Review Article

Open Access

CrossMark

The benefits of yoga as an intervention for depression: a meta–analysis

Abstract

Depression is a major societal issue that affects a large proportion of the population. Yoga has been introduced as a viable alternative approach to reduce symptoms. While prior studies have used meta–analysis to examine the benefits of yoga for depression, these studies incorporated a small number of studies and were limited in their ability to conduct a sub–group analysis. The purpose of this study was to quantify the effect size of yoga in the treatment of depression. Inclusion criteria included experimental, quasi–experimental, and feasibility studies that examined yoga with physical postures (asanas) as a treatment for depression. Nine moderator variables were examined including type of yoga, components of yoga (i.e., breathing, meditation, or relaxation), experience of yoga instructor, depression diagnosis, type of comparison group, research design, and length of treatment. Risk of bias was assessed using the Jadad instrument. Electronic databases were used to identify studies, and the search concluded on January 31st, 2022. A total of 152 studies (150 articles) met the inclusion criteria in this meta–analysis with 8210 participants assessed. The overall weighted effect size of yoga for treatment of depression was Hedges' $g = 0.55$ (95% CI 0.44–0.65), demonstrating a medium effect. Meta–regression and subgroup analyses found larger effect sizes as the amount of yoga practiced increased, when relaxation was practiced, and when participants had been clinically diagnosed with depression. Funnel plot and trim–and–fill procedure found little evidence of publication bias and the fail–safe number was 21783. These results demonstrate that yoga is an effective integrative approach in the treatment of depression. This study was limited by the methodological quality of the individual studies that make up the larger analysis, including participants who were not blind to the procedure and a failure to report withdrawals and dropouts.

Keywords: asanas, depression, complementary and alternative medicine, mind–body intervention, moderator analysis

Michael C. Rhoads,[1] Nels Grevstad,[1] Rena A. Kirkland,[2] Madison E. Barber,[1] Shannon Myers,[1] & Traci Lundstrom[1]
[1]Department of Psychological Sciences, Metropolitan State University of Denver, USA
[2]Psychology Department, Adams State University, USA

Correspondence: Michael Rhoads, Department of Psychological Sciences, Metropolitan State University of Denver, 890 Auraria Pkwy, Denver, Colorado, 80204, USA, Tel 303–615–1056, Email mrhoads@msudenver.edu

Abbreviations: RCT, randomized controlled trial; PRISMA preferred reporting items for systematic reviews and meta–analyses; IG, independent groups; PP, pretest/posttest; PPC, pretest/posttest with control; IRQ, interquartile range; CIs, confidence intervals; ES, effect size; SE, standard error

Introduction

Psychological disorders are a rampant global problem, with mental illness accounting for one–third of global disability.[1] In a national survey of U.S. adults, the lifetime prevalence of major depressive disorder was estimated at 20.6%.[2] During the COVID–19 pandemic, prevalence of depression rose from 3% to 25% globally.[3] Drug therapy is a standard treatment approach which commonly serves to treat the symptoms of depression but does not fully treat or cure the disorder. Thus, individuals may benefit from the addition of a complementary or alternative therapy.[4] A growing body of research has examined integrative and complementary medicine in the treatment of psychological disorders. For instance, yoga has been examined as an approach to enhance the efficacy of mental health interventions.

Yoga as an intervention

The first written records of yoga date back to 200 BC in Yogasutra of Patanjali.[5] Traditionally, the goal of yoga was to unite mind, body, and spirit.[6] In addition to the growing popularity of yoga, the scientific study of yoga practice has burgeoned over the past few decades. Yoga is sometimes used as a mind–body intervention for the treatment of depression. Prior systematic reviews have been conducted on the benefits of yoga for depression.[7,8,9,10,11,12] Of these, three are meta–analyses.[7,8,10] These meta–analyses, however, focused on randomized

controlled trials (RCTs) and excluded observational studies. While RCT's are considered the gold–standard in research methodology, there are several reasons why including non–RCT studies is advantageous. First, though RCTs theoretically reduce selection bias and confounding variables compared to non–RCTs, there is evidence that observational studies do not always overestimate treatment effects compared to RCTs.[13,14] Second, since observational studies are not always more prone to bias, excluding non–RCTs lowers the precision of the estimated effect. Third, if study design is related to differences in effect sizes, then it is important to identify such discrepancies to make recommendations for future research. Finally, excluding studies limits the ability to examine potential moderator variables. Moderator analysis assesses the relationship between one or more covariates and an effect size.[15] By identifying significant moderator variables, future research can be better informed and mental health treatments can be implemented more effectively. Therefore, non–RCTs were included with the goal of obtaining a more comprehensive estimate of the population effect size, to examine whether RCTs versus non–RCTs produce different effects, and to examine potential moderator variables.

Moderators

The following moderators were examined: type of yoga practiced, whether yoga included breathing, meditation, or relaxation, expertise of yoga instructor, depression diagnosis, type of comparison group, type of research design, and length of treatment. The nuances of yoga practice (i.e., type, frequency, and expertise of instructor) were selected for examination because a few studies have examined whether there are differential impacts when yoga is focused on

breathing (*pranayama*), relaxation, or meditation. Qi et al. (2020) found that college students benefited more from practicing yoga with a focus on breathing compared to yoga with a focus on meditation.[16] In a review, researchers reported that improvements in blood pressure were only found when all three components of yoga were practiced (breathing, postures, and meditation).[17] The research, however, has been insufficient in determining which aspect of yoga is most impactful for alleviating depression. The second moderator examined the experience of the yoga instructor; this moderator was included based on findings that yoga with a trained instructor was more effective compared to yoga practiced at home for treating trauma.[18] Examining whether there are any moderating effects based on the type of yoga, expertise of yoga instructor, and the amount of yoga practiced has important implications for making appropriate recommendations.

Based on previous meta–analytic findings, the current study examined whether the type of depression diagnosis moderated the effect of yoga. A meta–analysis by Cramer et al.[19] examined yoga as a treatment for anxiety. Findings indicated that when individuals were diagnosed by Diagnostic and Statistical Manual criteria there was no effect, but a small effect was found for diagnosis by other methods or when participants experienced symptoms without a diagnosis. Finally, as previously described, RCTs and non–RCTs were included to examine whether the research design moderated the impact of the yoga intervention. Prior meta–analyses that have examined the impact of yoga on depression have excluded non–RCTs; therefore, the current study has the benefit of examining whether the mean effect size differs based on study design.

Aim and objectives

The aim of this study was to determine the effectiveness of yoga in the treatment of depression. After a review of the literature, it was hypothesized that yoga is more effective under the following circumstances:

1. When more strenuous forms of yoga are practiced.

2. When yoga included breathwork (compared to no focused breathwork).

3. When yoga included meditation (compared to no focused meditation).

4. When yoga included relaxation (compared to no focused relaxation).

5. When yoga instructors who have more expertise are utilized.

6. When yoga is practiced for a longer duration.

7. When participants do not have a clinical diagnosis.

8. When compared to a no–treatment control group (e.g., wait list control group).

9. In non–RCT studies compared to RCT studies.

Material and methods

A meta–analysis was conducted which is often considered a superior approach compared to systematic or narrative reviews because the meta–analytic approach calculates a mean effect size[15] and provides a more precise estimate of the magnitude of an effect compared to a single study. The Preferred Reporting Items for Systematic Reviews and Meta–Analyses (PRISMA) guidelines[20] were followed and this study was prospectively registered with the PROSPERO database (ID: CRD42020221400).

Literature search

The following electronic databases were searched to find published and nonpublished studies: Academic Search Premier, Google Scholar, PsycINFO, PubMed, and SportDiscus. The following key terms were used: *yoga, yoga therapy, yoga intervention, depression*. Studies were also located through a process of backward searching (i.e., using references of articles to track down older studies) and forward searching (i.e., entering the citation for an article into Google Scholar and selecting "as cited by" to locate newer studies). The search ended on January 31st of 2022.

Inclusion criteria

In guiding the selection of articles to be included in this meta–analysis, the following inclusion criteria were utilized:

1. The study had to examine yoga related to the treatment of depression.

2. The study had to implement a yoga program that involved physical postures (asanas).

3. The study had to be an experimental design, quasi–experimental design, or a feasibility study with an experimental condition and a control condition.

4. Manuscripts needed to have the necessary statistical values to compute effect sizes (e.g., sample sizes, sample means, and sample standard deviations).

