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Systematic review to explore the effect of yoga on anxiety in adults

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Abstract

Introduction: The National Health Service cannot chronically sustain the overwhelming demands being placed on it due to financial cuts, staff numbers and recent presence of Covid-19. As a result, anxiety levels are on the rise thus increasing the need for effective first-line treatment.

Purpose: The purpose of this systematic review was to examine the efficacy of yoga as a first-line treatment for anxiety. Previous systematic reviews have produced mixed results.

Methodology: The inclusion criteria followed the PICO research statement. The population (P) were either healthy or diagnosed with anxiety and the intervention (I) was yoga. The comparison (C) was a control group, or CBT, or used a pre-and post-intervention design. The outcome (O) was the change in the level of anxiety post-intervention.

Results and Discussion: After the review of 64 studies, 7 studies fit the inclusion criteria: four randomized controlled studies, one longitudinal study, and two pre- and post-intervention comparisons. All the studies included provided statistically significant results for the beneficial effect of yoga on anxiety.

Conclusion: This study adds to preceding literature on the current anxiety levels of adults and the potential utility of yoga as a first-line treatment for self-management of anxiety levels. This review stresses the issue of heterogeneity, mode of yoga and calls for more robust randomised controlled trials to pioneer the subject matter to help, if not prevent, to slow down the rising cases of anxiety and ill mental health worldwide.

Keywords

Anxiety, Mental Health, Yoga, Systematic Review, Adults

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Introduction

According to the “Diagnostic and Statistical Manual of Mental Disorders V” (DSM V) anxiety disorders that are divided into subtypes all of which are characterised by excessive worrying about events and situations over a period of six months and occurring on more days than not (American Psychiatric Association, 2013). Neuroimaging studies have demonstrated that those with anxiety demonstrated increased activity in the amygdala, interior insula and areas of the prefrontal cortex and decreased activity in some areas of the ventrolateral prefrontal cortex. The result is an increased sensitivity to negative events and more effortful cognitive reappraisal of an event (Buhle et al., 2013; Gorka et al., 2019; Groenewold et al., 2013). Anxiety disorders are one of the two most common mental illnesses globally and are most prevalent among those in the 20 to 39 age group and among women. Worldwide, anxiety disorders were ranked eighth among mental disorders with respect to years lived with disability and the twenty-fourth leading cause of disability-adjusted life years (Ferrari et al., 2022). Anxiety has been associated with poorer physical health, a decreased tendency to engage in healthy behaviours, and an increased tendency to engage in unhealthy behaviour (Hearon et al., 2014; Morissette et al., 2007; Sareen et al., 2005). Subtypes of anxiety frequently overlap and are frequently comorbid with other mental conditions. For example, generalised anxiety disorder is frequently comorbid with depression (Bandelow & Michaelis, 2015). In a systematic review, Horenstein and Heimberg (2020) determined that anxiety, in particular the generalised anxiety disorder, was associated with a greater utilisation of healthcare resources. In summary, anxiety is a common mental disorder, associated with a reduced number of years spent in good health, and a burden on healthcare delivery.

Yoga

Yoga has different forms and the ones most frequently offered in the western world are Yin, Kundalini, Vinyasa, and Hatha yoga (Khalsa, 2004). Yin, Kundalini, and Hatha yoga are slower paced with pauses between poses whereas Vinyasa is a more vigorous activity without pauses (Khalsa, 2004). Yoga is a practical as well as a spiritual practice that focuses on breathing techniques and postures that are believed to bring the mind and body into union (Khalsa, 2004). The suspected biomechanism in yoga is a deep relaxation achieved by a modification of the autonomic nervous system and the hypothalamic pituitary axis (Anand et al., 1961; Benson, 1975). Previously, yoga was regarded as an alternative and complementary therapy in the west. Now yoga is being examined as a cost-effective first-

line therapy for anxiety (Kirkwood et al., 2005). The fact that the physical and mental benefits of yoga are now generally accepted is evidenced by the National Health Service endorsement of yoga on their website (NHS, 2021). The effect of yoga on anxiety has become the subject of formal systematic literature reviews, e. g. Cramer et al. (2018), Khalsa (2004), Kirkwood et al. (2005), and Volbehr et al. (2018).

