (9,5)	I: 47 C: 70	MTAU + MBSR	Group-based	-	8, 1,5h- 2,5h	TAU	40	21	QoL: CPAQ	+	3m, +	d=1,14 (l)
S15	Ljótsson et al.	06/2010	RCT	7	Irritable bowel syndrome	I: 36,4 (10,1) C: 32,8 (8,6)	I: 17 C: 14	Mindfulness-based CBT	Internet-based	Individual	10, 2,5h	CG: Online discussion forum	85	10	QoL: IBS-QoL Anxiety: VSI Depression: MADRS-S	+	3m, + 3m, + 3m, 0	d=0,93 (l) d=0,64 (m) d=0,43 (s)

## Acceptance-based therapies for treatment of chronic pain: A systematic review

S16	Johnston et al.	06/2010	RCT	4	Chronic pain	20-84	38	ACT	Self-help manual	Individual	6	Waitlist	25	50	Depression: CMDI Anxiety: BAI QoL: QoLI	+	+	d=1.10 (I) d=0.98 (I) d=0.97 (I)
S17	Cusens et al.	02/2010	RCT	2	Chronic pain	I: 46.7 (11.5) C: 48.4 (12.3)	I: 7 C: 45	MTAU+ Breathworks MBPM	Group-based	-	8-10, 2.5h	TAU	53	3	Depression: DAPOS Anxiety: DAPOS	+	0	partial $\eta^2 = 0.12$ (m)
S18	Wong	10/2009	RCT	4	Chronic pain	(18-65)	-	MBSR	Group-based	-	10	CG: Education Program	100	-	QoL: SF-12 Depression: CES-D Anxiety: STAI	0	0	3m: 0; 6m: 0 3m: 0; 6m: 0 3m: 0; 6m: 0
S19	Vowles et al. (Study 2)	02/2009	RCT	4	Chronic pain	50.4 (17.8)	82	ACT	Group-based	2-3	4, 1.5h	CBT	11	0	Depression: CES-D Anxiety: PASS	+	+	d=1.16 (I) d=1.26 (I)
S20	Gardner-Nix et al.	2008	CCT	1	Chronic pain	I: 51 C: 52	I: 20 C: 25	MBCPM	Group-based	10-20	10, 2h	Waitlist	156	49	QoL: SF-36 (PCS and MCS)	0	0	
S21	Wicksell et al.	2008	RCT	5	Whiplash associated disorder	I: 48.2 (7.8) C: 55.1 (11.2)	38.5	ACT	Individual	Individual	10, 1h	TAU	20	0	Anxiety: HADS Depression: HADS QoL: SWLS	0	+	partial $\eta^2 = 0.16$ (m) partial $\eta^2 = 0.60$ (I) partial $\eta^2 = 0.40$ (I)
S22	Zaura et al.	2008	RCT	7	Rheumatoid Arthritis	I: 57.3 (15.3) C: 52.4 (13.0)	31.9	MMERT	Group-based	6-10	8	CBT CG: Education	144	2	Depression: dairy rating	0	0	
S23	Grossman et al.	2007	CCT	3	Fibromyalgia	I: 54.4 (8.3) C: 48.8 (9.1)	0	MBSR	Group-based	10-15	8, 2.5h	TAU	52	9	Anxiety:HADS Depression: HADS QoL: QoL	+	+	d=0.67 (m) d=0.39 (s) d meanQoL=0.85 (I)
S24	Surawy et al. (Study 1)	2005	RCT	2	Chronic fatigue syndrome	18-65	44	MBSR	Group-based	9	8	Waitlist	17	6	Depression:HADS Anxiety: HADS	0	+	d=0.85 (I)
S25	Dahl et al.	2004	RCT	4	Chronic pain	I: 36.7 (12.5) C: 44.4 (13.6)	10.5	MTAU + ACT	Individual	Individual	4, 1h	MTAU	19	0	QoL: LSQ	0	0	6m: 0
S26	Goldenberg et al.	1994	CCT	3	Fibromyalgia	I: 46 (9.9) C: 47.2 (11.8)	I: 10 C: 3	SR-CBT	Group-based	7-12	10, 2h	Waitlist	121	9	QoL: FIQ	+	+	

*Note.* RCT, randomized controlled trial; CCT, clinical controlled trial; I, intervention group; C, control group; TAU, treatment as usual; MBCT, mindfulness-based cognitive therapy; ACT, acceptance and commitment therapy; MBPM, mindfulness-based based pain management; CBT, cognitive behavioral therapy; MBSR, mindfulness-based stress reduction; MTAU, medical treatment as usual; MDC, multidisciplinary center; MBCPM, mindfulness-based chronic pain management; MMERT, mindfulness- meditation and emotion regulation therapy; SR-CBT, stress reduction- cognitive behavioral therapy; CG, control group; BDI, beck depression inventory; PHQ, patient health questionnaire; HADS, hospital and anxiety depression scale; QoL, quality of life; QoLI, quality of life inventory; SF-36, 36- item short form health survey; STAI, spielberger trait-state anxiety inventory; SCL-8, 8-items symptoms checklist; STAI-T, trait-state anxiety inventory-trait; STAI-S, spielberger trait state anxiety inventory-state; PLC, quality of life profile for the chronically; CPAQ, chronic pain assessment questionnaire; IBS-QoL, irritable bowel syndrome quality of life instrument; VSI, visceral sensitivity index; MADRS-S, montgomery asberg depression rating scale-self report; CMDI, chicago multi-scale depression inventory; BAI, beck anxiety inventory; DAPOS, depression anxiety and positive outlook scale; PCS, physical component summary; LSQ, life satisfaction questionnaire; FIQ, fibromyalgia impact questionnaire; partial  $\eta^2$ , partial eta squared; d, Cohen's d.

