# EXPLORING THE INFLUENCE OF YOGA PRACTICES ON SLEEP HEALTH PARAMETERS AMONG INSOMNIA PATIENTS IN THE CONTEXT OF PUBLIC HEALTH ISSUE: A SYSTEMATIC REVIEW

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## ABSTRACT

**Background:** Insomnia is a common sleep problem. change in life style has played role for rising in cases of insomnia. Day time work is disturbed by sleep problems. It can have adverse effects on physical and mental health in the long run. Yoga promotes physical, mental, and emotional health. It seems that yoga can be considered as a tool for the management of insomnia.

**Aim:** To study role of yoga activities for parameters related to sleep health in people with insomnia. **Methods:** Researchers used the Preferred Reporting Items for Systematic Reviews and Meta- Analyses (PRISMA) guidelines for reporting systematic reviews and meta-analysis. Researchers searched articles on PubMed, Google scholar and by manual search. Searched articles were screened for relevancy. By use of inclusion and exclusion criteria potential articles were selected.

**Results:** Out of 232 articles, finally 4 studies included in current systematic review. The age of participants ranged from 25−70 years. Overall, included studies found beneficial effect on parameter related to sleep health by yoga activities in people with insomnia.

**Conclusion:** Yoga activities can be advantageous for sleep health in people with insomnia. Yoga activities can be useful as a part of therapy in people with insomnia. There is wide scope for further studies to assess beneficial effects of yoga activities.

**Key words:** Effect, Yoga Activities, Parameter Related to Sleep, Sleep Health, Insomnia.

## INTRODUCTION

Insomnia is a common sleep problem and major public health issue.[1-6] A variety of factors responsible for chronic insomnia includes cognitive and physiological arousal, psychological conditioning, genetic factors, and stress reactivity.[3,7] Change in life style has also played role for rising in cases of insomnia.[8,9] Day time work is disturbed by sleep problems.[8] It can have adverse effects on physical and mental health in the long run.[8,10,11]

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Limitation of behavioural interventions is requirement of trained professionals.[12,13] While limiting factors for pharmacological intervention is cost of medicines and its side effects. [1,12,14-19] So, it seems requirement of non-pharmacological and easily available modalities in the management of insomnia. [1,12,19]

Yoga activities as breathing and relaxation techniques can be beneficial in conditions like stress[3,8,20-22] and anxiety[8,23] which has key role to chronic insomnia.[3,8,20-23] Cconsidering this, it seems that yoga can be considered as a tool for the management of insomnia.[1,3]

This systematic review is conducted to know about role of yoga activities for sleep health in patients with insomnia. A good response can provide information regarding potential of yoga activities as one of the modalities for management of insomnia.

## MATERIALS AND METHODS

Researchers used the Preferred Reporting Items for Systematic Reviews and Meta- Analyses (PRISMA) guidelines for reporting systematic reviews and meta-analysis (Figure 1) [60]. This literature review did not require Institutional Review Board approval.

### Search Strategy

Relevant studies were identified by a literature search with language restriction of 'English' language in electronic database of Google Scholar and PubMed Central. Advance search with application of filter in PubMed Central and in Google scholar. Words used in search strategy are: effect, insomnia, sleep health, stress, yoga activities and relaxation techniques. Literature search was also done directly online in google search. Reference list of filtered studies was also searched to get relevant articles, while the grey literature was not searched

### Studies Selection Criteria

Studies filtered in primary search assessed for following inclusion and exclusion criteria:

Inclusion criteria:
- Studies including yoga activities
- Studies having participants with insomnia
- Studies includes yoga activities effect on participants

Exclusion criteria:
- Not satisfying inclusion criteria
- Articles not relevant to insomnia.
- Free full text article not available of studies
- Type of articles as letters and review articles

### Study Selection

Reviewers assessed studies independently for inclusion and exclusion criteria mentioned in study selection criteria. In detail reading of studies queries for inclusion and exclusion of studies were addressed and final decision reached by discussion.

### Data Extraction

Reviewers analysed selected studies with following headings: Name of first author with initials, year of publication, Brief detail of study population, sample size, age, gender, brief detail of yoga activities and brief detail of outcome measure. Data were verified by reviewers and any discrepancies were sort out by discussion and settled by consensus.

### Data Analysis

We extracted yoga activities and outcome measures in individual articles. yoga activities and outcomes were analysed in individual study. Collected data was compared.

