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The Effects of Yoga Interventions on Sleep Quality in Adults People with Depression and Anxiety: A Meta-Analysis of Randomized Controlled Trials

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ABSTRACT

Background: Depression is a public health problem affecting older people and causes many health problems. We aim to estimate the effects of yoga interventions on depression, anxiety and sleep quality in adults using meta-analysis.

Methods: Four digital databases were searched from the inception of databases to March 2022, including Web of Science, Cochrane Library, PubMed and Embase. The Cochrane Collaboration recommendations assessed the publication bias of the included studies. And all test models used a 95% confidence interval (CI).

Results: A total of 10 studies with 582 patients were included in this meta-analysis. The results demonstrated that the depression relief rate of experimental group was better than that of control group (depression (SMD = -0.20, 95% CI (-0.63 - 0.23) , p<0.001), anxiety(SMD = -0.55, 95% CI (−1.29 to 0.19)p<0.001). In addition, there was a significant improvement in sleep quality in the yoga group(SMD=-0.46,95% CI (-0.88,-0.05)p <0.001).

Conclusion: This review synthesized current evidence using yoga interventions to reduce negative emotion in adults, especially concerning targeting the applicability between different populations or intervention methods. In addition, yoga interventions are safe and convenient, which have great feasibility and potential to be used as an aspect of psychotherapy for clinical and nursing to improve well-being in adults.

INTRODUCTION

Adults' mental health is a rising public health issue Reed et al. (1989), Bovier et al. (2004) that requires effective and attractive interventions. Yoga is one of the most commonly used mind-body interventions Barnes et al. (2008). Physical activity is one of the complete options due to its multiple health benefits, low cost, and minimal side effects Hita-Contreras et al. (2014). Yoga has its roots in Indian philosophy and has been a part of traditional Indian spiritual practice for around 5000 years 5. Iyengar et al. (1966) Many forms of yoga exist—such as Hatha, Iyengar, and other yoga forms—that aim to promote overall movement, health, and wellness Birdee et al. (2008). These exercises are suitable for all ages, body types, and levels of physical ability due to the adjustable nature of their movements Kloubec et al. (2010). Traditional yoga is a complex intervention that comprises advice for ethical lifestyle, spiritual practice, physical activity, breathing exercises, and meditation et al. (1998) The goals of yoga therapy are to promote health benefits and self-awareness Cope et al. (2000) Yoga can offer an effective method of managing or reducing stress et al. (2007).

Yoga interventions are progressively being adopted for varieties of settings as practical interventions. The study of yoga intervention in health was initially developed on the motor system and cardiovascular system Bharshankar et al. (2003) With the continuous enrichment of research results, the study of yoga intervention on mental health increases Bansal et al.(2013) Results indicate that empirical evidence and theories for yoga mechanisms are most prevalent in areas of hormonal regulation McCall et al.(2013) After turning to the micro perspective, studies have found that meditation and yoga increase in recovery and relief of mood and anxiety symptoms; the reason is related to vagal tone and the ability to regulate the stress response and can be affected by breathing Breit et al.(2018) In a randomized, controlled pilot study, patients with an eight-week yoga therapy program experienced significant improvements in psychopathology and quality of life Shapiro et al.(2007) Studies of people who have been abused have shown that yoga breathing, which can be taught to calm their thoughts, significantly reduces feelings of depression, finding that learning to control yoga breathing has positive effects on mood and anxiety Franzblau et al.(2008).

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SKY Yoga has specific breathing techniques, and studies have established neurophysiological models of yoga breathing that can relieve anxiety, depression, daily stress, post-traumatic stress, and stress-related medical conditions Kriya et al. (2005).

Studies of yoga-based interventions on healthy populations have shown that yoga decreased depression and anxiety Pilkington et al. (2005) and reduced stress et al. (1999). Several studies have demonstrated the efficacy of yoga on stress-related disorders. As well, yoga has been shown to improve mental disorders such as anxiety disorders Li AW et al. (2012). According to the World Health Organization, depression affects roughly 10% of pregnant women worldwide and 13% of women in the immediate postpartum period Upadhyay et al.(2017) Hajieh Sheydaei et al.(2007), Franzblau et al.(2008), Kriya et al.(2005), Pilkington et al.(2005), Anand et al.(1999), Li AW et al.(2012), Upadhyay et al.(2017), Sheydaei et al.(2017)discovered that 8 weeks of mindfulness training in postpartum women resulted in significant ($p < 0.001$) post-test scores for the experimental group based on the Beck Depression Inventory, compared to those for the control group.In these studies Upadhyay et al.(2017), Sheydaei et al(2007), Buttner et al.(2015), El-Aziz et al.(2016) its shows a highly significant ($p < 0.001$) decrease in depression after the performance of yoga on postpartum women. Woolery indicated that yoga could reduce mildly depressed young adults Woolery et al. (2004) The value of yoga on depressive disorders was also supported by Pilkington Khalsa ey al. (2004) In the same year, Khalsa's review of papers over the past three decades concluded that yoga demonstrated efficacy for psychopathological (e.g.depression, anxiety),cardiovascular (e.g., hypertension, heart disease), respiratory (e.g., Asthma) diseases, and diabetes Pilkington et al.(2005).

Systematic reviews have shown that yoga can improve comorbid mental symptoms in physical conditions such as cancer Smith et al. (2009), Cramer et al. (2012) menopausal symptoms Cramer et al. (2012) or pain. Büssing et al.(2012)As well, yoga has been shown to improve mental disorders such as anxiety disorders GROSSMAN et al.(2005). Yoga can improve anxiety and psychological stress in female patients with mental disorders GROSSMAN et al(2005). However, the results showed promise, but no clear conclusions have been reached yet, and it is difficult to determine which intervention is effective in specific populations. Given the lack of systematic reviews in this area, this study used evidence from existing randomized controlled trials to quantify the effects of yoga interventions in a mixed sample of adult studies.

MATERIALS AND METHODS

Study Design

The review was conducted using methods outlined in the Cochrane Handbook (Higgins & Green, 2008) and reported using the preferred reporting items in systematic review and meta-analyses (PRISMA) guideline (Moher, Liberati, Tetzlaff, & Altman, 2009).

Search methods

HuangTian and ZhouTian performed a comprehensive literature search independently in electronic databases PubMed, Embase, Web of Science (SCI), and Cochrane Library Register of Controlled Trials to identify potentially relevant studies. The investigation was performed for articles published from database inception to March 2022. In addition, we systematically reviewed all references included in the research and previous review articles and meta-analyses to locate additional references. Missing information related to the trials was obtained by contacting corresponding authors.

