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Meditation and Mindfulness in the Management of Fibromyalgia Syndrome

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Abstract:
Fibromyalgia is a complex and chronic pain syndrome characterized by widespread musculoskeletal pain, fatigue, sleep disturbances, hypersensitivity to stimuli, and frequently co-occurring psychological symptoms such as depression and anxiety. Although conventional treatments remain essential, their limited effectiveness combined with the multifaceted nature of fibromyalgia, often leads patients to explore complementary approaches and encourages a holistic management strategy for the disease. This review includes studies from the last 15 years, sourced from PubMed database, that focus on the role of meditation - particularly mindfulness-based practices, as a non-pharmacological intervention in the management of fibromyalgia. A growing body of evidence suggests that techniques incorporating meditation, such as mindfulness, Qigong, yoga, and conscious breathing can reduce pain intensity, improve sleep quality, and alleviate psychological distress. Meditation may also enhance emotional resilience and support self-regulation, offering patients a sense of agency in coping with chronic symptoms. Importantly, some studies indicate that mindfulness-based interventions are not only clinically beneficial but also cost-effective, by reducing reliance on healthcare resources. While methodological limitations remain present in much of the research, meditation-based therapies emerge as a promising and accessible complement to conventional fibromyalgia treatments, supporting a more holistic and patient-centered model of care.

Key words: meditation, mindfulness, fibromyalgia, chronic pain

Introduction

Fibromyalgia (FM) is a complex and chronic pain syndrome, ranking as the third most frequent musculoskeletal disorder [7,8]. It is characterized by widespread musculoskeletal pain, often accompanied by chronic fatigue, sleep disturbances, hypersensitivity to stimuli and psychological comorbidities, including depression and anxiety. It is considerably more common in women than in men, impacting between 0.2% and 6.6% of the general population, with a prevalence of 2.4% to 6.8% among women [6]. The reason for its higher prevalence in females is not fully understood - it may be related to a wide range of factors, including genetics, psychosocial conditions, and hormonal fluctuations. In particular, hormonal changes arising throughout a woman's life, such as menopause and pregnancy, can influence the intensity and severity of symptoms. FM can develop at any age throughout life, however the likelihood of its onset increases over time, peaking in individuals aged from 20 to 55 years old [3]. Another significant contributing factor includes psychosocial elements and traumatic experiences, both psychological and physical, particularly adverse childhood experiences and highly stressful life events, all of these can increase the risk of its development [4,5]. Initially, fibromyalgia met with considerable skepticism, due to the lack of clearly identifiable organic cause. Its symptoms are often non-specific and may overlap with other conditions, which contributes to its continued underdiagnosis [1,8,25]. However, growing evidence has led to a deeper understanding of its pathophysiology, with central sensitization now recognized as a key mechanism. Owing to the highly complex and multifactorial nature of fibromyalgia, which involves a broad spectrum of interrelated symptoms and contributing factors, the use of a multimodal management strategy is considered essential to ensure effective and comprehensive care [8].

Current treatment strategies for fibromyalgia involve a combination of pharmacological, non-pharmacological, and complementary approaches aimed at reducing pain, improving physical function, and enhancing overall quality of life [4,7,8]. The two most commonly prescribed pharmacological treatments for fibromyalgia are antidepressants - such as tricyclics and serotonin-norepinephrine reuptake inhibitors, and GABAergic pain modulators like pregabalin [8]. Additionally, low-dose naltrexone, cannabinoids, and ketamine have demonstrated potential benefits in pain management. Yet, a non-pharmacological interventions play an equally crucial role in fibromyalgia care [1,2,4,8]. Among these, cognitive-behavioral therapy remains the most effective