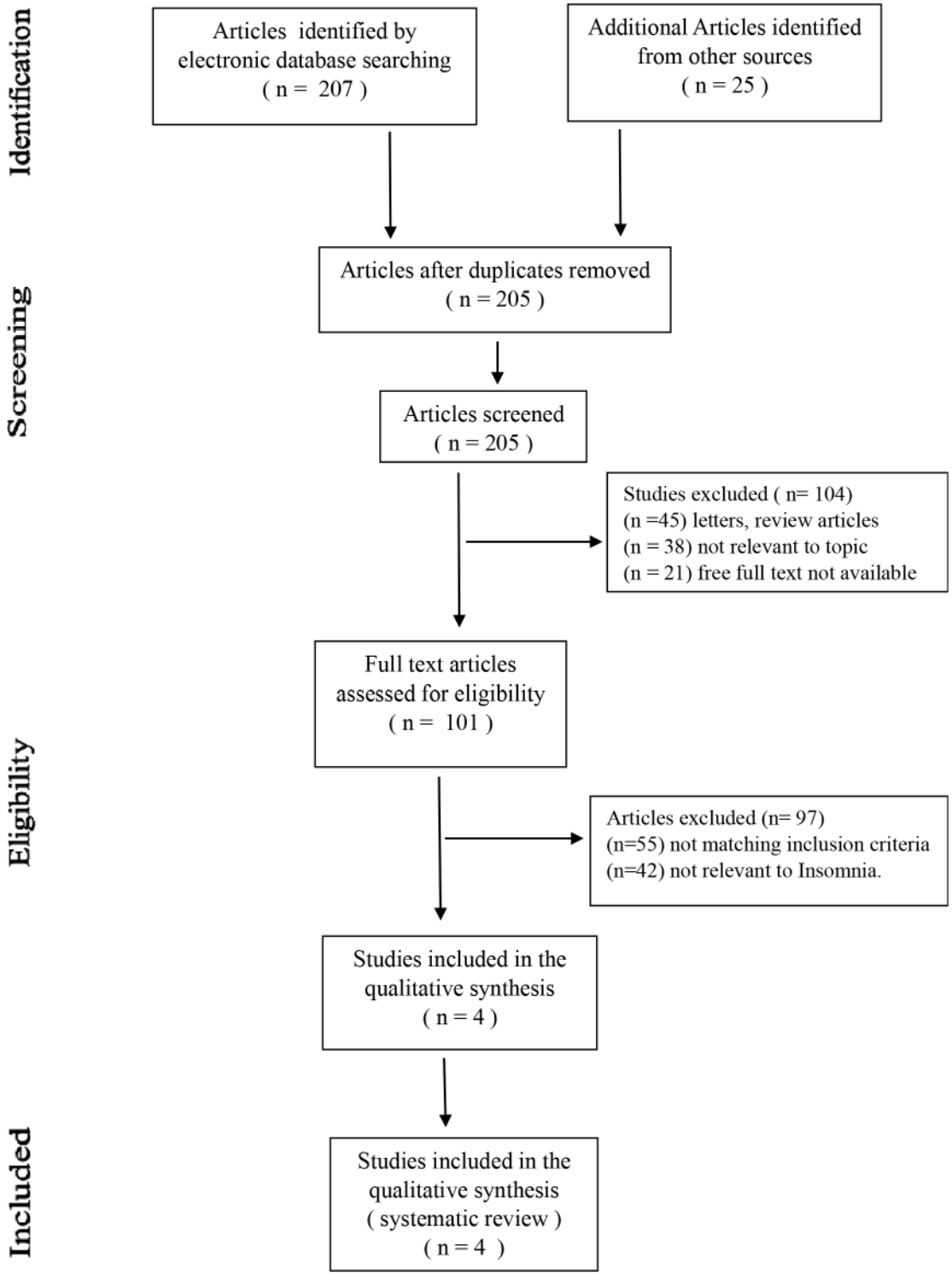


Figure – 1. Flow chart article search and study selection

Table 1: Summary of Characteristics of included studies

| First Author, Year | Brief detail of study population | Sample Size | Age group (Year) | Gender | Brief detail of yoga activities | Brief detail of outcome measure |
|---|---|---|---|---|---|---|
| Datta K[24] (2021) | Patients having diagnosis of chronic insomnia and volunteered to participate in study were assessed for eligibility. Inclusion and exclusion criteria described in the study. | 21 | 25 to 60 | ---- | *Yoga nidra* practice [24,25] done as described in the study. The supervised sessions were done in a laboratory, Information regarding guidelines for observer is provided in study.[24,25] | Outcome measures were both subjective and objective as described in study, and Salivary cortisol levels were also measured. [24,25,31-38] |
| Turmel D[8] (2022) | Newly diagnosed adults with chronic insomnia defined by International Classification of Sleep Disorders (ICSD)-3 criteria,[8,9,26]were included on voluntary basis. Inclusion and exclusion criteria described in the study. | 21 | 28 to 58 | Male-9, Female -12 | Viniyoga,[8,28-30] an individualised Yoga practice, as described in the study done for 14 weeks. | Single group pre-post study done. Baseline assessments as described in study was done and were repeated at the end of yoga practice. |
| Mathew D[1] (2024) | women screening positive for insomnia using the Insomnia Severity Index Questionnaire were eligible for study. [1,44] Inclusion criteria described in the study. | 30 | 60 to 70 | Female | Yoga intervention start with an initial full-day workshop. This followed by 60-minutes session held 6 days/week for 12 week. | Pretests and post-tests were conducted to assess Outcomes as described in the study |
| Khalsa SBS(3) (2021) | Participants with primary complaint of sleep onset insomnia included in study with selection process described in the study. Inclusion and exclusion criteria described in the study. | 20 | 25 to 59 | ---- | Kundalini yoga[3] as described in study was done for 8 week. | Assessment done at baseline, throughout the intervention, and at 6-month follow-up as described in the study |

## RESULTS

### Literature search

We find 232 eligible articles by combined electronic database search and manual search. After removal of 27 duplicated studied remaining 205 studies were screened by titles and abstracts. In screening process total 104 studies were excluded with reasons as 38 studies were not relevant to topic; 45 studies were letters or review articles and free full article was not available of 21 studies. Full text articles were assessed for eligibility in remaining 101 studies after screening process. In this assessment total 97 studies were excluded with reasons as 55 studies were not matching inclusion criteria and 42 studies were not relevant to Insomnia. And 4 articles were identified to include in qualitative analysis. Flow diagram for studies selection process and reason for exclusion is displayed in Figure 1.

