

## **Does Mindfulness Meditation improve Chronic Pain? A Systematic Review**

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## **Abstract**

### *Purpose of review*

Psychological factors are associated with chronic pain. Mindfulness meditation may ameliorate symptoms. The objective was to evaluate the effects of mindfulness meditation in chronic pain.

### *Recent findings*

A systematic search of four databases identified 534 citations, thirteen RCTs satisfied the inclusion criteria. Mindfulness meditation significantly reduced depression (SMD -0.28; 95%CI -0.53, -0.03;  $p = 0.03$ ;  $I^2 = 0\%$ ). For affective pain (SMD -0.13; 95% CI -0.42, 0.16;  $I^2 = 0\%$ ), sensory pain (SMD -0.02; 95% CI -0.31, 0.27;  $I^2 = 0\%$ ) and anxiety (SMD -0.16; 95% CI -0.47, 0.15;  $I^2 = 0\%$ ) there was a trend towards benefit with intervention. Quality of life items on mental health (SMD 0.65; 95%CI -0.27, 1.58;  $I^2 = 69\%$ ), physical health (SMD 0.08; 95% CI -0.40, 0.56;  $I^2 = 32\%$ ) and overall score (SMD 0.86, 95%CI -0.06, 1.78;  $I^2 = 88\%$ ) improved with mindfulness meditation.

### *Summary*

Mindfulness meditation has most prominent effect on psychological aspects on living with chronic pain, improving associated depression and quality of life.

## **Keywords**

Chronic pain, mindfulness meditation, Vipassana meditation, chronic pelvic pain

## **Key points**

1. Chronic pelvic pain has significant impact on patients' quality of life and is often resistant to surgical and medical treatment
2. Psychological and somatic causes require a multidimensional approach
3. Patient self-management (PSM) is now recognised as a tool empowering

patients to cope better with chronic condition and mindfulness meditation is one of PSM options

4. Effect of mindfulness meditation on chronic pain by assuming that chronic pelvic pain is a subset of chronic pain as they share the similar psychogenicity
5. Mindfulness meditation in chronic pain shows its most prominent effect on psychological aspects of living with chronic pain by improving associated depression and quality of life

## **Introduction**

Chronic pelvic pain (CPP) is defined as a subjective physical and emotional experience that has been present for at least six months that may or may not have an identifiable pathology. It affects up to 24% women worldwide (1) accounting for 20% of UK gynaecological clinic referrals (2) and has a considerable impact on patients' quality of life and their income. CPP costs the NHS € 3.3bn per year (3). Despite costly interventions, CPP is often resistant to surgical and medical treatment.

Multifactorial psychological and somatic causes require a multidimensional approach. Psychological and somatic causes require a multidimensional approach, which is not routinely offered in gynaecology clinics (3). Evidence from randomised trials suggests that primary inclusion of psychological interventions may be superior to primary surgery (4). Although psychological treatment is provided across the NHS, mostly in the context of primary care Improving Access to Psychological Therapies there are problems with capacity, waiting times and an overall number of patients being able to access services. Alternatively, patient self-management (PSM) is now recognised as a tool empowering patients to cope better with their condition (5) with mindfulness meditation being one of PSM options.

CPP is not limited to the reproductive age, and there is emerging evidence that CPP, especially idiopathic CPP is a pain, syndrome like other regional pains. (6) In the general population, the prevalence of chronic pain is as high as 50%, and it is a common reason for seeking healthcare (7). It affects the sufferer's life quality leading to work absenteeism and loss of employment.

Mindfulness-based meditation (MBM) is a complementary therapy for chronic pain (8) during which person suffering from the pain anchors their mind on the present moment what should allow them to cope better and ameliorates the experience of pain (9, 10). Two uncontrolled small pilot studies (10, 11) revealed a promising role for mindfulness meditation on CPP. Several reviews have assessed the effect of mindfulness meditation on a range of chronic pain conditions. However, there are limitations to their recommendations because of the small number of included studies, the variety of populations under study (12-14), and deficiencies in quality assessment (15-17). Systematic review by Bawa et al. (18) included studies only till June 2013 missing four recent trials (19-22). The primary aim of this study was to summarize evidence from randomised trials evaluating the effects of MBM on chronic pain and psychological morbidity.