The primary search strategy involved two steps. First, search filters were constructed for five comprehensive search themes "yoga,"、"adult,"、"Anxiety,"、"Depression,"、"Sleep," and"randomized controlled trial," using a combination of medical subject heading terms and text words. Relevant search terms (operators) were combined with Boolean conjunction (OR/AND), and search strategies were customized to each database. Details of the search strategy are seen in Appendix S1.

Study selection

After removing duplicates, the remaining studies were screened on title and abstract by two authors, and disagreements were resolved through discussion with a third author. Then, t-hey reviewed the full-text versions of the remaining studies to determine final inclusion. The inclusion criteria were as follows: (a) full-text article published in English or Chinese; (b) study populations were at least 18 years of age; (c) intervention methods were yoga; (d) the control group received no yoga intervention, such as usual care or only kept their daily lifestyle (e) the outcomes of the studies were depression, anxiety and sleep quality; (f) study design was Randomized Controlled Trial(RCT).

Quality appraisal

The included studies were then judged on methodological quality by two researchers independently using The Cochrane Collaboration "risk of bias" tool for systematic reviews of interventions version (v. 5.3.0), where critical assessments were made separately for six domains, including selection bias, performance bias, detection bias, attrition bias, reporting bias, and other sources of bias (Higgins et al., 2011). After completing the evaluation, both examiners came to a consensus on every item.

Data extraction

Data were extracted independently from the included studies using a standardized data collection form by two researchers, and they resolved any differences of opinion by discussing with the third reviewer. This form had the following information: authors and years of the published report, participant characteristics (e.g., sample size, age), intervention details (e.g., type of intervention, frequency, duration of intervention, etc.), control details, and outcome instruments. A separate table was used to record raw outcome data (e.g., mean and standard deviations) reported from each trial. We distinguished the primary outcomes of depression and anxiety; the secondary outcome was sleep quality.

Results

A total of 10 studies (Marian E, 2019 Papp et al.(2019) ; Agustín, 2019 Aibar-Almazánet al.(2019) ; Kuei-Min , 2010 Chen et al.(2010) ; Manas Rao, 2017 Rao et al.(2017) ; Michael R.2020 Goldstein et al.(2018); Lorenzo, 2004 Cohen et al.(2004) ; TAMMY M, 2019 Scott et al.(2019) ; Kuei-Min, 2009 Chen et al.(2009) ; Anand Dhruva, 2012 Dhruva et al.(2012) ;Julienne E, 2011 Bower et al.(2011) were included in the meta-analysis. They were all published in English between 2004 and 2020. The review process was illustrated in Table 1.

Study characteristics

Figure 1 provides an overview of the ten included studies. The data for the included RCTs comes from 582 adults (295 in experimental groups, 287 in control groups). Among the ten studies, two reported outcomes for older adults; one reported outcome for breast cancer; one reported outcome for Postmenopausal women the; one reported outcome for patients with lymphoma after treatment; one reported outcome for Cancer chemotherapy patients; one reported outcome for patients with the major depressive disorder; one reported outcome for Swedish adult population; one reported outcome for College students', one reported outcome for Female teacher. In most of the studies, the interventions were performed by trained professionals, most of whom were psychologists, physicians, nurses, or professional yoga instructors. The duration of the intervention varies from 4 to 48 weeks. In all studies, the effects of interventions were evaluated post-intervention directly.

Figure 1: Flow chart diagram of trial identification and selection

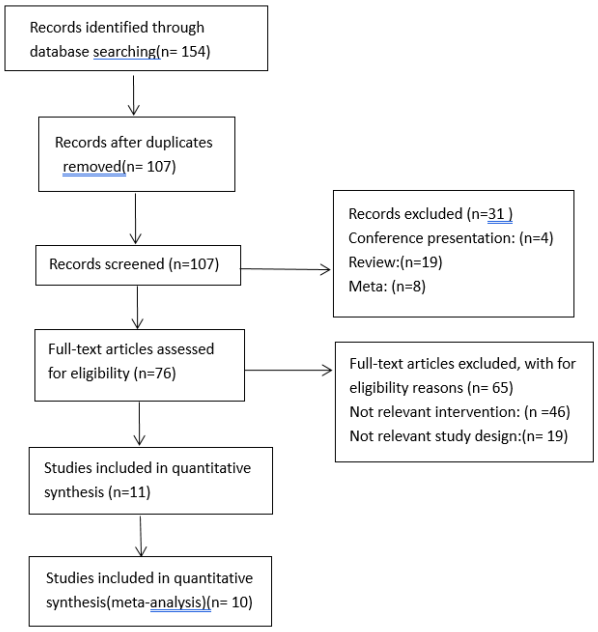

Figure 1: Flow chart diagram of trial identification and selection

Quality evaluation

For the quality methodology assessment of the included literatures (Fig. 2), 8 literatures reached low risk of bias and high quality, among which 7 literatures reached 4 points.