### Description of included studies

Brief description of each eligible 4 studies[1,3,8,24] is detailed in table 1. Sample size of eligible 4 studies ranged from 20 to 30 participants. All eligible studies were published from 2021 – 2024. Out of 4 eligible included studies, 2 studies[3,24] has not provided information of gender of participants. Out of 4 eligible included studies, 1 study[1] has only female participants, and 1 study[8] has participants from both gender. All 4 eligible Studies[1,3,8,24] included participants with insomnia as described in studies.[1,3,8,24] The age of participants ranged from 25−70 years.

### Description of intervention

Brief detail of activity is provided in table 1. In the study by Datta K[24] *Yoga nidra* practice [24,25] done as described in the study and the supervised sessions were done in a laboratory. Information regarding guidelines for observer is provided in study by Datta K[24] Medication was not stopped and participants continued their prescribed drugs without change throughout the intervention In the study by Datta K.[24]

In the study by Turmel D[8] newly diagnosed adults with chronic insomnia defined by International Classification of Sleep Disorders (ICSD)-3 criteria,[8,9,26] were included on voluntary basis if they agreed to follow the Yoga program rather than the reference therapy, Cognitive behavioral treatment for insomnia (CBT-I),[8,27] as first-line treatment. In the study by Turmel D[8] Viniyoga,[8,28-30] an individualised Yoga practice, as described in the study done for 14 weeks.[8] Viniyoga[8,28-30] was developed by T Krishnamacharya (1888–1989) as described in study by Turmel D,[8] while his son TKV Desikachar (1938–2016), invented the yoga stick figures,[8,29] and Stick figure guidelines were published in 1981.[8,30]

In the study by Mathew D,[1] Yoga intervention start with an initial full-day workshop. This followed by 60-minutes session held 6 days/week for 12 week. The yoga therapy session has various components, including loosening exercises, breathing awareness, relaxation techniques, a series of asanas, pranayamas, breathing stretches, mantra chanting, kriya, and yoga nidra.[1] A certified and experienced yoga instructor having over 12 years of expertise in providing yoga therapy conducted the yoga therapy program.[1]

