

# Methodological issues of systematic reviews and meta-analyses in the field of sleep medicine: A meta-epidemiological study

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## PROTOCL

### **Systematic review and meta-analysis of healthcare intervention in the science of sleep medicine: towards the methodological issues**

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## **Research question**

There is an increasing number of systematic reviews and meta-analyses of sleep medicine have been published during the past decades, and some of which have been used in clinical guidelines for evidence-based decision. Although these systematic reviews and meta-analyses provided direct and comprehensive evidence for clinical practice, it is unclear whether these systematic reviews and meta-analyses were of high quality in light with how they were designed and implemented.

## **Searches**

There were two ways to search related systematic reviews and meta-analysis. The first method is to search it by disease, in details, the MeSH terms and free text words of each diseases related to sleep will be collected and then combine them (use “AND”) with the topic (and free text words) of systematic review and meta-analysis. Another method is to search it by journals, that is, we search systematic reviews and meta-analyses published in journals specific to sleep medicine. After a discussion with the core authors, we decided to take the second scheme. Literature search will be conducted by searching the main sleep medicine journals indexed in PubMed, Medline and Embase databases. Given the primary aim of current study, we will not consider journals of neurosciences, psychology, otolaryngology, although some systematic reviews and meta-analyses related to sleep medicine may published in these journals. By a prior search in Scimago Journal & Country Rank (<https://www.scimagojr.com/>), we identified 23 journals in

sleep medicine, for example, “Sleep”, “Sleep medicine reviews”, “Sleep medicine”. We however excluded 4 of them as they were listed as predatory journals. A full list of the remaining 19 journals detailed and search strategy will be presented in the supplementary file (search strategy).

Grey literature will not be considered as we only aim to assess the methodological quality of published systematic reviews and meta-analyses. And the sample size we will use would be sufficient and representative. Due to the same reason, we will not use hand search for the reference lists of each systematic reviews and meta-analyses.

### **Types of study to be included**

Systematic reviews that contained one or more meta-analyses published in the main journals of sleep medicine. Overviews, scoping reviews, and narrative reviews will not be considered. Pooled analysis that do not using a comprehensive (at least one database) literature search will also not be considered. In some situation authors may present their paper as an original study combined with a systematic review or an overview/scoping review combined with a systematic review, again, will not be considered in current study.

**Context**

This review will focus on the methodological issues of published systematic reviews and meta-analyses published in main sleep journals. The methodological issues will be measured by the AMSTAR 2.0 checklist which documented 16 main methodological tips for systematic reviews and meta-analyses of healthcare intervention []. The major methodological issues will be recorded and discussed. Some baseline variables like region, author number, use of reporting checklist will be used as potential moderator to see if the extent of methodological issues differs by these variables. A potential practical guideline will be presented.

**Main outcome(s)**

Summary of methodological issues among the eligible studies.

**Assessment of methodological issues**

The AMSTAR 2.0 checklist for systematic reviews and meta-analyses of healthcare intervention will be used to assess the main methodological issues.

**Data extraction (selection and coding)**

Two authors will screen the literature (full-text stage) for eligibility independently

through the Rayyan online app, since this app allows a restrict blinding for the two raters to ensure the process was independent. The assessment of methodological issues will be employed by a methodologist of evidence synthesis, who also have rich experience on the production of systematic review and meta-analysis (X.C). The results will be double checked by another experienced systematic review author (L.Y). Baseline characteristics such as author name, number of authors, publication year, region of first author, study type included, use of reporting guidance, funding information, type of meta-analyses will be extracted by one author (L.Y) and will be double checked by the principle author (X.C).

### **Analysis of subgroups or subsets**

Some variables will be used to set out the subgroup analysis, which includes author number, region of first author, publication year, and use of reporting guidance.

### **Contact details for further information**

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### **Conflicts of interest**

We declare no conflict of interest.

## **Funding**

This study did not receive any financial supporting.

## **Stage of review**

Review Ongoing: A crude search strategy has been developed but the literature search has not been conducted (By Oct-15, 2019).

## Search strategy

### Medline and EMBASE (OVID) Search strategy

The information was obtained from Scimago Journal & Country Rank(<https://www.scimagojr.com>)

Note: *Nature and science of sleep* (ISSN: 1179-1608), *Waking and sleeping* (ISSN: 0340-0905), *Neurobiology of sleep and circadian rhythms* (ISSN: 2451-9944), *Sleep and biological rhythms* (ISSN: 1446-9235) cannot be searched by journal, so the electronic ISSN were used instead.

1. Sleep.jn
2. Sleep medicine.jn
3. Sleep Medicine Research.jn
4. Journal of clinical sleep medicine.jn
5. Sleep & breathing.jn
6. Journal of sleep research.jn
7. Sleep medicine reviews.jn
8. Behavioral sleep medicine.jn
9. Sleep health.jn
10. Sleep medicine clinics.jn
11. 1179-1608.es
12. Sleep science.jn
13. Sleep disorders.jn
14. Sleep research online: sro.jn
15. 0340-0905.es
16. 2451-9944.es
17. Current sleep medicine reports.jn
18. 1446-9235.es.
19. The Indian journal of sleep medicine.jn
20. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or  
19
21. Meta-analysis as topic/

22. Meta analy\*.ti,ab.
23. Meta-analy\*.ti,ab.
24. Pool\* analy\*.ti,ab.
25. Pool\* stud\*.ti,ab.
26. Systematic review\*.ti,ab.
27. or/21-26
28. 20 AND 27
29. Conference paper.pt.
30. Conference abstract.pt.
31. Letter.pt.
32. Protocol.ti
33. Editorial.pt.
34. Or/29-33
35. 28 AND 34
36. 28 NOT 35
37. limit 36 to humans

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**PubMed**

1. (((((((((((("Sleep"[Journal]) OR "Sleep medicine"[Journal]) OR "Journal of clinical sleep medicine : JCSM : official publication of the American Academy of Sleep Medicine"[Journal]) OR "Sleep & breathing = Schlaf & Atmung"[Journal]) OR "Journal of sleep research"[Journal]) OR "Sleep medicine reviews"[Journal]) OR "Behavioral sleep medicine"[Journal]) OR "Sleep health"[Journal]) OR "Sleep medicine clinics"[Journal]) OR ("Nature and science of sleep"[Journal])) OR "Sleep science (São Paulo, Brazil)"[Journal]) OR "Sleep disorders"[Journal]) OR "Sleep research online : SRO"[Journal]) OR ("Waking and sleeping"[Journal])) OR ("Neurobiology of sleep and circadian rhythms"[Journal])) OR ("Sleep and biological rhythms"[Journal])) OR "Current sleep medicine reports"[Journal]
2. (((("meta-analysis as topic"[MeSH Major Topic]) OR Meta analysis[Title/Abstract]) OR Meta-analysis[Title/Abstract]) OR Pool\* analysis[Title/Abstract]) OR Systematic review\*[Title/Abstract]
3. 1 AND 2

### List of excluded studies that judged by abstracts and titles

As showed in Figure 1, 104 records [1-104] were first removed in the stage of titles and abstracts' screen and most of which were commentary, original articles, response, or overviews.