Figure 2: Methodological Quality of Included Studies

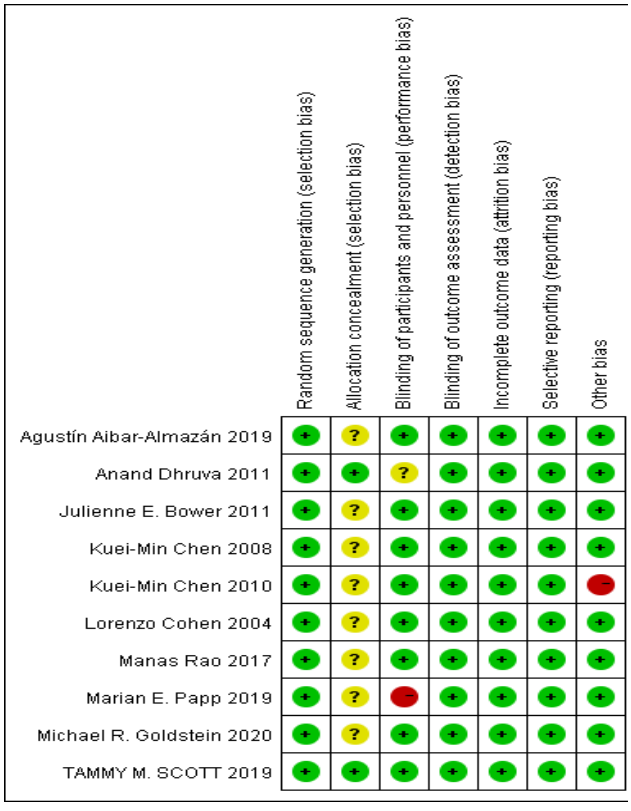

Table 1: Characteristics of included studies

Author	Public year	Country	Duration (week)	Participants	Age in Years Range and/or mean (SD)	Sample size	Intervention
Marian E	2019	The Swedish	6	Swedish adult population	20-39	44	high intensity hatha yoga
Agustín	2019	Spain	16	Spanish postmenopausal women	69.15±8.94	110	Pilates training
Kuei-Min	2010	Japan	24	Frail elderly	65+	55	yoga exercise
Manas Rao	2017	India	4	Women teachers	30-55	60	Yogic Relaxation
Michael R.	2020	The USA	12	College students'	18-35	69	Sudarshan Kriya Yoga
Lorenzo	2004	The USA	7	Patients with lymphoma after treatment	19-65	39	yoga exercise
TAMMY M	2019	The USA	12	People with major depression	18-65	30	Iyengar Yoga
Kuei-Min	2009	Taiwan, China	24	The elderly	60+	128	silver yoga exercises
Anand Dhruva	2012	The USA	48	Cancer chemotherapy patients	18+	16	yoga exercise
Julienne E	2011	The USA	24	Breast cancer patients	40-65	31	Iyengar yoga

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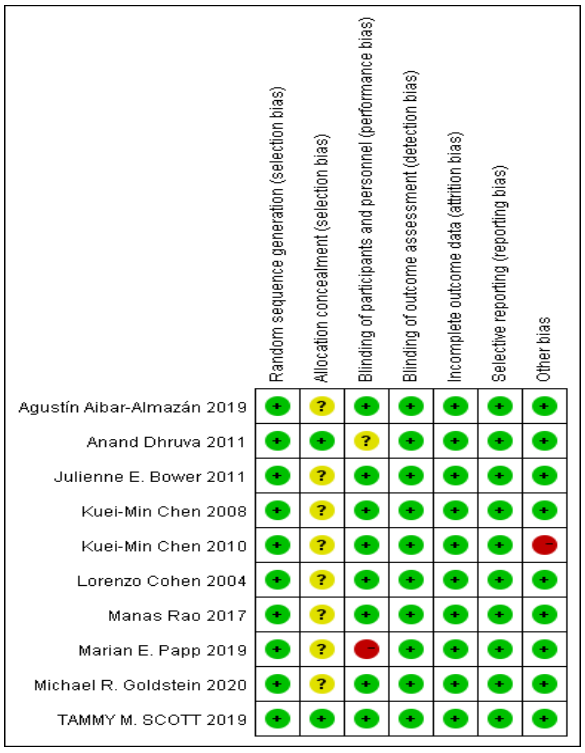
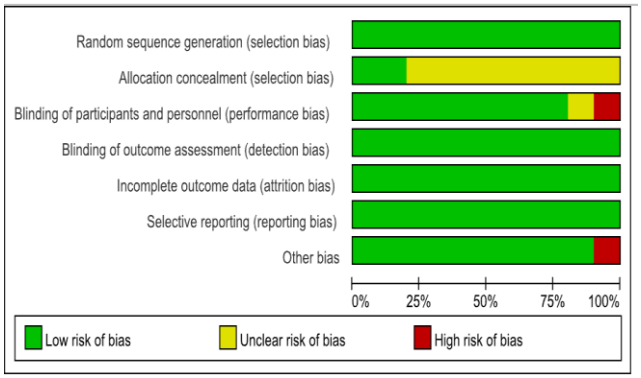


Publication bias evaluation

In the heterogeneity analysis, I2 < 25% considered that there was no significant heterogeneity in multiple similar studies. 25% < I2 < 50% thought that there was moderate heterogeneity in multiple similar studies; According to the quality evaluation criteria recommended by Cochrane5.3 evaluation manual, I2 > 75% considered that the combined results of various studies had significant heterogeneity, requiring sensitivity analysis and Meta-regression analysis if necessary. The publication bias of this paper was tested by the funnel plot method and Egger method, and the data were processed by Review Manager 5.3 software. P < 0.05 was considered as the statistical difference standard. In this paper, the Egger test on publication bias showed P>0.05 (not shown in the article), indicating that there was no publication bias in the included literature.

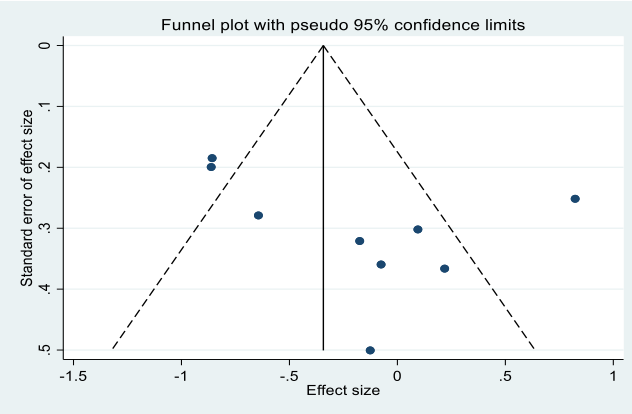
Figure 3: The Distribution of the Methodological Quality of Included Studies



When publication bias exists, funnel plots are asymmetric and tilted. (a) Funnel plot yoga intervention has a certain publication bias on depression. In principle, more than nine studies should be included. The disadvantage of a funnel plot is that it is more subjective and has more significant publication bias, which requires further measures. Few outcome measures were included, and the relatively limited number of studies does not allow for meaningful sub-analyses.