psychological intervention, helping patients in identifying and modifying maladaptive thoughts and behaviors, while also incorporating psychoeducation specific to fibromyalgia care [2]. Other strategies such as regular physical exercise, patient education, acupuncture, neurostimulation, meditation, and mindfulness, offer additional avenues for pain relief and symptom management [1,2,4,8]. Despite the wide range of available treatments, current approaches still present notable limitations. Due to the limited efficacy of conventional options and the frequent underrecognition of symptoms by healthcare providers, many patients increasingly turn to complementary and alternative medicine in search of more effective relief [24]. Pharmacological therapies often yield only partial symptom control and are associated with side effects such as drowsiness, weight gain, and dizziness, which can reduce adherence. Their long-term effectiveness also remains uncertain [2,8,9].
The aim of this review is to explore and synthesize recent scientific research on the effectiveness of meditation and mindfulness-based interventions in the treatment of fibromyalgia. These non-pharmacological approaches are gaining increasing attention due to their potential to alleviate not only physical symptoms like chronic pain and fatigue, but also emotional and psychological challenges commonly associated with the condition, including anxiety, depression, and stress. By focusing on mind-body techniques like mindfulness meditation, this review seeks to evaluate their therapeutic value, underlying mechanisms of action, and clinical relevance, as well as their potential role as complementary strategies within a broader, multimodal framework for fibromyalgia care.

Discussion

Pathogenesis of fibromyalgia

The complex and multifactorial interplay of various physiological and psychological mechanisms involved in fibromyalgia contributes to the ongoing uncertainty surrounding its pathogenesis. Current evidence suggests that the symptoms associated with FM stem from the body's inadequate response to pain stimuli [3]. Its etiology and pathophysiology are believed to involve a combination of genetic predisposition, neurotransmitter dysregulation, central sensitization, immune system involvement [1], and, presumably oxidative stress [10]. The development of fibromyalgia may also be influenced by a range of additional factors, including psychosocial influences, environmental changes, and exposure to stressful or traumatic life events. Endocrine disturbances - particularly dysfunction of the hypothalamic-pituitary-adrenal (HPA) axis, which can be initiated by trauma, are also considered potential contributors. [1,3,5,10,11]. A central focus in the pathophysiology of FM is neurotransmitter dysregulation. This is characterized by reduced levels of serotonin and norepinephrine in descending pain-inhibitory pathways, alongside with elevated levels of glutamate and substance P, leading to an inadequate, amplified perception of pain [1,3,11,14]. Additionally, dopamine imbalance and altered activity of endogenous opioids contribute to hyperalgesia or allodynia, mood disturbances, and fatigue. Central sensitization involves a dysregulation of NMDA receptor in central nervous system and an imbalance between excitatory and inhibitory neurotransmitters [1,3]. A hereditary component has also been identified, with specific genetic markers linked to pain perception and immune function. Studies have shown that individuals with a family history of fibromyalgia are at a higher risk of developing the condition themselves [1,3,12]. Furthermore, immune dysfunction, marked by elevated levels of inflammatory cytokines and altered immune cell activity, as well as peripheral input from muscles and joints, reinforces central sensitization. This, in turn, exacerbates chronic pain and fatigue while also contributing to sleep disturbances and mood disorders [1,3,13]. Impaired pain modulation often results in heightened pain sensitivity and hypervigilance. Importantly, it is not only the pain itself that diminishes a patient’s quality of life, but also the fear of pain, which can restrict daily functioning and negatively impacts emotional well-being [15]. As previously noted, fibromyalgia is a syndrome in which psychosocial and environmental factors play a significant role. Traumatic experiences - both psychological and physical - along with stressful events and their associated emotions can increase the risk of developing fibromyalgia or act as triggers for its onset, particularly in individuals with a genetic predisposition [1,3,5]. Pain catastrophizing and chronic stress may further amplify pain perception. Patients with fibromyalgia often report elevated stress levels, which have been associated with increased concentrations of pro-inflammatory cytokines, particularly IL-1, IL-6, and IL-8 [2]. These underlying mechanisms support a multifaceted treatment approach, that includes both pharmacological therapies and alternative substances, such as cannabinoids [1,3,4,9]. However, treatment should not rely solely on medication - non-pharmacological interventions are equally essential. Given the complex etiology of fibromyalgia, alternative methods, such as meditation and mind-body techniques have been proposed as promising strategies in symptom management [2].