1. Abetz, L., et al., *The reliability, validity and responsiveness of the International Restless Legs Syndrome Study Group rating scale and subscales in a clinical-trial setting*. Sleep Med, 2006. 7(4): p. 340-9.
2. Ahmed, M.M. and R.J. Schwab, *Chronic Noninvasive Positive-Pressure Ventilation: Considerations During Sleep*. Sleep Medicine Clinics, 2008. 3(4): p. 557-568.
3. Al-Jewair, T.S., B.O. Gaffar, and C. Flores-Mir, *Quality assessment of systematic reviews on the efficacy of oral appliance therapy for adult and pediatric sleep-disordered breathing*. Journal of Clinical Sleep Medicine, 2016. 12(8): p. 1175-1183.
4. Almeneessier, A.S. and A.S. BaHammam, *Sleep medicine in Saudi Arabia*. Journal of Clinical Sleep Medicine, 2017. 13(4): p. 641-645.
5. Alwardat, M., et al., *Comments on: "Complementary and alternative therapies for restless legs syndrome: An evidence-based systematic review"*. Sleep Med Rev, 2018. 40: p. 215-216.
6. Anic-Labat, S., et al., *Validation of a cataplexy questionnaire in 983 sleep-disorders patients*. Sleep, 1999. 22(1): p. 77-87.
7. Anonymous, *Abstracts for the 6th World Congress on Sleep Medicine*. Sleep Medicine, 2015. 16.
8. Anonymous, *Abstracts for the 14th World Sleep Congress*. Sleep Medicine, 2017. 40.
9. Anonymous, *Sleep DownUnder 2018, 30th ASM of Australasian Sleep Association and the Australasian Sleep Technologists Association*. Journal of Sleep Research, 2018. 27.
10. Augelli, D.M. and A.C. Krieger, *Social and Economic Impacts of Managing Sleep Hypoventilation Syndromes*. Sleep Medicine Clinics, 2017. 12(1): p. 87-98.
11. Aurora, R.N., et al., *Updated adaptive servo-ventilation recommendations for the 2012 AASM guideline: "The treatment of central sleep apnea syndromes in adults: Practice parameters with an evidence-based literature review and meta-analyses"*. Journal of Clinical Sleep Medicine, 2016. 12(5): p. 757-761.
12. Aurora, R.N., et al., *Update to the AASM Clinical Practice Guideline: "The treatment of restless legs syndrome and periodic limb movement disorder in adults-an update for 2012: practice parameters with an evidence-based systematic review and meta-analyses"*. Sleep, 2012. 35(8): p. 1037.
13. Aurora, R.N., et al., *The treatment of restless legs syndrome and periodic limb movement disorder in adults--an update for 2012: practice parameters with an evidence-based systematic review and meta-analyses: an American Academy of Sleep Medicine Clinical Practice Guideline*. Sleep, 2012. 35(8): p. 1039-62.
14. Aurora, R.N. and S.F. Quan, *Quality measure for screening for adult obstructive sleep apnea by primary care physicians*. Journal of Clinical Sleep Medicine, 2016. 12(8): p. 1185-1187.
15. Bakker, J.P., et al., *Blood pressure improvement with continuous positive airway pressure is independent of obstructive sleep apnea severity*. Journal of Clinical Sleep Medicine, 2014. 10(4): p. 365-369.

16. Barfield, R., et al., *Epigenome-wide association analysis of daytime sleepiness in the Multi-Ethnic Study of Atherosclerosis reveals African-American-specific associations*. Sleep, 2019. **42**(8).
17. Basner, M. and D.F. Dinges, *Maximizing sensitivity of the Psychomotor Vigilance Test (PVT) to sleep loss*. Sleep, 2011. **34**(5): p. 581-591.
18. Bastianini, S., et al., *Post-sigh sleep apneas in mice: Systematic review and data-driven definition*. Journal of Sleep Research, 2019: p. e12845.
19. Benjamins, J.S., et al., *Insomnia heterogeneity: Characteristics to consider for data-driven multivariate subtyping*. Sleep Medicine Reviews, 2017. **36**: p. 71-81.
20. Berrouguet, S., et al., *Comment on "Associations between sleep duration and suicidality in adolescents: A systematic review and dose-response meta-analysis"*. Sleep Med Rev, 2019. **47**: p. 125-126.
21. Berry, R.B., et al., *Rules for scoring respiratory events in sleep: update of the 2007 AASM Manual for the Scoring of Sleep and Associated Events. Deliberations of the Sleep Apnea Definitions Task Force of the American Academy of Sleep Medicine*. Journal of clinical sleep medicine : JCSM : official publication of the American Academy of Sleep Medicine, 2012. **8**(5): p. 597-619.
22. Bevans, K.B., et al., *Qualitative Development and Content Validation of the PROMIS Pediatric Sleep Health Items*. Behav Sleep Med, 2019. **17**(5): p. 657-671.
23. Bian, H. and C.L. Smith, *Development of a questionnaire to assess dentists' knowledge, opinion, education resources, physician cooperation, and clinical practice regarding obstructive sleep apnea (OSAQ-D)*. Sleep Breath, 2006. **10**(2): p. 76-82.
24. Bothelius, K., et al., *Manual-guided cognitive-behavioural therapy for insomnia delivered by ordinary primary care personnel in general medical practice: A randomized controlled effectiveness trial*. Journal of Sleep Research, 2013. **22**(6): p. 688-696.
25. Bratton, D.J. and M. Kohler, *Comments on "Meta-analysis of randomised controlled trials of oral mandibular advancement devices and continuous positive airway pressure for obstructive sleep apnoea-hypopnoea" by Sharples et al*. Sleep Med Rev, 2016. **27**: p. 39-40.
26. Broughton, R.J., *SCN controlled circadian arousal and the afternoon "nap zone"*. Sleep research online : SRO, 1998. **1**(4): p. 166-178.
27. Campbell, R.L. and A. Germain, *Nightmares and Posttraumatic Stress Disorder (PTSD)*. Current Sleep Medicine Reports, 2016. **2**(2): p. 74-80.
28. Chaput, J.P., *The integration of pediatric sleep health into public health in Canada*. Sleep Medicine, 2019. **56**: p. 4-8.
29. Covassin, N. and V.K. Somers, *Portable sleep monitoring systems: Broadening the horizons*. Journal of Clinical Sleep Medicine, 2017. **13**(6): p. 773-774.
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31. Edwards, B.A., et al., *Personalized Medicine for Obstructive Sleep Apnea Therapies: Are We There Yet?* Sleep Medicine Clinics, 2016. **11**(3): p. 299-311.
32. Eghbal Heidari, M. and T. Arabzadeh, *Comment on Zhang et al., "Worldwide and regional prevalence rates of co-occurrence of insomnia and insomnia symptoms with obstructive sleep apnea: A systematic review and meta-analysis"*. Sleep Med Rev, 2019. **46**: p. 161.
33. Evans, D.S., et al., *Common genetic variants in ARNTL and NPAS2 and at chromosome 12p13*