Research on Yoga and Anxiety

Cramer et al. (2018) conducted a systematic review and meta-analysis on eight randomised controlled trials and concluded that yoga could be an effective intervention for anxiety disorders or elevated anxiety, but the evidence was inconclusive. Further, an explanation of a biomechanical mechanism was lacking. No effects were found for participants who had been diagnosed with an anxiety disorder in accordance with the DSM-V guidelines (American Psychiatric Association, 2013). Supportive evidence was found only for those with elevated anxiety and without a formal diagnosis or diagnosed by means other than the DSM-V. Some forms of yoga were specified, e. g. Vinyasa, Agni (meditative), but most were unspecified. Volbehr et al. (2018) conducted a systematic review and meta-analysis of 18 studies. The inclusion criteria were studies on Hatha yoga and participants with a formal diagnosis of an acute or chronic mood disorder and/or anxiety disorder in accordance with the guidelines of the DSM V or earlier editions, or the International Classification of Disease 10 (American Psychiatric Association, 2013; World Health Organization, 1993). The authors found that Hatha yoga was not effective for anxiety disorders and that the results were equivalent to control groups or treatment as usual groups. Other factors to be considered in a systematic review of the effect of yoga on anxiety are comorbidities. Anxiety disorders and depression are frequently comorbid, which makes the assessment of anxiety as an independent factor difficult (Ionescu et al., 2013). Also, most recent research focuses on the effect of yoga on anxiety in a clinical population with a specific disease, such as cancer and Parkinson (Hardoerfer & Jentschke, 2018; Kwok et al., 2019). Overall, the systematic reviews and meta-analyses concluded that the results are weak for the effects of yoga on anxiety. The investigators stated that the inconclusive results could be due to the inclusion of studies that lacked: (1) adequate methods, (2) consistent means of diagnosis, (3) diagnosis at baseline, and (4) adequate description of yoga practice (Cramer et al., 2018; Kirkwood et al., 2005; Vollbehr et al., 2018). Cramer et al. (2018) commented that in-depth systematic reviews and meta-analyses are hampered by the sheer lack of volume of yoga and anxiety studies, a high risk of bias arising from methodology issues such as

variations in blinding and lack of participant randomising, and the lack of control groups.

Purpose

This systematic review attempts to fill some of the above gaps by including studies that had adequate research designs, specified the type of yoga intervention, and included only participants who were healthy or had a diagnosis of anxiety at baseline. The objective of the study is to perform a systematic review of recent literature to assess the evidence for the effect of yoga practice as a first-line therapy for anxiety. The rationale of the study is to determine if yoga practice should be recommended as part of a low-cost self-care regime for adults.

Methodology

The following databases were used to identify studies on anxiety and yoga: PubMed, Cochrane Library, British Medical Journal, and ScienceDirect. As the search tools differed by database, they are described individually. PubMed’s advanced search function allowed a Boolean algorithm to filter by words in the title and abstract. The following terms were entered: anxiety AND yoga, NOT depression, NOT children, NOT meditation. NOT depression was specified in the title and abstract search because anxiety and depression are frequently comorbid and studied together. This review wanted to assess the effect of yoga on anxiety alone. Further filters included publication date of 2019 to the present and in English. The search identified 78 records. An additional search of the results filtered by clinical trial, randomised controlled trial, and the availability of a full text reduced the number of records to 11. The Cochrane Library has a database that includes only studies that are clinical trials. The advanced search keywords

used were anxiety AND yoga, NOT children, NOT depression. The search was further filtered by a publication date range of January 2019 to January 2022. The search identified 46 studies. The ScienceDirect database allowed a search by keywords, publication date range, and article type. The search terms yoga AND anxiety NOT depression, date range of 2019 to 2022, filtered by research type article yielded 23 results. For the British Medical Journal database, the keyword was generalised to yoga with an expanded publication date between 2017 and 2022 and limited to research articles. The search yielded two studies. The next step was to eliminate the duplicates from a total of 135 articles, which left 64. The method is outlined according to the 2009 PRISMA flow diagram in figure 1.