### *Effects on the outcome measures*

The frequencies of significant effects of the interventions on the outcome measures quality of life, depression and anxiety are summarized in Table 3.

### *3.2. Primary outcome measure Quality of life*

#### *3.2.1. Post-intervention effects*

Seventeen of the included 26 studies reported measures of quality of life. Nine of these 17 (53%) studies reported an improvement in quality of life that was significantly higher than observed in the comparison groups. Four studies described ACT interventions and five studies described mindfulness-based interventions like MBSR (S6,S14,S23), MBCBT or SR-CBT (S15,S26). The ACT studies reported the effects in patients with fibromyalgia (S5, S9), chronic pain in general (S16) and whiplash associated disorder (S21). Among the 9 significant studies, 8 studies suggested that the mindfulness or ACT intervention was better in comparison to a waitlist or TAU (S5,S6,S9,S14,S16,S21,S23,S26) and one study compared to an educational/attention control, like an online discussion forum (S15).

Eight studies (47%) showed no significant effect on quality of life. Four studies were ACT-interventions, three studies were MBSR interventions and one study MBCPM. The non-significant studies used more active control conditions than the significant studies. The studies compared to an educational/attention control group (S3, S18), an active control group (S11,S12,S13) and to waitlist/TAU (S10,S20,S25).

The quality of the non-significant studies tends to be somewhat higher. The mean quality of the significant studies is 4,3. One study showed high quality (S15), three scored low (S9, S23, S26) and five medium (S5, S6, S14, S16, S21). The mean quality score of the non-significant studies is 4,6. Two studies showed high quality (S12, S13), one scored low (S20) and six studies scored medium (S3,S10,S11,S18,S25).

Finally, six studies reported the effects of a MBSR-intervention on the outcome measure quality of life and three studies (50%) demonstrated significant effects. No studies reported the effects of MBCT interventions on the outcome measure quality of life. Eight studies reported the effects of an ACT-intervention on quality of life and four studies (50%) showed significant effects. Three other mindfulness-based interventions reported effects on quality of life and two studies (67%) demonstrated significant effects of the intervention compared to the control condition.

**Table 3.**  
Frequencies of significant effects for each outcome measure

Treatment	Measurement	Study quality	Quality of life	Depression	Anxiety			
MBSR	Post-intervention	High quality	<b>3/6</b>	<b>1/6</b>	<b>2/6</b>			
		Medium quality	S6,S14					
		Low quality	S23	S23	S23,S24			
	Follow-up	High quality	<b>2/6</b>	<b>0/5</b>	<b>0/5</b>			
		Medium quality	S6,S14					
		Low quality						
MBCT	Post-intervention	High quality	<b>0/0</b>	<b>2/2</b>	<b>0/1</b>			
		Medium quality		S1, S4				
		Low quality						
	Follow-up	High quality	<b>0/0</b>	<b>1/2</b>	<b>0/1</b>			
		Medium quality		S1				
		Low quality						
ACT	Post-intervention	High quality	<b>4/8</b>	<b>7/10</b>	<b>6/10</b>			
		Medium quality	S5,S16,S21	S2,S3,S5,S8,S16,S19,S21	S3,S5,S7,S8,S16,S19			
		Low quality	S9					
	Follow-up	High quality	<b>2/6</b>	<b>3/6</b>	<b>1/5</b>			
		Medium quality	S5,S21	S2,S5,S21	S5			
		Low quality						
Other mindfulness-based therapies	Post-intervention	High quality	<b>2/3</b>	<b>2/3</b>	<b>1/2</b>			
		Medium quality	S15	S15	S15			
		Low quality	S26	S17				
	Follow-up	High quality	<b>1/1</b>	<b>0/1</b>	<b>1/1</b>			
		Medium quality	S15		S15			
		Low quality						
Total of significant interventions	Post-intervention		9/17	<b>53%</b>	12/21	<b>57%</b>	9/19	<b>47%</b>
	Follow-up		5/13	<b>38%</b>	4/14	<b>29%</b>	2/12	<b>17%</b>

Note. MBSR, mindfulness-based stress reduction; MBCT, mindfulness based cognitive therapy; ACT, acceptance and commitment therapy; S, number of study.

### 3.2.2. Follow-up effects

Thirteen studies reported follow-up effects on the outcome measure quality of life. Most studies reported follow-up data of three or six months after intervention. Five studies reported a significant follow-up effect in quality of life (38%). Two of the five studies used an ACT intervention, two studies a MBSR intervention and one study a MBCBT intervention. Four of the five studies that reported a significant follow-up effect compared to a waitlist or TAU (S5,S6,S14,S21) and one study compared to an online discussion forum (S15).