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  37. Gharib, S.A., et al., *Intermittent hypoxia mobilizes bone marrow-derived very small embryonic-like stem cells and activates developmental transcriptional programs in mice*. *Sleep*, 2010. **33**(11): p. 1439-46.
  38. Gleason, K., et al., *Challenges in recruitment to a randomized controlled study of cardiovascular disease reduction in sleep apnea: an analysis of alternative strategies*. *Sleep*, 2014. **37**(12): p. 2035-8.
  39. Gordon, S., et al., *Sociodemographic and behavioral correlates of insufficient sleep in Australian adults*. *Sleep health*, 2019. **5**(1): p. 12-17.
  40. Grigg-Damberger, M.M., *Wake-up call to identify obstructive sleep apnea in patients with ischemic strokes*. *Journal of Clinical Sleep Medicine*, 2016. **12**(4): p. 463-465.
  41. Harvey, A.G. and N.K.Y. Tang, *Cognitive behaviour therapy for primary insomnia: Can we rest yet?* *Sleep Medicine Reviews*, 2003. **7**(3): p. 237-262.
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  43. Hertenstein, E., et al., *Reference data for polysomnography-measured and subjective sleep in healthy adults*. *Journal of Clinical Sleep Medicine*, 2018. **14**(4): p. 523-532.
  44. Hill, C.M., et al., *Polysomnography in Bolivian Children Native to High Altitude Compared to Children Native to Low Altitude*. *Sleep*, 2016. **39**(12): p. 2149-2155.
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84. Romem, A., et al., *Obstructive sleep apnea in patients with end-stage lung disease*. J Clin Sleep Med, 2013. **9**(7): p. 687-93.
85. Sanguaneko, A. and S. Upala, *Comments on: "Sleep disturbances increase the risk of dementia: A systematic review and meta-analysis"*. Sleep Med Rev, 2019. **43**: p. 22.
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88. Sharples, L.D. and T.G. Quinell, *Response to comments on "Meta-analysis of randomised controlled trials of oral mandibular advancement devices and continuous positive airway pressure for obstructive sleep apnoea-hypopnoea"*. Sleep Med Rev, 2016. **27**: p. 41-2.
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102. Young, T., *Increasing sleep duration for a healthier (and less obese?) population tomorrow: Commentary on Cappuccio FP, Taggart FM, Kandala N-B, et al. Meta-analysis of short sleep duration and obesity in children and adults. Sleep 2008;31:619-626*. Sleep, 2008. **31**(5): p. 593-594.
103. Zhang, H., et al., *The association between PSQI score and hypertension in a Chinese rural population: the Henan Rural Cohort Study*. Sleep Medicine, 2019. **58**: p. 27-34.
104. Zhang, Y., et al., *Response to commentary by Heidari and Arabzadeh on "Worldwide and regional prevalence rates of co-occurrence of insomnia and insomnia symptoms with obstructive sleep apnea: A systematic review and meta-analysis"*. Sleep Med Rev, 2019. **46**: p. 162-163.

## Records of discrepancy

For the 590 articles that assessed by full-text, 323 of them were systematic reviews with meta-analysis, 210 of them were identified as “exclusion”, by both the two raters. And there were 57 have conflict decisions of the eligibility<sup>[1-57]</sup>. For the 57 articles, 32 were identified as “inclusion” by X.C while were identified as “exclusion” by L.Y; and 25 were identified as “exclusion” by X.C while were identified as “inclusion” by L.Y. The kappa statistic was 0.66, showed a good agreement. Finally, after a teleconference by WeChat, 30 of them [1, 4, 5, 7, 8, 10, 12-14, 18, 20, 22, 23, 25-27, 29, 32, 34-36, 38-40, 42, 44, 46, 49, 50, 55] were included while the rest 27 were excluded. For the 353 systematic reviews with meta-analysis, we further assessed whether they were about healthcare intervention.

1. Abma, I.L., et al., *Measurement properties of patient-reported outcome measures (PROMs) in adults with obstructive sleep apnea (OSA): A systematic review*. Sleep Medicine Reviews, 2016. **28**: p. 14-27.
2. Agha, B. and A. Johal, *Facial phenotype in obstructive sleep apnea-hypopnea syndrome: a systematic review and meta-analysis*. Journal of Sleep Research, 2017. **26**(2): p. 122-131.
3. Aurora, R.N., et al., *The treatment of restless legs syndrome and periodic limb movement disorder in adults--an update for 2012: practice parameters with an evidence-based systematic review and meta-analyses: an American Academy of Sleep Medicine Clinical Practice Guideline*. Sleep, 2012. **35**(8): p. 1039-62.
4. Bartel, K.A., M. Gradisar, and P. Williamson, *Protective and risk factors for adolescent sleep: A meta-analytic review*. Sleep Medicine Reviews, 2015. **21**: p. 72-85.
5. Beebe, D.W., et al., *The neuropsychological effects of obstructive sleep apnea: A meta-analysis of norm-referenced and case-controlled data*. Sleep, 2003. **26**(3): p. 298-307.
6. Camacho, M., S.A. Song, and A.M. Tolisano, *Oral pressure therapy (winx) for obstructive sleep apnea: a meta-analysis updating the systematic review*. Sleep Breath, 2016. **20**(3): p. 1011-2.
7. Cheung, J.M.Y., et al., *A systematic review of cognitive behavioral therapy for insomnia implemented in primary care and community settings*. Sleep Medicine Reviews, 2019. **44**: p. 23-36.
8. Cortese, S., et al., *Sleep and alertness in children with attention-deficit/hyperactivity disorder: A systematic review of the literature*. Sleep, 2006. **29**(4): p. 504-511.
9. Davies, G., et al., *A systematic review of the nature and correlates of sleep disturbance in early psychosis*. Sleep Medicine Reviews, 2017. **31**: p. 25-38.
10. Dewald, J.F., et al., *The influence of sleep quality, sleep duration and sleepiness on school performance in children and adolescents: A meta-analytic review*. Sleep Medicine Reviews, 2010. **14**(3): p. 179-189.
11. Ellen, R.L.B., et al., *Systematic review of motor vehicle crash risk in persons with sleep apnea*. Journal of Clinical Sleep Medicine, 2006. **2**(2): p. 193-200.
12. Fortier-Brochu, E., et al., *Insomnia and daytime cognitive performance: a meta-analysis*. Sleep medicine reviews, 2012. **16**(1): p. 83-94.