## **Methods**

The systematic review was conducted based on prospective protocol designed using established methods (23-25).

### *Identification of studies*

A systematic search without any language restrictions was conducted in: MEDLINE (via OVID), EMBASE, PsychINFO and AMED from database inception to July 2013 and subsequently update in December 2015 and May 2016. The databases were searched for relevant studies using the following key words and word variants: “chronic pain” or “pelvic pain”, and “meditation” or “mindfulness” or “Vipassana” or “mindfulness based stress reduction” or “mindfulness based intervention” or “mindfulness based therapy”. The reference lists from the articles obtained were

examined for additional articles. We also hand searched all relevant systematic reviews (12-14, 16-17, 26) and in case of any difficulties with obtaining identified articles we approached the authors.

### *Study selection*

We included studies with adults with chronic pain where researchers compared the impact of mindfulness meditation with standard care or ‘waiting list’ on pain perception and relevant outcomes. The secondary outcome was any psychological morbidity. From the downloaded database of electronic searches, duplicates were removed retaining the most recent and complete versions of the citations. Two reviewers (EB and EM) independently scrutinized the full manuscripts of citations thought to be potentially relevant in the electronic searches on the basis of title and abstract. Studies were excluded if the intervention was conducted on children or in cancer patients. Any disagreements were discussed or judged by the third reviewer (ER).

### *Data extraction and study quality assessment*

Means, with standard deviations and sample sizes were extracted from eligible articles where possible. Additionally, study characteristics and methods were extracted (EB and EM) on to piloted Excel sheets. The quality of RCT was assessed using Cochrane risk of bias tool (23) for following domains: random sequence generation, allocation concealment, blinding, incomplete outcome data and selective reporting. Any disagreements were discussed or judged by the third reviewer (ER).

### *Data synthesis*

Forest plots were used to display the effects of intervention on pain related and psychological outcomes, and quality of life. All outcomes were continuous measures, thus results were presented as standardized mean differences. Meta-analysis with random effects model was carried out using RevMan software (version 5.2). Funnel plots were generated in order to investigate small study effect.

## **Results**

### *Study selection*

A total of 472 citations were initially identified by electronic searches, further 62 were identified on updated search. We evaluated the full text of which thirteen met the inclusion criteria: (19-22, 27 - 35). The study selection process can be found on Figure 1.

### *Characteristics of the included studies and intervention*

The included trials studied the effect of intervention on populations with a variety of chronic pains (musculoskeletal pain, back pain, fibromyalgia, diabetic neuropathy pain, general chronic pain, headache, and medically unexplained pain). The typical mindfulness program applied in the studies was based on Kabat-Zinn's well-known mindfulness based stressed reduction (MBSR) program (8). Length of intervention varied between 7 - 12 weeks. In some studies, mindfulness meditation was also accompanied with the usual treatment, psycho-education, home CD guide, group retreat, or daily diary. (Table 1)

The quality of the included 13 RCTs was assessed. Random sequence generation was assessed as low risk in 7/13 studies (54%). The risk of bias for allocation concealment

was assessed as low in 4/13 studies (31%). Performance bias was graded as low in 1/13 (8%) and as high in 5/13 (38%) RCTs. Detection bias was of a high risk in 3/13 (23%), low in 4/13 (31%) studies. Attrition bias was evaluated as low risk in 5/13 trails (38%). 10/13 (77%) of trials were assessed as having a low risk of reporting bias (Figure 2).

### *Effects of mindfulness meditation*

Three RCTs (n = 183) looked at the effect of mindfulness meditation on reduction of affective pain and three (n = 183) looked at reduction in sensory pain. Six trials looked at effect of meditation on pain intensity (n = 374) and three (n = 251) looked at pain acceptance.

