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The Impact of Mindfulness-Based Stress Reduction Programs on Fibromyalgia Patients' Quality of Life - A Meta-Analysis

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Abstract

This study assessed the effectiveness of Mindfulness-Based Stress Reduction (MBSR) programs on improving the quality of life in patients with fibromyalgia. A meta-analysis was conducted to evaluate patients' quality of life immediately after treatment, followed by an examination of descriptive data to observe potential long-term effects of the intervention. Following PRISMA guidelines, a systematic search was conducted in November 2023 across PubMed, PsycInfo, Ovid-Medline, and MEDLINE-EBSCO to identify randomized and non-randomized controlled trials comparing MBSR programs to control conditions. The primary outcome of interest was quality of life, with measurements taken at post-intervention and follow-up. Standardized mean differences (SMDs) and confidence intervals (CIs) were extracted and calculated. A random-effects model was used to compute the overall effect size at post-intervention. Eight studies were included in the meta-analysis, with five studies contributing data on the long-term effects of MBSR. The meta-analysis revealed a significant small to medium effect of MBSR on quality of life (SMD = 0.38; 95% CI 0.23 to 0.53; $p < 0.0001$). However, the overall risk of bias was high, with only two studies categorized as having a low risk of bias. No conclusive evidence regarding long-term effects was found, though a general trend of decreasing

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efficacy of MBSR over time was observed. MBSR is an effective treatment for improving quality of life in patients with fibromyalgia, particularly in the short term. Further research is needed to evaluate the long-term efficacy of MBSR and to address the potential risk of bias in existing studies.

Keywords: Mindfulness, Fibromyalgia, Meta-analysis, Quality of life, Long-term effects

Cette étude évalue l'efficacité des programmes de réduction du stress basée sur la pleine conscience (Mindfulness-Based Stress Reduction, MBSR) sur l'amélioration de la qualité de vie des patients atteints de fibromyalgie. Une méta-analyse a été réalisée pour évaluer la qualité de vie des patients immédiatement après le traitement, suivie d'un examen des données descriptives pour observer les effets potentiels à long terme de l'intervention. Conformément aux directives PRISMA, une recherche systématique a été effectuée en novembre 2023 dans PubMed, PsycInfo, Ovid-Medline et MEDLINE-EBSCO afin d'identifier les essais contrôlés randomisés et non randomisés comparant les programmes MBSR à des conditions de contrôle. Le principal critère d'évaluation était la qualité de vie, mesurée après l'intervention et au cours du suivi. Les différences moyennes standardisées (SMD) et les intervalles de confiance (CI) ont été extraits et calculés. Huit études ont été incluses dans la méta-analyse, dont cinq ont fourni des données sur les effets à long terme de la MBSR. La méta-analyse a révélé un effet significatif faible à moyen de la MBSR sur la qualité de vie (SMD = 0,38 ; 95 % CI 0,23 à 0,53 ; p < 0,0001). Toutefois, le risque global de biais était élevé, seules deux études ayant été classées comme présentant un faible risque de biais. Aucune preuve concluante concernant les effets à long terme n'a été trouvée, bien qu'une tendance générale à la diminution de l'efficacité de la MBSR au fil du temps ait été observée. La MBSR est un traitement efficace pour améliorer la qualité de vie des patients atteints de fibromyalgie, en particulier à court terme. Des recherches supplémentaires sont nécessaires pour évaluer l'efficacité à long terme de la MBSR et pour remédier au risque de biais dans les études existantes.

(Traduit avec DeepL, 7 mars 2025)

Mots clés : Pleine conscience, fibromyalgie, méta-analyse, qualité de vie, effets à long terme.

Introduction

Fibromyalgia (FM) is a syndrome characterized by widespread, chronic musculoskeletal pain, affecting approximately 2.7% of the global population (Sarzi-Puttini et al., 2020). In addition to head-to-toe paresthesia and numbness, patients often report chronic fatigue, sleep disturbances, cognitive impairment, and psychiatric symptoms

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(Grossman et al., 2007; Sarzi-Puttini et al., 2020). FM often coexists with other conditions, such as irritable bowel syndrome, gastroesophageal reflux, interstitial cystitis, chronic headaches, pelvic pain, and dysmenorrhea (Haugmark et al., 2019; Martins et al., 2021). These combined challenges significantly impair patients' work, daily activities, and interpersonal relationships, leading to a substantial reduction in their quality of life (Galvez-Sánchez et al., 2019).

Currently, various management strategies are recommended, including pharmacotherapy, psychotherapy, physiotherapy, and patient education (Macfarlane et al., 2017). While it may be tempting to focus solely on improving individual symptoms, such as pain or sleep disturbances, treatments must aim to improve patients' overall quality of life (QoL) by addressing the full range of their impairments (Haugmark et al., 2019).

Mindfulness is one method that has shown promise in treating a range of mental health conditions, such as depression (McCarney et al., 2012), anxiety (Haller et al., 2021), addiction (Vadivale & Sathiyaseelan, 2019), and eating disorders (Beccia et al., 2018). Originally rooted in Eastern contemplative traditions, mindfulness has been adapted for use in Western psychology as a practice that fosters an "inherent state of consciousness" (Kabat-Zinn, 2003; Lee et al., 2021). It is commonly described as paying attention on purpose, in the present moment, and without judgment (Kabat-Zinn, 1990). The aim is to cultivate nonjudgmental awareness of present-moment experiences, promoting openness, curiosity, and acceptance (Hofmann & Gómez, 2017; Kabat-Zinn, 1990).

Among mindfulness-based interventions, the Mindfulness-Based Stress Reduction (MBSR) program is the most widely studied and has shown promising results in chronic conditions (Niazi & Niazi, 2011). MBSR consists of eight weekly group sessions lasting 2.5 to 3.5 hours, along with a daylong silent retreat between the sixth and seventh weeks. Participants learn various mindfulness techniques, such as body scan meditation, gentle hatha yoga, sitting meditation, and walking meditation. Crucially, participants are expected to continue practicing at home for at least 45 minutes each day (Kabat-Zinn, 1990). Mindfulness is considered an educational rather than therapeutic practice, and the self-regulation skills learned in the program are intended to be sustained throughout life (Shapiro & Carlson, 2009).

In the context of FM, MBSR has been particularly helpful in reducing feelings of shame and catastrophic thinking (Martins et al., 2021). Through increased resilience, patients learn to shift their perspective on their experiences, and the nonjudgmental attitude fostered by mindfulness helps them

better cope with their symptoms and accept their condition (Ablin et al., 2013). Furthermore, patients develop better pain management strategies, respond more adaptively to stress, and feel less anger toward their illness (Weissbecker et al., 2002). This holistic approach helps FM patients manage their physical and emotional symptoms, thereby improving their overall QoL (Ablin et al., 2013; Taub et al., 2024).

This study builds on the growing body of literature on the impact of mindfulness on FM patients and its potential long-term effects. To date, two meta-analyses have reported small to moderate effects of MBSR on FM patients (Haugmark et al., 2019; Lauche et al., 2013), with one including both MBSR and acceptance and commitment therapy (Haugmark et al., 2019). However, due to the limited number of randomized controlled trials, no conclusive results on the long-term effects of MBSR have been established (Lauche et al., 2013).