Pain relief in meditation.

Meditation has been practiced across cultures for centuries, encompassing a variety of forms such as movement-based practices, mantra repetition, visualization, and mindfulness meditation. Its primary aim is to cultivate stillness, self-awareness, and inner peace. Among its many applications, mindfulness meditation is particularly well-recognized for its role in chronic pain management, as it encourages non-judgmental awareness of the present moment, fostering openness and curiosity [17-19]. Research has demonstrated that mindfulness meditation can reduce pain intensity and discomfort in conditions such as fibromyalgia, migraines, chronic low

back pain, and irritable bowel syndrome [17,18]. However, a crucial step in establishing the clinical value of this technique lies in identifying and characterizing the specific analgesic mechanisms that underlie its effects [2]. The pain-modulating effects of meditation involve key brain regions, including the posterior insula, secondary somatosensory cortices, and anterior cingulate cortex, all of which are associated with the cognitive and emotional aspects of pain processing [18-20]. Additionally, meditation has been found to influence neurotransmitter activity by increasing serotonin levels, which promote relaxation, while reducing the levels of norepinephrine, a chemical linked to stress response [19]. Although mindfulness meditation typically results in a modest but statistically significant reduction in pain, its effects tend to emerge gradually over time rather than immediately. Rather than functioning as a direct analgesic, its effectiveness is rooted in the enhancement of pain-coping strategies and emotional regulation. Clinical trials comparing mindfulness meditation to placebo and sham interventions have shown that mindfulness offers greater pain relief, with observed differences in neural activation patterns suggesting that it engages unique mechanisms in pain modulation [18]. Based on these findings, meditation may be beneficial for individuals with fibromyalgia by aiding in stress regulation and improving emotional well-being. While it does not offer a cure, meditation plays a meaningful role in a comprehensive and integrative approach to pain management.

Mindfulness meditation in treating fibromyalgia syndrome.

A randomized controlled trial by Cash et al. (2015) [5] evaluated the effects of an eight-week Mindfulness-Based Stress Reduction (MBSR) program on women with fibromyalgia. The intervention included mindfulness meditation, body scanning, and gentle yoga. MBSR is the most extensively studied mindfulness-based approach for managing fibromyalgia-related symptoms and has been shown to be as effective as other behavioral interventions, such as cognitive behavioral therapy (CBT) and health education, in addressing a broad range of chronic pain conditions [2]. The study aimed to examine the impact of MBSR on fibromyalgia symptoms, including stress perception, pain, sleep quality, fatigue, and symptom severity, as well as on physiological stress responses measured by salivary cortisol levels. Participants in the intervention group reported significant improvements in perceived stress, sleep disturbances, and overall symptom severity. A two-month follow-up revealed that those who engaged in regular mindfulness practice at home, regardless of session attendance, experienced greater reductions in pain and symptom severity, suggesting a potential dose-response relationship. However, no significant changes were observed in physical functioning, pain intensity, or cortisol-related neuroendocrine markers, indicating no measurable impact on HPA axis function. Secondary analyses, which included only participants with follow-up data, confirmed the main findings related to perceived stress and symptom severity. However, the effect of MBSR on sleep was no longer statistically significant. These results remained unchanged after controlling for a history of childhood trauma, suggesting that such trauma does not significantly influence the effectiveness of MBSR. Yet, when changes in depressive symptoms were considered, the effects of MBSR on stress perception, fatigue, and functional impairment were no longer significant [5]. These findings indicate that the observed improvements may, in fact, be driven by reductions in depressive symptoms. Therefore, considering the level of depressive symptoms is essential when designing interventions, as it may influence treatment efficacy.

