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Effectiveness of Mindfulness-Based Stress Reduction on Anxiety Disorder: A Systematic Review

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ABSTRACT

Anxiety disorders, including generalized anxiety disorder (GAD), social anxiety disorder (SAD), panic disorder, and specific phobias, are significant public health concerns that affect millions worldwide and lead to substantial impairments in daily functioning and quality of life. Traditional treatments may not suit everyone, highlighting the need for alternatives like Mindfulness-Based Stress Reduction (MBSR), which emphasizes mindfulness meditation. This systematic review evaluates the effectiveness of MBSR in reducing anxiety symptoms across various anxiety disorders by synthesizing research findings from studies published between January 2013 and April 2024. A comprehensive search was conducted in electronic databases, including PubMed, Semantic Scholar, ScienceDirect, PsycINFO, and Web of Science, using keywords such as “Mindfulness-Based Stress Reduction,” “MBSR,” “anxiety disorder,” and “effectiveness.” Peer-reviewed studies assessing the efficacy of MBSR on anxiety disorders were included, with data extraction and quality assessment performed following PRISMA 2022 guidelines. The search identified 1095 articles, with 13 studies meeting the inclusion criteria for the final analysis, encompassing a total sample size of 751 participants. The studies varied in design, sample size, participant demographics, and targeted anxiety disorders. Findings consistently showed significant reductions in anxiety symptoms among participants receiving MBSR compared to control groups. For GAD, studies reported improvements in anxiety and stress measures such as the Beck Anxiety Inventory (BAI) and Hamilton Anxiety Rating Scale (HAM-A). For SAD, reductions in social anxiety symptoms were observed, with some studies showing comparable effectiveness to CBT. This review presents compelling evidence supporting the efficacy of MBSR in reducing symptoms associated with anxiety disorders. Future research should focus on the long-term effects, impact on diverse demographic groups, and specific mechanisms to improve its clinical applicability.

INTRODUCTION

Anxiety disorders are a significant public health issue, affecting approximately 264 million people globally. These disorders encompass a range of conditions, including generalized anxiety disorder (GAD), social anxiety disorder (SAD), panic disorder, and specific phobias, all characterized by excessive fear, worry, and behavioural disruptions (World Health Organization (WHO), 2017). Chronic stress, if not managed effectively, can lead to anxiety, leading to substantial impairments in memory, concentration, problem-solving, and overall academic and occupational outcomes (Kang *et al.*, 2009).

Anxiety disorders are notably prevalent, with about 25% of individuals experiencing them at some point in their lives (Kessler *et al.*, 2005). These conditions significantly reduce quality of life, disrupt daily functioning, and are linked to poorer academic achievements, relationship instability, and lower occupational and financial status ((Jean-Pierre Lépine, 2002; Marciniak *et al.*, 2004; Olatunji *et al.*, 2007). For example, generalized anxiety disorder (GAD) involves persistent anxiety and worry about various life areas, often accompanied by symptoms like tension, sleep disruption, and irritability (American Psychiatric Association. & American Psychiatric

Association. DSM-5 Task (Force, 2013; Newman *et al.*, 2013). Social anxiety disorder (SAD) entails a persistent fear of social or performance situations where one might be negatively evaluated, severely impairing educational and relational aspects of life (Ruscio *et al.*, 2008; Stein & Stein, 2008).

Conventional treatments for anxiety disorders, such as pharmacotherapy and cognitive-behavioural therapy (CBT), have shown effectiveness but are not suitable for everyone due to side effects or personal preferences. This has urged interest in alternative therapies like Mindfulness-Based Stress Reduction (MBSR) developed by (Kabat-Zinn, 1990), MBSR is an 8-week program that incorporates mindfulness meditation practices aimed at reducing stress and enhancing emotional well-being. Originally designed for patients with chronic illnesses, MBSR has since been applied to a variety of psychological issues, showing significant reductions in psychological symptoms and improvements in emotional health (Chiesa & Serretti, 2011; de Vibe *et al.*, 2012).

Mindfulness-based interventions (MBIs), including MBSR, have demonstrated promise in reducing symptoms of anxiety disorders. These interventions are accessible and affordable, making them feasible alternatives or

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complements to traditional therapies (Haller *et al.*, 2021; Strauss *et al.*, 2014; Vøllestad, 2016). Given the growing body of research supporting the efficacy of mindfulness practices, this systematic review aims to assess the effectiveness of MBSR in treating anxiety disorders by synthesizing findings from studies conducted over the past decade.