5. The study had to be in English for the authors to read, code, and interpret the data.

An article inclusion flowchart is provided for a visual representation of the articles that were included in this meta–analysis (Figure 1). Using the above procedures, 150 papers were identified that met the inclusion criteria and 152 studies were included in the final analysis.
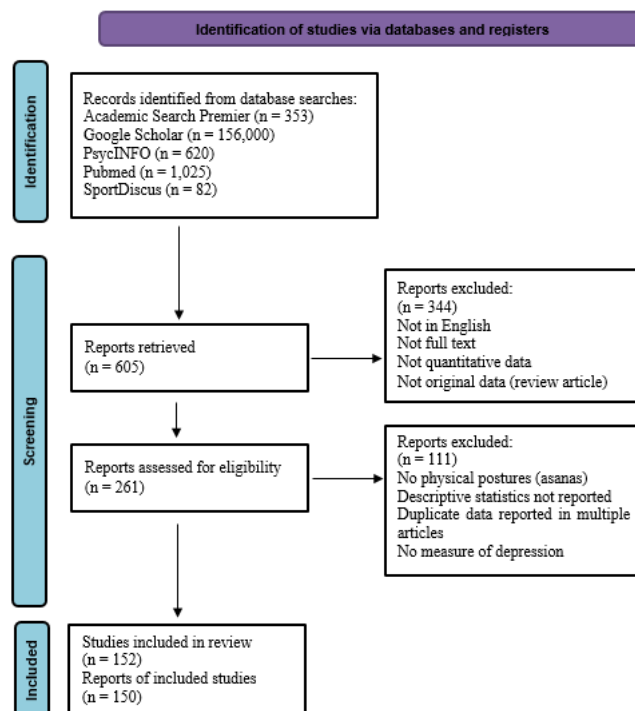

Figure 1 PRISMA Article Inclusion Flowchart.

Inter–rater reliability

To evaluate the accuracy of the coded variables, inter–rater reliability was analyzed. All variables were coded by the first author and by research assistants. After coder training was completed, the initial inter–rater agreement was 95%, with Cohen's kappa = .89. This initial reliability assessment using kappa is considered an "almost perfect" strength of agreement.[21] All discrepancies were resolved between coders until 100% rater agreement was achieved.

Study coding procedures

Classifying the characteristics of the yoga program was the first step in the coding process (see Table 1). The first moderator variable coded was the type of yoga utilized. In the first round of coding, the exact type of yoga was recorded. Next, the most common types of yoga that appeared in the literature were identified. The five emergent categories were Swami Vivekananda Yoga, the Inner Resources Program, Kripalu, Iyengar, and Bikram yoga. A sixth "other" category was labeled for types of yoga that were not developed for the research study, or only appeared once in the literature. Further, each study was coded for whether the yoga practice focused on breathing, relaxation, or meditation.

The second moderator variable was the yoga instructor's level of expertise. Four categories were identified for this variable, including: 1) expertise not specified; 2) certification indicated, but hours of training not stated; 3) certified instructor with 200 hours of training; and 4) certified instructor with 500 hours of training or 5 years of teaching experience. The third moderator was length of treatment (how many hours yoga was practiced). This was calculated by multiplying session length with number of sessions.

Additionally, the type of depression diagnosis and the control group were coded. For depression diagnosis, studies were classified as including participants who were clinically depressed if this was used as the criterion for participation, versus studies where participants were not selected based on this criterion. For the type of control group, the possibilities included: 1) no–treatment (e.g., wait list or placebo control); 2) a comparison group (some alternative treatment was provided; e.g., psychoeducation, drug therapy, exercise); or 3) repeated measures (a pre–test post–test design was used in which participants served as their own controls). The final moderator variable coded for was whether the studies were RCTs versus non–RCTs.

Following procedures utilized by Wang et al.,[172] methodological quality of each article was coded using the Jadad instrument (1996),[173] which evaluates randomization, blinding, and withdrawals/dropouts. Finally, the statistical values necessary to calculate effect sizes were coded. These values included the means, standard deviations, and sample sizes (n) of the experimental and control groups.

Statistical procedures

For each study, an effect size, which is a standardized difference in means, and its variance were calculated. The effect size and its variance are computed differently depending on the study design. The study designs fell into three categories:

1. Independent groups (IG). Each participant was included in one of two groups (experimental or control), but not both, and there were only post–intervention scores for the experimental group. Nine studies used this design.[81,94,99,118,129–131,144,152]

2. Pretest/Posttest (PP). Participants formed a single group with repeated measures (pre– and post–intervention). Thirty–five studies used this design.[24,25,27,31,46,49,52,54,55,60,63,77, 78,84,87,93,95,101,109-112,119,122, 123,128,143,146,148,150,154,162–164,170]

3. Pretest/Posttest with Control (PPC). Each participant was included in one of two groups (experimental or control) with repeated measures (pre– and post–intervention) in both groups. One hundred six studies used this design.[22,23,26,28-30,32-45,47,48,50,51,53,56-59,61,62,64-76, 79,80,82,83,85,86,88-92,96-98,100,102-108,113-117,120,121,124-127,132-142,145,147,149,151,153,155-161,165-169,171]

For IG studies, the effect size was Hedges g, which is the difference between the group means divided by the pooled standard deviation and corrected for bias.[15] For PP studies, the standardized mean change using the pre–intervention standard deviation was used, correcting for bias.[174] For PPC studies, the effect size was the difference between the bias–corrected standardized mean change for the treatment and control groups.[175] In each case, a positive effect size corresponds to a favorable outcome.

For repeated measures studies (PP and PPC), the variance of the effect size decreases as the within–subject correlation between pre– and post–intervention depression scores, r_1, increases.[15] Furthermore, 14 studies reported multiple measures of depression for each participant.[25,28,35,39,65,76,96,99,113,114,119,135,138,154] For each of these studies, the measure–specific effect sizes were averaged to obtain one combined effect size per study as recommended in the literature.[15] The variance of the combined effect size for these studies increases as the within–subject correlation between different measures of depression, r_2, increases.[15] Because neither r_1 nor r_2 was reported in any of the studies, $r_1 = 0.5$ and $r_2 = 0.5$ were used, and a sensitivity analysis was conducted to assess the impact of these choices on the meta–analysis results.

Ray et al.[136] reported results separately for males and females, and Streeter et al.[148] reported results separately for two different yoga dose groups. Each of these articles were treated as two separate studies in the meta–analysis; one for males and the other for females (Ray et al.), and one for low–dose and the other for high–dose (Streeter et al.), as recommended by other authors.[15] Chan et al.[40] and Pruthi et al.[130] reported the interquartile range (IQR) instead of the standard deviation. The standard deviations were approximated using the IQRs divided by 1.35 (based on the normal distribution ratio).

The overall summary effect was computed by fitting a random effects model (without moderator variables) to the primary studies' observed effects, and the null hypothesis of no overall effect was tested using the corresponding z test.[15] Heterogeneity (variation in observed effect sizes beyond that due to sampling error) was quantified using the statistic T^2. Heterogeneity was tested for using Cochran's Q test of whether T^2 differed significantly from zero.[15]

To assess the potential impact of heterogeneity in the meta–analysis, the I^2 statistic was used, which represents the percentage of the variation in observed effect sizes that is due to heterogeneity rather than sampling error.[15] To determine which of the nine moderator variables contribute to heterogeneity, subgroup and meta–regression analyses were performed. These are analogous to ANOVA and regression on the observed effect sizes. The null hypothesis that the effect size is the same across different levels of the moderator variable (i.e., across different subgroups of studies or different numbers of total session hours) was tested using the Wald Q test (subgroup analyses) and the z test (meta–regression).[15]

Publication bias was examined using three methods. First, a funnel plot of the 152 studies was produced. A funnel plot examines whether

there is evidence that studies with small sample sizes were less likely to be published.[176] Second, a trim–and–fill procedure was conducted using the R_0 statistic.[177,178] The trim–and–fill procedure provides an estimate of the number of studies missing from the funnel plot and provides a test of the null hypothesis that the number of missing studies is zero. Third, Rosenberg's fail–safe n, which provides an estimated number of studies with no effect that would reduce the mean effect size to non–significance, was calculated.[179] For all hypothesis tests, statistical significance was assessed using alpha level of .05. The meta–analysis was carried out in R using the "metafor" package.[180]

Results

The observed effect size and characteristics of each study appear in Table 1, and the caterpillar plots in Figures 2 and 3 show the effect sizes with 95% confidence intervals (CIs). The overall mean effect size, based on the fitted random effects model, is $g = 0.55$ ($SE = 0.05$) with 95% CI 0.44–0.65. This is statistically significantly different from zero based on the z test ($z = 10.3$, $p < .001$).
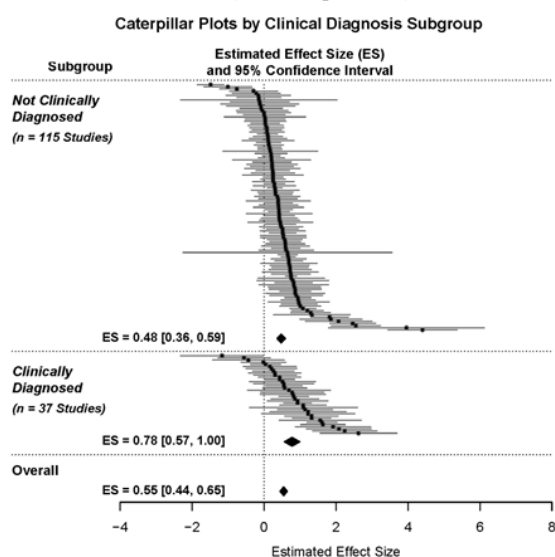

Figure 2 Caterpillar plots of the 152 primary studies split into clinical diagnosis subgroups.
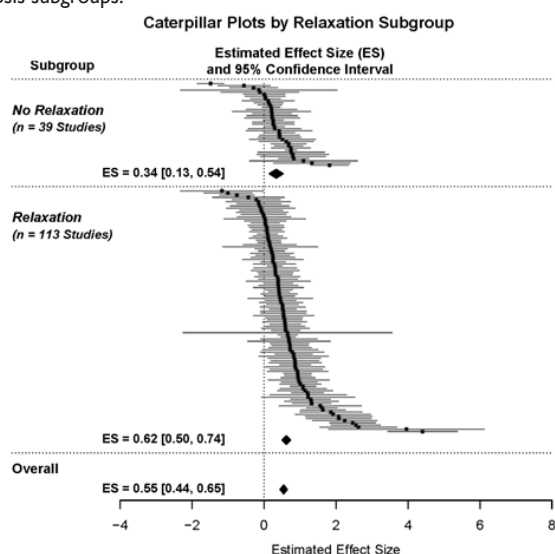

Figure 3 Caterpillar plots of the 152 primary studies split into relaxation subgroups.