A more recent pre–post study by Ciacchini et al. (2024) [32] also examined the effectiveness of an eight-week MBSR program, involving 89 participants - 84.3% of whom were women. Among them, 49 individuals were diagnosed with fibromyalgia (FM), while 40 suffered from low back pain (LBP). This non-randomized, pre-post longitudinal study did not include a control group. All participants continued standard pharmacological treatment during the intervention. Psychological outcomes were assessed before and after the program using validated self-report questionnaires. The results indicated improved sleep quality in both FM and LBP groups. In the FM group specifically, participants reported reduction in anxiety and a noticeable trend toward decreased depressive symptoms. Moreover, a significant between-group difference was found in perceived stress, with MBSR proving more effective at reducing stress among individuals with FM compared to those with LBP [32] .

Adler-Neal and Zeidan (2017) [2] provide a comprehensive review of the clinical and neurobiological evidence supporting mindfulness meditation as a complementary treatment for fibromyalgia. They highlight how mindfulness-based interventions - particularly those emphasizing acceptance, non-attachment, and social engagement, may alleviate fibromyalgia-related symptoms by targeting both psychological comorbidities and altered pain processing in the brain. Mindfulness meditation appears to engage distinct neural mechanisms, including reduced activation of brain regions involved in pain anticipation and appraisal, such as the anterior insula and medial prefrontal cortex, while enhancing top-down regulatory control. Tailored programs like meditation awareness training (MAT) showed promising results in improving pain, sleep, and emotional distress, especially when combined with social support. While evidence supporting the impact of MBSR on quality of life and pain reduction in fibromyalgia is still limited in comparison to standard care, health education, or social support alone, the authors suggest that modified formats, such as shorter and more accessible interventions, could improve both feasibility and outcomes. The concept of non-attachment, which promotes a more neutral and accepting view of pain and pain-related thoughts, may help reduce emotional distress without the need to

eliminate pain itself. Importantly, given that many fibromyalgia patients experience severe fatigue, the cognitive and physical demands of traditional MBSR programs may serve as a barrier. Reducing the intensity of these interventions could enhance accessibility. Additionally, integrating opportunities for social connection may further reduce stress and depression, thereby amplifying the overall therapeutic benefits of mindfulness-based treatments [2].

A large systematic review and meta-analysis by Hilton et al. (2017) [17] synthesized evidence on the effectiveness of mindfulness meditation as a standalone or adjunct therapy for chronic pain, including fibromyalgia, compared to standard care, no treatment, or other active interventions. The primary focus was on mindfulness-based therapy, with studies on other forms of meditation or those lacking formal meditation components excluded from the analysis. The primary outcome measured was pain, while secondary outcomes included depression, quality of life, and analgesic use Results indicated that mindfulness interventions were associated with small but statistically significant improvements in pain, depressive symptoms, and quality of life compared to various control conditions. However, the overall quality of evidence was rated as low, mainly due to methodological limitations, substantial heterogeneity and potential publication bias. Subgroup analysis revealed that effects were more pronounced in studies with follow-up longer than 12 weeks, indicating that potential benefits may increase gradually overtime. Although data on adverse effects were limited, the review concluded that mindfulness meditation appears to be a safe and potentially useful adjunct in the management of chronic pain [17].