The goal of this study is to re-evaluate the existing literature on the effects of MBSR programs on FM patients, with a particular focus on QoL. Given the interconnectedness of FM symptoms and their impact on QoL, this study will assess the overall effectiveness of MBSR by focusing on QoL outcomes. The first hypothesis posits that FM patients who undergo MBSR treatment will have higher QoL scores, as measured by validated questionnaires, compared to patients in a control condition. To test this, a meta-analysis will be conducted, including effect sizes for QoL outcomes from various studies. The second exploratory hypothesis will examine whether the effects of MBSR on QoL are sustained over time compared to control groups. A descriptive analysis of follow-up QoL scores from the included studies will be conducted to evaluate long-term effects.

Method

This meta-analysis was conducted in accordance with the PRISMA 2020 guidelines (Page et al., 2021). Data collection involved searching four databases in November 2023: PubMed, PsycInfo, Ovid–Medline, and MEDLINE–EBSCO. The search terms used were [fibromyalgia OR fibromyalgia syndrome OR fibrositis] AND [mindfulness-based stress reduction OR MBSR OR mindfulness intervention OR mindfulness]. On PubMed, MeSH terms were also applied for fibromyalgia (fibromyalgia [MeSH Terms] and mindfulness (Mindfulness/ methods [MAJR]). No additional filters were applied.

The inclusion criteria were defined based on previous meta-analyses on related topics (Haugmark et al., 2019; Lauche et al., 2013), and a comprehensive literature review. To be eligible for inclusion, studies

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had to respect the following criteria: (1) randomized controlled trials (RCT), quasi-RCT or non-RCT, (2) availability of full-text articles in English, (3) inclusion of adult participants with diagnosed fibromyalgia, (4) inclusion of a MBSR intervention group that followed Kabat-Zinn's curriculum or comparable adaptation, lasting between 6 and 12 sessions, and a control group consisting of no intervention, a wait-list control, treatment as usual, or an active comparator, and (5) use of a validated measure of QoL, such as the FIQ, FIQ-R, SF-36 or other standardized QoL instruments.

Initially, any study that included a measure of fibromyalgia was considered for inclusion. Subsequently, the validity of the QoL questionnaires used in the studies was evaluated. We also assessed whether these questionnaires were correlated, based on existing literature, to ensure consistency in the measures of quality of life.

All selected articles from the different databases were imported into Zotero version 6.0.36, and then transferred to Excel version 2403. Duplicates were first removed electronically using Excel, and then manually verified. The article selection process was conducted within Excel, where each article was marked as either included or excluded. For articles that did not meet the inclusion criteria, the specific unmet criterion was noted. In cases where multiple criteria were not satisfied, only the most relevant was recorded. At each step of the selection process, articles were cross-referenced in Zotero to ensure accuracy (Mateo, 2020). After completing the selection process, a second rater independently re-evaluated all articles from the post-duplicate removal stage. Discrepancies between raters were discussed until a consensus was reached. Inter-rater reliability was measured using Cohen's Kappa statistic (McHugh, 2012).

For each selected article, general information was extracted into an Excel document, including author, publication date, sample sizes, type of QoL measures, and mean (M) and standard deviation (SD) values. For longitudinal studies, data from various follow-up time points (M and SD) were also collected. However, follow-up reporting methods varied across studies, with some measuring time in weeks post-intervention and others counting from the start of treatment. To ensure consistency and facilitate comparison, all time points were standardized to weeks, beginning from the start of treatment. In this meta-analysis, week 1 represents the baseline, week 8 marks the end of treatment, week 16 corresponds to two months post-intervention, week 24 to four months post-intervention, and week 32 to a 12-month follow-up.

Next, additional descriptive information was retrieved from each study using an adapted

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version of the ERC data collection form from Cochrane (Li et al., 2023). When data was incomplete, the corresponding authors were contacted to obtain the missing outcome measures. The risk of bias was assessed using the Cochrane revised tool, RoB 2 (Sterne et al., 2019).

All statistical analyses were conducted using R version 4.2.2 and RStudio version 2023.12.1. Standard mean differences (SMD) and measures of heterogeneity were calculated using the metafor package (version 4.4.-0). In cases where reverse scaling was used, SMD values were inverted to align with the other studies. Publication bias was assessed using funnel plots, along with rank correlation and regression tests, all performed with the metafor package.

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Results

Study selection

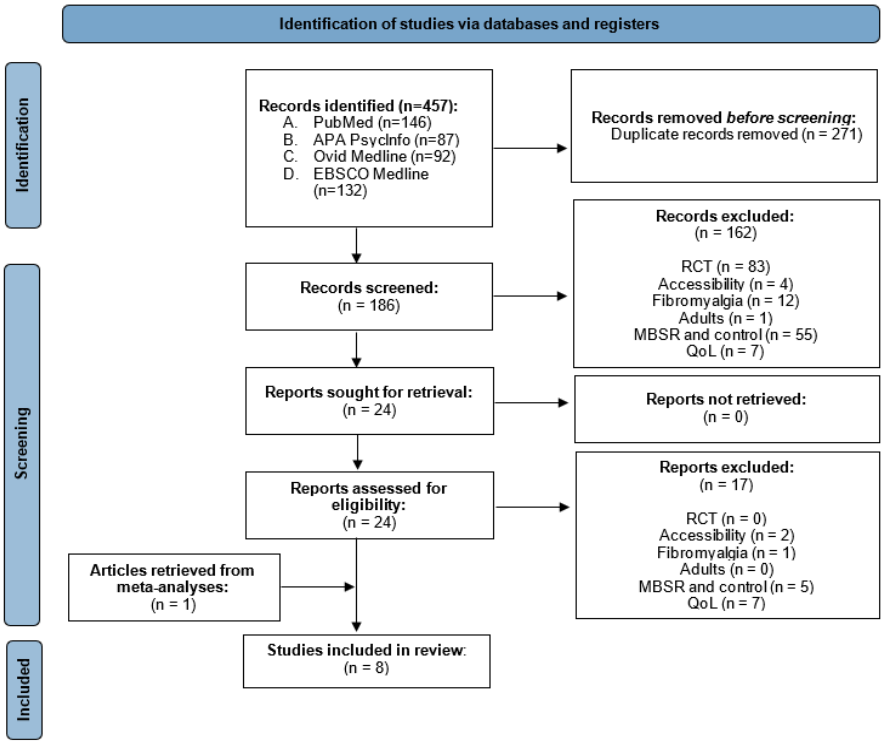
The database search provided 457 records across all four databases (Figure 1

PRISMA Flow Diagram). After removal of all duplicates (automatic: n=118, manually n=153), 186 records remained for screening based on title and abstracts. In the second screening phase, 24 full text articles were reviewed. Studies featuring programs not explicitly labeled as MBSR were carefully evaluated to determine whether their components and principles aligned closely enough with Kabat-Zinn's (1982) description for inclusion.

Articles that combined MBSR with other practices were generally excluded, with exception of one study that integrated MBSR and Qigong (Astin et al., 2003). Although Qigong has different cultural roots than MBSR, it is founded on similar principles, particularly emphasizing the mind-body connection and breathing

Figure 1

PRISMA Flow Diagram



Note. RCT = Randomized Control Trials, MBSR = Mindfulness-Based Stress Reduction, QoL = Quality of Life

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techniques. A distinguishing feature of Qigong is its more fluid movements, which can be likened to the yoga component of MBSR (Boaventura et al., 2022). Moreover, physical therapy is often part of the treatment regimen for FM patients (Sarzi-Puttini et al., 2020). Given that the study adhered to Kabat-Zinn's guidelines for MBSR, and that Qigong was deemed comparable to both MBSR and physical therapy, this study was included in the meta-analysis.

