

Research Findings Using Mindfulness-Based Interventions for Chronic Pain

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Abstract

Chronic pain is a complex condition that is very detrimental to physical and psychological wellbeing. It carries a significant level of disability and economic burden. Pain patients frequently experience comorbid mental illness (e.g. depression, anxiety, PTSD, insomnia) and often require psychotherapeutic interventions in addition to medication management. Mindfulness-based interventions (MBIs) have emerged as a means to treat several chronic conditions (e.g. chronic pain, depression, anxiety, substance abuse, stress, insomnia). The objective of this review is to evaluate the current research on the use of MBIs in chronic pain management. Although there are several controlled trials on the use of MBIs in chronic pain management, only a few studies were found that demonstrated significant effects on pain intensity, quality of life, as well as physical and psychological functioning. Therefore, the current evidence is mixed and there are insufficient data to definitively confirm the full impact of the use of MBIs in chronic pain conditions such as fibromyalgia, chronic low back pain, rheumatoid arthritis, and chronic musculoskeletal pain. The lack of compelling evidence at this time signals a demand for higher quality investigations in this area. Research examining MBIs and concomitant CBT may be of great value in order to synergize and strengthen patient outcomes.

Keywords

Chronic Pain, Fibromyalgia, Chronic Low Back Pain, Mindfulness-Based Stress Reduction, Acceptance and Commitment Therapy, Depression, Anxiety, Quality of Life, Psychiatric Comorbidities

1. Introduction

Chronic pain results in significant economic, societal and health burdens. It is the leading cause of long-term disability, affects over 100 million people in the US, and accounts for \$635 billion annually in direct and indi-

rect costs [1] [2]. At least 10 percent of the world's population or about 60 million people suffer from chronic pain [3]. In working adults, almost 5 hours per week are lost in productivity due to chronic pain conditions [4]. The resultant consequences for those living with chronic pain are reduced ability for daily activities, pleasure, general health, and overall quality of life (QOL) [5]-[7].

Pharmacotherapy remains one of the primary treatment modalities for chronic pain. Unfortunately, medications have limited effectiveness and may only reduce pain 30 to 40 percent in less than 50% of patients [7]. Additionally, surgical implants used for medication delivery have limited efficacy and are only helpful to a small portion of the chronic pain population [8] [9].

Those suffering from chronic pain often experience an increased incidence of depression, anxiety, posttraumatic stress disorder and insomnia [10]-[13]. Pain patients with comorbid mental illness often require psychotherapeutic interventions in addition to medication management [14] [15]. Cognitive behavioral therapy (CBT) has demonstrated effectiveness in the treatment of chronic pain and helps change impractical thinking through recognition of and reduction in harmful thought patterns while also providing enhanced coping skills [16] [17]. CBT utilizes several strategies including, but not limited to, problem solving, pain education, relaxation training, coping skills development, and cognitive restructuring of pain-related beliefs [17].

Mindfulness-based programs have emerged as novel interventions for chronic pain management, behavior modification, depression, anxiety, stress, addictions treatment, and relapse prevention [18]-[20]. The first formal program, mindfulness-based stress reduction (MBSR), was introduced by Jon Kabat-Zinn in 1979 [21]. Mindfulness practices utilize meditation, body awareness, and yoga to help reduce negative emotional reactions, enhance resilience, and promote self-healing [21]. Mindfulness fosters acute awareness of the present moment, thoughts, emotions, sensations, and the impermanent nature of things [19]. The patient is thereby able to cultivate the ability to respond to stimuli in a nonjudgmental way; allowing them to navigate their life in a manner that does not involve attachment to particular beliefs.

The objectives of this review are to evaluate the current literature available on mindfulness-based interventions (MBIs) in chronic pain management and present the most recent research previously not yet examined. The intent is to provide further insight into the value of MBIs for the treatment of chronic pain.