13. Franklin, K.A., et al., *Effects and side-effects of surgery for snoring and obstructive sleep apnea-a systematic review*. Sleep, 2009. **32**(1): p. 27-36.
14. Galbiati, A., et al., *The risk of neurodegeneration in REM sleep behavior disorder: A systematic review and meta-analysis of longitudinal studies*. Sleep Medicine Reviews, 2019. **43**: p. 37-46.
15. Grandner, M.A. and N.P. Patel, *From sleep duration to mortality: implications of meta-analysis and future directions*. J Sleep Res, 2009. **18**(2): p. 145-7.
16. Gupta, M.A. and F.C. Simpson, *Obstructive sleep apnea and psychiatric disorders: A systematic review*. Journal of Clinical Sleep Medicine, 2015. **11**(2): p. 165-175.
17. Guthrie, K.A., et al., *Effects of pharmacologic and nonpharmacologic interventions on insomnia symptoms and self-reported sleep quality in women with hot flashes: A pooled analysis of individual participant data from four MsFLASH trials*. Sleep, 2018. **41**(1): p. Y.
18. He, D., et al., *Biphasic Feature of Placebo Response in Primary Insomnia: Pooled Analysis of Data from Randomized Controlled Clinical Trials of Orexin Receptor Antagonists*. Sleep, 2019.
19. Hertenstein, E., et al., *Sleep in patients with primary dystonia: A systematic review on the state of research and perspectives*. Sleep Medicine Reviews, 2016. **26**: p. 95-107.
20. Holty, J.E.C. and C. Guilleminault, *Maxillomandibular advancement for the treatment of obstructive sleep apnea: A systematic review and meta-analysis*. Sleep Medicine Reviews, 2010. **14**(5): p. 287-297.
21. Hoyos, C.M., et al., *Dose-dependent effects of continuous positive airway pressure for sleep apnea on weight or metabolic function: Individual patient-level clinical trial meta-analysis*. Journal of Sleep Research, 2019. **28**(5): p. e12788.
22. Huang, X., et al., *Structural and functional brain alterations in obstructive sleep apnea: a multimodal meta-analysis*. Sleep Medicine, 2019. **54**: p. 195-204.
23. Javaheipour, N., et al., *Functional brain alterations in acute sleep deprivation: An activation likelihood estimation meta-analysis*. Sleep Medicine Reviews, 2019. **46**: p. 64-73.
24. Kajeepeta, S., et al., *Adverse childhood experiences are associated with adult sleep disorders: A systematic review*. Sleep Medicine, 2015. **16**(3): p. 320-330.
25. Kendzerska, T.B., et al., *Evaluation of the measurement properties of the Epworth sleepiness scale: A systematic review*. Sleep Medicine Reviews, 2014. **18**(4): p. 321-331.
26. Leach, M.J. and A.T. Page, *Herbal medicine for insomnia: A systematic review and meta-analysis*. Sleep Medicine Reviews, 2015. **24**: p. 1-12.
27. Linton, S.J., et al., *The effect of the work environment on future sleep disturbances: A systematic review*. Sleep Medicine Reviews, 2015. **23**: p. 10-19.
28. Liu, R., et al., *Age- and gender-specific associations of napping duration with type 2 diabetes mellitus in a Chinese rural population: the RuralDiab study*. Sleep Medicine, 2017. **33**: p. 119-124.
29. Mathias, J.L. and P.K. Alvaro, *Prevalence of sleep disturbances, disorders, and problems following traumatic brain injury: A meta-analysis*. Sleep Medicine, 2012. **13**(7): p. 898-905.
30. Maurer, L.F., C.A. Espie, and S.D. Kyle, *How does sleep restriction therapy for insomnia work? A systematic review of mechanistic evidence and the introduction of the Triple-R model*. Sleep Medicine Reviews, 2018. **42**: p. 127-138.
31. Mellman, T.A., *A new meta-analysis of sleep findings in PTSD, toward integration and coherence*. Sleep Med Rev, 2019. **48**: p. 101220.
32. Montgomery, P. and J. Dennis, *A systematic review of non-pharmacological therapies for sleep*

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- problems in later life*. Sleep Medicine Reviews, 2004. **8**(1): p. 47-62.
33. Moorman, J.D., P. Morgan, and T.L. Adams, *The Implications of Screen Media Use for the Sleep Behavior of Children Ages 0-5: a Systematic Review of the Literature*. Current Sleep Medicine Reports, 2019. **5**(3): p. 164-172.
  34. Morgenthaler, T.I., et al., *High school start times and the impact on high school students: What we know, and what we hope to learn*. Journal of Clinical Sleep Medicine, 2016. **12**(12): p. 1681-1689.
  35. Nascimento-Ferreira, M.V., et al., *Validity and reliability of sleep time questionnaires in children and adolescents: A systematic review and meta-analysis*. Sleep Medicine Reviews, 2016. **30**: p. 85-96.
  36. Olaithe, M. and R.S. Bucks, *Executive dysfunction in OSA before and after treatment: A meta-analysis*. Sleep, 2013. **36**(9): p. 1297-1305.
  37. Olds, T., et al., *The relationships between sex, age, geography and time in bed in adolescents: A meta-analysis of data from 23 countries*. Sleep Medicine Reviews, 2010. **14**(6): p. 371-378.
  38. Philibert, I., *Sleep loss and performance in residents and nonphysicians: A meta-analytic examination*. Sleep, 2005. **28**(11): p. 1392-1402.
  39. Pilcher, J.J., B.J. Lambert, and A.I. Huffcutt, *Differential effects of permanent and rotating shifts on self-report sleep length: A meta-analytic review*. Sleep, 2000. **23**(2): p. 155-163.
  40. Rediehs, M.H., J.S. Reis, and N.S. Creason, *Sleep in old age: Focus on gender differences*. Sleep, 1990. **13**(5): p. 410-424.
  41. Russell, K., et al., *Sleep problem, suicide and self-harm in university students: A systematic review*. Sleep Medicine Reviews, 2019. **44**: p. 58-69.
  42. Saletin, J.M., et al., *A coordinate-based meta-analysis comparing brain activation between attention deficit hyperactivity disorder and total sleep deprivation*. Sleep, 2019. **42**(3): p. zsy251.
  43. Sarris, J. and G.J. Byrne, *A systematic review of insomnia and complementary medicine*. Sleep Medicine Reviews, 2011. **15**(2): p. 99-106.
  44. Sassani, A., et al., *Reducing motor-vehicle collisions, costs, and fatalities by treating obstructive sleep apnea syndrome*. Sleep, 2004. **27**(3): p. 453-458.
  45. Sawyer, E., H. Heussler, and R. Gunnarsson, *Defining short and long sleep duration for future paediatric research: A systematic literature review*. J Sleep Res, 2019: p. e12839.
  46. Schredl, M. and I. Reinhard, *Gender differences in dream recall: A meta-analysis*. Journal of Sleep Research, 2008. **17**(2): p. 125-131.
  47. Schreier, D.R., C. Banks, and J. Mathis, *Driving simulators in the clinical assessment of fitness to drive in sleepy individuals: A systematic review*. Sleep Medicine Reviews, 2018. **38**: p. 86-100.
  48. Sharpless, B.A. and J.P. Barber, *Lifetime prevalence rates of sleep paralysis: A systematic review*. Sleep Medicine Reviews, 2011. **15**(5): p. 311-315.
  49. Spruyt, K., W. Braam, and L.M. Curfs, *Sleep in Angelman syndrome: A review of evidence*. Sleep Medicine Reviews, 2018. **37**: p. 69-84.
  50. Stuck, B.A., et al., *Radiofrequency surgery of the soft palate in the treatment of snoring: a review of the literature*. Sleep, 2004. **27**(3): p. 551-555.
  51. Thompson, W., et al., *Atypical antipsychotics for insomnia: A systematic review*. Sleep Medicine, 2016. **22**: p. 13-17.
  52. Upala, S. and A. Sanguankeo, *Association between 25-Hydroxyvitamin D and Obstructive Sleep*

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- Apnea: A Systematic Review and Meta-Analysis*. J Clin Sleep Med, 2015. **11**(11): p. 1347.
53. Upala, S., A. Sanguankeo, and S. Congrete, *Obstructive Sleep Apnea is Not Associated with an Increased Risk of Osteoporosis: a Systematic Review and Meta-Analysis*. J Clin Sleep Med, 2015. **11**(9): p. 1069-70.
  54. Warland, J., et al., *Maternal sleep during pregnancy and poor fetal outcomes: A scoping review of the literature with meta-analysis*. Sleep Medicine Reviews, 2018. **41**: p. 197-219.
  55. Weng, H.H., et al., *Mapping gray matter reductions in obstructive sleep apnea: An activation likelihood estimation meta-analysis*. Sleep, 2014. **37**(1): p. 167-175.
  56. Wischhusen, J., U. Qureshi, and M. Camacho, *Laser-assisted uvulopalatoplasty (LAUP) complications and side effects: a systematic review*. Nat Sci Sleep, 2019. **11**: p. 59-67.
  57. Zhang, W.D., et al., *Effect of rhythm control on sleep disordered breathing in patients with atrial fibrillation or flutter: a systematic review and meta-analysis*. Sleep Breath, 2017. **21**(4): p. 963-964.