The study by Fjorback (2012) [30] examined the application of mindfulness therapy in treating Bodily Distress Syndrome (BDS), a condition characterized by persistent, disabling physical symptoms without a clear medical cause. BDS encompasses several functional somatic disorders, fibromyalgia being one of them. Patients recruited to this study had experienced symptoms for at least two years. As highlighted by the author - impaired perception and understanding of pain, may trigger fear of movement and unhealthy ways of managing symptoms and so, the goal of mindfulness therapy is to enhance self-regulation and promote self-care. Patients were randomly assigned to one of two groups: the first participated in a four-month MBSR program (including yoga, meditation, and compassion practices), while the second received specialist care—consisting of a personalized treatment plan, cognitive behavioral therapy (CBT), and psychiatric support. After 15 months, mindfulness therapy was found to be comparable to specialist care in improving quality of life and symptom severity in patients with BDS. It also led to faster and greater improvements in physical health and was associated with lower healthcare costs. Both groups showed a reduction in overall healthcare utilization in the year following the intervention compared to the previous year, with no significant difference between the two. The social and economic consequences associated with employment difficulties and frequent sick leave among individuals affected by BDS may also be alleviated, at least to some extent, through the use of mindfulness therapy. Importantly, the study also demonstrated that patients with BDS were both willing and able to engage in mindfulness therapy, despite this population often presenting challenges with treatment adherence [30].

Neuromodulation and mind–body techniques.

As interest in non-pharmacological approaches to chronic pain management continues to grow, researchers have begun exploring the combination of neuromodulation and mind–body techniques. Among these, transcranial direct current stimulation (tDCS) and transcutaneous vagus nerve stimulation (tVNS) have been promising in fibromyalgia treatment, leading to recent efforts to examine their combined therapeutic potential. A triple-blind, placebo-controlled clinical trial by Ramasawmy et al. (2024) [20], examined the effects of combining at-home anodal tDCS, targeting the primary motor cortex, with a guided mindfulness meditation program. It is a non-invasive brain stimulation technique that delivers a low-intensity direct current (2 mA) through electrodes placed on the scalp. In this study, anodal stimulation was applied over the left primary motor cortex, with the cathode placed over the right orbitofrontal area. The goal was to modulate cortical excitability, potentially leading to pain relief and improvements in quality of life for patients with fibromyalgia. Interestingly, the results showed that while participants in both the active tDCS and placebo groups experienced significant improvements in emotional pain, sleep, stress, and mindfulness, adding tDCS didn't lead to better outcomes than meditation alone. Even though brain activity changes were observed using transcranial magnetic stimulation (TMS) - a neurophysiological assessment tool to measure changes in motor cortex excitability, these shifts didn't translate into stronger clinical benefits. The authors concluded that regular at-home mindfulness practice may suffice to provide meaningful symptom relief for individuals with fibromyalgia - highlighting its value as a low-cost, non-invasive, and accessible therapy particularly effective when practiced consistently and without the need for clinical supervision or equipment [20].

Paccione et al. (2022) [31] conducted a randomized controlled trial comparing meditative-based diaphragmatic breathing (MDB) and transcutaneous vagus nerve stimulation (tVNS) in 116 adults with severe fibromyalgia. Participants were randomized into one of four groups: active tVNS, sham tVNS, active MDB, or sham MDB. Interventions were self-administered at home for 15 minutes, twice a day, over a 14-day period. The primary outcome was heart rate variability (HRV), measured using photoplethysmography (PPG), while secondary outcomes included pain intensity and fibromyalgia symptom severity. No significant between-group differences

in short-term HRV changes were found, nor any meaningful correlations between HRV and pain intensity. Nonethless, a significant reduction in the pain levels was observed in both the active and sham tVNS groups. These results suggest that neither MDB nor tVNS produced measurable changes in autonomic function over a short period, though both may contribute to symptom relief. Notably, the observed analgesic effect in the tVNS groups, regardless of stimulation type, raises questions about the specificity of vagal stimulation effects and the reliability of short-term HRV as markers of vagal tone in FM. The findings support the potential of MDB and tVNS as complementary therapeutic strategies for fibromyalgia management and highlight the need for further research exploring long-term applications of non-invasive vagal stimulation [31].