In the study by Khalsa SBS,[3] the instructor (S.B.S.K.)[3] held a met with participants for one 60-minute, in-person training session.[3] Paper instructions were given to participants and advised to follow the protocol.[3] After one week, the instructor met participants in-person for 15 minutes to address issues, answers questions and for suggestions.[3] After that the instructor followed-up participants via telephone every two weeks for 5-to-10-minute call.[3] The 45-minute daily yoga session utilizes practice from kundalini yoga as described in study. [3] In the study by Khalsa SBS,[3] Participants were remunerated for their participation. Participants were instructed to perform in the evening time just before bedtime and if evening schedule is difficult to manage for

them, they were instructed to practice at another time of the day.[3]

### Measures

Measures in each study is provided in brief in table 1. In the study by Datta K[24] Outcome measures were both subjective by using sleep diary and objective by using polysomnography, and salivary cortisol levels were also measured.[24,25,31-38] Self-administered questionnaires used in study by Datta K[24] are Pittsburgh Sleep Quality Index (PSQI),[24,33] Insomnia Severity Index (ISI),[24,34] Depression Anxiety Stress Scale (DASS),[24,35] Epworth Sleepiness Scale,[24,36] and Pre-Sleep Arousal Scale (PSAS).[24,37]

In the study by Turmel D[8] Baseline assessments included home polysomnography (PSG) ,[8,39,40] actigraphy,[8,41,42] and questionnaires which includes Pittsburgh Sleep Quality Index questionnaire (PSQI),[8,33] Hospital Anxiety Depression scale (HADS),[8,43] Epworth Sleepiness Scale (ESS),[8] Pichot fatigue scale (PS),[8] Assessments were repeated at the end of Yoga practice.[8] In study by Turmel D[8] Sleep quality and quantity were assessed subjectively using the Pittsburgh Sleep Quality Index questionnaire (PSQI ).[8,33] In Pittsburgh Sleep Quality Index questionnaire (PSQI) the overall score ranges from 0 to 21, poor quality sleep is indicated by higher score and scores below 5 considered to be high quality sleep.[8,33] In study by Turmel D[8] in Hospital Anxiety Depression scale (HADS),[8,43] Scores > 11 on either subscale indicate significant psychological comorbidity, a score of 8–10 is borderline, and a score of 7 or below is considered to be normal. In study by Turmel D[8] Epworth Sleepiness Scale (ESS)[8] was used to assess daytime sleepiness where a score ≥ 10 indicates excessive daytime sleepiness and in Pichot fatigue scale (PS),[8] A score ≥ 22 indicates excessive fatigue as described in study.[8]

In the study by Mathew D[1] Insomnia severity was assessed by using the Insomnia Severity Index (ISI), a self-reported questionnaire specifically designed to measure the intensity, nature, and repercussions of insomnia symptoms.[1,44] Pretest for insomnia severity was conducted at baseline before the initiation of the yoga therapy intervention and Post-test was conducted at the end of the 12-week intervention period to assess changes in insomnia severity.[1,44]

In the study by Khalsa SBS[3] outcome measures included Therapy evaluation questionnaire (TEQ),[3,45] Sleep diaries[3] as described in the study[3] and Sleep questionnaires which includes 7-item Insomnia Severity Index (ISI),[3,44] 13-item Insomnia Symptom Questionnaire (ISQ),[3,46] Pittsburgh Sleep Quality Index (PSQI),[3,33] 9-item Self-Efficacy for Sleep scale (SES)[3,47] and Pre-Sleep Arousal Scale (consisting of "Cognitive" and "Somatic" subscales).[3,37] In the study by Khalsa SBS[3] The Self-Efficacy for Sleep scale (SES)[3,47] and Insomnia Symptom Questionnaire (ISQ)[3,46] were collected with a modified visual analog scale format,[3,48] consistent with procedures from Edinger et al.[3,48] In the study by Khalsa SBS[3] as described in the study, the therapy evaluation questionnaire (TEQ)[3,45] was administered in the beginning and end session of the protocol. Completed sleep diaries as described in the study[3] were brought in by the participants following the 2-week baseline and after the first week of the session and then mailed in every 2 weeks for the remainder of the session phase and for 6-month follow-up in the study by Khalsa SBS.[3] Regarding sleep questionnaire in the study by Khalsa SBS[3] Questionnaire measures were collected once at baseline, end of intervention (week 8), and follow-up, with different intervals during treatment phase: weekly for Insomnia Severity Index (ISI)[3,44] and Insomnia Symptom Questionnaire (ISQ),[3,46] biweekly for Pre-Sleep Arousal Scale,[3,37] treatment midpoint (week 4) for Self-Efficacy for Sleep scale (SES),[3,47] and no intermediate intervals for Pittsburgh Sleep Quality Index (PSQI).[3,33]