### List of included studies (The list has the same order to Appendix 3)

Finally, the following 163 studies <sup>[1-163]</sup> were identified as systematic reviews of healthcare intervention that met the inclusion criteria.

1. Abud, R., et al., Efficacy of continuous positive airway pressure (CPAP) preventing type 2 diabetes mellitus in patients with obstructive sleep apnea hypopnea syndrome (OSAHS) and insulin resistance: a systematic review and meta-analysis. *Sleep Medicine*, 2019. 62: p. 14-21.
2. Alessandri-Bonetti, A., et al., Effects of mandibular advancement device for obstructive sleep apnea on temporomandibular disorders: A systematic review and meta-analysis. *Sleep Medicine Reviews*, 2019. 48: p. 101211.
3. Alshaikh, M.K., et al., Sodium oxybate for narcolepsy with cataplexy: Systematic review and meta-analysis. *Journal of Clinical Sleep Medicine*, 2012. 8(4): p. 451-458.
4. Anandam, A., et al., Effects of dietary weight loss on obstructive sleep apnea: a meta-analysis. *Sleep & breathing = Schlaf & Atmung*, 2013. 17(1): p. 227-34.
5. Antonopoulos, C.N., et al., Nasal continuous positive airway pressure (nCPAP) treatment for obstructive sleep apnea, road traffic accidents and driving simulator performance: A meta-analysis. *Sleep Medicine Reviews*, 2011. 15(5): p. 301-310.
6. Araghi, M.H., et al., Effectiveness of lifestyle interventions on obstructive sleep apnea (OSA): Systematic review and meta-analysis. *Sleep*, 2013. 36(10): p. 1553-1562.
7. Araie, T., et al., Dental and skeletal changes associated with long-term oral appliance use for obstructive sleep apnea: A systematic review and meta-analysis. *Sleep Medicine Reviews*, 2018. 41: p. 161-172.
8. Aslund, L., et al., Cognitive and behavioral interventions to improve sleep in school-age children and adolescents: A systematic review and meta-analysis. *Journal of Clinical Sleep Medicine*, 2018. 14(11): p. 1937-1947.
9. Augedal, A.W., et al., Randomized controlled trials of psychological and pharmacological treatments for nightmares: A meta-analysis. *Sleep Medicine Reviews*, 2013. 17(2): p. 143-152.
10. Auld, F., et al., Evidence for the efficacy of melatonin in the treatment of primary adult sleep disorders. *Sleep Medicine Reviews*, 2017. 34: p. 10-22.
11. Avellar, A.B.C.C., et al., Pharmacotherapy for residual excessive sleepiness and cognition in CPAP-

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- treated patients with obstructive sleep apnea syndrome: A systematic review and meta-analysis. *Sleep Medicine Reviews*, 2016. 30: p. 97-107.
12. Ayas, N.T., et al., Auto-titrating versus standard continuous positive airway pressure for the treatment of obstructive sleep apnea: results of a meta-analysis. *Sleep*, 2004. 27(2): p. 249-253.
  13. Baba, R.Y., et al., Temperature controlled radiofrequency ablation at different sites for treatment of obstructive sleep apnea syndrome: a systematic review and meta-analysis. *Sleep & breathing = Schlaf & Atmung*, 2015. 19(3): p. 891-910.
  14. Ballesio, A., et al., The effectiveness of behavioural and cognitive behavioural therapies for insomnia on depressive and fatigue symptoms: A systematic review and network meta-analysis. *Sleep Medicine Reviews*, 2018. 37: p. 114-129.
  15. Barnes, H., et al., Positional modification techniques for supine obstructive sleep apnea: A systematic review and meta-analysis. *Sleep Medicine Reviews*, 2017. 36: p. 107-115.
  16. Bartolucci, M.L., et al., The effectiveness of different mandibular advancement amounts in OSA patients: a systematic review and meta-regression analysis. *Sleep & breathing = Schlaf & Atmung*, 2016. 20(3): p. 911-9.
  17. Belanger, L., et al., Meta-analysis of sleep changes in control groups of insomnia treatment trials. *Journal of Sleep Research*, 2007. 16(1): p. 77-84.
  18. Boscolo-Berto, R., et al., Narcolepsy and effectiveness of gamma-hydroxybutyrate (GHB): A systematic review and meta-analysis of randomized controlled trials. *Sleep Medicine Reviews*, 2012. 16(5): p. 431-443.
  19. Brzezinski, A., et al., Effects of exogenous melatonin on sleep: A meta-analysis. *Sleep Medicine Reviews*, 2005. 9(1): p. 41-50.
  20. Caldeira, D., et al., Risk of insomnia with non-vitamin K oral anticoagulants: systematic review and meta-analysis. *Sleep & breathing = Schlaf & Atmung*, 2015. 19(3): p. 1043-9.
  21. Camacho, M., et al., Myofunctional therapy to treat obstructive sleep apnea: A systematic review and meta-analysis. *Sleep*, 2015. 38(5): p. 669-675.
  22. Camacho, M., et al., The effect of nasal surgery on continuous positive airway pressure device use and therapeutic treatment pressures: A systematic review and meta-analysis. *Sleep*, 2015. 38(2): p. 279-286.
  23. Camacho, M., et al., Laser-assisted uvulopalatoplasty for obstructive sleep apnea: A systematic

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- review and meta-analysis. *Sleep*, 2017. 40(3): p. zsx004.
24. Caples, S.M., et al., Surgical modifications of the upper airway for obstructive sleep apnea in adults: A systematic review and meta-analysis. *Sleep*, 2010. 33(10): p. 1396-1407.
  25. Charakorn, N., et al., The effects of topical nasal steroids on continuous positive airway pressure compliance in patients with obstructive sleep apnea: a systematic review and meta-analysis. *Sleep & breathing = Schlaf & Atmung*, 2017. 21(1): p. 3-8.
  26. Chen, L.-D., et al., Effect of positive airway pressure on glomerular filtration rate in patients with sleep-disordered breathing: a meta-analysis. *Sleep & breathing = Schlaf & Atmung*, 2017. 21(1): p. 53-59.
  27. Chen, Q., et al., Effects of CPAP on visceral adipose tissue in patients with obstructive sleep apnea: a meta-analysis. *Sleep Breath*, 2020;24(2):425-432.
  28. Chen, X., et al., Effect of continuous positive airway pressure on homocysteine levels in patients with obstructive sleep apnea: a meta-analysis. *Sleep & breathing = Schlaf & Atmung*, 2014. 18(4): p. 687-94.
  29. Cheung, J.M.Y., et al., A systematic review of cognitive behavioral therapy for insomnia implemented in primary care and community settings. *Sleep Medicine Reviews*, 2019. 44: p. 23-36.
  30. Costantino, A., et al., Hypoglossal nerve stimulation long-term clinical outcomes: a systematic review and meta-analysis. *Sleep Breath*, 2020;24(2):399-411
  31. da Silva Paulitsch, F. and L. Zhang, Continuous positive airway pressure for adults with obstructive sleep apnea and cardiovascular disease: a meta-analysis of randomized trials. *Sleep Medicine*, 2019. 54: p. 28-34.
  32. de Vries, G.E., et al., Cardiovascular effects of oral appliance therapy in obstructive sleep apnea: A systematic review and meta-analysis. *Sleep Medicine Reviews*, 2018. 40: p. 55-68.
  33. Deng, F., A. Raza, and J. Guo, Treating obstructive sleep apnea with continuous positive airway pressure reduces risk of recurrent atrial fibrillation after catheter ablation: a meta-analysis. *Sleep Medicine*, 2018. 46: p. 5-11.
  34. Elshaug, A.G., et al., Redefining success in airway surgery for obstructive sleep apnea: A meta analysis and synthesis of the evidence. *Sleep*, 2007. 30(4): p. 461-467.
  35. Emami, E., et al., The effect of nocturnal wear of dentures on the sleep quality: a systematic review