Figure 4: Funnel Plot

Depression



Sleep quality

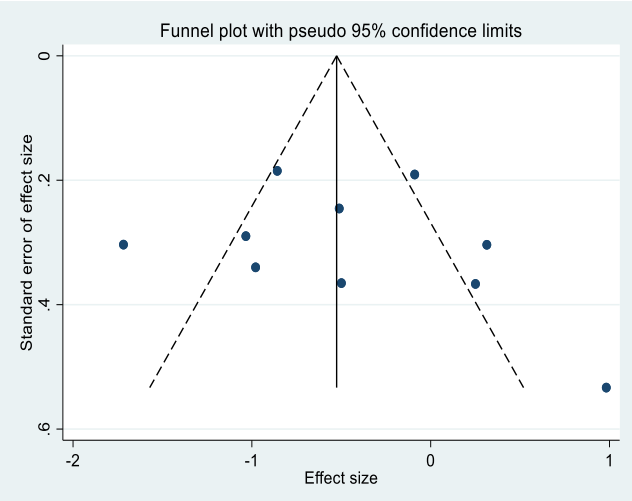
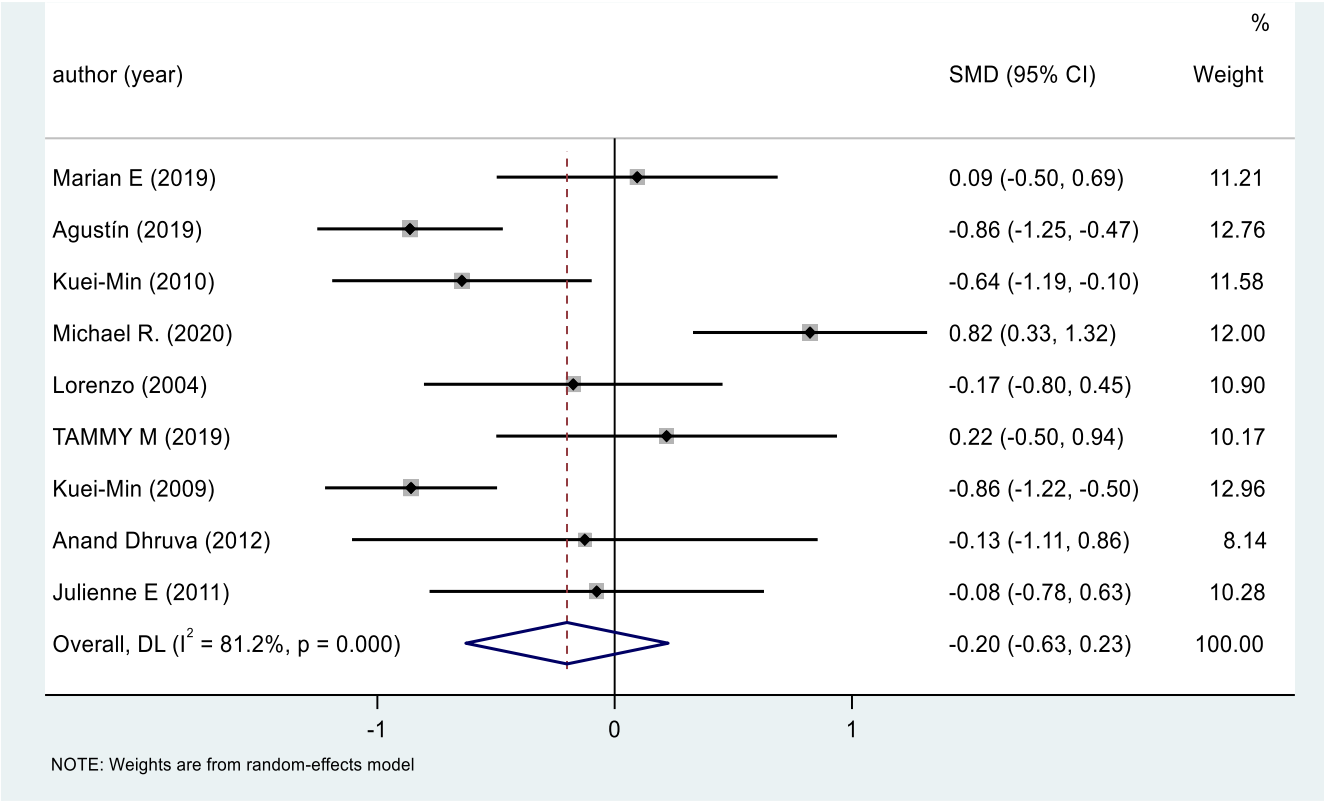


Figure 5: The effect of yoga intervention on depression



Effectiveness of yoga interventions in adults

Depression

Nine studies (Marian E, 2019[35]; Agustín, 2019 Aibar-Almazán et al. (2019); Kuei-Min, 2010 Chen et al. (2010); Michael R.2020 Goldstein et al. (2022); Lorenzo, 2004 Cohen et al. (2004); TAMMY M, 2019 Scott et al. (2019); Kuei-Min, 2009 Chen et al. (2009); Anand Dhruva, 2012 Dhruva et al. (2012); Julienne E, 2011 Bower et al. (2011)) reported depression at baseline and post-intervention. Compared with the control of pre and post-intervention, yoga interventions provided a statistical improvement in depression (SMD = -0.20, 95% CI (-0.63 to 0.23), p<0.001), Compared with the control group, yoga intervention can improve the symptoms of depression. There was substantial evidence of high heterogeneity. Further, Egger's test and inspection of the funnel plot for the main analysis revealed no publication bias(p = 0.356>0.05, I2 = 81.2%) (Fig 5).

Anxiety

We reported results from seven studies (Marian E, 2019 Papp et al. (2019) ; Agustín, 2019 Aibar-Almazán et al. (2019) ; Michael R.2020 Goldstein et al. (2022) ; Lorenzo, 2004 Cohen et al.(2004) ; TAMMY M, 2019 Scott et al(2019) ; Kuei-Min, 2009 Chen et al.(2009) ; Anand Dhruva, 2012 Dhruva et al.(2012) for anxiety. The figure resulted in a statistically significant improvement in anxiety relative to control from pre- to post-intervention (SMD = −0.55, 95% CI (−1.29 to 0.19), p = 0.000) and a medium positive effect of yoga interventions on anxiety. There was substantial evidence of high heterogeneity. Further, Egger's test and inspection of the funnel plot for the main analysis revealed no publication bias.(p = 0.146>0.05, I2 = 90.6%) (Fig 6).