### Outcome

In the study by Datta K[24] showed improvement in total sleep time in both subjective

and objective measures, and salivary cortisol reduced significantly after yoga nidra.[24,25,31-38] Improvement of total wake duration and subjective sleep quality occurred following yoga nidra practice[24,25,31-38] in study by Datta K.[24]

In the study by Turmel D,[8] measurement in objective sleep showed no change in polysomnography parameters while on actigraphy decreased in arousals is observed after yoga practice and Subjective symptoms improved for all questionnaires ( Pittsburgh Sleep Quality Index questionnaire (PSQI ),[8,33] Hospital Anxiety Depression scale (HADS-A and HADS-D),[8,43] Epworth Sleepiness Scale (ESS)[8] and Pichot fatigue scale (PS)[8] as described in study.[8]

In the study by Mathew D,[1] the results of the study showed a significant reduction in Insomnia Severity Scores after the 12-week yoga intervention.[1,44]

In the study by Khalsa SBS[3] Total sleep time increased progressively across yoga treatment, concurrent with increased sleep efficiency and decreased sleep onset latency, while no changes in pre-sleep arousal. For more than 50% of yoga participants, the insomnia severity index[3,44] decreased by at least 8 points at end of treatment and follow-up in the study by Khalsa SBS.[3]

## DISCUSSION

Studies included in systematic review investigate role of yoga activities on different parameters related to sleep health in patients with insomnia. Overall, included studies found improvements in various aspects of sleep health by yoga activities in patients with insomnia.

Studies[1,49,50] in the past has shown effectiveness of yoga in patients with insomnia across various populations. Yoga has been shown to increase melatonin levels.[8,23,51,52,53] Increase in melatonin levels may be helpful for improvement in insomnia.[8,54] Yoga might be a potent and safe intervention for people with high levels of anxiety.[8,23] Decrease in complaints of anxiety indicates potential of yoga in reduction of stress, with a potential effect on insomnia.[8,23]

It has been found that parasympathetic drive at night is increased by yoga practice in morning which cause sleep to be more restorative.[24,55] Possible mechanisms that might affect quality of sleep and feeling better subjectively may be connected to cognitive structuring effects of these practices, which leads to relaxation in mental processing of external inputs.[24,56] The possible reasons for beneficial effect with mindfulness mediation in patients with insomnia may be reduction in emotional state and reduced sympathetic arousal.[24,57-59]

### Limitation

In this review yoga activities are primarily focused. schedule and period in the design of yoga activities programme was different among selected studies. Parameter of outcome measures were also different among selected studies. As similar module of yoga activities programme is not used in different studies and similar outcome parameter is not used, it is difficult to generalize the interpretation of individual study. Sample size was also comparatively small in selected studies. Other health problems were not screened for in the study selection criteria. Other limitation in search strategy was English language and articles which were not freely available also decreased scope of articles. The selection of articles was done by using only a pre-defined set of electronic databases. Therefore, studies of other electronic databases which were not included into the search strategy, may contain relevant articles for the topic of this review.

### Recommendations for future

For more specific analysis, research should focus on specific parameter related to sleep health with yoga activities in individual with insomnia. Research with a comparatively large sample size, appropriate methodology and with use of standardized outcome measures should be done for evaluation.

## CONCLUSION

The present review focused on the effect of yoga activities on the parameter related to sleep health of individuals with insomnia. Overall, included studies found advantageous effect of yoga activities in individuals with insomnia. Further research is required to explore the long-term effects of yoga activities and to explore effects with optimal frequency and schedule of sessions. However, it seems hopeful the role of yoga activities in insomnia, but before utilizing it in practice and treatment, properly designed studies are required to examine these effects in more detail, with adequate specificity and accuracy.