MATERIALS AND METHODS

This systematic review was conducted in accordance with the PRISMA 2022 guidelines (Preferred Reporting Items for Systematic Reviews and Meta-Analyses)

Search Strategy

A systematic search was conducted in electronic databases including PubMed, Semantic Scholar, ScienceDirect, PsycINFO, and Web of Science for studies published between January 2013 and April 2024. The search terms included “Mindfulness-Based Stress Reduction,” “MBSR,” “anxiety disorder,” “effectiveness,” “systematic review,” and related synonyms.

Inclusion and Exclusion Criteria

Eligibility criteria for studies included in this review encompassed publications in peer-reviewed journals from the period of 2013 to 2024. Participants were required to have a diagnosed anxiety disorder, which includes generalized anxiety disorder (GAD), social anxiety disorder (SAD), panic disorder, or specific

phobias. The focus of the studies had to be on assessing the effectiveness of Mindfulness-Based Stress Reduction (MBSR) as a primary intervention. Accepted study designs comprised randomized controlled trials (RCTs), quasi-experimental studies, and intervention studies. Exclusion criteria involved studies not published in English, those not primarily focused on anxiety disorders, and publications categorized as reviews, meta-analyses, or theoretical papers.

Data Extraction and Synthesis

Data were extracted using a standardized form, including study characteristics (authors, year, sample size), participant demographics, study design, intervention details, outcome measures, and main findings. The quality of the studies was assessed using quality assessment, and meta-analysis were performed following PRISMA 2022 guidelines, a narrative synthesis was conducted to summarize the results.

RESULTS AND DISCUSSION

Study Selection

1,095 papers from PubMed =105, Semantic Scholar =66, ScienceDirect =829, PsycINFO =53, and Web of Science = 42 were found in the first search. A full text review of 165 papers was conducted after duplicates were eliminated and titles and abstracts were screened. Thirteen papers in all satisfied the inclusion requirements and were incorporated into the final analysis.