The eight studies (62%) that did not report a positive follow-up effect on quality of life used a TAU control group (S10, S23,S25), an educational/attention control group

(S3,S18) or active programs like applied relaxation (S11), CBT (S12) or progressive relaxation and waitlist (S13).

The mean quality of the studies that showed a significant follow-up effect is 5,4. One study showed high quality (S15) and four studies showed medium quality (S5, S6, S14,S21). The mean quality score of the non-significant studies is 4,8. Two studies showed high quality (S12, S13), one scored low (S23) and five studies scored medium (S3,S10, S11,S18,S25).

At last, six studies demonstrated the follow-up effects of a MBSR-intervention on quality of life and two of these six studies (33%) showed significant results compared to TAU (S6,S14). No study reported the follow-up effects of a MBCT-intervention on the outcome measure quality of life. Six studies reported follow-up effects on quality of life after ACT-intervention and two of the six studies showed significant follow-up effects (33%) in comparison to TAU or waitlist (S5,S21). One study reported follow-up effects of other mindfulness-based intervention and this study showed a significant effect of a MBCBT intervention compared to an online discussion forum (S15).

### *3.3. Secondary outcome measure Depression*

#### *3.3.1. Post-intervention effects*

Twenty-one of the included studies reported measures of depression. Twelve of these 21 studies (57%) reported an improvement in depression that was significantly higher than observed in the comparison groups. Seven of the significant studies reported the effects of an ACT intervention (S2,S3,S5,S8,S16,S19,S21), one study reported MBSR (S23), two studies MBCT (S1,S4), one MBCBT (S15) and one study Breathworks MBPM (S17). Most of the significant studies compared to a waitlist or TAU, two studies compared to the educational/attention control group online discussion forum (S3,S15) and one study compared the intervention to an active control group (S19).

Nine of the 21 (43%) studies showed no significant effect on depression. Three of the nine studies were an ACT intervention, five studies were MBSR interventions and one study a MMERT intervention. Five studies used TAU or waitlist control groups (S6,S9,S10,S12,S24), one study an educational/attention control group (S18) and three studies used active control groups (S11,S13,S22).

The quality of the non-significant studies tends to be somewhat higher. The mean quality of the significant studies is 4,6. One study showed high quality (S15), two scored low (S17, S23) and nine medium. The mean quality score of the non-significant studies is 4,8. Three studies showed high quality (S12,S13,S22), two scored low (S9,S24) and four studies scored medium (S6,S10,S11,S18).

Finally, six studies reported the effects of a MBSR intervention on the outcome measure depression and only one of these (17%) studies showed significant effect (S23). Two studies reported the effects of a MBCT-intervention on depression and both (100%) of the studies were significant (S1,S4). Ten studies demonstrated the effects of ACT intervention on depression and seven of these 10 (70%) studies showed significant effects compared to the control group. At last, three other mindfulness-based studies reported the effects on depression and two of the three (67%) studies demonstrated significant effects (S15,S17).

### 3.3.2. *Follow-up effects*

In total, 14 studies reported follow-up effects on the outcome measure depression. Four of the 14 studies (29%) reported a significant follow-up effect on depression. Three of the four studies reported described an ACT intervention (S2,S5,S21) and one study described a MBCT- intervention (S1). The significant studies reported the effects on chronic pain (S2), fibromyalgia (S1,S5) and whiplash associated disorder (S21). The four positive follow-up studies suggested that the intervention was better in comparison to waitlist or TAU. The non-significant follow-up studies used more active control groups. Three studies described an educational/attention control group (S3,S15,S18), three an active control group (S11,S12,S13) and the remaining studies used waitlist or TAU control condition.

The mean quality of both significant and non-significant follow-up studies is 5,3. All significant follow-up studies showed medium quality. Three of the non-significant studies showed high quality (S12,S13,S15), one low quality (S23) and six studies scored medium (S3,S4,S6,S10,S11,S18).

At last, five studies reported the follow-up effects of a MBSR-intervention on depression and none of them showed significant effects compared to the control groups. Two studies reported the follow-up effects of a MBCT intervention on depression and one study (50%) showed significant follow-up effects (S1). Six studies reported the follow-up effects of an ACT-intervention on depression and three of them (50%) showed significant follow-up effects compared to the TAU or waitlist control groups. One study reported the effects of other mindfulness-based studies. The MBCBT intervention showed no significant effects compared to the control condition (S15).

## 3.4. *Secondary outcome measure Anxiety*

### 3.4.1. *Post-intervention effects*

Overall, 19 of the included studies reported measures of anxiety. Nine of these 19 (47%) studies reported an improvement in anxiety that was significantly higher than observed in control conditions. Among the nine studies, six studies described the effects of ACT (S3,S5,S7,S8,S16,S19), two the effects of MBSR (S23,S24) and one study described the effects of a MBCBT intervention (S15). Among the nine significant studies, six studies suggested that ACT demonstrated a significant decrease in the anxiety grade in comparison to a waitlist or TAU. The other significant studies used active control groups (S3,S15,S19).