Additionally, three studies met all inclusion criteria but failed to report the necessary outcome measures in their articles (Fjorback et al., 2013; Sephton et al., 2007; Weissbecker et al., 2002). All corresponding authors were contacted, however, only one responded and provided the missing data (Fjorback et al., 2013), leading to the exclusion of the other two studies (Sephton et al., 2007; Weissbecker et al., 2002). A supplementary review was conducted, examining meta-analyses and literature reviews identified during the data collection process. Notably, the study by Goldenberg et al. (1994), which was not included in the database search, was incorporated due to its citation in the meta-analysis conducted by Lauche et al. (2013). During the reassessment phase, two articles were discussed between raters, and consensus was reached without the need for a third rater. The inter-rater reliability was found to be excellent, κ = 0.87.

In total, eight articles were selected for inclusion in the meta-analysis. Prior to conducting the statistical analyses, data were extracted from each study, necessitating some transformations. In the study by Grossman et al. (2007), QoL scores were reported for each subscale separately; therefore, a composite score was calculated, along with its corresponding standard deviation. One study reported scores for two control groups -an active control and a wait-list group - so only the data from the wait-list participants were included in the analyses (Schmidt et al., 2011). Additionally, two studies (Fjorback et al., 2013; Grossman et al., 2007) utilized scales with inverted scoring, necessitating the reversal of their standardized SMD for consistency in analysis.

Six studies also investigated the longitudinal effects of MBSR by assessing QoL questionnaires during follow-up periods (Astin et al., 2003; Cash et al., 2015; Fjorback et al., 2013; Grossman et al., 2007; Perez-Aranda et al., 2019; Schmidt et al., 2011). However, among these studies, Grossman et al. (2007) did not include control groups for the follow-up assessments, consequently, its results were excluded from the analysis.

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Study characteristics

The included studies were conducted in Spain (Andres-Rodriguez et al., 2019; Perez-Aranda et al., 2019), Denmark (Fjorback et al., 2013), Switzerland (Grossman et al., 2007), Germany (Schmidt et al., 2011) and the USA (Astin et al., 2003; Cash et al., 2015; Goldenberg et al., 1994), between 1994 and 2019 (Table 1). All studies diagnosed patients with FM according to the latest American College of Rheumatology criteria (ACR), with four using the ACR 1990 criteria (Astin et al., 2003; Goldenberg et al., 1994; Grossman et al., 2007; Schmidt et al., 2011), and the other four applying the ACR 2010 criteria (Andres-Rodriguez et al., 2019; Cash et al., 2015; Fjorback et al., 2013; Perez-Aranda et al., 2019).

Four studies exclusively included women (Andres-Rodriguez et al., 2019; Cash et al., 2015; Grossman et al., 2007; Schmidt et al., 2011), while the others had a predominant female sample (Astin et al., 2003; Fjorback et al., 2013; Goldenberg et al., 1994; Perez-Aranda et al., 2019). Sample sizes ranged from 58 (Grossman et al., 2007) to 225 participants (Perez-Aranda et al., 2019) with a total of 829 participants in this meta-analysis, of which 96% were women. The reported sample sizes reflect participants at the start of treatment after group allocation and differ from those in the results synthesis section.

All studies delivered MBSR over eight weekly group sessions, except for one that lasted 10 weeks (Goldenberg et al., 1994). Sessions durations varied between 2 hours (Andres-Rodriguez et al., 2019; Goldenberg et al., 1994; Perez-Aranda et al., 2019), 2.5 hours (Astin et al., 2003; Cash et al., 2015; Grossman et al., 2007; Schmidt et al., 2011), and 3.5 hours in one study (Fjorback et al., 2013). Comparison groups were treatment as usual (Andres-Rodriguez et al., 2019; Perez-Aranda et al., 2019), enhanced treatment as usual (Fjorback et al., 2013), wait-list (Cash et al., 2015; Goldenberg et al., 1994; Schmidt et al., 2011) or active treatments (Astin et al., 2003; Grossman et al., 2007).

Quality of life (QoL) was assessed using various tools: the Fibromyalgia Impact Questionnaire (Astin et al., 2003; Cash et al., 2015; Goldenberg et al., 1994; Schmidt et al., 2011), its revised version (FIQ-R) (Andres-Rodriguez et al., 2019; Perez-Aranda et al., 2019), the Quality Of Life Profile for The Chronically Ill (Grossman et al., 2007), and the 36-item Medical Outcomes Study Short-Form Health Survey (SF-36) (Fjorback et al., 2013). The SF-36 is a widely used and validated QoL assessment tool (Andresen & Meyers, 2000). Both the FIQ and FIQ-R are validated specifically for fibromyalgia patients (Bennett, 2005; Bennett et al., 2009). The Quality Of Life Profile for The Chronically Ill has also been validated and

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translated into English and in Spanish (Bohrer et al., 2011; Laubach et al., 2001). Strong correlations have been observed between the original FIQ (Burckhardt et al., 1991) and the FIQ-R (Bennett et al., 2009), as well as between the FIQ and SF-36 (Bennett et al., 2009). Additionally, comparable reliability and construct validity have been shown between the SF-36 and the Quality of Life Profile (Goldbeck & Schmitz, 2001).

Among the eight studies, five reported follow-up QoL measures (Andres-Rodriguez et al., 2019; Astin et al., 2003; Cash et al., 2015; Fjorback et al., 2013; Schmidt et al., 2011). Three studies reported measures for week 16 (Astin et al., 2003; Cash et al., 2015; Schmidt et al., 2011), one for week 24 (Astin et al., 2003), one for week 32 (Fjorback et al., 2013), and two for week 60 (Fjorback et al., 2013; Perez-Aranda et al., 2019). One study reported a 3-year post-intervention measure but lacked control groups for follow-up, leading to its exclusion from follow-up analyses (Grossman et al., 2007).

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Table 1

Characteristics of the included studies

Author, year Country	Study design	Participants	Intervention	Comparison	Outcome measures		Measurement time point
Andres-Rodriguez et al., 2019 Spain	RCT	N=70 $M_{(age)}$ = 53.36 100% women	TAU + MBSR N=35 2h weekly sessions	TAU N=35	MMSE SCID-I VAS FIQR HADS	PSS-10 MISCI PCS PIPS FFMQ	Baseline Post-treatment
Astin et al., 2003 USA	RCT	N=128 $M_{(age)}$ = 47.7 One man	MBSR and Qigong N = 64 2.5h weekly sessions	Educational-support N= 64 2.5h weekly sessions	Tender point count Total myalgic score FIQ	Coping Strategies 6-minute walk time BDI	Baseline Post-treatment Week 16 Week 24

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				Medical care history	SF-36 (pain)	
Cash et al., 2015 USA	RCT	N = 91 100% Women	MBSR N = 51 2.5h weekly sessions	Wait-list N = 40	PSS-10 Stanford Sleep Questionnaire FIQ	VAS Fatigue Symptom Inventory	Baseline Post-treatment Week 16
Fjorback et al., 2013 Denmark	RCT	N = 120 (FM: N = 99) $M_{(age)}$ = 38 80% women	MBSR N = 48 3.5h weekly sessions	Enhanced treatment as usual N = 51 2h individual consultation	SF-36 Physical Component Summary	SF-36 Health related	Baseline Post-treatment Week 32 Week 60
Goldenberg et al., 1994 USA	Non-RCT	N = 121 $M_{(age)}$ = 46 94% women	SR-CBT N = 79	Wait-list N = 42	VAS SCL-90-R	FIQ	Baseline Post-treatment