Compared to control group, there were reduction of affective pain (SMD -0.13, 95% CI -0.42, 0.16,  $I^2 = 0\%$ ) and sensory pain (SMD -0.02, 95% CI -0.31, 0.27,  $I^2 = 0\%$ ) shown in SDC1 and SDC2. Meditation did not show reduction in pain intensity (SMD 0.14, 95% CI -0.06, 0.35,  $I^2 = 20.2\%$ ) (Figure 3). The estimate for pain acceptance is of SMD 0.34, 95% CI 0.09, 0.59 (Figure 4).

Four RCTs (n = 368) reported the effect of mindfulness meditation on reduction of depression and three (n = 278) the effect of reduction of anxiety. Pooled estimates for depression and anxiety were SMD -0.31, 95% CI -0.52, -0.10,  $I^2 = 0\%$ ; SMD -0.21, 95% CI -0.45, 0.03,  $I^2 = 0\%$  respectively (Figure 5 and Figure 6). Four trials (n = 193) looked at effect of mindfulness meditation on mental health quality of life, five randomized trials (n = 230) looked at effect of mindfulness meditation on physical

health quality of life and four randomized trials (n = 215) looked at overall quality of life following mindfulness meditation.

There is no difference in quality of life (physical health) SMD 0.04, 95% CI -0.22, 0.30,  $I^2 = 0\%$  (SDC3). One can observe a trend on the forest plot for improvement in quality of life (mental health) (SMD 0.57, 95% CI 0.25, 0.89,  $I^2 = 52.9\%$ ) (Figure 7). The total quality of life improvement is of borderline significance (SMD 0.86, 95% CI -0.06, 1.78,  $I^2 = 88\%$ ) (SDC4).

## **Discussion**

We believe that our systematic review is one of the few without language restriction including only RCT evidence. Most included RCTs omitted objective clinical outcomes such as emergency hospital visits; only two studies (32 , 36) report a reduction in need for pain and sleeping medication as a clinical outcome. We identified an additional two studies (37-38), which could not be included due to reporting of their findings. However these studies broadly concur with the findings, showing significant improvement in chronic pain and pain related distress. Only two (28, 34) of the nine included RCTs were graded as having low overall risk of bias. In most other studies lack of reported details of randomization, allocation concealment and blinding led to an assessment of unclear risk of bias. It was our protocol to grade studies on the basis of published study design and not to contact authors for unpublished details.

A criticism that applies to all included studies is the lack of a suitable control group that would allow us to identify specific contribution from mindfulness meditation.

The ideal control group would receive ‘sham’ meditation sessions, to ensure proper blinding of participants. Although difficult to design such a control group would avoid any unspecific effects, which can arise merely from the additional attention, and care the intervention group receives in comparison to treatment as usual or waitlist controls. Replacing an active control such as massage or education with ‘sham’ meditation sessions would avoid any influences on outcomes from active interventions. Bawa et al. (18) noted that the effect of mindfulness meditation was smaller when compared to active controls. Yet, they subgroup comparison was not powered to show statistical significance. Our attempt of subgroup analysis was hampered by the same issue of insufficient power to detect a meaningful difference.

Most previous systematic reviews (12, 17, 26) do not report effect sizes, thus making a quantitative comparison with the present findings is difficult. The findings of improved depressive symptoms in the present study match the subgroup analysis of RCTs from Veehof et al. (14), but in contrast to this systematic review we do not report improvement in pain. The most likely reason for this is the controversial combination of diverse pain scales by Veehof et al. (14), who combined pain intensity with pain interference and pain related affect. In addition, Veehof et al. (14) included seven studies of Acceptance and Commitment Therapy (ACT), which is a therapeutic approach that overlaps with cognitive behavioural therapy, can be practiced in many different forms. Meditation is not an integral part of ACT. Veehof et al. (14) did not analyse those studies separately but they may account for a larger effect on pain reduction. Rainer et al. (17) also reported improvement in pain scores but the authors included a large number of non-randomized trials, which risks bias in particular in psychological interventions. Several of the studies included in the present paper have

also been included in previous systematic reviews. Veehof et al. (14) with a similar scope to the present paper closed data collection in January 2009, since then we identified and analysed three new RCTs (33-35) thus enabling us to include purely RCT evidence. We were also able to add 4 new studies to the most recent systematic review (18), a good quality systematic review as assessed by the CASP checklist, who closed their data collection in 2013.