Meditation can be practiced independently, but its core elements such as focused attention, breath awareness, and intentional presence, are also integral to various movement-based practices. While Mindfulness-Based Stress Reduction remains one of the most widely studied approaches, it is important to recognize that mindfulness meditation is only one component within a broader category of mind–body interventions. Other modalities, particularly those that integrate physical movement - such as tai chi, qi gong, and yoga, may be equally or even more effective, likely due to their combined impact on physical body movement with meditative mental state. These therapies can help counteract the physical deconditioning and stiffness commonly seen in fibromyalgia, thereby providing a dual-action benefits [21].

A recurring theme that emerges from literature is that the effectiveness of mind-body therapies is closely linked to the consistency, duration, and intensity of practice. Sawynok & Lynch (2017) studies on qigong [22] have shown that patients who practice for 30–45 minutes daily over 6–8 weeks experience significant improvements in key symptom domains, including pain, sleep quality, physical, mental functioning, and overall disease impact. Benefits often persist for 4–6 months and are significantly greater among those who follow structured protocols (≥5 hours/week) compared to minimal engagement (≤3 hours/week). Core elements of qigong practice include gentle physical movements, focused breathing, meditative awareness, and the cultivation of deep relaxation and mind-body integration. Unlike conventional exercise, qigong emphasizes movement and internal awareness, placing it within a framework of somatic experience and mindfulness [22].

Also a pilot randomized clinical trial by Sarmento et al. (2020) [33] evaluated the therapeutic efficacy of a 10-week Qigong program for individuals with fibromyalgia (FM). Twenty women diagnosed with FM were randomized to either an experimental Qigong group or a sham-Qigong control group. The Qigong intervention combined three core components: diaphragmatic breathing, gentle body movements, and meditative focus, along with the practice of six healing sounds. Both groups engaged in home practice two times per day and attended weekly group sessions; however, the control group performed only the physical movements without the meditative or breathwork components. The Qigong group demonstrated greater improvements across several outcomes, including pain intensity, sleep quality, fatigue, anxiety, depression, and overall fibromyalgia impact. These benefits were not observed in the sham group, suggesting that the therapeutic effects go beyond physical movement alone. Although quality of life improvements were more pronounced in the control group - possibly due to social interactions or measurement limitations, the study supports Qigong as a promising self-management approach for FM symptoms [33].

Another mind-body technique that is gaining growing scientific interest is yoga. This practice combines physical postures, breath control, and relaxation, with meditation playing a central role in enhancing body awareness during movement. A comprehensive review by Mohammad et al. (2019) [16] examined the biological mechanisms underlying the health benefits of yoga-based interventions, including meditation, in various chronic conditions, such as fibromyalgia, cardiovascular diseases, and neurodegenerative disorders. The authors report that regular yoga practice, integrating postures, breathing exercises, and meditation, can strengthen the body's antioxidant defenses by increasing levels of glutathione, superoxide dismutase, and catalase, while simultaneously reducing oxidative stress markers, such as malondialdehyde and reactive oxygen species [16]. These findings seem promising, given that oxidative stress is considered a potential contributing factor in the pathophysiology of fibromyalgia [10]. Observed biochemical changes have been linked to improvements in stress resilience, emotional well-being, inflammation, and even aging-related biomarkers, including interleukin-6, cortisol levels, and telomerase activity. The reduction in cortisol levels suggests that yoga may influence regulation of the HPA axis, potentially lowering physiological stress. Although some studies included in the review lacked methodological rigor, the overall body of evidence indicates that meditation, when practiced as part of an integrated yogic routine, may exert therapeutic effects at both molecular and cellular levels, offering a promising complementary strategy for managing fibromyalgia and similar chronic conditions. Notably, the integration of meditative elements with physical movement appears to play a critical role in generating these health benefits and should not be overlooked [16].

Complementary and alternative medicine (CAM) is increasingly utilized by patients with fibromyalgia. In a survey-based study by Pfalzgraf et al. (2020) [24], more than 66% of respondents reported using CAM methods, with meditation, massage, and aerobic exercise being among the most commonly adopted approaches. Respondents who combined CAM with pharmacological treatment reported significantly higher quality of life compared to those relying solely on medication. Meditation was rated as moderately effective by the participants.