2. Previous Analyses and Reviews

Several meta-analyses and critical reviews have been published evaluating MBIs (primarily MBSR) for the treatment of chronic pain [22]-[26]. These studies focus on the effectiveness of MBIs on reducing pain intensity, improving patient outcomes, and treatment of comorbid depression and anxiety. A summary of the search methodology, target populations, outcomes, and results of these analyses and reviews are presented in [Table 1](#).

Chiesa and Serretti reviewed 10 controlled trials using MBIs for chronic pain [23]. Studies chosen for inclusion were those suffering from a chronic pain condition (e.g. low back pain, rheumatoid arthritis, fibromyalgia), with a minimum of 6 months of pain symptoms, had at least one outcome measure of pain and/or depression, and provided quantitative data [27]-[36]. Results from these trials indicated that there was insufficient data available as to whether MBIs were more effective than control group interventions (e.g. educational or support-based group therapy) in reducing pain and depression in chronic pain sufferers.

A systematic review and meta-analysis of both controlled and uncontrolled studies was conducted on acceptance-based interventions (e.g. MBSR) and acceptance and commitment therapy (ACT) in chronic pain [26]. The inclusion criteria for the analysis were studies of effectiveness of a standardized acceptance (ACT) or MBI (MBSR, mindfulness-based cognitive therapy or MBCT) in participants with chronic pain or chronic pain-related illnesses. A literature search was conducted and 9 randomized controlled trials (RCTs), 5 clinical controlled trials (CCTs) without randomization, and 8 uncontrolled studies were selected for analysis out of the 1121 reviewed. The RCTs followed by the CCTs had the best quality scores measuring research strength [27]-[29] [31]-[35] [37]-[40]. RCTs and CCTs demonstrated small yet significant improvements in pain and depression. CCTs also showed statistically significant improvements in QOL. When RCT and CCT data were pooled, there were slight but significant improvements in pain, depression, anxiety, physical wellbeing, and QOL. However, subgroup (study quality, intervention, control group, pain type, attrition rate, and publication status) analysis for pain and depression outcomes did not result in significant findings. Thus, the authors concluded that MBSR and ACT could not be considered better than CBT but may be a good alternative. They further recommended that the combination of mindfulness-based interventions with cognitive therapies should be the focus of future re-

Table 1. Meta-analysis, systematic and/or critical reviews on the use of mindfulness-based interventions in chronic pain.

Study	Population	Search Engines	Outcomes	Findings
Bawa 2015 N = 11 RCTs	Mixed etiology CP (e.g. CLBP, RA, fibromyalgia, CMSP) in all ages	PubMed, Embase, AMED, CINAHL, PsycInfo, Index of Theses up to April 3, 2013	Economic, pain intensity, depression, physical functioning, sleep quality, trait anxiety, QOL, pain acceptance	Results did not identify any statistically significant impact on patient outcomes
Chiesa 2011 N = 10; 6 CTs, 4 CCTs)	Mixed etiology CP (e.g. CLBP, RA, fibromyalgia, CMSP)	PubMed, ISI Web of Knowledge, Cochrane Database, references of retrieved articles up to July 31, 2009	Pain intensity, coping, stress reduction, depression, QOL, physical functioning, other psychiatric changes	Insufficient data to support MBIs as more effective in reducing pain and depression when compared to educational or support-based group therapy controls.
Reiner 2013 (N = 16; 8 RCTs, 8 uncontrolled)	Mixed etiology CP ages 18 years or older with at least 10 participants per treatment cohort	PubMed and PsycInfo from 1960 to December 31, 2010	Pain intensity	Reductions in pain intensity noted in 6 out of 8 controlled trial. The high quality study by Zautra and colleagues, however, did not have significant findings on pain control.
Song 2014 (N = 16; 8 RCTs, 8 uncontrolled)	Primary care patients ages 18 years or older with mixed etiology CP	PubMed, EPS-Cohost, Elsevier, Wiley, Springer, Cochrane Database, references of retrieved articles up to December 31, 2011	Pain intensity, presence of psychiatry comorbidity	Insufficient evident that MBIs effectively reduce pain intensity but data do support that MBIs improve psychiatric comorbidities of depression and trait anxiety.
Veehof 2011 (N = 22; 9 RCTs, 5 CCTs; 8 uncontrolled)	Mixed etiology CP	PubMed, Embase, PsycInfo, Cochrane Database up to January 31, 2009	Pain intensity, depression	MBSR and ACT could not be considered better than CBT but may work well as an alternative or adjunct to CBT.