Figure 6: The effect of yoga intervention on anxiety

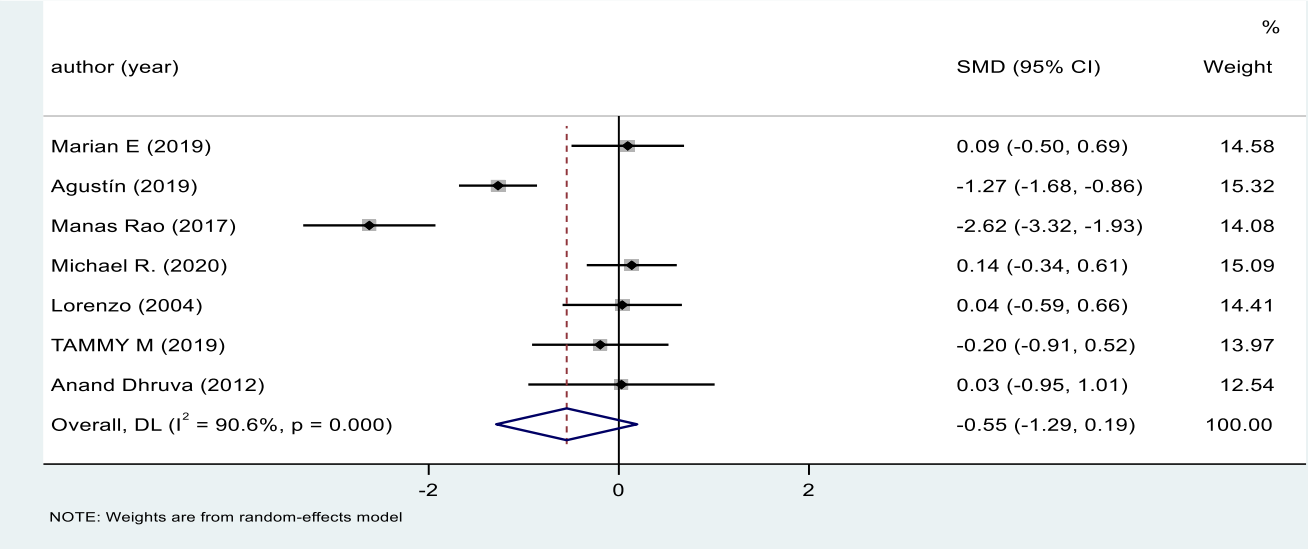
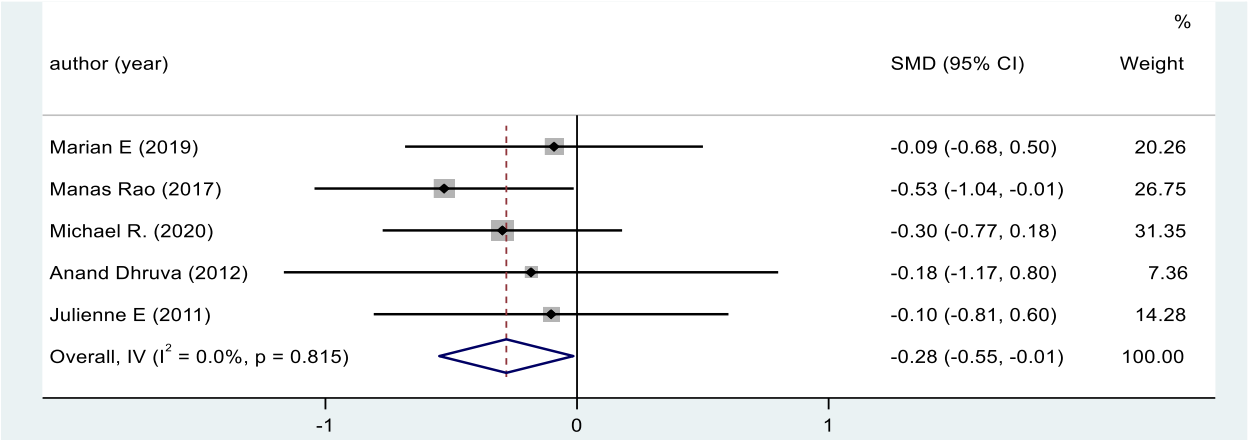


Figure 7: The effect of yoga intervention on sleep quality



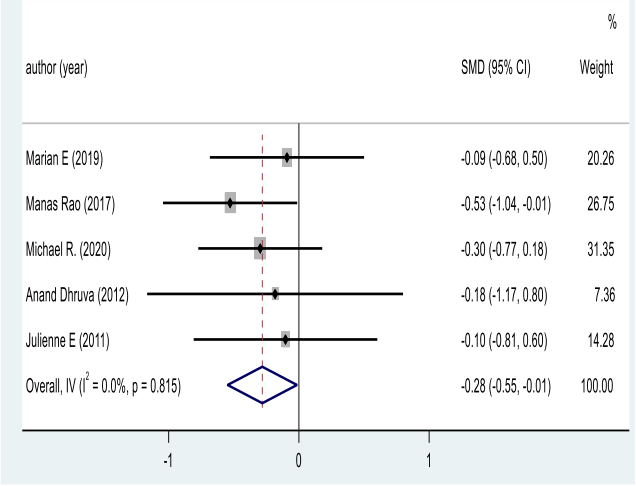
Sleep quality

We reported results from seven studies (Marian E, 2019 Papp et al. (2019) ; Agustín, 2019 Aibar-Almazán et al. (2019) ; Kuei-Min, 2010 Chen et al. (2010) ; Michael Rao., 2017 Rao et al. (2017); Michael R., 2020 Goldstein et al. (2022) ; Lorenzo, 2004 Cohen et al. (2004) ; TAMMY M, 2019 Scott et al. (2019) ; Kuei-Min, 2009 Chen et al. (2009) ; Anand Dhruva, 2012 Dhruva et al. (2012) ; Julienne E, 2011 Bower et al. (2011) for Sleep quality. The figure resulted in a statistically significant improvement in anxiety relative to control from pre to post-intervention (SMD=-0.46,95% (-0.88,-0.05)p <0.001) and a medium positive effect of yoga interventions on anxiety. There was substantial evidence of high heterogeneity. Egger's test and inspection of the funnel plot for the principal analysis did reveal some publication bias (p = 0.028<0.05, I2 = 81.6%).

Stress

We reported results from five studies (Marian E, 2019Papp et al. (2019) ; Michael Rao.2017 Rao et al. (2017); Michael R.2020 Goldstein et al. (2022) ; Anand Dhruva, 2012 Dhruva et al. (2012) ; Julienne E, 2011 Bower et al. (2011) for Stress. The figure resulted in a statistical improvement in anxiety relative to control from pre-to post-intervention (SMD=-0.28,95% (-0.55, -0.01) , p = 0.815) and a medium positive effect of yoga interventions on anxiety. There was substantial evidence of low heterogeneity. Further, Egger's test and inspection of the funnel plot for the main analysis revealed no publication bias (p = 0.039>0.05, I2 =0.0%). (Figure 8).

Figure 8: The effect of yoga intervention on stress



DISCUSSIONS

This study aimed to evaluate the effects of yoga intervention on sleep quality, anxiety, and depression in people 18 years of age and older. The results of this study show that yoga training can effectively improve the emotional state of individuals and relieve the level of perceived stress, which is consistent with the results of previous studies Xu et al. (2016), Perez-Lopez et al. (2017), Nyer et al. (2018)，and fit with previous systematic reviews of other stress-reduction techniques, such as tai chi Wang et al. (2010), qigong Wang et al. (2014) and mindfulness-based stress reduction among adults. The intervention effect of yoga training was statistically significant in the dimensions of depression, sleep quality and tension and anxiety, but not in the dimension of stress.