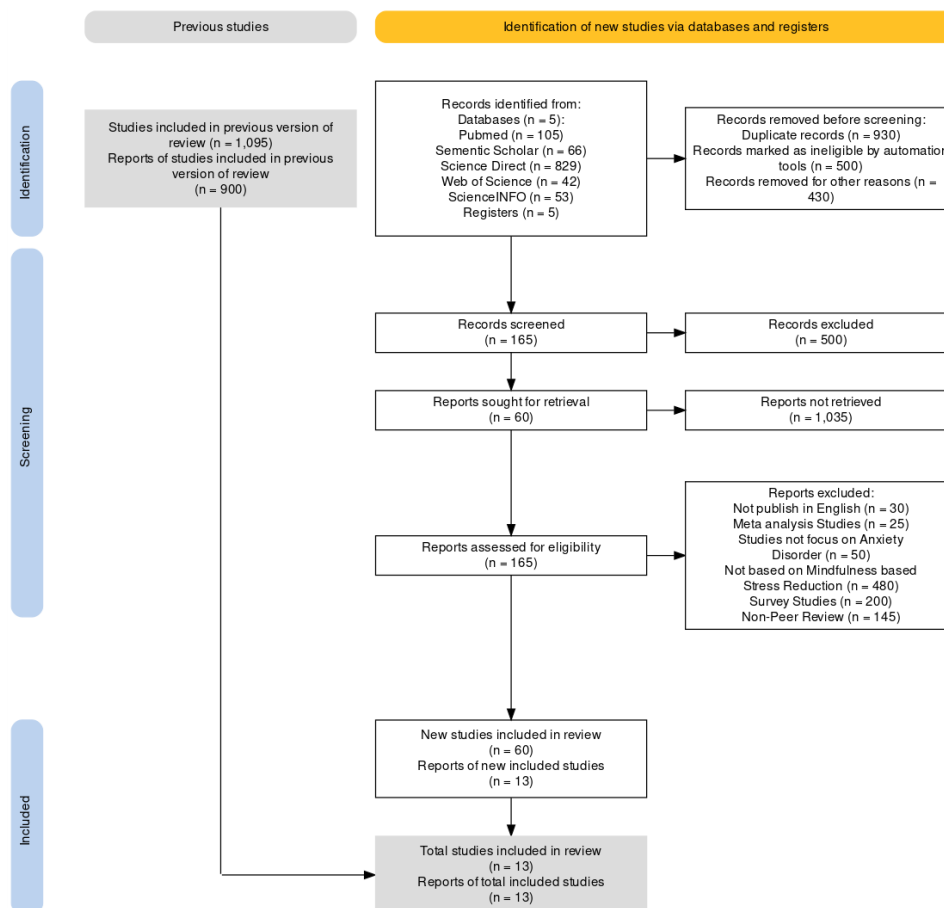


Figure 1: PRISMA Flow Diagram of the selection process of meta-analysis

This systematic review includes 13 studies investigating the effectiveness of Mindfulness-Based Stress Reduction (MBSR) on anxiety disorders, with a total sample size of 751 participants. The studies vary in design, sample size, participant demographics, and anxiety disorders targeted. Participants ranged from 15 to 75 years old, with a mix of gender, primarily focusing on Generalized Anxiety Disorder (GAD) and Social Anxiety Disorder (SAD). The interventions predominantly comprised 8-week MBSR programs, often compared against control groups

(CG) or alternative treatments like Cognitive Behavioural Therapy (CBT) and Stress Management Education (SME). Standardized anxiety assessment tools were used across studies, with the HAM-A, BAI, and STAI being the most reported measures. 9 studies employed RCT designs, while 2 quasi-experimental, 1 intervention and 1 mixed method design, that examined the effects of MBSR interventions on anxiety disorder for all studies are reported in Table 1.

Table 1: Characteristics of 14 included study

Author name and year	Study Design	N CG no's Age	Participants	Intervention	Session & Duration	Outcome measure
(Hölzel <i>et al.</i> , 2013)	RCT	N=26 MBSR-15 SME-11 Age: 37.9 (12.2) 54% Female	GAD	MBSR & SME	8-week Once a week, 2 hrs session	(BAI) & (PSS)
(Arch <i>et al.</i> , 2013)	RCT	N=105 CBT-60 MBSR 45 Age: 18-75 17% Female	Veteran, participants, one or more DSM-IV anxiety disorders	Group CBT and Adapted MBSR	90 min over the course of 10 weeks (10 sessions)	Clinical severity ratings of principal anxiety disorders, Penn State Worry Questionnaire, Mini Mood and Anxiety Symptom Questionnaire, Beck Depression Inventory-II
(Hoge <i>et al.</i> , 2013)	Intervention study	N=89 MBSR-48 SME-41 Age: 18 & older 51% Female	GAD	MBSR & SME	8 weeks 2.5 hrs session 45-20 mins home practices	(HAM-A), (BAI), & (CGI-S).
(Hoge <i>et al.</i> , 2015)	RCT	N=38 MBSR-19 SME-19 Age: 18 & older 55% Female	GAD	MBSR & SME	8-week 2.5 hrs session 45-20 mins home practices	(BAI) and (PSWQ-PW)
(Hjeltnes <i>et al.</i> , 2018)	Two-stage Mixed Methods Design	N=14 CG=7 Age:19 – 25	SAD	MBSR	8-week	(SPS) and (SCL-90R)
(Goldin <i>et al.</i> , 2016a)	RCT	N= 108 MBSR-36, CBGT-36, CG-36 Age: 32.7, 7.8 55.60% Female	SAD	MBSR	12 weekly 2.5 hrs sessions	(LSAS-SR)
(Hjeltnes <i>et al.</i> , 2017)	Quasi-Experimental	N=53 Age:19-25 62.20% Female	SAD	MBSR	Weekly sessions over 8 weeks 2.5/3-hr session	Social anxiety symptoms, global psychological distress, mindfulness, self-compassion, self-esteem