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			2h weekly sessions for 10 weeks				
Grossman et al., 2007 Switzerland	Quasi-RCT	N = 58 $M_{(age)}$ = 53 100% women	MBSR N = 39 2.5h weekly sessions	Active control procedure N = 13	VAS HADS IPR	QoL PPS SSI	Baseline Post-treatment 3 year follow-up (no control)
Perez-Aranda et al., 2019 Spain	RCT	N = 225 $M_{(age)}$ = 53 2 men in MBSR and 1 in TAU	MBSR + TAU N = 75 2h weekly session	TAU N = 75	FIQR HADS PSS-10 FFMQ PIPS CEQ	FSDC PCS MISCI SCS-12 PCIX	Baseline Post-treatment Week 60

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Schmidt et al., 2011 RCT Germany	N = 177	MBSR	Wait-list	PLC (HRQoL)	FIQ	Baseline
	$M_{(age)}$ = 52.5	N = 59	N = 59	CES-D	STAI	Post-treatment
	100% Women	2.5h weekly sessions		PSQI	PPS	Week 16
				FMI	GCQ	

Note. RCT = Randomized Controlled Trials, N = number of participants, M = Mean age, FM = Fibromyalgia, TAU = Treatment as Usual, MBSR = Mindfulness-Based Stress Reduction, SR-CBT = Stress Reduction Cognitive-Behavioral Treatment, FIQ = Fibromyalgia Impact Questionnaire, FIQ-R = Fibromyalgia Impact Questionnaire Revised, QoL = Quality of Life Profile For The Chronically Ill, SF-36 = 36-item Medical Outcomes Study Short-Form Health Survey

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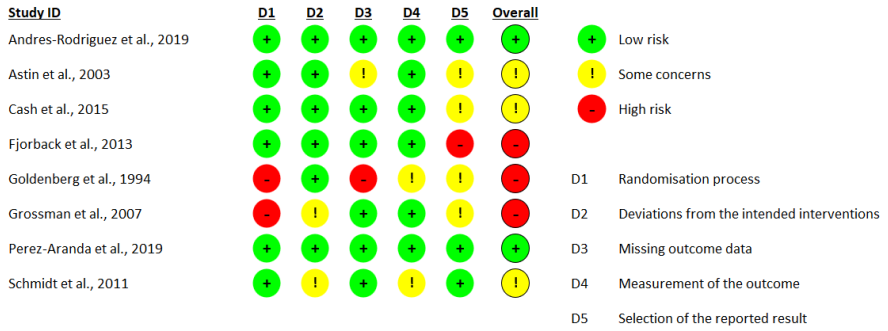
Risk of bias in studies

Risk of Bias was evaluated for each study (Figure 2

Risk of Bias Assessment) by reviewing the articles and available protocols. Two studies (Andres-Rodriguez et al., 2019; Perez-Aranda et al., 2019) had all domains rated as having low risk for bias, while three studies raised some concerns, (Astin et al., 2003; Cash et al., 2015; Schmidt et al., 2011), and three had a high risk of bias (Fjorback et al., 2013; Goldenberg et al., 1994; Grossman et al., 2007). Notably, the lack of adequate randomization processes in Goldenberg et al. (1994) and Grossman et al. (2007) contributed to their high-risk ratings. While most studies exhibited low risks of deviations from intended interventions, two raised concerns: Grossman et al. (2007) provided insufficient information, and Schmidt et al. (2011) reported issues with blinding. Goldenberg et al. (1994) faced a high risk of missing outcome data due to lack of dropout information, and both it and Schmidt et al. (2011) had concerns regarding outcome measurement, with the latter providing Fibromyalgia Impact Questionnaire scores that did not match the original scale. Lastly, three studies were rated as high risk for result reporting (Fjorback et al., 2013; Goldenberg et al., 1994; Grossman et al., 2007), while four showed some concerns four had some concerns (Astin et al., 2003; Cash et al., 2015; Goldenberg et al., 1994; Grossman et al., 2007).

Figure 2

Risk of Bias Assessment



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Synthesis of results

Our random-effects model shows a significant small to medium effect of MBSR on QoL (*SMD* = 0.38; 95% CI 0.23 to 0.53; $p < 0.0001$) (Figure 3

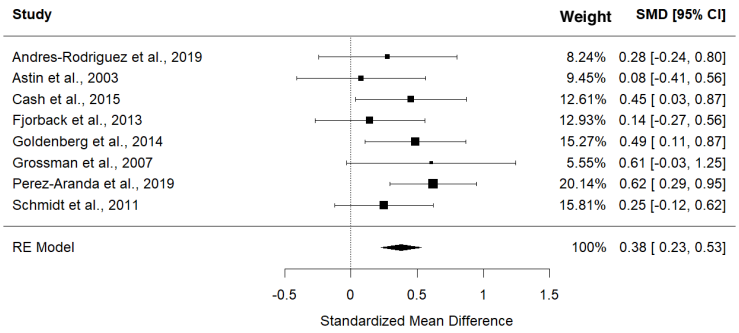
Quality of Life Forest Plot Post-Treatment, Table 2

Standardized Mean Differences of Quality of Life at Follow-ups). Three studies had significant standardized mean differences (SMDs) (Cash et al., 2015; Goldenberg et al., 1994; Perez-Aranda et al., 2019), and all other studies had positive but non-significant effect sizes (Andres-Rodriguez et al., 2019; Astin et al., 2003; Fjorback et al., 2013; Grossman et al., 2007; Schmidt et al., 2011).

The heterogeneity among the studies is low, as indicated by the heterogeneity index, $I^2 = 3.68\%$, and non-significative, as reflected by the test for heterogeneity, $\chi^2(7) = 6.38$, $p = 0.50$. This is further confirmed

Figure 3

Quality of Life Forest Plot Post-Treatment



Note. SMD = Standardized Mean Differences, CI = Confidence Intervals, RE = Random Effects

Table 2

Standardized Mean Differences of Quality of Life at Follow-ups

Study	Control Group			MBSR			SMD
	N	M	SD	N	M	SD	[95% CI]
Andres-Rodriguez et al., 2019	28	55.17	22.55	29	48.91	21.86	0.28 [-0.24, 0.80]
Astin et al., 2003	33	50.1	18.3	32	48.8	15.4	0.08 [-0.41, 0.56]
Cash et al., 2015	40	68.4	16.74	51	59.6	21.02	0.45 [0.03, 0.87]
Fjorback et al., 2013	45	54.17	30.62	45	58.33	27	0.14 [-0.27, 0.56]
Goldenberg et al., 2014	42	54.8	16	79	46	18.89	0.49 [0.11, 0.87]
Grossman et al., 2007	13	14.48	4.25	39	17.28	4.63	0.61 [-0.03, 1.25]
Perez-Aranda et al., 2019	75	60.73	21.28	75	47.99	19.5	0.62 [0.29, 0.95]
Schmidt et al., 2011	59	5.32	1.62	53	4.9	1.74	0.25 [-0.12, 0.62]

Note. N = Number of participants, M = Mean, SD = Standard Deviation, SMD = Standardized Mean Differences, CI = Confidence Intervals, MBSR = Mindfulness-Based Stress Reduction

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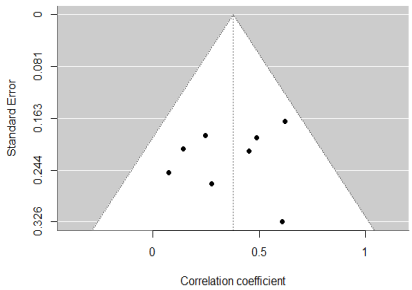
by the Baujat plot, which shows no outliers. One study (Perez-Aranda et al., 2019) is particularly influential (Weight = 20.14%), due to its large sample size (n=225). The funnel plot indicates no significant

Figure 4

Funnel Plot for Quality of Life



publication bias (Figure 4), which is corroborated by the regression test for funnel plot asymmetry, z = -0.69, p = 0.49, and the rank correlation test, t = -0.14, p = 0.72.