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- and meta-analysis. *Sleep & breathing = Schlaf & Atmung*, 2017. 21(1): p. 9-18.
36. Faulkner, S.M., et al., Light therapies to improve sleep in intrinsic circadian rhythm sleep disorders and neuro-psychiatric illness: A systematic review and meta-analysis. *Sleep Medicine Reviews*, 2019. 46: p. 108-123.
  37. Fei, L., D. Zhou, and Z.T. Ding, The efficacy and safety of rotigotine transdermal patch for the treatment of sleep disorders in Parkinson's disease: a meta-analysis. *Sleep Medicine*, 2019. 61: p. 19-25.
  38. Fernandez-San-Martin, M.I., et al., Effectiveness of Valerian on insomnia: A meta-analysis of randomized placebo-controlled trials. *Sleep Medicine*, 2010. 11(6): p. 505-511.
  39. Filiatrault, M.L., et al., Medium increased risk for central sleep apnea but not obstructive sleep apnea in long-term opioid users: A systematic review and meta-analysis. *Journal of Clinical Sleep Medicine*, 2016. 12(4): p. 617-625.
  40. Franklin, K.A., et al., Effects and side-effects of surgery for snoring and obstructive sleep apnea--a systematic review. *Sleep*, 2009. 32(1): p. 27-36.
  41. Fu, Y., et al., Meta-analysis of all-cause and cardiovascular mortality in obstructive sleep apnea with or without continuous positive airway pressure treatment. *Sleep & breathing = Schlaf & Atmung*, 2017. 21(1): p. 181-189.
  42. Gaddam, S., S.K. Gunukula, and M.J. Mador, Post-operative outcomes in adult obstructive sleep apnea patients undergoing non-upper airway surgery: a systematic review and meta-analysis. *Sleep & breathing = Schlaf & Atmung*, 2014. 18(3): p. 615-33.
  43. Gaisl, T., et al., Efficacy of pharmacotherapy for OSA in adults: A systematic review and network meta-analysis. *Sleep Medicine Reviews*, 2019. 46: p. 74-86.
  44. Gao, W., et al., Is automatic CPAP titration as effective as manual CPAP titration in OSAHS patients? A meta-analysis. *Sleep & breathing = Schlaf & Atmung*, 2012. 16(2): p. 329-40.
  45. Gee, B., et al., The effect of non-pharmacological sleep interventions on depression symptoms: A meta-analysis of randomised controlled trials. *Sleep Medicine Reviews*, 2019. 43: p. 118-128.
  46. Geiger-Brown, J.M., et al., Cognitive behavioral therapy in persons with comorbid insomnia: A meta-analysis. *Sleep Medicine Reviews*, 2015. 23: p. 54-67.
  47. Geoffroy, P.A., et al., Efficacy of light therapy versus antidepressant drugs, and of the combination versus monotherapy, in major depressive episodes: A systematic review and meta-analysis. *Sleep*

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- Medicine Reviews, 2019. 48: p. 101213.
48. Guo, J., et al., Effect of CPAP therapy on cardiovascular events and mortality in patients with obstructive sleep apnea: a meta-analysis. *Sleep & breathing = Schlaf & Atmung*, 2016. 20(3): p. 965-74.
  49. Guo, Y., et al., Impact of continuous positive airway pressure on C-reactive protein in patients with obstructive sleep apnea: a meta-analysis. *Sleep & breathing = Schlaf & Atmung*, 2013. 17(2): p. 495-503.
  50. Gupta, M.A., F.C. Simpson, and D.C.A. Lyons, The effect of treating obstructive sleep apnea with positive airway pressure on depression and other subjective symptoms: A systematic review and meta-analysis. *Sleep Medicine Reviews*, 2016. 28: p. 51-64.
  51. Ha, S.C.N., H.W. Hirai, and K.K.F. Tsoi, Comparison of positional therapy versus continuous positive airway pressure in patients with positional obstructive sleep apnea: A meta-analysis of randomized trials. *Sleep Medicine Reviews*, 2014. 18(1): p. 19-24.
  52. Haghayegh, S., et al., Before-bedtime passive body heating by warm shower or bath to improve sleep: A systematic review and meta-analysis. *Sleep Medicine Reviews*, 2019. 46: p. 124-135.
  53. He, D., et al., Biphasic Feature of Placebo Response in Primary Insomnia: Pooled Analysis of Data from Randomized Controlled Clinical Trials of Orexin Receptor Antagonists. *Sleep*, 2020;43(3): zsz238.
  54. Hernandez, A.V., et al., Use of adaptive servo ventilation therapy as treatment of sleep-disordered breathing and heart failure: a systematic review and meta-analysis. *Sleep Breath*, 2020;24(1):49-63.
  55. Ho, F.Y.Y., et al., Self-help cognitive-behavioral therapy for insomnia: A meta-analysis of randomized controlled trials. *Sleep Medicine Reviews*, 2015. 19: p. 17-28.
  56. Holty, J.E.C. and C. Guilleminault, Maxillomandibular advancement for the treatment of obstructive sleep apnea: A systematic review and meta-analysis. *Sleep Medicine Reviews*, 2010. 14(5): p. 287-297.
  57. Hornyak, M., et al., What treatment works best for restless legs syndrome? Meta-analyses of dopaminergic and non-dopaminergic medications. *Sleep Medicine Reviews*, 2014. 18(2): p. 153-164.
  58. Hornyak, M., et al., Efficacy and safety of dopamine agonists in restless legs syndrome. *Sleep Medicine*. *Sleep Med*. 2012;13(3):228-236.