Heterogeneity

The Q test for heterogeneity indicates statistically significant variation in the observed effect sizes beyond variation due to random sampling error ($Q = 695.7$, $df = 151$, $p < .001$). The percentage of variation in observed effects that is due to heterogeneity rather than sampling error is $I^2 = 83.1\%$.

Risk of bias

Methodological Quality was assessed using the Jadad Instrument.[173] Each study was evaluated for randomness, blinding, and attrition and given a final rating of 0–3 (with a high score indicating low risk of bias). The risk of bias assessment for each study is presented in table 1. The mean rating score was 1.5, indicating that on average, studies would benefit from using more rigorous methodological procedures to reduce the risk of bias.

Subgroup and meta–regression analyses

Because there is a statistically significant level of heterogeneity, subgroup and meta–regression analyses were performed on the primary studies' observed effect sizes to identify sources of the heterogeneity.[181] Both relaxation and clinical diagnosis of depression were found to be statistically significant contributors to heterogeneity in effect sizes. The mean effect size was larger for studies that utilized relaxation than for those that did not (0.62 vs 0.34, respectively, $Q = 5.5$, $p = 0.019$). The mean effect size was larger for studies whose participants were clinically diagnosed with depression than for studies whose participants were not clinically diagnosed (0.78 vs 0.48, respectively, $Q = 6.0$, $p = 0.014$). Table 2 lists the results of the subgroup analyses for all eight qualitative moderator variables. The meta–regression indicates the effect size increases statistically significantly with the length of treatment ($\hat{\beta}_1 = 0.005$, $SE = 0.001$, $z = 3.65$, $p < .001$). A scatterplot of the meta–regression results appears in Figure 4.
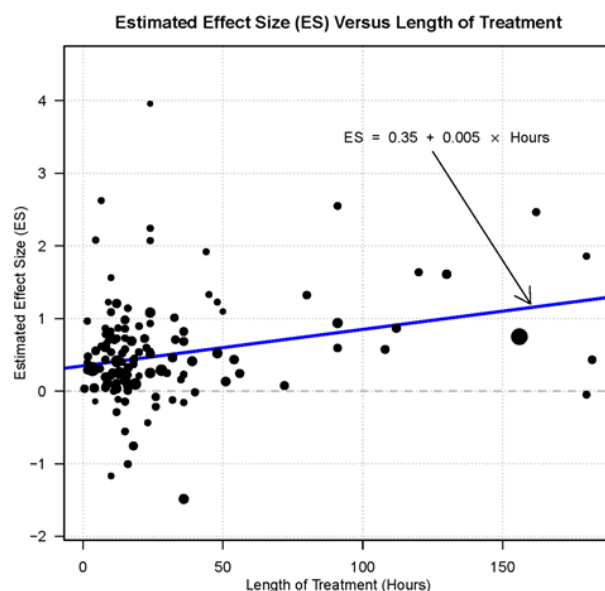

Figure 4 Scatterplot of the Meta-Regression for Effect Size versus Length of Treatment.

Publication bias assessment

The funnel plot in Figure 5 shows very little tendency for studies with larger standard errors (smaller sample sizes) to be missing due

to null findings (i.e., no evidence for publication bias). Although the trim–and–fill procedure produced an estimate of three missing studies on the left side of the funnel plot (*SE* = 2.83), the corresponding

hypothesis test found no significant evidence that the actual number of missing studies is different from zero (*p* = 0.063). The fail–safe *n*, using Rosenberg's method, was found to be 21782.

Table 2 Subgroup Analysis Results

| Moderator Variable	*n*	Subgroup	Mean ES	SE	95% Confidence Interval		Wald Q Test	
					From	To	Q (df)	*p*-value
Type of Yoga	114	Other	0.51	0.06	0.39	0.63	12.4 (6)	0.054
	11	Swami Vivekananda Yoga	1.02	0.19	0.64	1.41		
	2	Inner Resources Program	0.49	0.47	-0.43	1.42		
	5	Kripalu	0.07	0.27	-0.46	0.60		
	17	Iyengar	0.74	0.17	0.41	1.07		
	1	Bikram Yoga	0.66	0.57	-0.46	1.77		
	2	Kundalini	0.02	0.44	-0.84	0.88		
Breathing	18	No breathing	0.46	0.16	0.15	0.77	0.35 (1)	0.551
	134	Breathing	0.56	0.06	0.45	0.67		
Meditation	38	No meditation	0.52	0.11	0.31	0.73	0.08 (1)	0.780
	114	Meditation	0.56	0.06	0.44	0.67		
Relaxation	39	No relaxation	0.34	0.10	0.13	0.54	5.50 (1)	0.019
	113	Relaxation	0.62	0.06	0.50	0.74		
Yoga Instructor's Expertise	40	No certification	0.59	0.10	0.39	0.79	7.02 (3)	0.071
	72	Hours not stated	0.58	0.08	0.43	0.73		
	22	200+ hours of training	0.23	0.14	-0.03	0.50		
	18	500+ hours of training	0.72	0.15	0.42	1.03		
Diagnosis of Depression	115	Not clinical	0.48	0.06	0.36	0.59	5.99 (1)	0.014
	37	Clinical	0.78	0.11	0.57	1.00		
Type of Control Group	54	No Treatment	0.50	0.09	0.33	0.67	3.30 (2)	0.192
	61	Comparison Group	0.48	0.09	0.31	0.65		
	37	Repeated Measures	0.71	0.10	0.50	0.91		
Study Design	115	Non-RCT	0.59	0.09	0.42	0.77	0.43 (1)	0.510
	37	RCT	0.52	0.07	0.39	0.65		
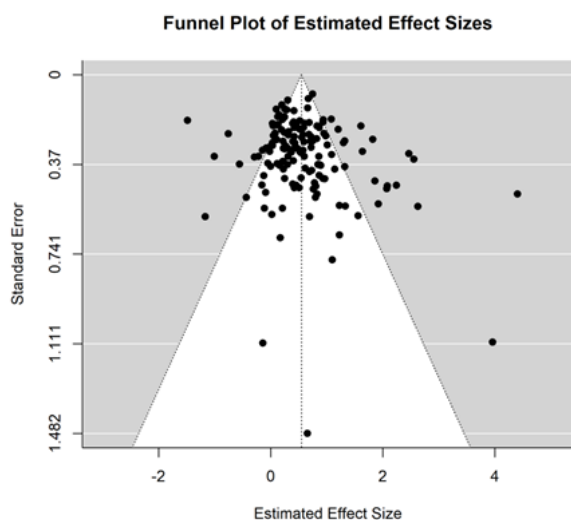
Figure 5 Funnel plot of the 152 primary studies.

Sensitivity analysis

All but nine of the studies included in the meta–analysis used a repeated measures study design (PP or PPC). To determine the sensitivity of the meta–analysis results to the assumption of a within–subject correlation value $r_1 = 0.5$, the analysis was repeated using $r_1 = 0.2$ and $r_1 = 0.8$. In both cases, the overall effect, and subgroup and meta–regression analyses results remained essentially unchanged.

Only 14 studies reported multiple different measures of depression for each participant. To determine the sensitivity of the meta–analysis results to the assumption of a within–subject correlation value of $r_2 = 0.50$, the analysis was repeated using $r_2 = 0.20$ and $r_2 = 0.80$. The results were again found to be essentially unchanged.

Discussion

This meta–analysis provides evidence for the efficacy of yoga in the treatment of depression. A mean effect size of $g = 0.55$ was found with a 95% confidence interval of 0.44–0.65. According to standards outlined by Cohen,[182] this is classified as a medium effect suggesting that yoga has a moderate effect for treating depression. The relatively narrow confidence interval suggests the estimated mean effect size does not contain a high degree of variance and that the true effect is likely to be moderate.

Nine potential moderating variables were examined: type of yoga practiced, components of yoga, expertise of yoga instructor, depression diagnosis, type of comparison group, research design, and length of treatment. Three significant moderators were found. First, the effect was larger when yoga was practiced with a focus on relaxation compared to studies without a stated focus on relaxation. Though other authors have suggested that breath work is particularly helpful for reducing depression symptoms,[183] the moderator analysis in the current study did not demonstrate differential effects of breathing or meditative components of yoga practice. Second, the prediction was that yoga would be more impactful for non–clinically diagnosed participants; however, the analysis demonstrated the opposite effect. Three possible reasons that yoga was found to be more impactful for clinically depressed individuals include: another variable could be

confounded with diagnosis; regression to the mean; or the true effect is larger for individuals clinically depressed compared to individuals with milder symptoms.