Among the studies that measured follow-up scores, only two reported significant standardized mean differences (SMDs) right after the intervention (Table 3

Standardized Mean Differences of Quality of Life at Follow-ups), and both effects decreased and became non-significant at follow-up timepoints (Cash et al., 2015; Perez-Aranda et al., 2019). Overall, the trend across all studies was for the SMD to decline over time, however, despite being non-significant, the effects remained positive.,. Astin et al. (2003) showed slightly different results, with the effect size close to 0 at week 16, followed by an increase at week 24 (Figure 5

Standardized Mean Differences of Quality of Life at Follow-Ups). Fjorback et al. (2013) also observed a slight increase in the SMD at week 32 compared to week 8, before returning to the post-treatment level at week 60.

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Figure 5

Standardized Mean Differences of Quality of Life at Follow-Ups

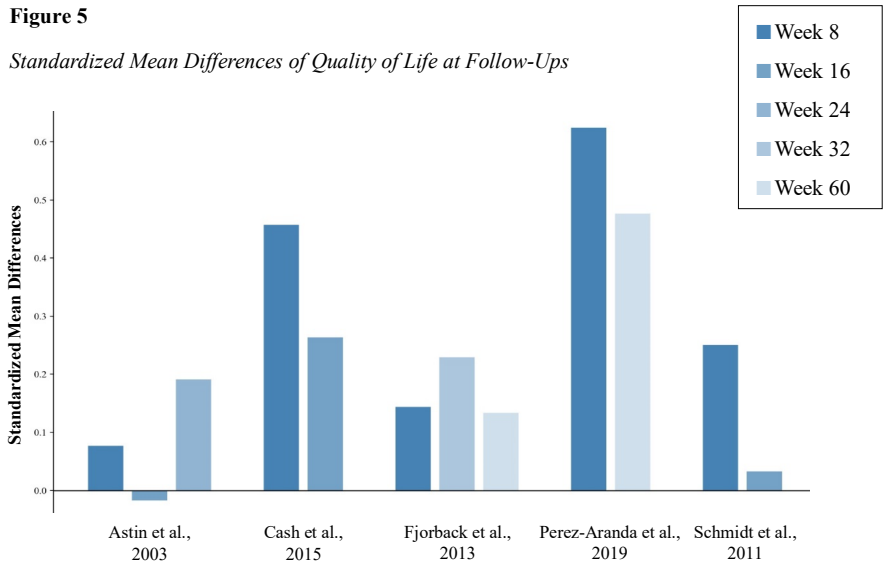

Table 3

Standardized Mean Differences of Quality of Life at Follow-ups

Study	**SMD** [95% CI]				
	Week 8	Week 16	Week 24	Week 32	Week 60
Astin et al., 2003	**0.08** [-0.41, 0.56]	**-0.2** [-0.50, 0.47]	**0.19** [-0.30, 0.68]		
Cash et al., 2015	**0.45** [0.03, 0.87]	**0.26** [-0.15, 0.68]			
Fjorback et al., 2013	**0.14** [-0.27, 0.56]			**0.23** [-0.21, 0.66]	**0.13** [-0.31, 0.58]
Perez-Aranda et al., 2019	**0.62** [0.29, 0.95]				**0.48** [-0.40, 0.78]
Schmidt et al., 2011	**0.25** [-0.12, 0.62]	**0.03** [-0.34, 0.40]			

Note. SMD = Standardized Mean Differences, CI = Confidence Interval

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Discussion

This meta-analysis demonstrated a significant small to medium effect of Mindfulness-Based Stress Reduction (MBSR) programs on the quality of life (QoL) of fibromyalgia patients, supporting our primary hypothesis. These results align closely with a prior meta-analysis from Lauche et al. (2013), which reported low quality evidence for small effects of MBSR on QoL. However, our study identified a larger effect size, likely attributable to the increased number of included studies; Lauche et al. considered only three studies comparing MBSR with usual care and three comparing it to active controls.

No other meta-analyses assessing QoL after MBSR treatment for fibromyalgia were found in the literature. Our results are consistent with a systematic review by Crowe et al. (2016), which evaluated the impact of MBSR on various long-term conditions. They reported improvements in functional health and well-being for fibromyalgia, chronic pain conditions, irritable bowel syndrome, asthma, and somatization disorders following MBSR interventions. Similarly, a meta-analysis by Haugmark et al. (2019) that included mindfulness-based and acceptance-based interventions found small to moderate uncertain effects on health-related quality of life for fibromyalgia patients. Although their study incorporated interventions beyond MBSR, our analysis focused solely on MBSR to minimize heterogeneity.

While the small to moderate effects favoring MBSR are noteworthy, they must be interpreted with caution due to concerns regarding risk of bias. Only two studies exhibited a low risk of bias, three showed some concerns, and three had a high risk. Therefore, the quality of evidence is questionable; however, it is reassuring that the most influential study included (Perez-Aranda et al., 2019) had a low risk of bias. Additionally, with fewer than ten studies included, analyses such as publication bias should be approached with caution. Although funnel plot analysis, regression tests, and correlation tests indicated no significant publication bias, there remains a possibility that studies with non-significant or negative results were not published. Notably, at least two articles reported non-significant outcomes for the MBSR intervention (Astin et al., 2003; Schmidt et al., 2011).

The limited number of studies can also bias the interpretation of meta-analysis statistics, particularly when heterogeneity is high. However, our sample exhibited low heterogeneity, likely due to our stringent inclusion criteria, which focused exclusively on fibromyalgia patients and MBSR interventions.

Regarding long-term results, we cannot draw definitive conclusions due to the

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observational nature of the included studies. Only five studies reported various follow-up timepoints. Nonetheless, MBSR groups generally exhibited better, though non-significant, QoL levels compared to control groups. Moreover, the effects of MBSR appeared to diminish from immediately post-intervention to follow-up assessments, consistent with Lauche et al. (2013), who noted a lack of conclusive evidence for long-term effects.

This study has several notable strengths. The selection process adhered to PRISMA guidelines, incorporating a second rater to minimize selection biases. Authors whose studies lacked proper reporting were contacted for raw data, enhancing data integrity. Furthermore, the inclusion of studies from diverse countries increases the generalizability of our findings.

However, several general study limitations should be acknowledged. The control groups across the included studies were heterogeneous, ranging from usual care to active controls, such as emotional support therapy. Karlsson and Bergmark (2015) emphasized the importance of distinguishing control types, as different controls yield varying effect sizes. For instance, MBSR compared to a waitlist typically shows greater effects than when compared to an active control group, which may introduce non-specific therapy effects. In our study, the two studies with active control groups (Astin et al., 2003; Grossman et al., 2007) yielded small non-significant effect sizes. However, we could not separate control group types in this analysis due to the limited number of studies.