Ten of the 19 (53%) studies did not report a significant effect. Four of the nine studies reported an ACT intervention, four studies described MBSR, one study described MBCT and one study reported a Breathworks MBPM intervention. The non-significant studies used more active control groups than the significant studies, like applied relaxation (S11), CBT (S12) or progressive relaxation and waitlist (S13). The remaining non-significant studies used an educational control condition (S18) or a TAU control group (S4,S6,S9,S10,S17,S21).

The mean quality of the significant studies is 4,3. One study showed high quality (S15), two scored low (S23,S24) and six studies ranged between 4 and 6. The mean quality

score of the non-significant studies is 4,7. Two studies showed high quality (S12,S13), two scored low (S9,S17) and the remaining six studies scored medium.

In the end, six studies reported the effects of a MBSR-intervention on anxiety and two of the six studies (33%) reported a significant effect (S23,S24). One study reported the effects of MBCT-intervention on the outcome measure anxiety but this study did not demonstrate significant effects (S4). Ten studies reported the effects of ACT-intervention on anxiety. Six of these studies (60%) demonstrated significant effects. At last, two studies reported the effects of other mindfulness-based therapies and one of them (50%) showed significant effects compared to the active control condition (S15).

### 3.4.2. *Follow-up effects*

Two of the 12 studies (17%) that reported follow-up effects on anxiety, demonstrated a significant follow-up effect compared to the control condition (S5,S15). One of the two significant studies compared an ACT intervention with a waitlist and included patients with fibromyalgia (S5). The other study included patients with irritable bowel syndrome and compared a MBCBT intervention to an online discussion forum (S15).

Ten of the 12 studies (83%) showed no significant effect. The non-significant follow-up studies used a broader repertoire of active control conditions, like applied relaxation (S11), CBT (S12) or a progressive relaxation and waitlist (S13). The remaining non-significant studies used an educational/ attention control condition (S3,S18), or a TAU control group.

One significant study showed a high quality (S15) and one significant study showed medium quality (S5). The mean quality score of the non-significant studies is 5,1. Two studies showed high quality (S12,S13), one scored low (S23) and seven studies scored medium.

Finally, five MBSR interventions reported effects on anxiety and these studies could not demonstrate significant follow-up effects in comparison to waitlist/TAU (S6,S10,S23) or educational/attention control conditions (S13,S18). One MBCT study reported follow-up effects on anxiety, but did not demonstrate a significant follow-up effect (S4). Five studies reported the effect of ACT-intervention on anxiety. One of them (20%) showed positive effects compared to waitlist (S5). At last, one study reported the effects of MBCBT on anxiety in patients with irritable bowel syndrome. The only study in the category other mindfulness-based therapies (100%) showed significant effects compared to the control condition (S15).

## 4. Discussion

### 4.1. *Main findings*

The aim of this study was to review studies that investigate the effects of mindfulness and ACT interventions on quality of life, depression and anxiety in patients with chronic pain. The second aim was to clarify the effects on the outcome measures separately for ACT, MBSR and MBCT. In total, 26 studies that described different acceptance-based interventions for different types of pain were selected for this review.

Five of the included studies demonstrated the effects after other mindfulness-based therapies like Mindfulness-Based Cognitive Behavioral Therapy (MBCBT), Breathworks

Mindfulness-Based Pain Management (MBPM), Mindfulness-Based Chronic Pain Management (MBCPM), Mindfulness Meditation and Emotion Regulation Therapy (MMERT) and Stress Reduction-Cognitive Behavioral Therapy (SR-CBT). Because of the large variety in treatment programs, number of sessions and study-design of the studies, no conclusions are drawn in this review about the effectiveness of these interventions.

The results of this review indicated that acceptance-based therapies can have a positive effect on the different outcome measures in patients with chronic pain. In total, nine of the seventeen (53%) acceptance-based interventions for the outcome measure quality of life, 57% of the interventions for the outcome measure depression and 47% of the interventions for the outcome measure anxiety were significant. A good half of the acceptance-based interventions were significant for the outcome measures and therefore, this review suggests that acceptance-based interventions are effective for the treatment of chronic pain. This is in line with the study of Veehof et al. (2011). Veehof et al. (2011) reported that acceptance-based therapies are at least as effective as CBT for chronic pain.

The long-term effects of acceptance-based interventions are less promising. Only 38% of the quality of life follow-up studies, 29% of the depression follow-up studies and 17% of the anxiety follow-up studies were significant. Further research is needed to decide if factors, like repeating interventions, would lead to preservation of the pre-post effects.