Of the ten randomized controlled trials included, three were from Asia (India, Japan, Taiwan, China), five were from the United States, and two were from Europe (Sweden, Spain). Participants from this study were recruited through advertisements on websites and student bulletin boards (e.g., student networking sites, public health websites, and university bulletin boards Papp et al. (2019). Postmenopausal Women's Association, via email and telephone Aibar-Almazán et al.(2019) .Assisted living facilities Chen et al.(2010) recruited by posters Scott et al.(2019)undergraduates and graduate students Goldstein et al.(2022) recruited by lymphoma centers Cohen et al.(2004) recruited by internet and advertisements Scott et al.(2019) senior activity centers Chen et al.(2009), patients receiving cancer chemotherapy Dhruva et al.(2012) breast cancer survivors who had completed cancer treatment, including tumor registry mailings, newspaper advertisements, and distribution of flyers on. The length of the program ranged from 4 weeks to 48 weeks, with a median of 14 weeks. Outcome measures Nine of the ten studies included the Pittsburgh Sleep Quality Index.

Three incorporated the Hospital Anxiety and Depression Scale Papp et al(2019). Aibar-Almazán et al.(2019). Dhruva et al. (2012). The yoga practice in lymphoma patients significantly improved sleep-related outcomes in both the experimental and control groups. Still, there were no significant differences between the two groups for other outcomes, such as intrusion or avoidance, state anxiety, depression, or fatigue, such as intrusion or avoidance Cohen et al.(2004). Many indicators in subjects in the experimental Silver Yoga group improved after three months of the intervention and were maintained throughout the 6-month study Chen et al.2009. Eight items compared yoga with no specific treatment, no yoga or change of high exercise dose HIY had a positive effect on both depression and sleep Papp et al. (2019) trained certified yoga instructors Aibar-Almazán et al.(2019) both groups performed yoga, comparing yoga and coherent breathing high and low dose groups and determining the optimal intervention dose.

As far as anxiety is concerned, high volumes of physical activity are associated with lower anxiety symptoms and status in adults aged ≥50 McDowell et al.(2019). And another recent meta-analysis concluded that programmed exercise, for at least six weeks and with low-to-moderate intensity, seems to improve mild-to-moderate anxiety symptoms in midlife and older women Perez-Lopez et al.(2017). It is consistent with the results of this paper that more prolonged yoga exercise has a better effect on female population intervention. Regarding Pilates training program, significantly significant reductions in anxiety symptoms have been reported in overweight/obese adults of both sexes (18–66 years) Vancini et al.(2017) and chronically-ill populations such as women with type-2 diabetes or with fibromyalgia Torabian et al.(2013), Ekici et al.(2017). These findings are consistent with previous studies showing that yoga practice can decrease depression and anxiety Cramer et al.(2017), Nyer et al.(2018). Another qualitative review also found evidence of the effectiveness of yoga for both major depression and other mood disorders Meyer et al.(2012). The results of this meta-analysis showed that yoga exercise effectively reduced symptoms of depression and anxiety in adults. However, the number of articles on the elderly included in this paper is limited. Articles specifically targeted at obese and overweight people are not included, which need to be supplemented in future studies. Treatment of sleep disorders can alleviate psychological symptoms Iranpour et al. (2016). In terms of sleep quality and insomnia, studies have reported that healthy yoga practitioners sleep better than the the control group

Vera et al. (2009), Bankar et al. (2013). In this paper, the research results of yoga exercise in middle-aged women and postmenopausal women to improve sleep are consistent with the following research. Like aerobic exercise, have been shown to have positive effects on sleep quality in postmenopausal women Cai et al. (2014)and a systematic review and meta-analysis of RCTs concluded that programmed exercise improves sleep quality among middle-aged women Rubio-Arias et al.(2017). In a randomized controlled trial conducted by Newton et al., postmenopausal women with insomnia were randomly assigned to either yoga classes, exercise at home, or their usual activities. They found that, compared to usual activity, women assigned to yoga saw improvements in their sleep quality and sleep disorders Newton et al.(2014). The results of this study that yoga exercises improve sleep in older adults are consistent with previous studies. As stated previously, sleep disturbance in elders is attributed to inactivity that deprives the elders of physical exercise Foley et al.(2004). Through the progression of a sequence of static physical postures, yoga uses stretching to massage blood vessels and improve blood circulation Luskin et al.(2000). A 15-min guided imagery meditation at the end of the yoga exercise program further facilitated a state of relaxation Chen et al.(2007). The participant's bodies and minds were challenged and comforted at the same time, which led to more efficient habitual sleep.

LIMITATIONS

Several limitations should be noted. First, the results are limited by the relatively few well-controlled trials examining the effect of yoga. To some extent, only ten trials were included in the meta-analysis, which reflected the scarcity of RCTs in this field. Better controlled studies are needed to demonstrate the benefits of yoga for depression and anxiety symptoms. The relatively limited number of studies did not allow for meaningful subanalyses to examine the differential effects of yoga on specific depression and anxiety disorder diagnoses or even specific symptoms. Furthermore, in the ten articles, there is a relatively greater benefit among people with females. Female teachers controlled trials provide weak evidence for the efficacy of the 4-week treatment in sleep quality, anxiety, and stress. While yoga treatment in nearly all of the included studies contained postures and breathing, some studies involved additional treatment components (e.g., meditation, mindfulness). Thus further research is needed to best understand the active ingredients in yoga for depression and anxiety.

CONCLUSION

Yoga interventions are safe, low-cost, easy to use, and contribute greatly to improving negative mood and sleep quality in a variety of populations and

From the results of this study, patients with depression should be encouraged to practice yoga in order to improve their sleep quality and reduce symptoms of depression and anxiety. Another thing to note is that our results are limited by the lack of randomized controlled trials. On this basis, subsequent evaluation and more large sample randomized controlled studies are needed to validate the effectiveness of yoga interventions in future studies of adults in a broad population. More rigorous studies are needed to draw firm conclusions about yoga's effects on sleep quality, anxiety and depression in people 18 and older.

Abbreviations

RCTs: Randomized controlled trials; SMD: Standard mean difference

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Authors' contributions

ZT, HL and DY performed the meta-analysis and wrote the first draft of manuscript, ZT, HL and HT systematically searched and selected the literature, ZT and HL revised the final manuscript. All authors read and approved the final manuscript.

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Availability of data and materials

Data supporting our findings are contained within the article.