Another complexity concerning control groups arises from a critical analysis indicating that waiting-list participants may alter their activity during the study, potentially biasing results (Leça & Tavares, 2022). During the selection process, we excluded some studies deemed too dissimilar to standard MBSR programs. Yet, it is common practice in clinical settings to adapt mindfulness interventions to meet participants' needs (Kia & Choy, 2017). Thus, limiting inclusion to studies with identical protocols may diminish result generalizability. Moreover, therapies such as dialectical behavior therapy and acceptance and commitment therapy, which incorporate mindfulness components, were excluded. These second-generation mindfulness-based interventions (SG-MBIs), emerging in the past decade, could also provide valuable insights into effective treatments for fibromyalgia (Van Gordon & Shonin, 2020).

Additionally, this meta-analysis included one non-randomized controlled trial (RCT) and one quasi-RCT, which are generally less reliable and more susceptible to bias. This could partially account for the elevated risk of bias observed in these studies (Goldenberg et al., 1994; Grossman et al.,

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2007). However, there is growing recognition of the ecological implications of randomization, as preferential enrollment may better reflect clinical practice, where patients often choose whether to attend MBSR programs (Schmidt et al., 2011; Yao et al., 2023). Including non-RCTs in systematic reviews could be beneficial, provided biases are acknowledged.

Moreover, the studies utilized two different versions of the American College of Rheumatology (ACR) criteria for diagnosing patients. The ACR 1990 criteria, which rely on tender points, have faced criticism for potentially underestimating fibromyalgia in men (Wang et al., 2015). While we could not avoid this limitation in the current meta-analysis without excluding numerous studies, it underscores the necessity for future research using the updated ACR 2010 classification criteria.

Differences in outcome measurement scales may also contribute to heterogeneity in results. Some studies assessed disease-specific QoL using the Fibromyalgia Impact Questionnaire, while others focused on more general QoL aspects. Previous research has indicated that patients reporting on disease-specific questionnaires tend to show greater improvement than those using general QoL measures (Lakhan & Schofield, 2013). Although we did not control for this variable to avoid excessive study exclusion, it warrants consideration in future meta-analyses.

Finally, an important aspect not evaluated in this analysis, yet relevant to results, is participants' compliance with homework and assignments. Mindfulness practice emphasizes integrating learned principles into daily life. Previous meta-analyses have shown significant associations between home practice frequency and intervention outcomes (Parsons et al., 2017). However, few MBSR studies adequately report participant compliance, limiting our ability to account for this variable.

In summary, this study suggests significant clinical implications. Given the current need for holistic treatments for fibromyalgia, MBSR emerges as a recommendable intervention to enhance overall QoL. Its focus on present-moment awareness, intention, attention, and a non-judgmental attitude fosters resiliency, reduces stress, and alleviates catastrophic thoughts and ruminations regarding pain (Adler-Neal & Zeidan, 2017; Taub et al., 2024). Through mindful practice, patients learn to accept their pain and effectively manage symptoms, ultimately improving their QoL (Ablin et al., 2013; Taub et al., 2024). Furthermore, MBSR is a cost-effective alternative to other fibromyalgia treatments, as its group setting allows professionals to simultaneously treat multiple patients (Zhang et al., 2022).

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To mitigate the decline in effectiveness post-treatment, we recommend implementing booster sessions (Perez-Aranda et al., 2019). Participants often express interest in these sessions as a means to reinforce and refresh mindfulness practices and skills (Fjorback et al., 2013), potentially extending MBSR's benefits and enhancing long-term QoL.

Future research should prioritize methodological rigor. Researchers are encouraged to conduct transparent studies with low risk of bias. Encouragingly, the more recent studies included in this meta-analysis demonstrated lower risks of bias, reflecting a growing commitment to high-quality research. Future investigations should clearly report participant compliance, teacher training, and detailed descriptions of MBSR components to identify which specific variables exert the most influence. This information could clarify which aspects of the original MBSR program are amenable to modification. Additionally, more studies incorporating follow-up measures are essential to understand the long-term impacts of MBSR interventions better. Evaluating the implementation of booster sessions is also critical, as they represent an easily integrable tool in clinical practice.

Conclusion

In conclusion, this study evaluated the effectiveness of Mindfulness-Based Stress Reduction interventions on the quality of life of fibromyalgia patients. The meta-analysis revealed significant immediate effects on QoL compared to control groups that did not participate in mindfulness programs. Long-term effects were assessed descriptively, revealing a general trend of positive outcomes associated with MBSR, albeit small. Over time, the program's impact on QoL appeared to diminish; thus, we recommend the incorporation of booster sessions to counteract this decline. Overall, MBSR shows promise as a beneficial intervention for fibromyalgia patients, helping to reduce the illness's impact on their overall well-being. This finding is encouraging, especially in light of the lack of curative treatments for fibromyalgia and the need for alternatives that provide comprehensive care for patients and their symptoms. Future studies should explore the long-term impact of MBSR and identify the most influential components of the intervention.

Notes Article edited by Jade Vouilloz, Department of Clinical and Health Psychology, University of Fribourg, jade.vouilloz@unifr.ch

References

Ablin, J., Fitzcharles, M.-A., Buskila, D., Shir, Y., Sommer, C., & Häuser, W. (2013). Treatment of Fibromyalgia Syndrome : Recommendations of Recent Evidence-Based Interdisciplinary Guidelines with Special Emphasis on Complementary and Alternative

Article
Cortica 2025. *4*(1),
https://doi.org/10.26034/cortica.2025.7025

Therapies. *Evidence-Based Complementary and Alternative Medicine*, *2013*(1), 485272. https://doi.org/10.1155/2013/485272

Adler-Neal, A. L., & Zeidan, F. (2017). Mindfulness Meditation for Fibromyalgia : Mechanistic and Clinical Considerations. *CURRENT RHEUMATOLOGY REPORTS*, *19*(9), 59. https://doi.org/10.1007/s11926-017-0686-0

Andresen, E. M., & Meyers, A. R. (2000). Health-related quality of life outcomes measures. *Archives of Physical Medicine and Rehabilitation*, *81*, S30-S45. https://doi.org/10.1053/apmr.2000.20621

Andres-Rodriguez, L., Borras, X., Feliu-Soler, A., Perez-Aranda, A., Rozadilla-Sacanell, A., Montero-Marin, J., Maes, M., & Luciano, J. V. (2019). Immune-inflammatory pathways and clinical changes in fibromyalgia patients treated with Mindfulness-Based Stress Reduction (MBSR) : A randomized, controlled clinical trial. *BRAIN BEHAVIOR AND IMMUNITY*, *80*, 109-119. https://doi.org/10.1016/j.bbi.2019.02.030

Astin, J. A., Berman, B. M., Bausell, B., Lee, W.-L., Hochberg, M., & Forys, K. L. (2003). The efficacy of mindfulness meditation plus Qigong movement therapy in the treatment of fibromyalgia : A randomized controlled trial. *The Journal of Rheumatology*, *30*(10), 2257-2262.

Beccia, A. L., Dunlap, C., Hanes, D. A., Courneene, B. J., & Zwickey, H. L. (2018). Mindfulness-based eating disorder prevention programs : A systematic review and meta-analysis. *Mental Health & Prevention*, *9*, 1-12. https://doi.org/10.1016/j.mhp.2017.11.001

Bennett. (2005). The Fibromyalgia Impact Questionnaire (FIQ) : A review of its development, current version, operating characteristics and uses. *Clinical and Experimental Rheumatology*, *5*, 23.