Exclusion and Inclusion Criteria

The eligibility requirements were based on the PICO formula (Population, Intervention, Comparison, Outcome). The population selected was healthy adults or adults with a primary diagnosis of anxiety and age 18 years or above. The intervention was yoga practice. The comparison was either a control group, or a pre and post-intervention assessment of anxiety. The outcome is a change in the level of anxiety as measured by a validated anxiety scale or symptom inventory. Other inclusion criteria were publication date of 2019 or later, in the English language, and a full text was available. An exception was made for publication date for articles in the BMJ database as few records were located. Studies were excluded if the methods were poor, the participants were children or were recruited from a clinical population, e. g. participants with cancer or Parkinson’s. The Critical Appraisal Skills Programme was used in the assessment of the studies and in the formatting of the study synthesis (CASP, 2020).

Results

Table 1. Synthesis of Studies

Author	Study Participants (Ss)	Study Description Aim/design/methods	Main Findings	Comments Strengths /Limitations

<p>Brenes et al. (2020)</p>	<p>500 adults over the age of 60</p> <p>Recruited from the general public</p> <p>Diagnosis: score of ≥ 26 on Penn State Worry Questionnaire Abbreviated</p>	<p>Aim: Compare the efficacy of CBT and Hatha yoga on worry, anxiety, and sleep and to determine if preference for CBT or yoga modified the results.</p> <p>Design: Randomised controlled trials.</p> <p>Intervention: Group Hatha yoga.</p> <p>3 arms. 250 Ss were randomised to either CBT intervention or a yoga trial. The remaining Ss chose whether to enter the CBT (n = 120) or yoga intervention (n = 130).</p> <p>Method: anxiety assessed with Patient-Reported Outcomes Measurement Information System (PROMIS®), anxiety section.</p> <p>Anxiety assessed pre-intervention, at week 6, week 11, and week 37.</p>	<p>Logistic regressions controlled for age, psychotropic medication, race. For the randomised trial, both groups showed reduced anxiety symptoms post-intervention. However, there was no statistically significant differences between the yoga and CBT groups for change in anxiety score. CBT and yoga interventions did not differ by anxiety score in the preference group. There were no differences in anxiety reduction between the randomized groups and when Ss chose their intervention</p>	<p>Strengths: large sample size. Follow-up assessment</p> <p>Limitations: In this age bracket, Ss had comorbidities such as hypertension, diabetes, depression, anxiety, heart disease. Logistic regression analyses controlled for comorbidities, but they could have an impact on the agility needed for yoga. Over 80% of Ss were women.</p>
<p>Lemay et al. (2021)</p>	<p>United States Healthy adults. N = 20. Age 18 to 66.</p>	<p>Aim: Assess the effect of a 6-week Yin yoga class plus guided meditation on stress perception, anxiety, and mindfulness skills.</p> <p>Design: quasi-experimental. Pre- and Post-intervention assessments. Intervention: Yin yoga plus guided meditation</p>	<p>Compared to baseline, scores showed a statistically significant reduction in anxiety, stress, and mindfulness skills at post-intervention, at 3 months, and 6 months.</p>	<p>Strengths: Ss demonstrated the increasing benefit of yoga over 4 points in time.</p> <p>Limitations: No control group. Small sample size. 14 of the 20 Ss had prior experience with yoga and meditation. Some Ss practiced as home as well. Neither the previous</p>

Following the duplicates being removed, the number of articles was reduced from 135 to 64. Consequently, these 64 journal articles went through screening as of the abstract and title where 46 were excluded and 20 continued to remain and be fully assessed. Thereafter, with a full assessment using the CASP tool, 7 fully eligible studies were included in the systematic review and the procedure for this is conveyed below (Figure 1). Furthermore, a complete synthesis of studies is also displayed below (Table 1)