The third significant moderator indicated the mean effect size was larger when higher amounts of yoga were practiced. This finding aligns with the prediction based on prior research showing a relationship between total number of hours practicing yoga and treatment benefits for depression.[78,7] The relationship between duration of yoga training and intervention efficacy has also been found in the treatment of anxiety.[184] Furthermore, Harkess and colleagues[185] suggested that a minimum of once–a–week hour–long yoga sessions for a period of 8 weeks is necessary for treating chronic stress in nonclinical populations.

The remaining moderator variables were not significant, which could be the result of a low number of studies in some of the categories (e.g., for type of yoga, some categories only had one or two studies). It is possible, however, that these moderators do not play a role in the efficacy of yoga in treating depression. It is important to point out that there was no moderating effect based on RCTs versus non–RCT's. To the author's knowledge, this is the first meta–analysis of yoga interventions to include non–RCT's.

No evidence of publication bias, which occurs when studies with null findings are not published either due to author inaction or editor dismissal, was found. The funnel plot and trim–and–fill procedure did not show evidence of studies with small sample sizes being unpublished. Rosenberg's fail–safe number was 21782, indicating that more than twenty thousand studies with an average effect size of zero would have to be added to the analysis before the overall summary effect would become statistically nonsignificant. In other words, because it is unlikely that more than twenty thousand studies went unpublished, it is highly unlikely that the observed mean effect size is due to publication bias. Borenstein et al.[15] suggested that a goal of a publication bias assessment should be to classify the bias into one of three categories: (a) where the impact of the bias is trivial; (b) where the impact is not trivial, but the major finding is still valid; and (c) where the major finding might be called into question. Based on the trim–and–fill and fail–safe *n* of this meta–analysis, the bias falls into category a. Therefore, the impact of publication bias appears to be trivial and does not appear to have influenced the finding that yoga can have a positive effect on depression.

Limitations

Because this meta–analysis combines studies that used varying measures, study designs, and populations, some might argue it is inappropriate to lump together such discrepant studies. As Gotzsche[186] noted, researchers can be categorized as "lumpers" and "splitters." The intention of this analysis was to lump together all available studies to increase the power to examine potential moderator variables. It is acknowledged that some researchers may not share this ideological approach to conducting a meta–analysis. Additionally, the results of meta–analyses are limited by the quality of the individual studies.[187] Therefore, the results are limited by methodological weaknesses that may exist within the various studies, such as participants who were not blind to the procedure and a failure to report withdrawals and dropouts.[173]

Future research

While the current study found a larger effect for treating depression when yoga was focused on relaxation, future research

should further explore whether various aspects, or "limbs," of yoga are more impactful for improving mood. Further, more research is needed to understand the psychological and biological mechanisms of change that occur from practicing yoga and why they are related to improving depression symptoms. Several authors have hypothesized that yoga may decrease depression due to improvements in autonomic nervous system regulation.[188,189] The current study found that yoga was more beneficial when focused on relaxation, which may be due to the increased parasympathetic response; however, this hypothesis needs to be further explored. Other underlying mechanisms that have been hypothesized include changes in brain chemistry and decreased inflammation.[190] Despite some progress in examining mechanisms, more research is needed to understand how yoga reduces depression symptoms.

Two additional areas that warrant further investigation are studies examining the efficacy of yoga for children and adolescent samples and long–term follow–up studies. While some studies have examined the impact of yoga on quality–of–life measures for youth,[191] yoga should be further explored for treating a wide range of mental health challenges for children and adolescents. In addition, more research about the long–term benefits of yoga practice is needed. It is recommended that researchers report remission rates. Currently, few yoga studies were found to have reported long–term follow–up data.[7]

There is a growing use of yoga therapy which entails working with a practitioner who has received specialized training to increase a client's self–awareness and redirect energy.[192] Yoga therapy involves a yoga therapist whereas yoga as an intervention involves a yoga teacher. Further, there have been recent efforts to examine the use of psychotherapy in conjunction with a yoga intervention.[77] Kenny[193] described the blending of these two therapeutic approaches. Presumably, the combination of these two therapeutic approaches might produce even greater benefits to the patient.[194] It would be beneficial to examine the relative efficacy of three types of yoga interventions: yoga intervention, yoga in conjunction with psychotherapy, and yoga intervention without a specialized practitioner.

Policy and practice

Beyond informing future research, this study can help to inform social, political, and organizational policy. The significant effect of yoga for treating depression means that such a treatment approach should be taken seriously. Based on the meta–analytic findings of this study, mental health professionals are encouraged to utilize yoga as an integrative or complementary approach to intervention. Along with this, insurance companies would be wise to pay for yoga interventions for depression, and universities and institutions should consider training mental health care providers in the implementation of yoga. Finally, politicians should enact legislation that fosters the availability of holistic health treatments such as yoga.

Conclusion

In sum, the meta–analysis of 152 independent studies (*n* = 8210) that examined yoga practice for reducing depression produced a moderate mean effect size (*g* = .55). The 95% confidence interval 0.44–0.65 suggests that the true mean value in the population is likely to be moderate. These findings indicate that yoga is effective for reducing depression symptoms and should be considered as an integrative treatment. Three of the nine moderator variables examined were significant. The effect was larger when yoga was focused on relaxation, for individuals with a clinical diagnosis, and when treatment occurred for longer amounts of time.

Acknowledgments

Conflicts of interest

The authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

References

1. Vigo D, Thornicroft G, Atun R. Estimating the true global burden of mental illness. *Lancet Psychiatry*. 2016;3(2):171–178.

2. Hasin DS, Sarvet AL, Meyers JL, et al. Epidemiology of Adult DSM–5 Major Depressive Disorder and its specifiers in the United States. *JAMA Psychiatry*. 2018;75(4):336–346.

3. Bueno–Notivol J, Gracia–García P, Olaya B, et al. Prevalence of depression during the COVID–19 outbreak: A meta–analysis of community–based studies. *Int J Clin Health Psychol*. 2021;21(1):100196.

4. Astin JA, Marie A, Pelletier KR, et al. A review of the incorporation of complementary and alternative medicine by mainstream physicians. *Arch Intern Med*. 1998;158(21):2303–2310.

5. Singh K. Religions of India: Hinduism, Jainism, Buddhism, Sikhism, Zoroastrianism, Christianity, Islam, Judaism. New Delhi: Clarion Books; 1983.

6. Iyengar BS. Light on Yoga. New York, NY: Schocken Books; 1966.

7. Brinsley J, Schuch F, Lederman O, et al. Effects of yoga on depressive symptoms in people with mental disorders: A systematic review and meta–analysis. *Br J Sports Med*. 2021;55(17):992–1000.

8. Cramer H, Lauche R, Langhorst J, et al. Yoga for depression: A systematic review and meta–analysis. *Depress Anxiety*. 2013;30(11):1068–1083.

9. Cramer H, Anheyer D, Lauche R, et al. A systematic review of yoga for major depressive disorder. *J Affect Disord.* 2017;213:70–77.

10. Gong H, Ni C, Shen X, et al. Yoga for prenatal depression: A systematic review and meta–analysis. *BMC Psychiatry*. 2015;15:14.

11. Mehta P, Sharma M. Yoga as a complementary therapy for clinical depression. C*omplement Health Pract Rev*. 2010;15(3):156–170.

12. Pilkington K, Kirkwood G, Rampes H, et al. Yoga for depression: The research evidence. *J Affect Disord*. 2005;89(1–3):13–24.

13. Benson K, Hartz AJ. A comparison of observational studies and randomized, controlled trials. *N Engl J Med*. 2000;342(25):1878–1886.

14. Concato J, Shah N, Horwitz RI. Randomized, controlled trials, observational studies, and the hierarchy of research designs. *N Engl J Med*. 2000;342:1887–1892.

15. Borenstein M, Hedges LV, Higgins JT, et al. Introduction to meta–analysis. Chichester, UK: Wiley; 2009.

16. Qi X, Tong J, Chen S, et al. Comparing the psychological effects of meditation– and breathing–focused yoga practice in undergraduate students. *Front Psychol*. 2020;11:560152.

17. Hagins M, States, R, Selfe, T, et al. Effectiveness of yoga for hypertension: Systematic review and meta–analysis. *Evid Based Complementary Altern Med*. 2013;2013:649836.

18. Macy RJ, Jones E, Graham LM, et al. Yoga for trauma and related mental health problems: A meta–review with clinical and service recommendations. *Trauma Violence Abuse*. 2018;19(1):35–57.

19. Cramer H, Lauche R, Anheyer D, et al. Yoga for anxiety: A systematic review and meta–analysis of randomized controlled trials. *Depress Anxiety*. 2018;35(9):830–843.

20. Moher D, Liberati A, Tetzlaff J, et al. Preferred reporting items for systematic reviews and meta–analyses: The PRISMA statement. *PLoS Med*. 2009;6(7):e1000097.