Ethics approval and consent to participate

Not applicable.

Consent for publication

Not applicable.

Competing interests

The authors have no conflicts of interest to disclose.

REFERENCES

1.Reed PG, Boyd M, Buckwalter KC. 1989.Mental Health of Older Adults. Western Journal of Nursing Research. 11(2):143-163.

2.Bovier PA, Chamot E, Perneger TV. 2004 Feb. Perceived stress, internal resources, and social support as determinants of mental health among young adults. Qual Life Res. 13(1):161-70.

3.Barnes PM, Bloom B, Nahin RL. 2008 Dec 10. Complementary and Alternative Medicine Use Among Adults and Children: the United States, 2007.Natl Health Stat Report. (12):1-23.

4.Hita-Contreras F, Martínez-López E, Latorre-Román P A, et al. 2014 Jul. Reliability and validity of the Spanish version of the Pittsburgh Sleep Quality Index (PSQI) in patients with fibromyalgia. Rheumatol Int. 34(7):929-36.

5.Iyengar BKS. 1966. Light on Yoga. New York.

6.Birdee GS, Legedza AT, Saper RB, et al. 2008 Oct. Characteristics of yoga users: Results of a national survey. J Gen Intern Med. 23(10):1653-8.

7.Kloubec JA. 2010 Mar. Pilates for improvement of muscle endurance, flexibility, balance, and posture. J Strength Cond Res. 24(3):661-7.

8.Feuerstein G. 1998. The Yoga Tradition. Prescott.

9.Cope S, Feuerstein G, Kraftsow G, et al. 2000. Toward a Definition of Yoga Therapy: A Panel Discussion. International Journal of Yoga Therapy. 10(1): 5-10.

10.Smith C, Hancock H, Black-Mortimer J, et al. 2007 Jun. A randomized comparative trial of yoga and relaxation to reduce stress and anxiety. Complement Ther Med. 15(2):77-83.

11.Bharshankar JR, Bharshankar RN, Deshpande VN, et al. 2003 Apr. Effect of yoga on the cardiovascular system in subjects above 40 years. Indian J Physiol Pharmacol. 47(2):202-6.

12.Bansal R, Gupta M, Agarwal B, et al. 2013 Apr. Impact of short-term yoga intervention on mental well-being of medical students posted in community medicine: A pilot study. Indian J Community Med. 38(2):105-8.

13.McCall M C. 2013. How might yoga work? An overview of potential underlying mechanisms. Journal of Yoga & Physical Therapy. 3(1): 1.

14.Breit S, Kupferberg A, Rogler G, et al. 2018 Mar 13. Vagus nerve as modulator of the brain–gut axis in psychiatric and inflammatory disorders. Front Psychiatry. 9:44.

15.Shapiro D, Cook IA, Davydov DM, et al. 2007 Dec. Yoga as a complementary treatment of depression: effects of traits and moods on treatment outcome. Evid Based Complement Alternat. 4(4):493-502.

16.Franzblau SH, Echevarria S, Smith M, et al. 2008 Dec. A preliminary investigation of the effects of giving testimony and learning yogic breathing techniques on battered women's feelings of depression. J Interpers Violence. 23(12):1800-8.

17.Kriya S. 2005. Yogic Breathing In The Treatment of Stress, Anxiety and Depression. The Journal of Alternative and Complementary Medicine. 11(1): 189-201.

18.Pilkington K, Kirkwood G, Rampes H, et al. 2005 Dec. Yoga for depression: the research evidence. J Affect Disord. 89(1-3):13-24.

19.Anand MP. 1999 Jun. Non-pharmacological management of essential hypertension. J Indian Med Assoc. 97(6):220-5.

20.Li AW, Goldsmith CAW. 2012 Mar. The effects of yoga on anxiety and stress. Altern Med Rev. 17(1):21-35.

21.Upadhyay RP, Chowdhury R, Salehi A, et al. 2017 Oct 1. Postpartum depression in India: a systematic review and meta-analysis. Bull World Health Organ. 95(10):706-717C.

22.Sheydaei H, Ghasemzadeh A, Lashkari A, et al. 2017 Jul 25. The effectiveness of mindfulness training on reducing the symptoms of postpartum depression. Electronic physician. 9(7):4753-4758.

23.Buttner MM, Brock RL, O'Hara MW, et al. 2015 May. Efficacy of yoga for depressed postpartum women: a randomized controlled trial. Complement Ther Clin Pract. 21(2):94-100.

24.El-Aziz KSA, Mahdouh AM. 2016. Effect of relaxation exercises on postpartum depression. International Journal of Pharm Tech Research. 9(3): 9-17.

25.Woolery A, Myers H, Sternlieb B, et al. 2004 Mar-Apr. A yoga intervention for young adults with elevated symptoms of depression. Altern Ther Health Med. 10(2):60-3.

26.Khalsa SB. 2004 Jul. Yoga as a therapeutic intervention: a bibliometric analysis of published research studies. Indian J Physiol Pharmacol. 48(3):269-85.

27.Pilkington K, Kirkwood G, Rampes H, et al. 2005 Dec. Yoga for depression: the research evidence. J Affect Disord. 89(1-3):13-24.

28.Smith KB, Pukall CF. 2009 May. An evidence-based review of yoga as a complementary intervention for patients with cancer. Psychooncology. 18(5):465-75.

29.Cramer H, Lange S, Klose P, et al. 2012 Sep 18. Yoga for breast cancer patients and survivors: a systematic review and meta-analysis. BMC Cancer. 12:412.

30.Cramer H, Lauche R, Langhorst J, et al. 2012. Effectiveness of yoga for menopausal symptoms—a systematic review and meta-analysis of randomized controlled trials. Evid Based Complement Alternat Med. 2012:863905.

31.Büssing A, Ostermann T, Lüdtke R, et al. 2012 Jan. Effects of yoga interventions on pain and pain-associated disability: a meta-analysis. J Pain. 13(1):1-9.

32.Li AW, Goldsmith CA. 2012 Mar. The effects of yoga on anxiety and stress. Altern Med Rev. 17(1):21-35.

33.GROSSMAN P, Michalsen A, Acil A, et al. 2005 Dec. Rapid stress reduction and analysis among distressed women as a consequence of a three－month intensive yoga program． Med Sci Monit.11(12):CR555-561.

34.Rao M, Metri KG, Raghuram N, et al. 2017. Effects of Mind Sound Resonance Technique (Yogic Relaxation) on Psychological States, Sleep Quality, and Cognitive Functions in Female Teachers. Adv Mind Body Med. 31(1):4-9.