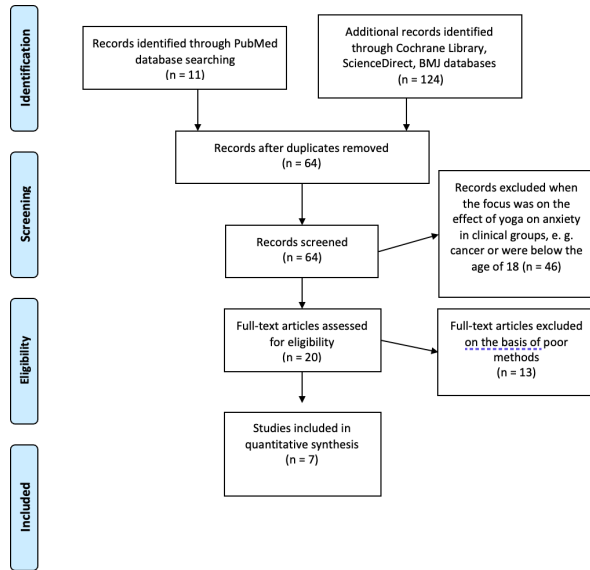


Figure 1. PRISMA flow chart of search results

Summary of the Results

The details of the studies are included in Table 1. The studies varied in their level of evidence. Four studies were randomised controlled trials, one was longitudinal, and two were quasi-experimental. All the studies included in the systematic review indicated that most yoga styles common in the west showed promise as a first-line therapy for anxiety for healthy adults and those diagnosed with anxiety. Different styles of yoga were represented in the review — Hatha, Yin, Kundalini, and Vinyasa. Four studies had healthy participants and three studies had participants with a diagnosis of anxiety in accordance with the DSM V (American Psychiatric Association, 2013). One of the eligibility criteria of the Phaniskar and Mullen (2022) study was the self-reporting of three or more symptoms on the Generalised Anxiety Scale of the DSM V. Pre-intervention mean scores of anxiety for the yoga group were provided but the standard deviation was quite high (mean 8.28, SD 4.15). Therefore, some of the participants could have had high levels of anxiety. Not all yoga styles were an effective treatment for anxiety. Marshall et al. (2020) compared two forms of yoga, Hatha and Vinyasa, and found that Hatha yoga reduced anxiety symptoms, but Vinyasa yoga did not.

Their results suggested that the style of yoga could influence the effect of the practice on anxiety. Two studies compared yoga with CBT for the first-line therapy for anxiety (Brenes et al., 2020; Simon et al., (2020)). The findings of Simon et al. (2020) suggested that Kundalini yoga was as effective as CBT but not better than CBT. Brenes et al. (2020) found that yoga was as effective as CBT among older adults. The evidence for the long-term effects of yoga on anxiety symptoms were not clear. Lemay et al. (2021) and Simon et al. (2020) examined the long-term effects of yoga on anxiety with follow-up assessments. In three- and six-month follow-up of the effect of Yin yoga on anxiety, Lemay et al. (2021) found that, compared to pre-intervention scores, anxiety levels showed a statistically significant reduction. However, the authors did not mention how or if Yin yoga was practiced in the follow-up periods. Simon et al. (2020) had two interventions, CBT and Kundalini yoga, and a control group. Compared to pre-intervention scores, at post-intervention, both CBT and Kundalini yoga produced a statistically significant at reduction in anxiety. At a six-month follow-up, the CBT group showed statistically significant reductions in anxiety levels. However, the yoga group anxiety scores were equivalent to the control group. Except for Brenes et al. (2020), none of the studies included individuals with comorbidities. Also, Brenes et al. (2020) was the only study that focused on adults aged 60 and over, an age group in which a higher level of comorbidities would be expected. In this large randomised controlled study (n = 500), the investigators compared the efficacy of CBT and yoga on worry and anxiety. Worry and anxiety were assessed as independent outcomes. Logistic regressions controlled for potential interactions between comorbidities and anxiety. A subgroup analysis revealed that CBT produced better results than yoga for participants with comorbid depression. No conclusions could be drawn on the safety of yoga as an intervention as five of the seven studies did not report adverse events. Brenes et al. (2020) and Simon et al. (2020) reported adverse events, but the events were not related to the interventions