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59. Huang, Z.W., et al., Association of continuous positive airway pressure with F2-isoprostanes in adults with obstructive sleep apnea: a meta-analysis. *Sleep Breath*, 2019;23(4):1115-1122.
  60. Huynh, N.T., E. Desplats, and F.R. Almeida, Orthodontics treatments for managing obstructive sleep apnea syndrome in children: A systematic review and meta-analysis. *Sleep Medicine Reviews*, 2016. 25: p. 84-94.
  61. Iftikhar, I.H., et al., Effect of oral appliances on blood pressure in obstructive sleep apnea: A systematic review and meta-analysis. *Journal of Clinical Sleep Medicine*, 2013. 9(2): p. 165-174.
  62. Iftikhar, I.H., et al., Meta-analyses of the association of sleep apnea with insulin resistance, and the effects of CPAP on HOMA-IR, adiponectin, and visceral adipose fat. *Journal of Clinical Sleep Medicine*, 2015. 11(4): p. 475-485.
  63. Iftikhar, I.H., et al., Comparative efficacy of CPAP, MADs, exercise-training, and dietary weight loss for sleep apnea: a network meta-analysis. *Sleep Medicine*, 2017. 30: p. 7-14.
  64. Ingram, D.G. and C.K. Matthews, Effect of adenotonsillectomy on c-reactive protein levels in children with obstructive sleep apnea: A meta-analysis. *Sleep Medicine*, 2013. 14(2): p. 172-176.
  65. Jiang, B., et al., Efficacy and placebo response of repetitive transcranial magnetic stimulation for primary insomnia. *Sleep Medicine*, 2019. 63: p. 9-13.
  66. Jiang, Y.H., C. Tan, and S. Yuan, Baduanjin Exercise for Insomnia: A Systematic Review and Meta-Analysis. *Behav Sleep Med*, 2017: p. 1-13.
  67. Johal, A. and B. Agha, Ready-made versus custom-made mandibular advancement appliances in obstructive sleep apnea: A systematic review and meta-analysis. *Journal of Sleep Research*, 2018. 27(6): p. e12660.
  68. Johnson, J.A., et al., A systematic review and meta-analysis of randomized controlled trials of cognitive behavior therapy for insomnia (CBT-I) in cancer survivors. *Sleep Medicine Reviews*, 2016. 27: p. 20-28.
  69. Joya, F.L., et al., Meta-analyses of hypnotics and infections: Eszopiclone, ramelteon, zaleplon, and zolpidem. *Journal of Clinical Sleep Medicine*, 2009. 5(4): p. 377-383.
  70. Kempler, L., et al., Do psychosocial sleep interventions improve infant sleep or maternal mood in the postnatal period? A systematic review and meta-analysis of randomised controlled trials. *Sleep Medicine Reviews*, 2016. 29: p. 15-22.
  71. Khurshid, K., et al., Effect of antihypertensive medications on the severity of obstructive sleep

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72. Koffel, E.A., J.B. Koffel, and P.R. Gehrman, A meta-analysis of group cognitive behavioral therapy for insomnia. *Sleep Medicine Reviews*, 2015. 19: p. 6-16.
  73. Kolla, B.P., et al., The impact of alcohol on breathing parameters during sleep: A systematic review and meta-analysis. *Sleep Medicine Reviews*, 2018. 42: p. 59-67.
  74. Kong, F., G. Liu, and J. Xu, Pharmacological agents for improving sleep quality at high altitude: a systematic review and meta-analysis of randomized controlled trials. *Sleep Medicine*, 2018. 51: p. 105-114.
  75. Kuriyama, A., M. Honda, and Y. Hayashino, Ramelteon for the treatment of insomnia in adults: A systematic review and meta-analysis. *Sleep Medicine*, 2014. 15(4): p. 385-392.
  76. Kuriyama, A. and H. Tabata, Suvorexant for the treatment of primary insomnia: A systematic review and meta-analysis. *Sleep Medicine Reviews*, 2017. 35: p. 1-7.
  77. Kylstra, W.A., et al., Neuropsychological functioning after CPAP treatment in obstructive sleep apnea: A meta-analysis. *Sleep Medicine Reviews*, 2013. 17(5): p. 341-347.
  78. Labarca, G., R. Cruz, and J. Jorquera, Continuous positive airway pressure in patients with obstructive sleep apnea and non-alcoholic steatohepatitis: A systematic review and meta-analysis. *Journal of Clinical Sleep Medicine*, 2018. 14(1): p. 133-139.
  79. Langford, D.J., K. Lee, and C. Miaskowski, Sleep disturbance interventions in oncology patients and family caregivers: A comprehensive review and meta-analysis. *Sleep Medicine Reviews*, 2012. 16(5): p. 397-414.
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## Studies excluded with detailed reasons

There were 237 studies were excluded after full-text screen stage, the list of the excluded studies and the reasons for exclusion were presented below.

Author	Citations	Reasons for exclusion
Abma IL, et al	Sleep Medicine Reviews, 2016: 18-31.	Without meta-analysis
Abtahi S, et al	Sleep Medicine Reviews, 2017: 164-173.	Without meta-analysis
Achuthan, S et al	Sleep and Breathing, 2015, 19(3): 1035-1042.	Without meta-analysis
Adams GC, et al	Sleep Medicine Reviews, 2014, 18(6): 495-507.	Narrative review
Ali SS, et al	Sleep Medicine Reviews, 2014, 18(5): 379-391.	Narrative review
Alsufyani NA, et al	Sleep and Breathing, 2013, 17(3): 911-923.	Without meta-analysis
Alvaro PK, et al	Sleep, 2013, 36(7): 1059-1068.	Without meta-analysis
Andreucci A, et al	Sleep, 2017, 40(7): pp. 093	Without meta-analysis
Angriman M, et al	Sleep Medicine Reviews, 2017: 34-45.	Narrative review
Auger RR, et al	Journal of Clinical Sleep Medicine, 2015, 11(10):1199-1236	Clinical guideline
Aurora RN, et al	Sleep, 2010, 33 (10): 1408-1413	Clinical guideline
Aurora RN, et al	Sleep, 2012, 35(1): 17-40.	Clinical guideline
Aurora RN, et al	Sleep, 2011, 34(3): 379-388.	Clinical guideline
Baddock S, et al	Sleep Medicine Reviews, 2019: 106-117.	Without meta-analysis
Barros D, et al	Sleep, 2019, 42(3). 10.1093/sleep/zsy236	Overview and animal study
Baylor GW, et al	Sleep. 2001 Mar 15;24(2):165-70.	Pooled analysis
Beattie L, et al	Sleep Med. 2015 Jun;16(6):669-77.	Narrative review
Beattie L, et al	Sleep Medicine Reviews, 2015: 83-100.	Narrative review
Becker SP, et al	Sleep Medicine Reviews, 2017: 94-121.	Without meta-analysis
Bei B, et al	Sleep Medicine Reviews, 2016: 108-124.	Without meta-analysis
Belmon LS, et al	Sleep Medicine Reviews, 2019: 60-70.	Without meta-analysis
Bin YS, et al	Sleep Medicine Reviews, 2012, 16(3): 223-230.	Narrative review
Bin YS, et al	Sleep Medicine Reviews, 2019: 47-59.	Without meta-analysis
Birkbak J, et al	Journal of clinical sleep medicine, 2014, 10(1): 103-108.	Without meta-analysis
Blackwell JE, et al	Sleep Medicine Reviews, 2017: 82-93.	Without meta-analysis
Booker LA, et al	Sleep Medicine Reviews, 2018: 220-233.	Without meta-analysis
Bordier P, et al	Sleep Medicine, 2016: 149-157.	Narrative review
Brockmann PE, et al	Sleep Medicine Reviews, 2013, 17(5): 331-340.	Without meta-analysis
Byun E, et al	Current Sleep Medicine Reports, 2016, 2(4): 191-205	Narrative review
Camacho M, et al	Sleep and Breathing, 2016, 20(3): 1011-1012.	Letter
Camacho M, et al	Sleep Disorders, 2015. Doi:10.1155/2015/293868	Without meta-analysis
Canellas JV, et al	Sleep and Breathing, 2016, 20(1): 387-394.	Narrative review
Canto GD, et al	Sleep Medicine, 2015, 16(3): 347-357.	Scoping review
Canuto R, et al	Sleep Medicine Reviews, 2013, 17(6): 425-431.	Without meta-analysis