The current paper and Bawa et al. (18) jointly included the same six, (29, 31, 32, 35, 36, 39). We did not include four papers that Bawa review due to absence of inactive controls (32, 40), lack of inclusion of chronic pain patients (41), or lack of pain as an outcome measure (42).

Bawa et al. (18) investigated similar chronic pain conditions as the present paper. The outcomes under investigation included Pain intensity sleep quality, depressive symptoms, anxiety, Mindfulness, perceived control, physical functioning, physical health related quality of life and pain acceptance. Significant effects from mindfulness meditation were reported in perceived pain control. Mindfulness intervention has similar favourable trends on outcomes as reported in the present paper. The present paper includes more studies and hence it is not surprising that more outcomes (depression, anxiety, affective and sensory pain) are significantly improved.

We would like to extrapolate the findings of the present review to chronic pelvic pain in women and this is supported by emerging evidence of CPP being a form of chronic pain syndrome (6). However, men and women may experience and cope with pain differently. Hence we attempted a subgroup analysis of our collated data by gender. Unfortunately, numbers were too small for this. However, the population in 9 out of

13 studies comprised of more or equal 75% of women, and three studies recruited only women. We therefore conclude that our findings apply to the women.

### **Conclusions**

The present systematic review, the first one based solely on RCT evidence, indicated that mindfulness meditation in chronic pain shows its most prominent effect not on reducing the perception of pain but on psychological aspects on living with chronic pain; improving associated depression and quality of life. Mindfulness meditation should be considered as an evidence-based adjunct in the treatment of chronic pain. Our review reveals that the lack of evidence on the use of mindfulness meditation on subgroups such as patients with chronic pelvic pain. From what we have gathered, we looked at the effect of mindfulness meditation on chronic pain by assuming that chronic pelvic pain is a subset of chronic pain as they share the similar psychogenicity. Two uncontrolled small pilot studies (10, 11) revealed a promising role for mindfulness meditation on chronic pelvic pain. A feasibility study, MEMPHIS (NCT02721108) using a smartphone app to teach mindfulness meditation to women with CPP is currently underway. We assume that findings from the current review also apply to patients with CPP.

### **Authors' contributions**

ENMS carried out the literature search, obtained the papers, extracted and tabulated data and wrote the paper.

EB came up with the idea for the review, carried out the literature search, extracted data and wrote the paper.

ER provided advice on quality assessment, led on the methodological section and produced all graphs.

GF carried out the searches and assisted with the writing of the paper.

All authors read and approved the final manuscript.

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### **Conflicts of interest**