In total, 17 studies reported measures of quality of life. Nine of these 17 (53%) studies reported a significant effect in quality of life. Thus, more than half of the quality of life studies showed significant effects. No significant effect means that the intervention was as effective as the compared treatment conditions. The significant studies compared to waitlist or TAU and the non-significant to more active control groups. In conclusion, the acceptance-based interventions were as effective as the active control treatments for quality of life and the interventions were more effective than TAU or waitlist for quality of life. The quality of the non-significant quality of life studies was somewhat higher but are difficult to compare because of the small number of studies. Thirteen studies reported follow-up effects on the outcome measure quality of life and only five (38%) were significant. All in all, it can be concluded that acceptance-based interventions may have a positive pre-post intervention effect on quality of life in patients with chronic pain. This is in line with the results of the study of Veehof et al. (2011). The authors reported medium effect-sizes for quality of life. The presented follow-up data demonstrated no clear evidence for significant effects of the interventions in the long term on the outcome measure quality of life.

The second aim of this study was to clarify the effects on quality of life separately for ACT, MBSR and MBCT. Three of the six MBSR studies (50%) demonstrated significant effects for quality of life compared to the TAU control groups. Four of the eight ACT studies (50%) showed significant effects for quality of life compared to TAU. No studies reported the effects or follow-up effects of MBCT interventions on the outcome measure quality of life. More studies that investigate the effect of MBCT intervention on quality of life are needed to draw conclusions. In conclusion, ACT and MBSR may have a positive effect on quality of life in patients with chronic pain but may not have a superior effect to active control groups, like CBT. The results of the review of Hayes et al. (2006) could not be replicated. Hayes et al. (2006) concluded that ACT may have little superior effects in comparison with CBT.

In total, the search found 21 studies that report measures of depression. Twelve of these 21 studies (57%) were significant. So, more than half of the depression studies showed significant effects compared to TAU condition. Yet, nine of the 21 (43%) studies showed no significant effect on depression compared to more active control conditions. To conclude, the acceptance-based interventions were as effective as the active control treatments for depression and the interventions were more effective than TAU or waitlist for depression.

Fourteen studies reported follow-up effects on the outcome measure depression and four studies (29%) were significant. The presented follow-up data demonstrated no clear evidence for significant effects of the interventions in the long term. Further research is needed to decide if factors like repeating interventions would lead to maintenance of pre-post effects.

The presented results suggest that acceptance-based interventions can have a positive effect on the outcome measure depression in patients with chronic pain. The results of the study of Baer (2003) seems to be replicated. Baer (2003) reported improvements on the outcome measure depression after MBSR intervention. The findings of the meta-analyses of Powers et al. (2009) and Veehof et al. (2011) that acceptance-based therapies were effective in the treatment of chronic pain patients are also comparable with the findings of this review. An important note is that this systematic review is difficult to compare with previous meta-analyses. This review did not pool effect-sizes. For a more validated conclusion, a future meta-analysis is recommended. In contrast with the previous mentioned studies, the findings of the review of Hayes et al. (2006) that concluded that ACT has little superior effects in the different outcome measures like depression in comparison to traditional CBT is not reproduced. This difference can be explained by small sample sizes of the intervention-groups. It is also possible that the attention received in the intervention contributes to improvement in symptoms.

The second aim of this study was to clarify the effects on depression separately for ACT, MBSR and MBCT. Six studies reported the effects of a MBSR intervention on the outcome measure depression and only one of them (17%) showed significant effect. An explanation for little effect of MBSR on depression is that MBSR is little focused on observing thoughts. Observing thoughts is important because recurrent negative thoughts are the most important risk factor for developing a depression (Hulsbergen, 2009). Two studies reported the effects of a MBCT-intervention on depression and both (100%) studies were significant. This is not surprising, because MBCT was designed to prevent depressive relapse (Segal et al., 2002). The result seems comparable with the results of the meta-analyses of Vittengl et al. (2007) and Piet & Hougaard (2011). The meta-analyses reported positive effects of MBCT on preventing depressive relapses. However, the effects of the MBCT in this review should be generalized with caution, because this review only contained two MBCT studies. More studies that investigate the effect of MBCT intervention on depression are needed to draw validated conclusions. Ten studies demonstrated the effects of ACT on depression. Seven of these 10 (70%) studies showed significant effects compared to different control conditions. It can be concluded that ACT and MBCT have a positive effect on depression in patients with chronic pain. However, ACT and MBCT seemed as effective as active control groups, like CBT.

In total, 19 of the included studies reported measures of anxiety and nine (47%) of these studies reported a significant effect. Thus, about half of the anxiety studies showed significant effects compared to TAU condition. Ten of the 19 (53%) studies reported a non-significant effect and used more active control groups than the significant studies. In conclusion, the acceptance-based interventions were more effective than TAU condition for anxiety and acceptance-based interventions were as effective as the active control treatments for anxiety. This finding seems comparable with the results of the meta-analyses of Powers et al. (2009). Powers et al. (2009) concluded that ACT is better than waitlist but has similar effects on anxiety as established treatments.

Based on the presented results, this review found evidence for the effectiveness of acceptance-based interventions on the outcome measure anxiety in patients with chronic pain. This finding seems comparable with the results of the meta-analyses of Veehof et al. (2011). Veehof et al. (2011) concluded that acceptance-based therapies were effective in the treatment of chronic pain patients and they reported medium effects for anxiety. The results of this review could not replicate the findings of Hayes et al. (2006). Hayes et al. (2006) concluded in their review that ACT has little superior effects in anxiety in comparison to traditional CBT. Twelve studies reported follow-up effects on the outcome measure anxiety and only two of the 12 studies (17%) reported a significant follow-up effect. There is no clear evidence for long-term effects of acceptance-based interventions on anxiety in chronic pain patients.