21. Landis JR, Koch GG. The measurement of observer agreement for categorical data. *Biometrics*. 1977;33(1):159–174.

22. Afonso RF, Hachul H, Kozasa EH, et al. Yoga decreases insomnia in postmenopausal women: a randomized clinical trial. *Menopause*. 2012;19(2):186–193.

23. Banerjee B, Vadiraj HS, Ram A, et al. Effects of an integrated yoga program in modulating psychological stress and radiation–induced genotoxic stress in breast *cancer* patients undergoing radiotherapy. *Integr Cancer Ther*. 2007;6(3):242–250.

24. Bartels L, Oxman LN, Hopkins A. "I would just feel really relaxed and at peace": Findings from a pilot prison yoga program in Australia. *Int J Offender Ther Comp Criminol*. 2019;63(15–16):2531–2549.

25. Bennett SM, Weintraub A, Khalsa SS. Initial evaluation of the LifeForce Yoga Program as a therapeutic intervention for depression. *Int J Yoga Therapy*. 2008;18:49–57.

26. Bershadsky S, Trumpfheller L, Kimble HB, et al. The effect of prenatal Hatha yoga on affect, cortisol and depressive symptoms. *Complement Ther Clin Pract*. 2014;20(2):106–113.

27. Bhomavat M. Effect of Raja Yoga on depression and anxiety. *Indian J of Ment Health*. 2015;2(3):291–294.

28. Bieber M, Görgülü E, Schmidt D, et al. Effects of body–oriented yoga: a RCT study for patients with major depressive disorder. *Eur Arch Psychiatry Clin Neurosci*. 2021;271(7):1217–1229.

29. Bonura KB. The impact of yoga on psychological health in older adults [dissertation on the internet]. Tallahassee (FL): Florida State University; 2007.

30. Bonura KB, Pargman D. The effects of yoga versus exercise on stress, anxiety, and depression in older adults. *Int J Yoga Therapy*. 2009;19(1):79–89.

31. Boulgarides LK, Barakatt E, Coleman–Salgado B. Measuring the effect of an eight–week adaptive yoga program on the physical and psychological status of individuals with Parkinson's disease. A pilot study. *Int J Yoga Therap*. 2014;24:31–41.

32. Bowden D, Gaudry C, An SC, Gruzelier J. A comparative randomised controlled trial of the effects of brain wave vibration training, iyengar yoga, and mindfulness on mood, well–being, and salivary cortisol. *Evid Based Complement Alternat Med*. 2012;2012:234713.

33. Bower JE, Garet D, Sternlieb B, et al. Yoga for persistent fatigue in breast *cancer* survivors: A randomized controlled trial. *Cancer*. 2012;118(15):3766–3775.

34. Butler LD, Waelde LC, Hastings TA, et al. Meditation with yoga, group therapy with hypnosis, and psychoeducation for long–term depressed mood: A randomized pilot trial. *J Clin Psychol*. 2008;64(7):806–820.

35. Buttner MM, Brock RL, O'Hara MW, et al. Efficacy of yoga for depressed postpartum women: A randomized controlled trial. *Complement Ther Clin Pract*. 2015;21(2):94–100.

36. Butzer B, LoRusso A, Shin SH, et al. Evaluation of yoga for preventing adolescent substance use risk factors in a middle school setting: A preliminary group–randomized controlled trial. *J Youth Adolesc*. 2017;46(3):603–632.

37. Carei TR, Fyfe–Johnson AL, Breuner CC, Brown MA. Randomized controlled clinical trial of yoga in the treatment of eating disorders. *J Adolesc Health*. 2010;46(4):346–351.

38. Carter JJ, Gerbarg PL, Brown RP, et al. Multi–component yoga breath program for Vietnam veteran post–traumatic stress disorder: randomized controlled trial. *J Trauma Stress Disor Treat*. 2013;2(3):1–10.

39. Čekanauskaitė A, Skurvydas A, Žlibinaitė L, et al. A 10–week yoga practice has no effect on cognition, but improves balance and motor learning by attenuating brain–derived neurotrophic factor levels in older adults. *Exp Gerontol*. 2020;138:110998.

40. Chan W, Immink MA, Hillier S. Yoga and exercise for symptoms of depression and anxiety in people with poststroke disability: A randomized, controlled pilot trial. *Altern Ther Health Med*. 2012;18(3):34–43.

41. Chandwani KD, Thornton B, Perkins GH, et al. Yoga improves quality of life and benefit finding in women undergoing radiotherapy for breast *cancer*. *J Soc Integr Oncol*. 2010;8(2):43–55.

42. Chandwani KD, Perkins G, Nagendra HR, et al. Randomized, controlled trial of yoga in women with breast *cancer* undergoing radiotherapy. *J Clin Oncol*. 2014;32(10):1058–1065.

43. Chang TFH, Ley BL, Ramburn TT, et al. Online Isha Upa Yoga for student mental health and well–being during COVID–19: A randomized control trial. *Appl Psychol Health Well Being*. 2022;14(4):1408–1428.

44. Chen KM, Chen MH, Chao HC, et al. Sleep quality, depression state, and health status of older adults after silver yoga exercises: Cluster randomized trial. *Int J Nurs Stud*. 2009;46(2):154–163.

45. Chen KM, Chen MH, Lin MH, et al. Effects of yoga on sleep quality and depression in elders in assisted living facilities. *J Nurs Res*. 2010;18(1):53–61.

46. Chobe S, Bhargav H, Raghuram N, Garner C. Effect of integrated Yoga and Physical therapy on audiovisual reaction time, anxiety and depression in patients with chronic multiple sclerosis: a pilot study. *J Complement Integr Med*. 2016;13(3):301–309.

47. Chu IH, Wu WL, Lin IM, et al. Effects of yoga on heart rate variability and depressive symptoms in women: A randomized controlled trial. *J Altern Complement Med*. 2017;23(4):310–316.

48. Cohen L, Warneke C, Fouladi RT, et al. Psychological adjustment and sleep quality in a randomized trial of the effects of a Tibetan yoga intervention in patients with lymphoma. *Cancer*. 2004;100(10):2253–2260.

49. Cowen VS, Adams TB. Physical and perceptual benefits of yoga asana practice: Results of a pilot study. *J Bodyw Mov Ther*. 2005;9(3):211–219.

50. Cramer H, Rabsilber S, Lauche R, et al. Yoga and meditation for menopausal symptoms in breast *cancer* survivors–A randomized controlled trial. *Cancer*. 2015;121(13):2175–2184.

51. Cramer H, Pokhrel B, Fester C, et al. A randomized controlled bicenter trial of yoga for patients with colorectal *cancer*. *Psychooncology*. 2016;25(4):412–420.

52. Crowe BM, Van Puymbroeck M, Linder SM, et al. The Effects of Yoga Participation on Women's Quality of Life and Symptom Management During the Menopausal Transition: A Pilot Study. *Health Care Women Int*. 2015;36(10):1124–1142.

53. Culos–Reed SN, Carlson LE, Daroux LM, et al. A pilot study of yoga for breast *cancer* survivors: physical and psychological benefits. *Psychoncology*. 2006;15(10):891–897.

54. Curtis K, Osadchuk A, Katz J. An eight–week yoga intervention is associated with improvements in pain, psychological functioning and mindfulness, and changes in cortisol levels in women with fibromyalgia. *J Pain Res*. 2011;4:189–201.

55. Dale LP, Mattison AM, Greening K, et al. Yoga workshop impacts psychological functioning and mood of women with self–reported history of eating disorders. *Eating Disorders*. 2009;17(5):422–434.

56. Danhauer SC, Mihalko SL, Russell GB, et al. Restorative yoga for women with breast *cancer*: findings from a randomized pilot study. *Pcursychooncology*. 2009;18(4):360–368.

57. Danhauer SC, Griffin LP, Avis NE, et al. Feasibility of implementing a community–based randomized trial of yoga for women undergoing chemotherapy for breast *cancer*. *J Community Support Oncol*. 2015;13(4):139–147.

58. Danielly Y, Silverthorne C. Psychological Benefits of Yoga for Female Inmates. *Int J Yoga Therap*. 2017;27(1):9–14.

59. Davis K, Goodman SH, Leiferman J, et al. A randomized controlled trial of yoga for pregnant women with symptoms of depression and anxiety. *Complement Ther Clin Pract*. 2015;21(3):166–172.

60. de Manincor M, Bensoussan A, Smith CA, et al. Individualized yoga for reducing depression and anxiety, and improving well–being: A randomized controlled trial. *Depress Anxiety*. 2016;33(9):816–828.

61. Devi KS, Rani MU. Effect of yogic exercise and physical exercise on physical health and mental health. *J Evol Med Dent Sci*. 2013;2(18):3031–3039.

62. Devi NJ, Singh BT, Subramanya P, Effect of yoga on depression and quality of life in drug abusers. *Int J Ayurveda Pharm Res*. 2014;2(2):61–65.

63. Devi NS, Devi NJ, Bilagi AS. Effect of yoga on depression and somatic symptoms of women labourers. *Int J Sci Res*. 2016;5(1):519–522.