Bennett, Friend, R., Jones, K. D., Ward, R., Han, B. K., & Ross, R. L. (2009). The Revised Fibromyalgia Impact Questionnaire (FIQR) : Validation and psychometric properties. *Arthritis Research & Therapy*, *11*(4), R120. https://doi.org/10.1186/ar2783

Boaventura, P., Jaconiano, S., & Ribeiro, F. (2022). Yoga and Qigong for Health : Two Sides of the Same Coin? *Behavioral Sciences*, *12*(7), Article 7. https://doi.org/10.3390/bs12070222

Bohrer, T., Koller, M., Schlitt, H. J., Bauer, H., & on behalf of the German Society of Surgery. (2011). Workload and quality of life of surgeons. Results and implications of a large-scale survey by the German Society of Surgery. *Langenbeck's Archives of Surgery*, *396*(5), 669-676. https://doi.org/10.1007/s00423-011-0791-x

Burckhardt, C. S., Clark, S. R., & Bennett, R. M. (1991). The fibromyalgia impact questionnaire : Development and validation. *The Journal of Rheumatology*, *18*(5), 728-733.

Cash, E., Salmon, P., Weissbecker, I., Rebholz, W. N., Bayley-Veloso, R., Zimmaro, L. A., Floyd, A., Dedert, E., & Sephton, S. E. (2015). Mindfulness meditation alleviates fibromyalgia symptoms in women : Results of a randomized clinical trial. *Annals of Behavioral Medicine: A Publication of the Society of*

Article
Cortica 2025. *4*(1),
https://doi.org/10.26034/cortica.2025.7025

Behavioral Medicine, *49*(3), 319-330. https://doi.org/10.1007/s12160-014-9665-0

Crowe, M., Jordan, J., Burrell, B., Jones, V., Gillon, D., & Harris, S. (2016). Mindfulness-based stress reduction for long-term physical conditions : A systematic review. *Australian and New Zealand Journal of Psychiatry*, *50*(1), 21-32. https://doi.org/10.1177/0004867415607984

DeepL Translator. (n.d.). *DeepL SE*. Retrieved March 7, 2025, from https://www.deepl.com/translator

Fjorback, L. O., Arendt, M., Ornbol, E., Walach, H., Rehfeld, E., Schroder, A., & Fink, P. (2013). Mindfulness therapy for somatization disorder and functional somatic syndromes—Randomized trial with one-year follow-up. *JOURNAL OF PSYCHOSOMATIC RESEARCH*, *74*(1), 31-40. https://doi.org/10.1016/j.jpsychores.2012.09.006

Galvez-Sánchez, C. M., Duschek, S., & Reyes del Paso, G. A. (2019). Psychological impact of fibromyalgia : Current perspectives. *Psychology Research and Behavior Management*, *12*, 117-127. https://doi.org/10.2147/PRBM.S178240

Goldbeck, L., & Schmitz, T. G. (2001). Comparison of three generic questionnaires measuring quality of life in adolescents and adults with cystic fibrosis : The 36-item short form health survey, the quality of life profile for chronic diseases, and the questions on life satisfaction. *Quality of Life Research: An International Journal of Quality of Life Aspects of Treatment, Care and Rehabilitation*, *10*(1), 23-36. https://doi.org/10.1023/a:1016711704283

Goldenberg, D. L., Kaplan, K. H., Nadeau, M. G., Brodeur, C., Smith, S., & Schmid, C. H. (1994). A Controlled Study of a Stress-Reduction, Cognitive-Behavioral Treatment Program in Fibromyalgia. *Journal of Musculoskeletal Pain*, *2*(2), 53-66. https://doi.org/10.1300/J094v02n02_05

Grossman, P., Tiefenthaler-Gilmer, U., Raysz, A., & Kesper, U. (2007). Mindfulness Training as an Intervention for Fibromyalgia : Evidence of Postintervention and 3-Year Follow-Up Benefits in Well-Being. *Psychotherapy and Psychosomatics*, *76*(4), 226-233. https://doi.org/10.1159/000101501

Haller, H., Breilmann, P., Schröter, M., Dobos, G., & Cramer, H. (2021). A systematic review and meta-analysis of acceptance- and mindfulness-based interventions for DSM-5 anxiety disorders. *Scientific Reports*, *11*(1), 20385. https://doi.org/10.1038/s41598-021-99882-w

Haugmark, T., Hagen, K. B., Smedslund, G., & Zangi, H. A. (2019). Mindfulness- and acceptance-based interventions for patients with fibromyalgia – A systematic review and meta-analyses. *PLOS ONE*, *14*(9), e0221897. https://doi.org/10.1371/journal.pone.0221897

Hofmann, S. G., & Gómez, A. F. (2017). Mindfulness-based interventions for anxiety and depression. *Psychiatric Clinics*, *40*(4), 739-749. https://doi.org/10.1016/j.psc.2017.08.008

Kabat-Zinn. (1990). *Full catastrophe living : Using the wisdom of your body and mind to face stress, pain and illness.*

Kabat-Zinn, J. (1982). An outpatient program in behavioral medicine for chronic pain patients based on the practice of mindfulness meditation : Theoretical considerations and preliminary results. *General Hospital Psychiatry*, *4*(1), 33-47. https://doi.org/10.1016/0163-8343(82)90026-3

Kabat-Zinn, J. (2003). Mindfulness-Based Interventions in Context : Past, Present, and Future. *Clinical Psychology: Science and Practice*, *10*(2), 144-156. https://doi.org/10.1093/clipsy.bpg016

Karlsson, P., & Bergmark, A. (2015). Compared with what? An analysis of control-group types in Cochrane and Campbell reviews of psychosocial treatment efficacy with substance use disorders. *Addiction (Abingdon, England)*, *110*(3), 420-428. https://doi.org/10.1111/add.12799

Kia, S., & Choy, E. (2017). Update on Treatment Guideline in Fibromyalgia Syndrome with Focus on Pharmacology. *Biomedicines*, *5*(2), Article 2. https://doi.org/10.3390/biomedicines5020020

Lakhan, S. E., & Schofield, K. L. (2013). Mindfulness-based therapies in the treatment of somatization disorders : A systematic review and meta-analysis. *PloS One*, *8*(8), e71834. https://doi.org/10.1371/journal.pone.0071834

Laubach, W., Schröder, & Siegrist. (2001). *Normierung der Skalen "Profil der Lebensqualität Chronisch Kranker " an einer repräsentativen deutschen Stich probe*. http://dx.doi.org/10.1024/0170-1789.22.2.100

Lauche, R., Cramer, H., Dobos, G., Langhorst, J., & Schmidt, S. (2013). A systematic review and meta-analysis of mindfulness-based stress reduction for the fibromyalgia syndrome. *Journal of Psychosomatic Research*, *75*(6), 500-510. https://doi.org/10.1016/j.jpsychores.2013.10.010

Leça, S., & Tavares, I. (2022). Research in mindfulness interventions for patients with fibromyalgia : A critical review. *Frontiers in Integrative Neuroscience*, *16*. https://doi.org/10.3389/fnint.2022.920271

Lee, J., Kim, K. H., Webster, C. S., & Henning, M. A. (2021). The Evolution of Mindfulness from 1916 to 2019. *Mindfulness*, *12*(8), 1849-1859. https://doi.org/10.1007/s12671-021-01603-x

Li, T., Higgins, J., & Deeks, J. (2023). Chapter 5 : Collecting data. In J. Higgins, J. Thomas, J. Chandler, M. Cumpston, T. Li, M. Page, & V. Welch (Éds.), *Cochrane Handbook for Systematic Reviews of Interventions version 6.4*. Cochrane. www.training.cochrane.org/handbook