The second aim of this study was to clarify the effects on anxiety separately for ACT, MBSR and MBCT. Six studies reported the effects of a MBSR-intervention on anxiety and two studies (33%) reported a significant effect compared to TAU. Only one study reported the effects of MBCT-intervention on the outcome measure anxiety. The study did not demonstrate significant effects. More studies that investigate the effect of MBCT intervention on anxiety are needed to draw validated conclusions. Ten studies reported the effects of ACT-intervention on anxiety; six of these studies (60%) demonstrated significant effects in comparison to waitlist, TAU and a few active control groups. It can be concluded that ACT has a positive effect on anxiety in patients with chronic pain. ACT may have a superior effect on anxiety compared to MBSR and MBCT.

All in all, acceptance-based interventions are effective for the treatment of chronic pain but are not superior to active treatments. In addition, ACT may have a superior effect than the MBSR and MBCT on anxiety and MBSR may have an inferior effect than ACT or MBCT on depression. The long-term effects of acceptance-based interventions are less promising. It seems that the pre-post effects are not preserved.

#### *4.2. Strengths and limitations of the study*

The strength of this review is that most of the studies were randomized controlled trials. Most studies in this review had medium quality. Another strength is seen in the search procedure. The search of the two reviewers is checked for good inter-rater reliability in the test-sample. A third strength is that this review contained more ACT-interventions than the previous review of Veehof et al. (2011). There were more ACT studies available in the databases. A fourth strength is that different sorts of pain are included in the study. Not only chronic pain in general is tested and this is positive for clinical implications. A fifth strength of this review

is that the results are divided in the outcome measures depression, anxiety and quality of life. The specific outcome measure can be treated to have positive effects on chronic pain in general. Additionally, in a general conclusion of the effects on chronic pain, the strengths to fit the intervention to the specific outcome measures can be missed.

However, this study also has several limitations. First of all, this review is a literature research. The effects of interventions are described. No effect-sizes are compared and the pooling of the effects are beyond the scope of this review. A meta-analysis is recommended to draw more validated conclusions that are based on quantitative data. A meta-analysis that include all six outcome measures is suggested for comparability with previous and future studies. This review is also limited to published studies written in English. Books and dissertations were excluded in this review and this can possible cause publication bias. In addition, it is possible that some complete studies were not concluded in the databases of Pubmed, PsycInfo or the Cochrane Library Register of Controlled Trials what may also cause publication bias. Another limitation is that only 4 studies reported high quality and no study met all quality criteria. Further, the quality criteria was hand-scored by the reviewers. When a criterion was not reported, the score was negative. This hand-scoring may have led to an under- evaluated study quality. Another explanation for the low number of high quality studies is that CCT's and low quality studies (a hand-scored quality of three or less) were not excluded in the current review. To draw a more solid conclusion, CCT's and low quality studies should be excluded. A fifth limitation is the limitation in quality assessment. The quality of the studies is described by one reviewer. For more reliable quality data, the procedure should be supervised or controlled with more reviewers. In addition, the selection process has been performed by two independent reviewers. The inter-rater reliability is only measured after step 3. For more reliable findings, the reliability should also be calculated after the whole selection process. Another limitation is that only two studies reported the effects of MBCT-interventions. More studies are needed to draw more solid conclusions about the effects of these interventions. The last limitations were study characteristics. Much sample sizes were small so there is a higher risk of type II error. Additionally, many studies did not describe the protocol of the intervention in detail and, therefore, the studies with the same intervention should be compared with caution. Besides this, most studies did not describe if the included patients received additional care, outside the intervention of the study. This can lead to different results and should be more controlled in interventions. For further research, detailed patient and protocol information is needed.

### *4.3. Conclusions and implications*

There is now evidence from a little number of studies about the effectiveness of acceptance-based therapies on depression, anxiety and quality of life in chronic pain patients.

Acceptance-based interventions are effective for the treatment of chronic pain but seem not superior to active treatments. MBSR seems to have an inferior effect on depression compared to ACT or MBCT. In addition, ACT may have a superior effect than MBSR or MBCT on anxiety. The long-term effects of acceptance-based interventions are less positive. It seems that the pre-post effects are not preserved.

A subsequent meta-analysis is recommended to compare quantitative results of the findings with previous reviews. This review recommends to use the outcome measures as mentioned in the study of Veehof et al. (2011) and the methods section of this review for the comparability of treatment effects. More high quality studies are needed. This review encourages to report the quality criteria accurately for a correct quality score in following reviews. More research for insight in the factors that create positive long-term effects is required. Data of more MBCT interventions is also necessary for clinical implications. Future studies should be of high quality with emphasis on large sample-sizes and a detailed description of the intervention protocol.