Key: ACT—acceptance and commitment therapy; CBT—cognitive behavioral therapy; CCT—clinical controlled trial; CLBP—chronic low back pain, CMSP—chronic musculoskeletal pain, CP—chronic pain; MBSR—mindfulness-based stress reduction; RA—rheumatoid arthritis; RCT—randomized controlled trial.

search in order to synergize and strengthen patient outcomes.

Reiner and colleagues critically reviewed 16 out of 133 studies (8 uncontrolled, 8 controlled) that examined pre- and post-treatment pain ratings using a standardized MBI teaching techniques and included 6 or more hourly sessions of the MBSR or ACT basic curriculum [24]. At least 10 participants were required in the treatment cohorts, study participants were 18 years or older, and outcome measures utilized standardized scales to assess pain intensity [28] [32] [35] [36] [41]-[52]. While the results stemming from three of the larger uncontrolled studies indicated significant reductions in pain intensity and that the benefits were maintained for at least 3 months, they did not provide adequate supportive evidence of a specific connection between MBIs and reductions in pain [42]-[44]. These results are not surprising however since the quality of the uncontrolled studies were generally poor. The results from the controlled trials however did demonstrate pain intensity reductions in 6 out of the 8 studies [28] [32] [35] [41] [49] [50]. There was one low quality RCT that did not generate any significant findings [48]. Interestingly, the only high quality RCT conducted by Zautra and colleagues did not have significant findings on pain control [36].

Song and colleagues completed a meta-analysis examining RCTs using MBIs for chronic pain in primary care and its effects on relieving pain and improving mental health comorbidity [25]. The inclusion criteria for the study were ages 18 or older with pain for at least 3 months or illness with chronic pain symptoms. The primary outcome measures included various measure of pain intensity (e.g. presence of pain symptoms, pain acceptance). The presence of psychiatric comorbidity, including depression and anxiety, were evaluated as secondary outcomes. A total of 372 potential studies were identified and 8 of these met criteria for the analysis [29] [31] [34] [37] [53]-[56]. All except one study employed the standard 8-week MBSR protocol; the remaining RCT conducted in breast cancer survivors utilized a 6-week intervention [56]. The analysis showed that MBIs did not significantly decrease pain intensity when compared to controls but this could have been due to the sample sizes (largest was 22 intervention to 18 control) and the use of heterogeneous patient populations including various sites or types of pain and various ages. MBIs did improve mental health comorbidities (e.g. depression and trait anxiety). Unfortunately, the level of benefit did not show an advantage over other interventions such as educational support groups. The authors concluded that there was insufficient evidence that MBIs effectively reduced

pain intensity but data did support that MBIs improve psychiatric comorbidities of depression and trait anxiety in chronic pain patients.

A systematic review and meta-analysis of chronic pain conditions including fibromyalgia, rheumatoid arthritis, failed back surgery syndrome, chronic musculoskeletal pain, and pain of mixed etiology evaluated the impact of MBIs on economic, clinical, and patient outcomes [22]. All ages, genders, and ethnicities were included in the study and chronic pain had to be present for at least 13 weeks. Only RCTs with active or inactive control groups were selected resulting in 11 out of 2463 studies meeting criteria for evaluation [27] [30] [33] [34] [36] [49] [53] [55] [57]-[59]. Economic outcomes reported from 4 studies were insufficient to identify any significant effects [27] [49] [53] [55]. There was only limited evidence to support MBIs in chronic pain which was most likely due to small sample sizes. Results reported in these studies did not identify any statistically significant impact on patient outcomes (e.g. pain intensity, pain acceptance, sleep quality, trait anxiety depression, physical functioning, and QOL).