(Alimehdi <i>et al.</i> , 2016)	Quasi-Experimental	N=46 MBSR-23 CG-23 Age: 15 & older	GAD	MBSR	8 sessions, 90 minutes	(GAD-7), Intolerance of Uncertainty Scale, and Anxiety Sensitivity Index.
(Jazairi <i>et al.</i> , 2016)	RCT	N=47 MBSR-27 AE-20 Age: 23-53 53% Female	SAD	MBSR & AE	8 weeks 2.5 hrs session	(LSAS-SR) Working Alliance Inventory (WAI)
(Ye, 2017)	RCT	N= 27 MBSR 14 CG-13 Age: 16-40	SAD	MBSR	8-week 2.5 hrs session	(PSS-14)
(Hoge <i>et al.</i> , 2018)	RCT	N= 72 MBSR-43 SME-29 Age: 18 & older 46% Female	GAD	MBSR vs. SME	8-week intervention	Cortisol and ACTH AUC concentrations TNF-alpha and IL-6 AUC concentrations
Jazairi <i>et al.</i> , 2018	RCT	N=86 CBT-46 MBSR-40 Age: 33.41 ± 7.94 7.62 32.77 ± 7.94 58% Female	SAD	MBSR	12 week 2.5hr session	LSAS-SR WAI
(Hoge <i>et al.</i> , 2020)	RCT	N=42 MBSR-28 SME-28 40% Female	GAD	MBSR	8 weeks Group classes and home practice	(HAM-A)

MBSR: Mindfulness-Based Stress Reduction, SME: Stress Management Education, BAI: Beck Anxiety Inventory, PSS: Perceived Stress Scale RCT: Randomized controlled trial, CG: Control Group, ABCT: Attachment-Based Compassion Therapy, TAU: Treatment as Usual, DASS-21: Depression Anxiety Stress Scales, PSWQ-PW: Penn State Worry Questionnaire, CBGT: Cognitive-behavioural group therapy, LSAS-SR: Liebowitz Social Anxiety Scale - Self-Report, GAD-7: Generalized Anxiety Disorder Scale, HAM-A: Hamilton Anxiety Scale, CGI-S: Clinical Global Impression of Severity, AE: Aerobic Exercise, MAGT: Mindfulness and acceptance-based group therapy, Social Phobia Scale (SPS) and Symptom Checklist 90 Revised (SCL-90R)

Discussion

The comprehensive analysis of 13 research studies investigating the efficacy of Mindfulness-Based Stress Reduction (MBSR) in addressing anxiety disorders presents robust findings that endorse MBSR as a feasible approach for alleviating anxiety symptoms. These studies underscore the psychological and neurobiological advantages, underscoring the extensive influence of MBSR on individuals grappling with anxiety disorders, such as Generalized Anxiety Disorder (GAD) and Social Anxiety Disorder (SAD). Our findings align with previous research that highlights the positive impact of mindfulness-based interventions on mental health outcomes (Hofmann *et al.*, 2010; Khoury *et al.*, 2013). Across the included studies, participants receiving MBSR consistently showed significant reductions in anxiety symptoms compared to control groups. For example, (Hölzel *et al.*, 2013; Hoge *et al.*, 2013; Hoge *et al.*, 2015) demonstrated significant reductions in anxiety symptoms following MBSR. In these studies, participants with GAD showed marked improvement in Beck Anxiety

Inventory (BAI) scores, with MBSR outperforming Stress Management Education (SME) in reducing anxiety. Similarly, (Arch *et al.*, 2013) reported large effect size improvements in anxiety symptoms for both MBSR and Cognitive Behavioural Therapy (CBT), with MBSR showing superior outcomes for mood disorders and worry. MBSR was found to be effective in treating a range of anxiety disorders, including Generalized Anxiety Disorder (GAD), Social Anxiety Disorder (SAD), and panic disorder. (Hoge *et al.*, 2013) found that MBSR significantly reduced anxiety symptoms in individuals with GAD, as measured by the Hamilton Anxiety Rating Scale (HAM-A) and BAI. Additionally, (Goldin *et al.*, 2016b; Hjeltnes *et al.*, 2017) observed significant reductions in social anxiety symptoms among participants with SAD following MBSR interventions. The mechanisms through which MBSR reduces anxiety symptoms are multifaceted. MBSR enhances emotion regulation, increases awareness and acceptance of anxiety-related thoughts and sensations, and reduces rumination (Hölzel *et al.*, 2013) For example (Hoge *et al.*,