35.Papp ME, Nygren-Bonnier M, Gullstrand L, et al. 2019 Oct. A randomized controlled pilot study of the effects of 6-week high-intensity hatha yoga protocol on health-related outcomes among students. J Bodyw Mov Ther. 23(4):766-772.

36.Aibar-Almazán A, Hita-Contreras F, Cruz-Díaz D, et al. 2019 Jun. Effects of Pilates training on sleep quality, anxiety, depression, and fatigue in postmenopausal women. Maturitas. 124:62-67.

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

38.Goldstein MR, Lewin RK, Allen JJB, et al. 2022 Apr. Improvements in well-being and cardiac metrics of stress following a yogic breathing workshop: a randomized controlled trial with active comparison. J Am Coll Health. 70(3):918-928.

39.Cohen L, Warneke C, Fouladi R T, et al. 2004 May 15. Psychological adjustment and sleep quality in a randomized trial of the effects of a Tibetan yoga intervention in patients with lymphoma. Cancer. 100(10):2253-60.

40.Scott TM, Gerbarg PL, Silveri MM, et al. 2019 Nov. Psychological function, Iyengar yoga, and coherent breathing: a randomized controlled dosing study. J Psychiatr Pract. 25(6):437-450.

41.Chen KM, Chen MH, Chao HC, et al. 2009 Feb. Sleep quality, depression state, and health status of older adults after silver yoga exercises: cluster randomized trial. Int J Nurs Stud. 46(2):154-63.

42.Dhruva A, Miaskowski C, Abrams D, et al. 2012 May. Yoga breathing for cancer chemotherapy-associated symptoms and quality of life: results of a pilot randomized controlled trial. J Altern Complement Med. 18(5):473-9.

43.Bower JE, Garet D, Sternlieb B, et al. 2011. Yoga for persistent fatigue in breast cancer survivors: results of a pilot study. Evid Based Complement Alternat Med. 2011:623168.

44.Xu W， Jia K， Liu X, et al. 2016 Oct. The effects of mindfulness training on emotional health in Chinese long-term male prison inmates. Mindfulness (N Y).7(5):1044-1051.

45.Perez-Lopez F R, Martinez-Dominguez S J, Lajusticia H, et al. 2017 Dec. Effects of programmed exercise on depressive symptoms in midlife and older women: A meta-analysis of randomized controlled trials. Maturitas. 106:38-47.

46.Wang C, Bannuru R, Ramel J, et al. 2010 May 21. Tai Chi on psychological well-being: systematic review and meta-analysis. BMC Complement Altern Med.10:23.

47.Wang CW, Chan CHY, Ho RTH, et al. 2014 Jan 9. Managing stress and anxiety through qigong exercise in healthy adults: a systematic review and meta-analysis of randomized controlled trials. BMC Complement Altern Med. 14:8

48.McDowell CP, Gordon BR, Andrews KL, et al. 2019 Aug. Associations of physical activity with anxiety symptoms and status: results from the Irish longitudinal study on aging, Epidemiol. Epidemiol Psychiatr Sci. 28(4):436-445

49.Martínez-Domínguez S J, Lajusticia H, Chedraui P, et al. 2018 Apr. The effect of programmed exercise over anxiety symptoms in midlife and older women: a meta-analysis of randomized controlled trials. Climacteric. 21(2):123-131.

50.Vancini RL, Rayes ABR, Lira CAB, et al. 2017 Dec. Pilates and aerobic training improve levels of depression, anxiety and quality of life in overweight and obese individuals. Arq Neuropsiquiatr. 75(12):850-857.

51.Torabian M, Taghadosi M, Ajorpaz NM, et al. 2013.The effect of Pilates exercises on general health in women with type 2 diabetes. Life Sci J. 2: 1-39.

52.Ekici G, Unal E, Akbayrak T, et al. 2017 Jan. Effects of active/passive interventions on pain, anxiety, and quality of life in women with fibromyalgia: randomized controlled pilot trial. Women Health. 57(1):88-107.

53.Cramer H, Anheyer D, Lauche R, et al. 2017 Apr 15. A systematic review of yoga for major depressive disorder. J Affect Disord. 213:70-77.

54.Nyer M, Nauphal M, Roberg R, et al. 2018 Jan. Applications of yoga in psychiatry: what we know. Focus (Am Psychiatr Publ). 16(1):12-18.

55.Meyer HB, Katsman A, Sones AC, et al. 2012 Spring. Yoga as an ancillary treatment for neurological and psychiatric disorders: a review. J Neuropsychiatry Clin Neurosci. 24(2):152-64.

56.Iranpour S, Kheirabadi G R, Esmaillzadeh A, et al. 2016 Nov 7. Association between sleep quality and postpartum depression. J Res Med Sci. 21:110.

57.Vera FM, Manzaneque JM, Maldonado EF, et al. 2009 Jul. Subjective sleep quality and hormonal modulation in long-term yoga practitioners. Biol Psychol. 81(3):164-8.

58.Bankar MA, Chaudhari SK, Chaudhari KD, et al. 2013 Jan. Impact of long-term Yoga practice on sleep quality and quality of life in the elderly. J Ayurveda Integr Med. 4(1):28-32.

59.Cai ZY, Chen KWC, Wen HJ, et al. 2014 Sep. Effects of a group-based step aerobics training on sleep quality and melatonin levels in sleep-impaired postmenopausal women. J Strength Cond Res. 28(9):2597-603.

60.Rubio-Arias JÁ, Marín-Cascales E, Ramos-Campo DJ, et al. 2017 Jun. Effect of exercise on sleep quality and insomnia in middle-aged women: A systematic review and meta-analysis of randomized controlled trials. Maturitas. 100:49-56.

61.Newton KM, Reed SD, Guthrie KA, et al. 2014 Apr. Efficacy of yoga for vasomotor symptoms: a randomized controlled trial. Menopause. 21(4):339-46.

62.Foley D, Ancoli-Israel S, Britz P, et al. 2004 May. Sleep disturbances and chronic disease in older adults: results of the 2003 National Sleep Foundation Sleep in America Survey. J Psychosom Res.56(5):497-502.

63.Luskin FM, Newell KA, Griffith M, et al. 2000 Mar. A review of mind/body therapies in the treatment of musculoskeletal disorders with implications for the elderly. Altern Ther Health Med. 6(2):46-56.

64.Chen KM, Tseng WS, Ting LF, et al. 2007 Feb. Development and evaluation of a yoga exercise programme for older adults. J Adv Nurs. 57(4):432-41.