None

## **Figures and Tables**

**Figure 1** Flow chart of study selection (original)

**Figure 2** Quality assessment of included studies (original)

**Figure 3** Forest Plot Effect of Mindfulness Meditation on Pain Intensity (original)

**Figure 4** Forest Plot Effect of Mindfulness Meditation on Pain Acceptance (original)

**Figure 5** Forest Plot Effect of Mindfulness Meditation on Anxiety (original)

**Figure 6** Forest Plot Effect of Mindfulness Meditation on Depression (original)

**Figure 7** Forest Plot Effect of Mindfulness Meditation on Quality of Life (mental health) (original)

**Table 1** Characteristics of included RCTs (original)

### **Reference list:**

1. Latthe P, Latthe M, Say L, Gülmezoglu M, Khan KS. WHO systematic review of prevalence of chronic pelvic pain: a neglected reproductive health morbidity. *BMC Public Health*. 2006;6:177
2. Howard FM. The role of laparoscopy in chronic pelvic pain: promise and pitfalls. *Obstet Gynecol Surv*. 1993;48(6):357-87.
3. Simoens S, Dunselman G, Dirksen C, et al. The burden of endometriosis: costs and quality of life of women with endometriosis and treated in referral centres. *Hum Reprod*. 2012;27(5):1292-9.
4. Peters AA, van Dorst E, Jellis B, et al. A randomized clinical trial to compare two different approaches in women with chronic pelvic pain. *Obstet Gynecol*. 1991;77(5):740-4.
5. Warsi A, Wang PS, LaValley MP, Avorn J, Solomon DH. Self-management education programs in chronic disease: a systematic review and methodological critique of the literature. *Arch Intern Med*. 2004;164(15):1641-9.
6. Ayorinde A. *The Epidemiology of Chronic Pelvic Pain in Women*: University of Aberdeen; 2016
7. Smith B, Elliott AM, Chambers WA, et al. The impact of chronic pain in the community. *Fam Pract*. 2001;18(3):292-9.
8. Kabat-Zinn J. An outpatient program in behavioral medicine for chronic pain patients based on the practice of mindfulness meditation: theoretical considerations and preliminary results. *Gen Hosp Psychiatry*. 1982;4(1):33-47.
9. Carmody J, Baer RA. Relationships between mindfulness practice and levels of mindfulness, medical and psychological symptoms and well-being in a mindfulness-based stress reduction program. *J Behav Med*. 2008;31(1):23-33.

10. Kold M, Hansen T, Vedsted-Hansen H, Forman A. Mindfulness-based psychological intervention for coping with pain in endometriosis. *Nordic Psychology*. 2012;64(1):2-16.
11. Fox SD, Flynn E, Allen RH. Mindfulness meditation for women with chronic pelvic pain: a pilot study. *J Reprod Med*. 2011;56(3-4):158-62.
12. Cramer H, Haller H, Lauche R, Dobos G. Mindfulness-based stress reduction for low back pain. A systematic review. *BMC Complement Altern Med*. 2012;12:162
13. Kozasa EH, Tanaka LH, Monson C, et al. The effects of meditation-based interventions on the treatment of fibromyalgia. *Curr Pain Headache Rep*. 2012;16(5):383-7.
14. Veehof MM, Oskam MJ, Schreurs KM, Bohlmeijer ET. Acceptance-based interventions for the treatment of chronic pain: a systematic review and meta-analysis. *Pain*. 2011;152(3):533-42.
15. Merkes M. Mindfulness-based stress reduction for people with chronic diseases. *Aust J Prim Health*. 2010;16(3):200-10.
16. Reiner K, Tibi L, Lipsitz JD. Do mindfulness-based interventions reduce pain intensity? A critical review of the literature. *Pain Med*. 2013;14(2):230-42.
17. Teixeira ME. Meditation as an intervention for chronic pain: an integrative review. *Holist Nurs Pract*. 2008;22(4):225-34.
18. \*\*Bawa FL, Mercer SW, Atherton RJ, et al. Does mindfulness improve outcomes in patients with chronic pain? Systematic review and meta-analysis. *Br J Gen Pract*. 2015;65(635):e387-400.

This is a comprehensive systematic review of good quality.