64. Dhananjai S, Sadashiv, Tiwari S, et al. Reducing psychological distress and obesity through Yoga practice. *Int J Yoga*. 2013;6(1):66–70.

65. Drogla N, Berninger U, Lobmann R. Evaluation of a yoga group for depressive in– and outpatients. *J Altern Med Res*. 2014;6(1):55–65.

66. Duraiswamy G, Thirthalli J, Nagendra HR, Gangadhar BN. Yoga therapy as an add–on treatment in the management of patients with schizophrenia—a randomized controlled trial. *Acta Psychiatr Scand*. 2007;116(3):226–232.

67. Eda N, Ito H, Shimizu K, et al. Yoga stretching for improving salivary immune function and mental stress in middle–aged and older adults. *J Women Aging*. 2018;30(3):227–241.

68. Eda N, Ito H, Akama T. Beneficial effects of yoga stretching on salivary stress hormones and parasympathetic nerve activity. *J Sports Sci Med*. 2020;19(4):695–702.

69. Elavsky S, McAuley E. Physical activity and mental health outcomes during menopause: a randomized controlled trial. *Ann Behav Med*. 2007;33(2):132–142.

70. Ensari I, Sandroff BM, Motl RW. Effects of Single Bouts of Walking Exercise and Yoga on Acute Mood Symptoms in People with Multiple Sclerosis. *Int J MS Care*. 2016;18(1):1–8.

71. Eyre HA, Siddarth P, Acevedo B, et al. A randomized controlled trial of Kundalini yoga in mild cognitive impairment. *Int Psychogeriatr*. 2017;29(4):557–567.

72. Falsafi N. A randomized controlled trial of mindfulness versus yoga: Effects on depression and/or anxiety in college students. *J Am Psychiatr Nurses Assoc*. 2016;22(6):483–497.

73. Fan JT, Chen KM. Using silver yoga exercises to promote physical and mental health of elders with dementia in long–term care facilities. *Int Psychogeriatr*. 2011;23(8):1222–1230.

74. Felver JC, Butzer B, Olson KJ, et al. Yoga in public school improves adolescent mood and affect. *Contemp Sch Psychol*. 2015;19(3):184–192.

75. Field T, Diego M, Hernandez–Reif M, et al. Yoga and massage therapy reduce prenatal depression and prematurity. *J Bodyw Mov Ther*. 2012;16(2):204–209.

76. Field T, Diego M, Delgado J, et al. Yoga and social support reduce prenatal depression, anxiety and cortisol. *J Bodyw Mov Ther*. 2013;17(4):397–403.

77. Foulkrod K, Griesemer S, Banneyer KN, et al. Yoga plus talk therapy for depression: A case study of a six week group. *Int J Integr Psychother*. 2016;7:27–48.

78. Frank JL, Bose B, Schrobenhauser–Clonan A. Effectiveness of a school–based yoga program on adolescent mental health, stress coping strategies, and attitudes toward violence: Findings from a high–risk sample. J Appl Sch Psychol. 2014;30(1):29–49.

79. Gabriel MG, Curtiss J, Hofmann SG, et al. Kundalini yoga for generalized anxiety disorder: An exploration of treatment efficacy and possible mechanisms. *Int J Yoga Therap*. 2018;28(1):97–105.

80. Galantino ML, Bzdewka TM, Eissler–Russo JL, et al. The impact of modified Hatha yoga on chronic low back pain: a pilot study. *Altern Ther Health Med*. 2004;10(2):56–59.

81. Gallagher A, Kring D, Whitley T. Effects of yoga on anxiety and depression for high risk mothers on hospital bedrest. *Complement Ther Clin Pract*. 2020;38:101079.

82. Gangadhar BN, Naveen GH, Rao MG, et al. Positive antidepressant effects of generic yoga in depressive out–patients: A comparative study. *Indian J Psychiatry*. 2013;55(Suppl 3):S369–S373.

83. Gautam S, Tolahunase M, Kumar U, et al. Impact of yoga based mind–body intervention on systemic inflammatory markers and co–morbid depression in active Rheumatoid arthritis patients: A randomized controlled trial. *Restor Neurol Neurosci*. 2019;37(1):41–59.

84. Gawinski KS. The effects of type of yoga training on physiological and psychological fitness in college aged men and women [dissertation on the internet]. Windsor (ON): University of Windsor; 2012.

85. Hardoerfer K, Jentschke E. Effect of yoga therapy on symptoms of anxiety in *cancer* patients. *Oncol Res Treat*. 2018;41(9):526–532.

86. Harinath K, Malhotra AS, Pal K, et al. Effects of Hatha yoga and Omkar meditation on cardiorespiratory performance, psychologic profile, and melatonin secretion. *J Altern Complement Med*. 2004;10(2):261–268.

87. Harner H, Hanlon AL, Garfinkel M. Effect of Iyengar yoga on mental health of incarcerated women: a feasibility study. *Nurs Res*. 2010;59(6):389–399.

88. Harris N. A quantitative study of the effects of hatha yoga and mindfulness meditation in students experiencing romantic breakup distress [dissertation on the internet]. Palo Alto (CA): Sofia University; 2016.

89. Hartfiel N, Havenhand J, Khalsa SB, et al. The effectiveness of yoga for the improvement of well–being and resilience to stress in the workplace. *Scand J Work Environ Health*. 2011;37(1):70–76.

90. Huberty J, Eckert R, Dueck A, et al. Online yoga in myeloproliferative neoplasm patients: results of a randomized pilot trial to inform future research. *BMC Complement Altern Med*. 2019;19(1):121.

91. Huberty J, Sullivan M, Green J, et al. Online yoga to reduce post traumatic stress in women who have experienced stillbirth: a randomized control feasibility trial. *BMC Complement Med Ther*. 2020;20(1):173.

92. Innes KE, Selfe TK. The Effects of a Gentle Yoga Program on Sleep, Mood, and Blood Pressure in Older Women with Restless Legs Syndrome (RLS): A Preliminary Randomized Controlled Trial. *Evid Based Complement Alternat Med*. 2012;2012:294058.

93. Innes KE, Selfe TK, Agarwal P, et al. Efficacy of an eight–week yoga intervention on symptoms of restless legs syndrome (RLS): a pilot study. *J Altern Complement Med*. 2013;19(6):527–535.

94. Innes KE, Selfe TK, Montgomery C, et al. Effects of a 12–week yoga versus a 12–week educational film intervention on symptoms of restless legs syndrome and related outcomes: An exploratory randomized controlled trial. *J Clin Sleep Med*. 2020;16(1):107–119.

95. Javnbakht M, Kenari RH, Ghasemi M. Effects of yoga on depression and anxiety of women. *Complement Ther Clin Pract*. 2009;15(2):102–104.

96. Jeitler M, Kessler CS, Zillgen H, et al. Yoga in school sport – A non–randomized controlled pilot study in Germany. *Complement Ther Med*. 2020;48:102243.

97. Jindani F, Turner N, Khalsa SB. A yoga intervention for posttraumatic stress: A preliminary randomized control trial. *Evid Based Complement Alternat Med*. 2015;2015:351746.

98. Jong MC, Boers I, Schouten van der Velden AP, et al. A Randomized Study of Yoga for Fatigue and Quality of Life in Women with Breast *Cancer* Undergoing (Neo) Adjuvant Chemotherapy. *J Altern Complement Med*. 2018;24(9–10):942–953.

99. Khalsa SB, Hickey–Schultz L, Cohen D, et al. Evaluation of the mental health benefits of yoga in a secondary school: a preliminary randomized controlled trial. *J Behav Health Serv Res*. 2012;39(1):80–90.

100. Kiecolt–Glaser JK, Bennett JM, Andridge R, et al. Yoga's impact on inflammation, mood, and fatigue in breast *cancer* survivors: a randomized controlled trial. *J Clin Oncol* .2014;32(10):1040–1049.

101. Kosuri M, Sridhar GR. Yoga practice in diabetes improves physical and psychological outcomes. *Metab Syndr Relat Disord*. 2009;7(6):515–517.

102. Krishnamurthy MN, Telles S. Assessing depression following two ancient Indian interventions: Effects of yoga and ayurveda on older adults in a residential home. *J Gerontol Nurs*. 2007;33(2):17–23.

103. Kuntz AB, Chopp–Hurley JN, Brenneman EC, et al. Efficacy of a biomechanically–based yoga exercise program in knee osteoarthritis: A randomized controlled trial. *PLoS One*. 2018;13(4):e0195653.

104. Kwok JYY, Kwan JCY, Auyeung M, et al. Effects of mindfulness yoga vs stretching and resistance training exercises on anxiety and depression for people with parkinson disease: A randomized clinical trial. *JAMA Neurol*. 2019;76(7):755–763.

105. Lanctôt D, Dupuis G, Marcaurell R, et al. The effects of the Bali Yoga Program (BYP–BC) on reducing psychological symptoms in breast *cancer* patients receiving chemotherapy: results of a randomized, partially blinded, controlled trial. *J Complement Integr Med*. 2016;13(4):405–412.

106. La Rocque CL. A randomized controlled trial of Bikram Yoga and aerobic exercise in the treatment of depression: Efficacy and underlying physiological and psychological mechanisms [dissertation on the internet]. Ontario (CA): Queens University; 2018.