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Conflict of Interest: Nil

## REFERENCES

1. Mathew D, Rangasamy M. Effect of Yoga Therapy on Insomnia Severity and Systolic Blood Pressure in Aged Women: A 12-Week Intervention Study Conducted in Kerala. Cureus 2024; 16(3): e57169. doi: 10.7759/cureus.57169.

2. Drake CL, Roehrs T, Roth T: Insomnia causes, consequences, and therapeutics: an overview . Depress Anxiety. 2003, 18:163-76. doi: 10.1002/da.10151.

3. Khalsa SBS, Goldstein MR. Treatment of chronic primary sleep onset insomnia with Kundalini yoga: a randomized controlled trial with active sleep hygiene comparison. J Clin Sleep Med. 2021;17(9):1841–1852. doi:10.5664/jcsm.9320.

4. Roth T, Coulouvrat C, Hajak G, et al. Prevalence and perceived health associated with insomnia based on DSM-IV-TR; international statistical classification of diseases and related health problems, tenth revision; and research diagnostic criteria/ international classification of sleep disorders. Biol Psychiatry. 2011;69(6):592–600.

5. Ford ES, Cunningham TJ, Giles WH, Croft JB. Trends in insomnia and excessive daytime sleepiness among U.S. adults from 2002 to 2012. Sleep Med. 2015;16(3): 372–378.

6. Hartescu I, Morgan K. Regular physical activity and insomnia: an international perspective. J Sleep Res. 2019;28(2):e12745.

7. Morin CM, Drake CL, Harvey AG, et al. Insomnia disorder. Nat Rev Dis Primers. 2015; 1(1):15026.

8. Turmel D, Carlier S, Bruyneel AV, Bruyneel M. Tailored individual Yoga practice improves sleep quality, fatigue, anxiety, and depression in chronic insomnia disorder. BMC Psychiatry 2022;22(1):267. doi:10.1186/s12888-022-03936-w.

9. Kennedy SL. Yoga as the "next wave" of therapeutic modalities for treatment of insomnia. Int J Yoga Therap. 2014;24:125–9.

10. Miller MA, Renn BN, Chu F, Torrence N. Sleepless in the hospital: A systematic review of non-pharmacological sleep interventions. Gen Hosp Psychiatry. 2019. doi:10.1016/j. genho sppsy ch. 2019.05.006.

11. Taylor DJ, Lichstein KL, Durrence HH, Reidel BW, Bush AJ. Epidemiology of insomnia, depression, and anxiety. Sleep. 2005. doi:10.1093/ sleep/ 28.11.1457.

12. Sharpe E, Tibbitts D, Wolfe B, Senders A, Bradley R. Qualitative impressions of a yoga Nidra practice for insomnia: An exploratory mixed-methods design. J Altern Complement Med 2021;27(10):884–92. doi:10.1089/acm.2021.0125.

13. Asnis GM, Thomas M, Henderson MA. Pharmacotherapy treatment options for insomnia: A primer for clinicians. Int J Mol Sci 2015;17:50.

14. Chou TL, Chang LI, Chung MH. The mediating and moderating effects of sleep hygiene practice on anxiety and insomnia in hospital nurses. Int J Nurs Pract 2015; 21(Suppl. 2):9–18.

15. Irish LA, Kline CE, Gunn HE, et al. The role of sleep hygiene in promoting public health: A review of empirical evidence. Sleep Med Rev 2015;22:23–36.

16. Andersen LP, Gogenur I, Rosenberg J, Reiter RJ. The safety of melatonin in humans. Clin Drug Invest 2016;36:169–175.

17. Schroeck JL, Ford J, Conway EL, et al. Review of safety and efficacy of sleep medicines in older adults. Clin Ther 2016;38:2340–2372.

18. Mack LJ, Rybarczyk BD. Behavioral treatment of insomnia: A proposal for a stepped-care approach to promote public health. Nat Sci Sleep 2011;3:87–99.

19. Kay-Stacey M, Attarian H: Advances in the management of chronic insomnia . BMJ. 2016, 354:i2123. doi:10.1136/ bmj.i2123.

20. Agrawal G. A Review of the Psychological Benefits of Yoga. Int J Yoga Allied Sci. 2013;2:53–8.

21. Wang F, Szabo A. Effects of yoga on stress among healthy adults: a systematic review. Altern Ther Health Med. 2020;26(4):AT6214.