Macfarlane, G. J., Kronisch, C., Dean, L. E., Atzeni, F., Haeuser, W., Fluss, E., Choy, E., Kosek, E., Amris, K., Branco, J., Dincer, F., Leino-Arjas, P., Longley, K., McCarthy, G. M., Makri, S., Perrot, S., Sarzi-Puttini, P., Taylor, A., & Jones, G. T. (2017). EULAR revised recommendations for the management of fibromyalgia. *ANNALS OF THE RHEUMATIC DISEASES*, *76*(2), 318-328. https://doi.org/10.1136/annrheumdis-2016-209724

Martins, D. F., Viseux, F. J. F., Salm, D. C., Ribeiro, A. C. A., da Silva, H. K. L.,

Article
Cortica 2025. *4*(1),
https://doi.org/10.26034/cortica.2025.7025

Seim, L. A., Bittencourt, E. B., Bianco, G., Moré, A. O. O., Reed, W. R., & Mazzardo-Martins, L. (2021). The role of the vagus nerve in fibromyalgia syndrome. *Neuroscience & Biobehavioral Reviews*, *131*, 1136-1149. https://doi.org/10.1016/j.neubiorev.2021.10.021

Mateo, S. (2020). Procédure pour conduire avec succès une revue de littérature selon la méthode PRISMA. *Kinésithérapie, la Revue*, *20*(226), 29-37. https://doi.org/10.1016/j.kine.2020.05.019

McCarney, R. W., Schulz, J., & Grey, A. R. (2012). Effectiveness of mindfulness-based therapies in reducing symptoms of depression : A meta-analysis. *European Journal of Psychotherapy & Counselling*, *14*(3), 279-299. https://doi.org/10.1080/13642537.2012.713186

McHugh, M. L. (2012). Interrater reliability : The kappa statistic. *Biochemia Medica*, *22*(3), 276-282.

Niazi, A. K., & Niazi, S. K. (2011). Mindfulness-based stress reduction : A non-pharmacological approach for chronic illnesses. *North American Journal of Medical Sciences*, *3*(1), 20-23. https://doi.org/10.4297/najms.2011.320

Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S., … Moher, D. (2021). The PRISMA 2020 statement : An updated guideline for reporting systematic reviews. *BMJ*, *372*, n71. https://doi.org/10.1136/bmj.n71

Parsons, C. E., Crane, C., Parsons, L. J., Fjorback, L. O., & Kuyken, W. (2017). Home practice in Mindfulness-Based Cognitive Therapy and Mindfulness-Based Stress Reduction : A systematic review and meta-analysis of participants' mindfulness practice and its association with outcomes. *Behaviour Research and Therapy*, *95*, 29-41. https://doi.org/10.1016/j.brat.2017.05.004

Perez-Aranda, A., Feliu-Soler, A., Montero-Marin, J., Garcia-Campayo, J., Andres-Rodriguez, L., Borras, X., Rozadilla-Sacanell, A., Penarrubia-Maria, M. T., Angarita-Osorio, N., McCracken, L. M., & Luciano, J. (2019). A randomized controlled efficacy trial of mindfulness-based stress reduction compared with an active control group and usual care for fibromyalgia : The EUDAIMON study. *PAIN*, *160*(11), 2508-2523. https://doi.org/10.1097/j.pain.0000000000001655

Sarzi-Puttini, P., Giorgi, V., Marotto, D., & Atzeni, F. (2020). Fibromyalgia : An update on clinical characteristics, aetiopathogenesis and treatment. *Nature Reviews Rheumatology*, *16*(11), Article 11. https://doi.org/10.1038/s41584-020-00506-w

Schmidt, S., Grossman, P., Schwarzer, B., Jena, S., Naumann, J., & Walach, H. (2011). Treating fibromyalgia with mindfulness-based stress reduction : Results from a 3-armed randomized controlled trial. *PAIN®*, *152*(2), 361-369. https://doi.org/10.1016/j.pain.2010.10.043

Sephton, S. E., Salmon, P., Weissbecker, I., Ulmer, C., Floyd, A., Hoover, K., & Studts, J. L. (2007). Mindfulness meditation alleviates depressive symptoms in women with fibromyalgia : Results of a

randomized clinical trial. *Arthritis and Rheumatism*, *57*(1), 77-85. https://doi.org/10.1002/art.22478

Shapiro, S. L., & Carlson, L. E. (2009). Mindfulness-based interventions for physical health. In *The art and science of mindfulness : Integrating mindfulness into psychology and the helping professions.* (2009-08118-006; p. 75-91). American Psychological Association. https://doi.org/10.1037/11885-006

Sterne, J. A. C., Savović, J., Page, M. J., Elbers, R. G., Blencowe, N. S., Boutron, I., Cates, C. J., Cheng, H.-Y., Corbett, M. S., Eldridge, S. M., Emberson, J. R., Hernán, M. A., Hopewell, S., Hróbjartsson, A., Junqueira, D. R., Jüni, P., Kirkham, J. J., Lasserson, T., Li, T., … Higgins, J. P. T. (2019). RoB 2 : A revised tool for assessing risk of bias in randomised trials. *BMJ (Clinical Research Ed.)*, *366*, l4898. https://doi.org/10.1136/bmj.l4898

Taub, R., Agmon-Levin, N., Frumer, L., Samuel-Magal, I., Glick, I., & Horesh, D. (2024). Mindfulness-based stress reduction (MBSR) for fibromyalgia patients : The role of pain cognitions as mechanisms of change. *Complementary Therapies in Clinical Practice*, *56*, 101860. https://doi.org/10.1016/j.ctcp.2024.101860

Vadivale, A. M., & Sathiyaseelan, A. (2019). Mindfulness-based relapse prevention – A meta-analysis. *Cogent Psychology*, *6*(1), 1567090. https://doi.org/10.1080/23311908.2019.1567090

Van Gordon, W., & Shonin, E. (2020). Second-Generation Mindfulness-Based Interventions : Toward More Authentic Mindfulness Practice and Teaching. *Mindfulness*, *11*(1). https://doi.org/10.1007/s12671-019-01252-1

Wang, S.-M., Han, C., Lee, S.-J., Patkar, A. A., Masand, P. S., & Pae, C.-U. (2015). Fibromyalgia diagnosis : A review of the past, present and future. *Expert Review of Neurotherapeutics*. https://www.tandfonline.com/doi/abs/10.1586/14737175.2015.1046841

Weissbecker, I., Salmon, P., Studts, J. L., Floyd, A. R., Dedert, E. A., & Sephton, S. E. (2002). Mindfulness-based stress reduction and sense of coherence among women with fibromyalgia. *Journal of Clinical Psychology in Medical Settings*, *9*(4), 297-307. https://doi.org/10.1023/A:1020786917988

Yao, M., Wang, Y., Busse, J. W., Briel, M., Mei, F., Li, G., Zou, K., Li, L., & Sun, X. (2023). Evaluating the impact of including non-randomised studies of interventions in meta-analysis of randomised controlled trials : A protocol for a meta-epidemiological study. *BMJ Open*, *13*(7), e073232. https://doi.org/10.1136/bmjopen-2023-073232

Zhang, L., Lopes, S., Lavelle, T., Jones, K. O., Chen, L., Jindal, M., Zinzow, H., & Shi, L. (2022). Economic evaluations of mindfulness-based interventions : A systematic review. *Mindfulness*, *13*(10), 2359-2378. https://doi.org/10.1007/s12671-022-01960-1