19. Cathcart S, Galatis N, Immink M, et al. Brief mindfulness-based therapy for chronic tension-type headache: a randomized controlled pilot study. *Behav Cogn Psychother*. 2014;42(1):1-15.
20. Dowd H, Hogan MJ, McGuire BE, et al. Comparison of an Online Mindfulness-based Cognitive Therapy Intervention With Online Pain Management Psychoeducation: A Randomized Controlled Study. *Clin J Pain*. 2015;31(6):517-27.
21. Kanter G, Komesu YM, Qaedan F, et al. Mindfulness-based stress reduction as a novel treatment for interstitial cystitis/bladder pain syndrome: a randomized controlled trial. *Int Urogynecol J*. 2016.
22. la Cour P, Petersen M. Effects of mindfulness meditation on chronic pain: a randomized controlled trial. *Pain Med*. 2015;16(4):641-52.
23. Higgins JP, Green S, Collaboration C. *Cochrane handbook for systematic reviews of interventions*: Wiley Online Library; 2008.
24. <http://www.prisma-statement.org/statement.htm>.
25. Khan k, Kunz R, Kleijnen J, Antes G. *Systematic reviews to support evidence-based medicine*. 2nd ed: CRC Press; 2011.
26. Chiesa A, Serretti A. Mindfulness-based interventions for chronic pain: a systematic review of the evidence. *J Altern Complement Med*. 2011;17(1):83-93.
27. Sagula D, Rice K. The Effectiveness of Mindfulness Training on the Grieving Process and Emotional Well-Being of Chronic Pain Patients. *Journal of Clinical Psychology in Medical Settings*. 2004;11(4):333-42.
28. Carson J, Keefe F, Lynch T, et al. Loving-kindness meditation for chronic low back pain: results from a pilot trial. *J Holist Nurs*. 2005;23(3):287-304.

29. Plews-Ogan M, Owens JE, Goodman M, Wolfe P, Schorling J. A pilot study evaluating mindfulness-based stress reduction and massage for the management of chronic pain. *J Gen Intern Med.* 2005;20(12):1136-8.
30. Nash-Mc Feron DE. Mindfulness in the treatment of chronic headache pain. *Dissertation Abstracts International: Section B: The Sciences and Engineering.* 2006;67(5-B):2841.
31. Sephton SE, Salmon P, Weissbecker I, et al. Mindfulness meditation alleviates depressive symptoms in women with fibromyalgia: Results of a randomized clinical trial. *Arthritis Care and Research.* 2007;57(1):77-85.
32. Morone NE, Greco CM, Weiner DK. Mindfulness meditation for the treatment of chronic low back pain in older adults: a randomized controlled pilot study. *Pain.* 2008;134(3):310-9.
33. Teixeira ME. Meditation as an intervention for chronic pain: an integrative review. *Holist Nurs Pract.* 2008;22(4):225-34.
34. Schmidt, S., Grossman, P., Schwarzer, B., Jena, S., Naumann, J., & Walach, H. (2011a). Treating fibromyalgia with mindfulness-based stress reduction: results from a 3-armed randomized controlled trial. *Pain*, 152(2), 361-369.
35. Brown CA, Jones AK. Psychobiological correlates of improved mental health in patients with musculoskeletal pain after a mindfulness-based pain management program. *Clinical Journal of Pain.* 2013;29(3):233-44
36. Esmer G, Blum J, Rulf J, Pier J. Mindfulness-based stress reduction for failed back surgery syndrome: a randomized controlled trial. *J Am Osteopath Assoc.* 2010;110(11):646-52.

37. Davis MC, Zautra AJ, Wolf LD, et al. Mindfulness and cognitive-behavioral interventions for chronic pain: differential effects on daily pain reactivity and stress reactivity. *J Consult Clin Psychol*. 2015;83(1):24-35.
38. Ussher M, Spatz A, Copland C, et al. Immediate effects of a brief mindfulness-based body scan on patients with chronic pain. *J Behav Med*. 2014;37(1):127-34.
39. Schmidt S. Mindfulness meditation for the treatment of chronic low back pain in older adults: A randomized controlled pilot study - Commentary. 2008;15(2):106-8.
40. Wong SY, Chan FW, Wong RL, et al. Comparing the effectiveness of mindfulness-based stress reduction and multidisciplinary intervention programs for chronic pain: a randomized comparative trial. *Clin J Pain*. 2011;27(8):724-34.
41. Astin JA. Stress reduction through mindfulness meditation. Effects on psychological symptomatology, sense of control, and spiritual experiences. *Psychother Psychosom*. 1997;66(2):97-106.
42. Pradhan EK, Baumgarten M, Langenberg P, et al. Effect of Mindfulness-Based Stress Reduction in rheumatoid arthritis patients. *Arthritis Rheum*. 2007;57(7):1134-42.