107. Lin J, Chan SK, Lee EH, et al. Aerobic exercise and yoga improve neurocognitive function in women with early psychosis. *NPJ Schizophr*. 2015;1(0):15047.

108. Maddux RE, Daukantaité D, Tellhed U. The effects of yoga on stress and psychological health among employees: an 8– and 16–week intervention study. *Anxiety Stress Coping*. 2018;31(2):121–134.

109. Marefat M, Peymanzad H, Alikhajeh Y. The study of the effects of yoga exercises on addicts' depression and anxiety in rehabilitation period. *Procedia Soc Behav Sci*. 2011;30:1494–1498.

110. Martin AC, Keats MR. The impact of yoga on quality of life and psychological distress in caregivers for patients with *cancer*. *Oncol Nurs Forum*. 2014;41(3):257–264.

111. McGuirk MG. Mood, anxiety, rpe, and %mhr after a single 15, 30 and 60 minute session of vinyasa yoga [thesis on the internet]. Statesboro (GA): Georgia Southern University; 2012.

112. Mehrtash S, Koçak S, Altunsöz IH. The effect of yoga on stress, anxiety and depression among Turkish adults: A preliminary study. *Pamukkale J Sport Sci*. 2015;6(1):39–49.

113. Michalsen A, Jeitler M, Brunnhuber S, et al. Iyengar yoga for distressed women: a 3–armed randomized controlled trial. *Evid Based Complement Alternat Med*. 2012;2012:408727.

114. Milbury K, Li J, Weathers SP, et al. Pilot randomized, controlled trial of a dyadic yoga program for glioma patients undergoing radiotherapy and their family caregivers. *Neurooncol Pract*. 2019;6(4):311–320.

115. Mitchell J, Field T, Diego M, et al. Yoga reduces prenatal depression symptoms. *Psychology*. 2012;3:782–786.

116. Mitchell KS, Dick AM, DiMartino DM, et al. A pilot study of a randomized controlled trial of yoga as an intervention for PTSD symptoms in women. *J Trauma Stress*. 2014;27(2):121–128.

117. Mohapatra B, Shisler Marshall R. Psychosomatic and Physical Well–Being Factors After Mind–Body Interventions in a Hospital Setting. *Adv Mind Body Med*. 2019;33(3):4–11.

118. Mueller BA. The effects of Bikram–style hot yoga on posttraumatic stress and depressive symptoms in a military population [dissertation]. Fresno (CA): Alliant International University; 2013. 140 p.

119. Muzik M, Hamilton SE, Lisa Rosenblum K, et al. Mindfulness yoga during pregnancy for psychiatrically at–risk women: preliminary results from a pilot feasibility study. *Complement Ther Clin Pract*. 2012;18(4):235–240.

120. Noggle JJ, Steiner NJ, Minami T, et al. Benefits of yoga for psychosocial well–being in a US high school curriculum: A preliminary randomized controlled trial. *J Dev Behav Pediatr*. 2012;33(3):193–201.

121. Noradechanunt C, Worsley A, Groeller H. Thai Yoga improves physical function and well–being in older adults: A randomised controlled trial. *J Sci Med Sport*. 2017;20(5):494–501.

122. Oron G, Allnutt E, Lackman T, Sokal–Arnon T, Holzer H, Takefman J. A prospective study using Hatha Yoga for stress reduction among women waiting for IVF treatment. *Reprod Biomed Online*. 2015;30(5):542–548.

123. Ozlem U, Naciye YV. The effects of yoga on sleep, a depressed state, and quality of life, in both working and inactive women. *Ann Health & Health Sci*. 2018;5(2):82–86.

124. Paikkatt B, Singh AR, Singh PK, et al. Efficacy of Yoga therapy for the management of psychopathology of patients having chronic schizophrenia. *Indian J Psychiatry*. 2015;57(4):355–360.

125. Papp ME, Nygren–Bonnier M, Gillerius J, et al. Effects of hatha yoga on self–reported health outcomes in a randomized controlled trial of patients with obstructive pulmonary disorders, *Nord Psychol*. 2020;72(1):65–79.

126. Ponte SB, Lino C, Tavares B, et al. Yoga in primary health care: A quasi–experimental study to access the effects on quality of life and psychological distress. *Complement Ther Clin Pract*. 2019;34:1–7.

127. Porter LS, Carson JW, Olsen M, et al. Feasibility of a mindful yoga program for women with metastatic breast *cancer*: results of a randomized pilot study. Support Care *Cancer*. 2019;27(11):4307–4316.

128. Prado–Olmos R. Yoga for student veterans at a higher education institution: A feasibility study [dissertation on the internet]. San Marcos (CA): California State University San Marcos; 2017.

129. Prathikanti S, Rivera R, Cochran A, et al. Treating major depression with yoga: A prospective, randomized, controlled pilot trial. *PLoS One*. 2017;12(3):e0173869.

130. Pruthi S, Stan DL, Jenkins SM, et al. A randomized controlled pilot study assessing feasibility and impact of yoga practice on quality of life, mood, and perceived stress in women with newly diagnosed breast *cancer*. *Glob Adv Health Med*. 2012;1(5):30–35.

131. Raghavendra RM, Nagarathna R, Nagendra HR, et al. Effects of an integrated yoga programme on chemotherapy–induced nausea and emesis in breast *cancer* patients. *Eur J Cancer Care (Engl)*. 2007;16(6):462–474.

132. Raghunath S, Raghuram N, Ravi S, et al. Effect of yoga therapy on quality of life and depression in premenopausal nursing students with mastalgia: A randomized controlled trial with 6–month follow–up. *J Health Res Rev*. 2016;3(2):48–54.

133. Ranjita R, Badhai S, Hankey A, et al. A randomized controlled study on assessment of health status, depression, and anxiety in coal miners with chronic obstructive pulmonary disease following yoga training. *Int J Yoga*. 2016;9(2):137–144.

134. Rao RM, Raghuram N, Nagendra HR, et al. Effects of an integrated yoga program on self–reported depression scores in breast *cancer* patients undergoing conventional treatment: A randomized controlled trial. *Indian J Palliat Care*. 2015;21(2):174–181.

135. Ravindran AV, McKay MS, Silva TD, et al. Yoga as augmentation for unipolar and bipolar depression: A randomized controlled trial: Le yoga axé sur la respiration comme traitement d'appoint pour la dépression unipolaire et bipolaire: Un essai randomisé contrôlé. *Can J Psychiatry*. 2021;66(2):159–169.

136. Ray US, Mukhopadhyaya S, Purkayastha SS, et al. Effect of yogic exercises on physical and mental health of young fellowship course trainees. *Indian J Physiol Pharmacol*. 2001;45(1):37–53.

137. Razazian N, Yavari Z, Farnia V, et al. Exercising impacts on fatigue, depression, and paresthesia in female patients with multiple sclerosis. *Med Sci Sports Exerc*. 2016;48(5):796–803.

138. Sareen S, Kumari V, Gajebasia KS, et al. Yoga: a tool for improving the quality of life in chronic pancreatitis. *World J Gastroenterol*. 2007;13(3):391–397.

139. Satyapriya M, Nagarathna R, Padmalatha V, et al. Effect of integrated yoga on anxiety, depression & well being in normal pregnancy. *Complement Thera Clin Pract*. 2013;19(4):230–236.

140. Schulte EC. Yoga and adolescent psychological health, depressive symptoms, and flourishing [dissertation]. St Louis (MO): University of Missouri–St. Louis; 2015. 255 p.

141. Schuver KJ, Lewis BA. Mindfulness–based yoga intervention for women with depression. *Complement Ther Med*. 2016;26:85–91.

142. Sfendla A, Malmström P, Torstensson S, Kerekes N. Yoga practice reduces the psychological distress levels of prison inmates. *Front Psychiatry*. 2018;9:407.

143. Shohani M, Badfar G, Nasirkandy MP, et al. The effect of yoga on stress, anxiety, and depression in women. *Int J Prev Med*. 2018;9:21.

144. Singh AP. Efficacy of a 4–week yogic lifestyle education for promoting holistic health in Indian school adolescents. *Yoga Mimamsa*. 2015;47(1):22–29.

145. Singh M, Kannan S, Dhillon M, et al. Mindful awareness for female dental students through yoga, motivational video, and a combination of two on stress reduction. *J Family Med Prim Care*. 2020;9(4):2028–2032.

146. Speed–Andrews AE, Stevinson C, Belanger LJ, et al. Pilot evaluation of an Iyengar yoga program for breast *cancer* survivors. *Cancer* Nurs. 2010;33(5):369–381.

147. Street K. Effectiveness of ashtanga and vinyasa yoga: Combating anxiety, depression, stress and sleep quality [dissertation on the internet]. Fayetteville (AR): University of Arkansas; 2020.

148. Streeter CC, Gerbarg PL, Whitfield TH, et al. Treatment of major depressive disorder with Iyengar yoga and coherent breathing: A randomized controlled dosing study. *J Altern Complement Med*. 2017;23(3):201–207.