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## **Appendix**

## Appendix I

**Table 6.**

Inclusion and exclusion criteria

Inclusion criteria	Exclusion criteria
Standardized treatments	Systematic reviews
RCT or CCT	Uncontrolled studies
Patients with chronic pain or chronic diseases including chronic pain	Case study
Adults > 18 < 65	Adolescents < 18 and > 65
Acceptance-based interventions (MBCT, ACT, MBSR or MB)	Meta-analyses
Delivery format (group-based, internet-based or self-help manual)	
> 1 number session	
At least one outcome measure (depression, anxiety or quality of life)	

*Note.* RCT, randomized controlled trial; CCT, clinical controlled trial; MBCT, mindfulness-based cognitive therapy; ACT, acceptance and commitment therapy; MBSR, mindfulness-based stress reduction; MB, mindfulness-based interventions.

## Appendix II

**Table 7.**  
Quality assessment of the studies

Author (publication date)	Randomization	Randomization described	Reasons of attrition reported	Intention to treat analysis (ITT)	Trained professionals	Pain diagnosis by professional	Minimal statistical power	Treatment integrity checked	Quality score
Buhrman et al. (2013)	1	1	0	1	0	1	1	0	5
Fjorback et al. (2013)	1	1	1	1	1	1	1	0	7
McCracken et al. (2013)	1	1	1	1	1	0	1	0	6
Parra-Delgado & Latorre-Postigo (2013)	1	1	0	0	1	1	1	0	5
Rimes & Wingrove (2013)	1	1	1	0	1	1	0	0	5
Wicksell et al. (2013)	1	1	0	0	1	1	1	1	6
Jensen et al. (2012)	1	0	0	0	1	1	1	0	4
Mo'tamedi et al. (2012)	1	0	1	1	0	1	1	0	5
Carbonell Baeza et al. (2011)	0	0	1	1	0	0	0	0	2
Schmidt et al. (2011)	1	1	1	1	1	1	1	0	7
Thorsell et al. (2011)	1	0	0	0	1	1	1	0	4
Wetherell et al. (2011)	1	1	1	1	1	1	1	1	8
Wong et al. (2011)	1	1	0	1	1	1	1	0	6
Cusens et al. (2010)	0	0	1	0	0	0	1	0	2
Esmer et al. (2010)	1	0	1	0	1	0	1	0	4
Johnston et al. (2010)	0	0	0	1	0	1	1	1	4
Ljotsson et al. (2010)	1	1	1	1	1	0	1	1	7
Vowles et al. (Study 2, 2009)	0	0	1	0	1	1	1	0	4
Wong et al. (2009)	1	0	0	0	1	1	0	1	4
Gardner-Nix et al. (2008)	0	0	0	0	0	0	1	0	1
Wicksell et al. (2008)	1	1	1	1	1	0	0	0	5
Zautra et al. (2008)	1	1	1	1	0	1	1	1	7
Grossman et al. (2007)	0	0	0	0	1	1	1	0	3
Surawy et al. (Study 1; 2005)	1	0	0	0	0	1	0	0	2
Dahl et al. (2004)	1	1	1	0	0	1	1	0	5
Goldenberg et al. (1994)	0	0	1	0	0	1	1	0	3

### Appendix III

**Table 8.**

Excluded with full-text selection

Author, (publication date)	Article	Reason for exclusion
McCracken & Gauntlett-Gilbert (04,2011)	Role of psychological flexibility in parents of adolescents with chronic pain: Development of a measure and preliminary correlation analyses	No treatment; no adults with chronic pain
Thompson & McCracken (04,2011)	Acceptance and Related processes in adjustment to chronic pain	Review; no controlled study
Kerns, Sellinger & Goodin (04,2011)	Psychological treatment of chronic pain	Review
Hawtin & Sullivan (03,2011)	Experiences of mindfulness training in living with rheumatic disease: an interpretative phenomenological analysis	No controlled study
Prevedini et al. (03,2011)	Acceptance and Commitment Therapy (ACT): the foundation of the therapeutic model and an overview of its contribution to the treatment of patients with chronic physical diseases	Review
Veehof et al. (03,2011)	Acceptance-based interventions for the treatment of chronic pain: A systematic review and meta-analysis	Review; no adults
Son et al. (02,2011)	Testing the effectiveness of a mindfulness-based intervention to reduce emotional distress in outpatients with diabetes (DIAMind): design of a randomized controlled trial	No chronic pain
Ilggen et al. (02,2011)	Treating Chronic Pain in Veterans Presenting to an Addictions Treatment Program	Pilotstudy; no controlled study
Young (02,2011)	Mindfulness Meditation: A Primer for Rheumatologists	Review
Staud (02,2011)	Effectiveness of CAM Therapy: Understanding the Evidence	Review; no ACT or Mindfulness treatment
Maurel et al. (02,2011)	Correlational analysis and predictive validity of psychological constructs related with pain in fibromyalgia	No ACT or Mindfulness treatment
Christo et al. (02,2011)	Effective Treatments for Pain in the Older Patient	Older people, no adults; no ACT or Mindfulness treatment