Despite the widespread use of CAM, the study revealed that relatively few patients discussed these therapies with their healthcare providers. This lack of communication may result from time constraints, uncertainty, or limited physician knowledge about alternative treatments. However, open and informed dialogue between patients and clinicians is essential - especially in chronic conditions like fibromyalgia. Such communication enables providers to better understand patient preferences, values, and expectations, and to intergrade evidence-based CAM strategies into an individualized, comprehensive treatment plan. Moreover, it creates opportunities to educate patients about the safety and efficacy of specific interventions, while also reducing the risk of potentially inappropriate or ineffective self-directed treatments. Encouraging this type of dialogue may lead to greater treatment satisfaction, improved therapeutic outcomes, and a more holistic approach to fibromyalgia care [24].

The Impact of Meditation on Healthcare Costs and Self-Perception.

The choice of therapy for fibromyalgia depends not only on its clinical effectiveness but also on the associated treatment costs, which significantly influence patients' decisions during the search for relief. Therapies that provide a favorable balance between cost and therapeutic outcomes are particularly appealing in the context of constrained healthcare resources. D'Amico et al. (2020) [26] conducted a study comparing the economic and clinical benefits of Attachment-Based Compassion Therapy (ABCT) with those of relaxation therapy in patients with fibromyalgia. This pilot randomized controlled trial, which included a control group, evaluated both costs and outcomes three months after completing an eight-week intervention program to determine the cost-effectiveness of ABCT. Results showed that patients who received ABCT reported greater improvements in quality of life - measured in quality-adjusted life years (QALYs), which consider both the length and quality of life - while also incurring lower healthcare costs compared to those in the relaxation group. Both per-protocol and intention-to-treat analyses confirmed that ABCT yielded better outcomes at a reduced cost [26]. Similarly, a study by Pérez-Aranda et al., 2019, [27] on Mindfulness-Based Stress Reduction (MBSR) in fibromyalgia showed that after 12 months, MBSR had the lowest overall treatment costs and the highest Quality-Adjusted Life Year (QALY) score when compared to "usual care." These findings supports the conclusion that MBSR offers substantial economic benefits while reducing the symptoms of fibromyalgia, including pain and physical dysfunction. This cost-effectiveness of MBSR highlights its potential as a sustainable treatment option for patients with fibromyalgia [27, 28].

Chronic pain, noticeable physical changes, and their emotional consequences can significantly influence a person's sense of identity, self-esteem, and mood, thereby affecting how individuals respond to illness and their willingness to engage in self-care activities. Unwanted bodily changes resulting from chronic illness may negatively impact body image, leading to diminished self-worth and a reduced quality of life. Boyington et al. (2015) [29] explored perceptions and experiences related to body image in women diagnosed with rheumatoid arthritis (RA) and/or fibromyalgia (FM), two common rheumatic conditions affecting women. Participants with fibromyalgia identified the lack of visible physical symptoms as a major reason their condition was often dismissed, which led to delayed medical attention, frustration, and emotional distress. Compared to women with RA, those with FM reported a more profound impact of their symptoms across multiple domains of life, including physical, emotional, mental, and social functioning. A particularly prominent issue was "fibro fog," which many perceived as the primary barrier to completing everyday tasks. Participants described their bodies using terms such as "old" and "childlike," reflecting feelings of disempowerment, loss of control, and fear of becoming dependent. Meditation was mentioned by nearly all participants as a helpful self-management strategy. It provided relief by promoting relaxation and redirecting attention away from physical discomfort. Moreover, it fostered a sense of empowerment, increased awareness of personal agency in health management, and contributed to a reduction in negative thoughts related to the illness [29].

Methodological limitations in scientific research.