22. Pascoe MC, Thompson DR, Ski CF. Yoga, mindfulness-based stress reduction and stress-related physiological measures: aA meta-analysis. Psychoneuroendocrinology. 2017;86:152–168.

23. Cramer H, Lauche R, Anheyer D, Pilkington K, de Manincor M, Dobos G, et al. Yoga for anxiety: A systematic review and meta-analysis of randomized controlled trials. Depress Anxiety. 2018. doi:10. 1002/da.22762.

24. Datta K, Tripathi M, Verma M, Masiwal D, Mallick HN. Yoga nidra practice shows improvement in sleep in patients with chronic insomnia: A randomized controlled trial. Natl Med J India 2021;34(3):143–50. doi:10.25259/NMJI_63_19.

25. Datta K, Tripathi M, Mallick HN. *Yoga nidra*: An innovative approach for management of chronic insomnia–A case report. *Sleep Sci Pract* 2017;1:7. doi: 10.1186/s41606-017-0009-4.

26. Sateia MJ. International classification of sleep disorders-third edition: highlights and modifications. Chest. 2014;146(5):1387–94. doi:10.1378/ chest.14-0970.

27. Yu JS, Kuhn E, Miller KE, Taylor K. Smartphone apps for insomnia: examining existing apps' usability and adherence to evidence-based principles for insomnia management. Transl Behav Med. 2019. doi:10.1093/tbm/iby014.

28. Chandrasekaran N. Principles and Practices of Yoga Therapy Vhf Publications Chennai. 2012. (978-81-923433-0-3).

29. Desikachar TKV. The Heart of Yoga, Inner Traditions Ed. 1999. (978-0892817641).

30. Smith MJN. An Illustrated Guide to Āsanas and Prānāyāma, Krishnamacharya Yoga Mandiram Ed. 2007. (https://www. kym.org/research/).

31. Raveendran AV, Deshpandae A, Joshi SR. Therapeutic role of yoga in type 2 diabetes. Endocrinol Metab (Seoul) 2018;33:307–17.

32. Rani K, Tiwari S, Singh U, Singh I, Srivastava N. Yoga nidra as a complementary treatment of anxiety and depressive symptoms in patients with menstrual disorder. Int J Yoga 2012;5:52–6.

33. Buysse DJ, Reynolds CF 3rd, Monk TH, Berman SR, Kupfer DJ. The Pittsburgh sleep quality index: A new instrument for psychiatric practice and research. Psychiatry Res 1989;28:193- 213.

34. Morin CM, Belleville G, Bélanger L, Ivers H. The insomnia severity index: Psychometric indicators to detect insomnia cases and evaluate treatment response. Sleep 2011;34:601–8.

35. Brown TA, Chorpita BF, Korotitsch W, Barlow DH. Psychometric properties of the Depression Anxiety Stress Scales (DASS) in clinical samples. Behav Res Ther 1997;35:79–89.

36. Johns MW. A new method for measuring daytime sleepiness: The Epworth sleepiness scale. Sleep 1991;14:540–5.

37. Nicassio PM, Mendlowitz DR, Fussell JJ, Petras L. The phenomenology of the pre-sleep state: The development of the pre-sleep arousal scale. Behav Res Ther 1985;23:263–71.

38. Berry RB, Brooks R, Gamaldo CE, Harding SM, Lloyd RM Marcus CL, et al. The AASM Manual for the Scoring of Sleep and Associated Events: Rules, Terminology and Technical Specifications. Ver 2.0.3. Darien, Illinois:American Academy of Sleep Medicine; 2014.

39. Berry RB, Budhiraja R, Gottlieb DJ, Gozal D, Iber C, Kapur VK, et al. American Academy of Sleep Medicine, Rules for Scoring Respiratory Events in Sleep: Update of the 2007 AASM Manual for the Scoring of Sleep and Associated Events. J Clin Sleep Med. 2012;8(5):597–619. doi:10.5664/jcsm.2172.

40. Hertenstein E, Gabryelska A, Spiegelhalder K, Nissen C, Johann AF, Umarova R, et al. Reference Data for Polysomnography-Measured and Subjective Sleep in Healthy Adults. J Clin Sleep Med. 2018. doi:10.5664/jcsm.7036.