2015) elucidated the mechanisms through which MBSR reduces anxiety, highlighting the roles of mindfulness and decentring. These processes were shown to mediate the relationship between MBSR and reductions in both physiological anxiety and worry, providing insight into the cognitive shifts that accompany mindfulness practice. Decentring was linked to decreased physiological anxiety, while mindfulness was associated with reduced worry. Multiple studies, including those by (Hjeltnes *et al.*, 2018; Jazaieri *et al.*, 2016) consistently reported significant reductions in social anxiety symptoms following MBSR. These findings underscore MBSR's effectiveness in improving social functioning and reducing the psychological distress associated with social anxiety. The improvements were often comparable to those achieved through traditional CBT, suggesting that MBSR offers a valuable alternative or adjunctive treatment. (Hölzel *et al.*, 2013; Hoge *et al.*, 2018) provided compelling evidence of neurobiological changes associated with MBSR. Enhancements in ventrolateral prefrontal cortex (VLPFC) activation and strengthened connectivity between the amygdala and prefrontal cortex were detected post Mindfulness-Based Stress Reduction (MBSR) intervention. These findings suggest advancements in emotional regulation and decreased amygdala responsiveness, essential for the mitigation of anxiety symptoms. (Hoge *et al.*, 2018) also highlighted reductions in stress-related hormonal markers, such as adrenocorticotrophic hormone (ACTH) and inflammatory cytokines (TNF-alpha, IL-6), following MBSR. These physiological changes further support the stress-reducing effects of MBSR, contributing to overall improvements in anxiety and well-being. Several studies, including (Arch *et al.*, 2013; Goldin *et al.*, 2016a) compared MBSR with other established treatments like CBT and CBGT. These comparisons revealed that MBSR is as effective as these traditional interventions in reducing anxiety symptoms. Notably, Arch *et al.* (2013) found that MBSR had superior outcomes for mood disorders and worry, while CBGT more effectively targeted anxious arousal. Hoge *et al.* (2020) explored the cognitive benefits of MBSR, particularly in reducing interpretation bias—a tendency to interpret ambiguous stimuli as threatening. Although the direct relationship between reduced interpretation bias and anxiety was minimal, this finding suggests that MBSR may contribute to cognitive shifts that aid in anxiety management. (Jazaieri *et al.*, 2018) found that the therapeutic alliance in MBSR predicted long-term symptom reduction, highlighting the importance of the participant-facilitator relationship in the effectiveness of mindfulness interventions. This finding suggests that MBSR's benefits may extend beyond the immediate post-intervention period, promoting sustained anxiety reduction. The findings suggest that MBSR can be a valuable addition to the therapeutic options for anxiety disorders. Clinicians should consider integrating MBSR into treatment plans, particularly for patients who prefer non-pharmacological

interventions or have not responded adequately to conventional therapies. For instance, (Alimehdi *et al.*, 2016) found that MBSR was effective in reducing symptoms of generalized anxiety and anxiety sensitivity, though not in intolerance of uncertainty, highlighting the significant impact of MBSR across different anxiety-related measures.

Despite the vigorous evidence supporting MBSR, several limitations should be noted. The heterogeneity of study designs, participant characteristics, and intervention protocols may affect the generalizability of the findings. Additionally, the long-term effects of MBSR on anxiety disorders remain underexplored. Future research should focus on larger, high-quality randomized controlled trials (RCTs) with diverse populations and extended follow-up periods to better understand the sustained impact of MBSR. For example, (Ye, 2017) found that MBSR led to decreased anxiety and avoidance in participants with SAD, but the study had a relatively small sample size and short follow-up period. Similarly, (Hoge *et al.*, 2020) observed reduced interpretation bias following MBSR, yet the direct relationship with anxiety was minimal, suggesting the need for further investigation into the specific components of MBSR that contribute to its effectiveness.

The findings from these studies collectively endorse MBSR as a promising intervention for anxiety disorders. Its effectiveness in both reducing anxiety symptoms and promoting neurobiological changes provides a compelling case for its inclusion in therapeutic settings. Moreover, MBSR's ability to match the efficacy of CBT and CBGT while offering distinct cognitive and emotional benefits positions it as a versatile tool in the mental health practitioner's arsenal.

CONCLUSION

The study concludes that MBSR proves to be a successful intervention in alleviating symptoms of anxiety among individuals diagnosed with anxiety disorders. The results advocate for including mindfulness-based strategies in mental health services, offering an additional choice to conventional therapies. Subsequent studies ought to further investigate the enduring impacts and precise mechanisms of MBSR to optimize its implementation within clinical settings.

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