Discussion

The findings for the effect of yoga on anxiety remain mixed. The common factor in compromising the findings of systematic studies for this study and previous research on yoga are small sample sizes and the inclusion of studies with poorer levels of evidence, e. g. Cramer et al. (2018), Kirkwood, et al. (2005) and Volbehr et al. (2018). The explanations provided by Cramer et al. (2018) and Volbehr et al. (2018) for the inconclusive results were the limited number of

studies on yoga and anxiety, lack of a clear diagnostic criteria, lack of diagnosis at baseline, lack of independent evaluators and blinding of evaluators, heterogeneity of yoga practice, and inadequate description of yoga practice. This review was able to address some of the gaps, but not all. The research of Cramer et al. (2018) and Volbehr et al. (2018) included more studies, but most of the studies included suffered the common problem of yoga studies and that is small sample size that limits the credibility of the results. Three of the studies included in this review have reasonable sample sizes: Brenes et al. (2020) (n = 500), Simon et al. (2020) (n = 230) and Telles et al. (2019) (n = 320). The statistically significant effectiveness of yoga was demonstrated across the smaller and larger sample sizes. Three of the studies included participants diagnosed with anxiety and the diagnostic criteria were clearly stated (Brenes et al., 2020; Phaniskar & Mullen, 2022; Simon et al., 2020). The findings indicated that yoga was equally effective on those diagnosed with anxiety and a healthy population.

As Cramer et al. (2018) and Volbehr et al. (2018) commented, results are inconclusive due to lack of rigorous research designs. This review suggested that yoga was effective regardless of the sample size or research design. Both Lemay et al. (2021) and Sulastris et al. (2021) used quasi-experimental designs and had small sample sizes, but the results were statistically significant. Credibility of the current review was enhanced by only including studies with validated anxiety assessment scales, i. e. Beck Anxiety Inventory, State-Trait Anxiety Inventory, Hamilton Anxiety Rating Scale. An exception was Simon et al. (2020) who used a Clinical Global Impression of Improvement scale (CGI-I) conducted by an independent evaluator. The CGI-I is commonly used in psychiatry and has been validated (Forkmann et al., 2011).

Recommendations

The evidence for the efficacy remains inconclusive. While this review found that except for Vinyasa, yoga had a beneficial effect on anxiety, Cramer et al. (2018) and Volbehr et al. (2018) did not. Therefore, yoga as a first-line therapy should be recommended with caution. With respect to future research directions, this review confirms the conclusion drawn by Cramer et al. (2018) and Volbehr et al. (2018) that more well-designed studies with larger samples are needed. Other issues in need of further examination are the impact of yoga on different types of anxiety and different levels of anxiety. Kirkwood et al. (2005) found that yoga was effective with specific types of anxiety, such as obsession compulsive disorder and snake anxiety, and suggested that research that focussed on specific types of anxiety might produce clearer results.

Limitations and Strengths of the Study

Limitations of the Study

As mentioned above, Cramer et al. (2018) stated that systematic reviews and meta-analyses on yoga and anxiety tend to have a higher risk of bias, and this systematic review is no exception. Few studies have been published between 2017 and 2022 that fit the criteria of the PICO statement and the sample sizes were small. Participant blinding is not possible in a yoga class. Three of the studies were nonrandomised and had no control groups (Lemay et al., 2021; Sulastris et al., 2021; Telles et al., 2019). As with previous systematic reviews, the current study includes research with varying levels of evidence and small sample sizes. Yoga is an ancient multi-dimensional practice and encompasses practical aspects, such as breathing techniques and poses, and more spiritually oriented aspects, such as the underlying philosophy, that are not as easily quantifiable. The content of the yoga classes was not always well- described and, in any case, would vary by instructor. The studies that included long term data did not specify how and if yoga was practiced during the follow-up periods. Except for Telles et al. (2019), women were over-represented in the studies. All the above limitations compromise the generalisability of the results.

Conclusions

There are not enough well-designed studies on the effect of yoga on anxiety to draw conclusive evidence. The results could be improved if the heterogeneity of anxiety type and yoga form were better addressed. For example, studies that included only Hatha yoga and the sample only included those diagnosed with obsessive-compulsive disorder, could produce clearer results.

Conflict of interest

The authors declare that they have no conflicts of interest.

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