41. Withrow DJ, Roth T, Koshorek G, Roehrs T. Relation between ambulatory actigraphy and laboratory polysomnography in insomnia practice and research. J Sleep Res. 2019. doi:10.1111/jsr.12854.

42. Dalibalta S, Majdalawieh A, Yousef S, Gusbi M, Wilson JJ, Tully MA, et al. Objectively quantified physical activity and sedentary behaviour in a young UAE population. BMJ Open Sport Exerc Med. 2021. doi:10.1136/bmjsem- 2020- 000957.

43. Zigmond AS, Snaith RP. The Hospital Anxiety and Depression scale. Acta Psychiatr Scand. 1983. doi:10.1111/j.1600-0447.1983.tb09716.x.

44. Bastien CH, Vallières A, Morin CM: Validation of the Insomnia Severity Index as an outcome measure for insomnia research. Sleep Med. 2001, 2:297-307. 10.1016/S1389-9457(00)00065-4.

45. Edinger JD, Olsen MK, Stechuchak KM, et al. Cognitive behavioral therapy for patients with primary insomnia or insomnia associated predominantly with mixed psychiatric disorders: a randomized clinical trial. Sleep. 2009;32(4):499–510.

46. Okun ML, Kravitz HM, Sowers MF, Moul DE, Buysse DJ, Hall M. Psychometric evaluation of the Insomnia Symptom Questionnaire: a self-report measure to identify chronic insomnia. J Clin Sleep Med. 2009;5(1):41–51.

47. Lacks P. Behavioral Treatment for Persistent Insomnia. Pergamon Press: New York; 1987.

48. Edinger JD, Sampson WS. A primary care "friendly" cognitive behavioral insomnia therapy. Sleep. 2003;26(2):177–182.

49. Shathirapathiy G, Mooventhan A, Mangaiarkarasi N, Sangavi SA, Shanmugapriya V, Deenadayalan B, Gayathri A: Effect of trataka (yogic gazing) on insomnia severity and quality of sleep in people with insomnia. Explore (NY). 2022, 18:100-3. doi:10.1016/j.explore.2020.09.009.

50. Tunuguntla R, Tunuguntla HS, Kathuria H, Verma S: Effectiveness of app-based yoga of immortals (YOI) intervention for insomnia in asian population during pandemic restrictions. Int J Environ Res Public Health. 2021, 18:5706. doi:10.3390/ijerph18115706.

51. Wang WL, Chen KH, Pan YC, Yang SN, Chan YY. The effect of Yoga on sleep quality and insomnia in women with sleep problems: a systematic review and meta-analysis. BMC Psychiatry. 2020. doi:10.1186/s12888 020-02566-4.

52. Zeichner SB, Zeichner RL, Gogineni K, Shatil S, Ioachimescu O. Cognitive Behavioral Therapy for Insomnia, Mindfulness, and Yoga in Patients With Breast Cancer with Sleep Disturbance: A Literature Review. Breast Cancer (Auckl). 2017. doi:10.1177/1178223417745564.

53. Vadiraja HS, Raghavendra RM, Nagarathna R, Nagendra HR, Rekha M, Vanitha N, 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. doi:10.1177/1534735409331456.

54. Ferracioli-Oda E, Qawasmi A, Bloch MH. Meta-analysis: melatonin for the treatment of primary sleep disorders. PLoS ONE. 2013. doi:10.1371/journal.pone.0063773.

55. Patra S, Telles S. Heart rate variability during sleep following the practice of cyclic meditation and supine rest. Appl Psychophysiol Biofeedback 2010;35:135–40.

56. Deepak KK. Neurophysiological mechanisms of induction of meditation: A hypothetico-deductive approach. Indian J Physiol Pharmacol 2002;46:136–58.

57. Ong JC, Manber R, Segal Z, Xia Y, Shapiro S, Wyatt JK. A randomized controlled trial of mindfulness meditation for chronic insomnia. Sleep 2014;37:1553–63.

58. Ong JC, Shapiro SL, Manber R. Mindfulness meditation and cognitive behavioral therapy for insomnia: A naturalistic 12-month follow-up. Explore (NY) 2009;5: 30–6.

59. Martires J, Zeidler M. The value of mindfulness meditation in the treatment of insomnia. Curr Opin Pulm Med 2015;21:547–52.

60. Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta- Analyses: The PRISMA Statement. PLoS Med 2009;6(7): e1000097. doi:10.1371/journal.pmed.1000097.