Although numerous studies – including those discussed in this article – suggest that meditation and mindfulness-based approaches can positively impact patients' health and well-being, and represent a therapeutic option that should not be overlooked, many of these studies still suffer from significant methodological limitations, leaving the actual effectiveness of mindfulness techniques open to question. This concern was addressed in a critical review by Leça and Tavares (2022) [23], which aimed to evaluate the existing literature for scientific evidence supporting the use of mindfulness-based interventions (MBIs) in the treatment of fibromyalgia. The review focused not only on patient outcomes but also on the methodological quality of the included studies - an especially important consideration in mindfulness research. The authors highlighted that only a small percentage (4.38%) of the published studies met the inclusion criteria, such as the use of active control groups and randomized controlled trials. Frequently missing from the reviewed studies were important methodological details, including participants' prior experience with mindfulness, their treatment preferences (e.g., medical versus integrative approaches), information about the background and training of instructors, blinding of researchers to study hypotheses, disclosure of conflicts of interest, and clear identification of the specific meditation techniques used. Additionally, adverse or unpleasant effects of mindfulness-based interventions (MBIs) were rarely reported. Many of the reviewed studies had a high number of participants who dropped out

or did not fully follow the program. Overall, the global assessment of the seven studies analyzed indicated that MBIs may be effective in improving functioning and reducing fibromyalgia symptoms. Three studies reported moderate to large effects of MBIs in reducing pain - including both pain intensity and the subjective experience of pain. Four studies showed small to moderate effects on psychological health, including decreases in anxiety, depression, and perceived stress. Importantly, some interventions demonstrated sustained effects up to 12 months post-treatment. In terms of quality of life, reported effects ranged from small to substantial, with improvements in well-being, positive emotions, psychological resilience, sleep quality, reduced attachment to negative thoughts, and improved cognitive functioning [23].

Conclusions:
Meditation and mindfulness-based practices offer promising support in the treatment of fibromyalgia by addressing not only chronic pain but also co-occurring symptoms. Their effectiveness appears to be closely linked to the consistency, frequency, and duration of practice, with more substantial improvements observed in patients who engage regularly over extended periods. Importantly, studies also indicate that mindfulness-based interventions (MBIs) may contribute to lower healthcare costs and reduced reliance on medical services, making them both clinically and economically beneficial. Beyond clinical efficacy, patient-related factors - such as motivation, treatment expectations, and individual preferences also play a crucial role in shaping therapeutic outcomes. These variables are often underrepresented in research, despite growing evidence that they can significantly influence the success of MBI programs. Moreover, it is important to note that high dropout rates and difficulties in maintaining long-term engagement present notable challenges, highlighting the need to adapt these interventions to better align patients' daily routines and capacities. Suggested adaptations include offering shorter but more frequent sessions, integrating online formats, and allowing greater flexibility in practice requirements [23]. Ultimately, mindfulness-based therapies should not be viewed as substitutes for conventional treatment but rather as complementary strategies within a holistic, multimodal approach to fibromyalgia care. Integrating patient-centered, cost-effective, and accessible interventions like meditation can help improve both clinical outcomes and overall quality of life, while promoting a more compassionate and holistic view of managing chronic illness.

Disclosure

Author's contribution

Conceptualization: Martyna Biernacka and Anna Bieniasz; methodology: Katarzyna Zdziebło; software: Maria Sitko; check: Katarzyna Blicharz, Piotr Mojżesz and Igor Biernacki; formal analysis: Michalina Piwowar; investigation: Martyna Biernacka and Aleksandra Bąk; resources: Katarzyna Agopsowicz and Katarzyna Blicharz; data curation: Igor Biernacki; writing-rough preparation: Katarzyna Zdziebło; writing- review and editing: Anna Bieniasz and Maria Sitko ; visualization: Aleksandra Bąk; supervision: Katarzyna Agopsowicz; project administration: Piotr Mojżesz;

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Conflict of interest

The authors deny any conflict of interest.

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