149. Taylor TR, Barrow J, Makambi K, et al. A restorative yoga intervention for african–american breast *cancer* survivors: A pilot study. *J Racial Ethn Health Disparities*. 2018;5(1):62–72.

150. Tejvani R, Metri KG, Agrawal J, et al. Effect of Yoga on anxiety, depression and self–esteem in orphanage residents: A pilot study. *Ayu*. 2016;37(1):22–25.

151. Tekur P, Nagarathna R, Chametcha S, et al. A comprehensive yoga programs improves pain, anxiety and depression in chronic low back pain patients more than exercise: an RCT. *Complement Ther Med*. 2012;20(3):107–118.

152. Toise SC, Sears SF, Schoenfeld MH, et al. Psychosocial and cardiac outcomes of yoga for ICD patients: a randomized clinical control trial. *Pacing Clin Electrophysiol*. 2014;37(1):48–62.

153. Tolahunase MR, Sagar R, Faiq M, et al. Yoga– and meditation–based lifestyle intervention increases neuroplasticity and reduces severity of major depressive disorder: A randomized controlled trial. *Restor Neurol Neurosci*. 2018;36(3):423–442.

154. Uebelacker LA, Tremont G, Epstein–Lubow G, et al. Open trial of Vinyasa yoga for persistently depressed individuals: Evidence of feasibility and acceptability. *Behav Modif*. 2010;34(3):247–264.

155. Uebelacker LA, Battle CL, Sutton KA, et al. A pilot randomized controlled trial comparing prenatal yoga to perinatal health education for antenatal depression. *Arch Womens Ment Health*. 2016;19(3):543–547.

156. Uluğ N, Yılmaz ÖT, Kara M, et al. Effects of Pilates and yoga in patients with chronic neck pain: A sonographic study. *J Rehabil Med*. 2018;50(1):80–85.

157. Vadiraja HS, Raghavendra RM, Nagarathna R, et al. Effects of a yoga program on cortisol rhythm and mood states in early breast *cancer* patients undergoing adjuvant radiotherapy: A randomized controlled trial. *Integr Cancer Ther*. 2009;8(1):37–46.

158. Valoriani V, Lotti F, Vanni C, et al. Hatha–yoga as a psychological adjuvant for women undergoing IVF: a pilot study. *Eur J Obstet Gynecol Reprod Biol*. 2014;176:158–162.

159. van der Kolk BA, Stone L, West J, et al. Yoga as an adjunctive treatment for posttraumatic stress disorder: a randomized controlled trial. *J Clin Psychiatry*. 2014;75(6):e559–e565.

160. Varambally S, Vidyendaran S, Sajjanar M, et al. Yoga–based intervention for caregivers of outpatients with psychosis: A randomized controlled pilot study. *Asian J Psychiatr*. 2013;6(2):141–145.

161. Velásquez AM, López MA, Quiñonez N, et al. Yoga for the prevention of depression, anxiety, and aggression and the promotion of socio–emotional competencies in school–aged children. *Educ Res Eval*. 2015;21(5–6):407–421.

162. Waelde LC, Thompson L, Gallagher–Thompson D. A pilot study of a yoga and meditation intervention for dementia caregiver stress. *J Clin Psychol*. 2004;60(6):677–687.

163. Walter AA. Select psychological and physical impacts of therapeutic yoga for informal caregivers: A feasibility study [dissertation on the internet]. Clemson (SC): Clemson University; 2018.

164. Wankhede S, Udhan V, Shinde P. Assessment of long–term yoga training as a complementary therapeutic measure for anxiety, depression, and psychological distress in healthy individuals. *Natl J Physiol Pharm Pharmacol*. 2020;10(2):99–103.

165. Wolever RQ, Bobinet KJ, McCabe K, et al. Effective and viable mind–body stress reduction in the workplace: a randomized controlled trial. *J Occup Health Psychol*. 2012;17(2):246–258.

166. Woolery A, Myers H, Sternlieb B, et al. A yoga intervention for young adults with elevated symptoms of depression. *Altern Ther Health Med*. 2004;10(2):60–63.

167. Yagli NV, Ulger O. The effects of yoga on the quality of life and depression in elderly breast *cancer* patients. *Complement Ther Clin Pract* 2015;21(1):7–10.

168. Yulianti I, Respati SH, Sudiyanto A. The effect of prenatal yoga on anxiety and depression in Kudus, Central Java. *J Matern Child Health*. 2018;3(2):100–104.

169. Yuvarani G, Manoranjitham R, Tharani G, et al. A study to compare the effects of aerobic exercises and yoga on depression and maternal anxiety orienting among primiparous women. *Biomedicine*. 2020;40(3):395–398.

170. Zaccari B, Callahan ML, Storzbach D, et al. Yoga for veterans with PTSD: Cognitive functioning, mental health, and salivary cortisol. *Psychol Trauma*. 2020;12(8):913–917.

171. Zetzl T, Renner A, Pittig A, et al. Yoga effectively reduces fatigue and symptoms of depression in patients with different types of *cancer*. Support Care *Cancer* 2021;29(6):2973–2982.

172. Wang C, Bannuru R, Ramel J, et al. Tai Chi on psychological well–being: Systematic review and meta–analysis. *BMC Complement Altern Med*. 2010;10:23.

173. Jadad AR, Moore RA, Carroll D, et al. Assessing the quality of reports of randomized clinical trials: Is blinding necessary? *Control Clin Trials*. 1996;17:1–12.

174. Becker BJ. Synthesizing standardized mean–change measures. *Br J Math Stat Psychol*. 1988;41:257–278.

175. Morris SB. Estimating effect sizes from pretest–posttest–control group designs. *Organ Res Methods*. 2008;11(2):364–386.

176. Light RJ, Pillemer DB. Summing Up: The Science of Reviewing Research. Cambridge, MA: Harvard University Press; 1984.

177. Duval SJ, Tweedie RL. A nonparametric "trim and fill" method of accounting for publication bias in meta–analysis. *J Am Stat Assoc*. 2000;95:89–98.

178. Duval SJ, Tweedie RL. Trim and fill: A simple funnel–plot–based method of testing and adjusting for publication bias in meta–analysis. *Biometrics*. 2000;56:455–463.

179. Rosenberg MS. The file–drawer problem revisited: A general weighted method for calculating fail–safe numbers in meta–analysis. *Evolution*. 2005;59(2):464–468.

180. Viechtbauer W. Conducting meta–analyses in R with the metafor package. *J Stat Softw*. 2010;36(3):1–48.

181. Durlak JA. How to select, calculate, and interpret effect sizes. *J Pediatr Psychol*. 2009;34(9):917–928.

182. Cohen J. A power primer. *Psychol Bull*. 1992;112:155–159.

183. de Manincor M, Bensoussan A, Smith C, et al. Establishing key components of yoga interventions for reducing depression and anxiety, and improving well–being: A Delphi method study. *BMC Complement Altern Med*. 2015;15:85.

184. Hofmann SG, Andreoli G, Carpenter JK, et al. Effect of hatha yoga on anxiety: A meta–analysis. *J Evid Based Med*. 2016;9(3):116–124.

185. Harkess KN, Delfabbro P, Mortimer J, et al. Brief report on the psychophysiological effects of a yoga intervention for chronic stress. *J Psychophysiol*. 2017;31(1):38–48.

186. Gotzsche PC. Why we need a broad perspective on meta–analysis: It may be crucially important for patients. *BMJ*. 2000;321(7261):585–586.

187. Eysenck HJ. An exercise in mega–silliness. *Am Psychol*. 1978;33(5):517.

188. Uebelacker LA, Broughton MK. Yoga for depression and anxiety: A review of published research and implications for healthcare providers. *R I Med J (2013)*. 2016;99(3):20–2.

189. Pascoe MC, de Manincor J, Hallgren M, et al. Psychobiological mechanisms underlying the mental health benefits of yoga–based interventions: A narrative review. *Mindfulness*. 2021;12:2877–2889.

190. Kinser PA, Bourguignon C, Taylor AG, et al. "A feeling of connectedness": Perspectives on a gentle yoga intervention for women with major depression. *Issues Ment Health Nurs*. 2013; 34(6):402–411.

191. Galantino ML, Galbavy R, Quinn L. Therapeutic effects of yoga for children: A systematic review of the literature. *Pediatr Phys Ther*. 2008;20(1):66–80.

192. Kraftsow G. Defining yoga therapy: A call to action. *Int J Yoga Therap*. 2010;20(1):27–29.

193. Kenny M. Integrated movement therapy: Yoga–based therapy as a viable and effective intervention for autism spectrum and related disorders. *Int J Yoga Therap*. 2002;12:71–79.

194. Forfylow AL. Integrating yoga with psychotherapy: A complementary treatment for anxiety and depression. *Can J Couns Psychother*. 2011;45(2):132–150.

195. Woodyard C. Exploring the therapeutic effects of yoga and its ability to increase quality of life. *Int J Yoga*. 2011;4(2):49–54.

196. Douglass L. How did we get here? A history of yoga in America, 1800–1970. *Int J Yoga Therap*. 2007;17:35–42.

197. Jha A. Yoga therapy for schizophrenia. *Acta Psychiatr Scand*. 2008;117(5):397.