Malouff, Schutte & Zucker (02,2011)	Tinnitus-related Distress: A Review of Recent Findings	Review; no mindfulness or ACT treatment; no chronic pain
Chiesa & Serretti (01,2011)	Mindfulness-Based Interventions for Chronic Pain: A Systematic Review of the Evidence	Review
Niazi, A.K. & Niazi, S.K. (01,2011)	Mindfulness-based stress reduction: a non-pharmacological approach for chronic illnesses	Review
Sharpe et al. (09,2010)	A comparison of the effect of attention training and relaxation on responses to pain	No ACT or Mindfulness treatment; no adults; no chronic pain
Merkes (09,2010)	Mindfulness-based stress reduction for people with chronic diseases	Review
Cho et al. (08,2010)	Pain-Related Anxiety as a Mediator of the Effects of Mindfulness on Physical and Psychosocial Functioning in Chronic Pain Patients in Korea	No controlled study
MacLean et al. (06,2010)	Intensive Meditation Training Improves Perceptual Discrimination and Sustained Attention	No ACT or Mindfulness treatment; no chronic pain
Lo et al. (06,2010)	Cardiorespiratory phase synchronization during normal test and inward-attention meditation	No mindfulness or ACT treatment; no chronic pain
Dworkin et al. (05,2010)	Research design considerations for confirmatory chronic pain clinical trials: IMMPACT recommendations	No mindfulness or ACT treatment; no controlled study
Sato et al. (04,2010)	Nonimmersive Virtual Reality Mirror Visual Feedback Therapy and Its Application for the Treatment of Complex Regional Pain Syndrome: An Open-Label Pilot Study	No mindfulness or ACT treatment; no controlled study
Zautra et al. (04,2010)	The effects of slow breathing on affective responses to pain stimuli: An experimental study	No mindfulness or ACT treatment
McHugh, Simpson & Reed (02,2010)	Mindfulness as a potential intervention for stimulus over-selectivity in older adults	No controlled study; no adults; no chronic pain
McCracken & Zhao-O'Brien (02,2010)	General psychological acceptance and chronic pain: There is more to accept than the pain itself	No mindfulness or ACT treatment; no controlled study

Dillworth & Jensen (01,2010)	The Role of Suggestions in Hypnosis for Chronic Pain: A Review of the Literature	Review; no mindfulness or ACT treatment
Rosenzweig et al. (01,2010)	Mindfulness-based stress reduction for chronic pain conditions: Variation in treatment outcomes and role of home meditation practice	No controlled study
McCracken & Velleman (01,2010)	Psychological flexibility in adults with chronic pain: A study of acceptance, mindfulness, and values-based action in primary care	No controlled study
Schutze et al. (01,2010)	Low mindfulness predicts pain catastrophizing in a fear-avoidance model of chronic pain	No controlled study
Cardenas & Felix (12,2009)	Pain after Spinal Cord Injury: A Review of Classification, Treatment Approaches, and Treatment Assessment	Review; no mindfulness or ACT treatment
Ando et al. (12,2009)	The Efficacy of Mindfulness-Based Meditation Therapy on Anxiety, Depression, and Spirituality in Japanese Patients with Cancer	No controlled study
Lee, Pittler & Ernst (11,2009)	Internal Qigong for Pain Conditions: A Systematic Review	Review; no mindfulness or ACT treatment
Morone et al. (11,2009)	A Mind-Body Program for Older Adults with Chronic Low Back Pain: Results of a Pilot Study	Older people, no adults
Baranowsky et al. (11,2009)	Qualitative systematic review of randomized controlled trials on complementary and alternative medicine treatments in fibromyalgia	Review
Elomaa, Williams & Kalso (11,2009)	Attention management as a treatment for chronic pain	Combination, Mindfulness is not seen as one modality
Rasmussen et al. (10,2009)	Treatment of fibromyalgia at the Maharishi Ayurveda Health Centre in Norway. A six-month follow-up study	No mindfulness or ACT treatment
Bailey et al. (08,2009)	Treatments Addressing Pain-Related Fear and Anxiety in Patients with Chronic Musculoskeletal Pain: A preliminary Review	Review
Brandstetter-Rost, Cushing & Douleh (08,2009)	Personal Values and Pain Tolerance: Does a Values Intervention Add to Acceptance?	No chronic pain

Lush et al. (06,2009)	Mindfulness Meditation for Symptom Reduction in Fibromyalgia: Psychophysiological Correlates	No controlled study
Patill (04,2009)	Effectiveness of mindfulness meditation (Vipassana) in the management of chronic low back pain	Review; no controlled study
McCracken & Keogh (04,2009)	Acceptance, Mindfulness and Values-Based Action May Counteract Fear and Avoidance of Emotions in Chronic Pain: An Analysis of Anxiety Sensitivity	No controlled study
Calahan et al. (04,2009)	Use of Complementary and Alternative Medicine Among Patients With Arthritis	No mindfulness or ACT treatment
Pull (01,2009)	Current empirical status of acceptance and commitment therapy	Review
Morone et al. (02,2008)	Mindfulness meditation for the treatment of chronic low back pain in older adults: a randomized controlled pilot study	Older adults

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*Note.* ACT, acceptance and commitment therapy.