3. Latest Research

Four studies (3-RCTs, 1-uncontrolled) have been recently published on the effects of MBIs in adults with chronic pain [60]-[63]. An uncontrolled pilot study was conducted with 17 adult chronic pain patients (ages 33 to 71) who completed an 8-week MBSR group program [60]. Outcome measures included level of pain disability, engagement in activities, subjective pain intensity, level of distress, and willingness to experience pain. Although the sample size was limited, researchers did find significant improvements in the level of psychological distress, pain intensity, willingness to experience pain, engagement in life activities, and pain disability (overall, family/home, occupational, and recreational).

A RCT conducted in 88 female patients (average age 40 years) with chronic low back pain enrolled in an 8-week MBSR program demonstrated significantly lower pain intensity and improved physical and mental QOL compared to usual medical care controls [61]. Similar findings were reported in a RCT of 109 patients (83% female; mean age 47 years) suffering from nonspecific chronic pain [62]. Significant changes were observed for those who completed the MBSR cohort in the areas of pain control, pain acceptance, The Short Form 36 vitality scale, psychological wellbeing, and mental health composite, as well as the Hospital Anxiety and Depression Scale [62]. The authors concluded that MBSR had a significantly positive and long-lasting impact on chronic pain management.

A RCT using MRSR in women (N = 91) with fibromyalgia aged 18 years or older was just recently published [63]. Outcomes measures of this study included MBSR's effect on pain intensity, perceived stress, sleep disturbance, fatigue, physical functioning, symptom severity and cortisol. MBSR participants experienced significantly reduced sleep disturbance, perceived stress, fatigue, and symptom severity. These improvements were maintained at the 2-month post intervention follow-up. There were no significant effects discerned on pain severity, physical functioning, and cortisol levels. Those who established and maintained their MBSR home practice regimen at the 2-month follow-up continued to report reductions in symptom severity. Overall, MBSR was found to improve some of the major symptoms associated with fibromyalgia thereby reducing perceived disease burden.

4. Research Limitations

Several limitations were noted by researchers including limited number of comparative studies in general (especially those of high quality), small sample sizes, heterogeneity of chronic pain types (e.g. fibromyalgia, rheumatoid arthritis, musculoskeletal, low back), lack or use of varying types of control groups (e.g. wait listed, physical and psychological interventions, educational instruction, usual care), absence of randomization, inability to use double-blinding, use of self-reported scales and questionnaires, attrition, study populations consisting primarily of white females from Western countries, confounding effect of comorbid mental illness, lack of long-term follow-up, and differences in the intervention characteristics and duration [22]-[26]. These limitations were also present in the latest research attesting to the difficulty of constructing an ideal RCT or CCT in a complex disease state such as chronic pain.

5. Conclusion

MBIs have emerged as a potential means to combat stress, depression, substance abuse relapse prevention, an-

xiety, and chronic pain. Although there are several controlled trials on the use of MBIs in chronic pain management, only a few of these studies demonstrate significant effects on pain intensity, QOL, as well as physical and psychological functioning. The findings of this review are that the current evidence is mixed and there are insufficient data to definitively confirm the full impact of the use of MBIs in chronic pain management. Of important note is that MBIs are not primarily focused on reductions in pain intensity rather, that patients learn strategies to be aware and accept their pain as part of their lives. Thus, influences on physical functioning, mental health, and QOL are of greater importance for future study. The lack of compelling evidence at this time signals a demand for higher quality research in this area. Controlled trials examining MBIs and concomitant CBT may be of great value in order to synergize and strengthen patient outcomes.

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