Cardoso TD, et al	Sleep Medicine, 2018: 46-55.	Without meta-analysis
Castelnovo A, et al	Sleep Medicine Reviews, 2019: 70-82.	Narrative review
Chahine LM, et al	Sleep Medicine Reviews, 2017: 33-50.	Narrative review
Chamine I, et al	Journal of Clinical Sleep Medicine, 2018, 14(2): 271-283.	Without meta-analysis
Chang ET, et al	Sleep and Breathing, 2018, 22(4): 955-961.	Without meta-analysis
Chang ET, et al	Sleep and Breathing, 2017, 21(3): 727-735.	Without meta-analysis
Chen H, et al	Sleep Medicine, 2016: 19-27.	Without meta-analysis
Clark I, et al	Sleep Medicine Reviews, 2017: 70-78.	Narrative review
Cooper K, et al	Sleep Medicine Reviews, 2010,14(6). 10.1016/j.smrv.2010.07.004	Letter
Cooper K, et al	Sleep Medicine Reviews, 2010, 14(5): 329-337.	Without meta-analysis
da Costa Lopes AJ, et al	Sleep and Breathing, 2019: 1-9.	Without meta-analysis
Dautovich ND, et al	Sleep Health, 2019, 5(1): 31-48.	Without meta-analysis
Davies G, et al	Sleep Medicine Reviews, 2017: 25-38.	Narrative review
De Araujo TC, et al	Sleep Medicine Reviews, 2017: 58-69.	Without meta-analysis
De Bruin EJ, et al	Sleep Medicine Reviews, 2017: 45-57.	Narrative review
De Meyer MM, et al	Sleep Medicine Reviews, 2019: 88-94.	Narrative review
De Water AT, et al	Journal of Sleep Research, 2011: 183-200.	Narrative review
Denis D, et al	Sleep Medicine Reviews, 2017: 141-157.	Narrative review
Dias C, et al	Journal of Sleep Research, 2018, 27(5). Doi:10.1111/jsr.12654	Without meta-analysis
Diaz-Piedra C, et al	Sleep Medicine Reviews, 2015, 21:86-99	Without meta-analysis
Dickerson SS, et al	Nature and Science of Sleep, 2014: 85-100.	Narrative review
Dijemeni E, et al	Sleep and Breathing, 2017, 21(4): 983-994.	Without meta-analysis
Dimitrov L, et al	Journal of clinical sleep medicine, 2016, 12(9): 1293-1300.	Without meta-analysis
Dinis J, et al	Sleep Science, 2018, 11(4): 290-301.	Narrative review
Dodds KL, et al	Sleep Medicine Reviews, 2017, 33(33): 88-100.	Without meta-analysis
Driscoll T, et al	Sleep Medicine Reviews, 2007, 11(3): 179-194.	Without meta-analysis
Dutil C, et al	Sleep Medicine Reviews, 2018: 184-201.	Without meta-analysis
Ellen RL, et al	Journal of Clinical Sleep Medicine, 2006, 2(2): 193-200.	Without meta-analysis
Engleman HM, et al	Sleep, 2000, 23, Suppl 4:S102-8.	Overview
Franczak A, et al	Sleep Medicine Reviews, 2019: 9-16.	Without meta-analysis
Friedrich A, et al	Journal of Sleep Research, 2018, 27(1): 4-22.	Without meta-analysis
G, De Luca Canto, et al.	Journal of clinical sleep medicine, 2015, 11(1): 27-36.	Without meta-analysis
Gallaher KG, et al	Sleep Medicine Clinics, 2018, 13(3): 359-374.	Narrative review
Galland BC, et al	Sleep Medicine Reviews, 2012, 16(6): 561-573.	Without meta-analysis
Garland SN, et al	Current Sleep Medicine Reports, 2016, 2(3):142-151	Narrative review
Gates P, et al	Sleep Medicine Reviews, 2014, 18(6): 477-487.	Without meta-analysis

Gogou M, et al	Sleep and Breathing, 2015, 19(2): 421-432.	Narrative review
Gottlieb E, et al	Sleep Medicine Reviews, 2019: 54-69.	Without meta-analysis
Grading F, et al	Sleep Med Rev. 2011 Feb;15(1):33-40.	Overview
Gradisar M, et al	Sleep Medicine, 2011, 12(2): 110-118.	Narrative review
Grandner MA, et al	Journal of Sleep Research, 2009, 18(2): 145-147.	Letter
Guardanardini L, et al	Journal of clinical sleep medicine, 2015, 11(11): 1327-1334.	Without meta-analysis
Guenole F, et al	Sleep Medicine Reviews, 2011, 15(6): 379-387.	Narrative review
Guglielmi O, et al	Sleep Medicine, 2019: 100-106.	Without meta-analysis
Guglielmi O, et al	Sleep and Breathing, 2015, 19(1): 35-44.	Without meta-analysis
Gupta MA, et al	Journal of clinical sleep medicine, 2015, 11(2): 165-175.	Without meta-analysis
Gupta MA, et al	Sleep Medicine Reviews, 2016: 63-75.	Without meta-analysis
Gurubhagavatula I, et al	Journal of Clinical Sleep Medicine, 2017, 13(5): 745-758.	Clinical guideline
Guthrie KA, et al	Sleep, 2018, 41(1).10.1093/sleep/zsx190	Pooled analysis
Hall SJ, et al	Sleep Medicine Reviews, 2017: 79-87.	Without meta-analysis
Heller J, et al	Sleep Medicine Reviews, 2017: 23-33.	Without meta-analysis
Henst RH, et al	Journal of Sleep Research, 2019, 28(6). 10.1111/jsr.12865	Narrative review
Herbert V, et al	Sleep Medicine Reviews, 2017: 37-51.	Without meta-analysis
Herring WJ, et al	Sleep Medicine, 2017: 219-223.	Pooled analysis
Herring WJ, et al	Journal of clinical sleep medicine, 2016, 12(9): 1215-1225.	Pooled analysis
Hertenstein E, et al	Sleep Medicine Reviews, 2016: 95-107.	Without meta-analysis
Hoekema A, et al	Sleep & breathing, 2016, 10(2): 102-3	Letter
Hoyos C, et al	Current Sleep Medicine Reports, 2015, 1(4):195-204	Narrative review
Hoyos CM, et al	J Sleep Res. 2019 Oct;28(5):e12788.	Pooled analysis
Hu Z, et al	Sleep and Breathing, 2015, 19(2): 441-451.	Without meta-analysis
Huang W, et al	Sleep Medicine Reviews, 2009, 13(1): 73-104.	Without meta-analysis
Huizinga CR, et al	Sleep Medicine Reviews, 2019: 97-107.	Without meta-analysis
Ingravallo F, et al	Journal of Clinical Sleep Medicine, 2014, 10(8): 927-935.	Narrative review
Innes KE, et al	Sleep Medicine, 2011, 12(7): 623-634.	Narrative review
Innes KE, et al	Sleep Medicine Reviews, 2012, 16(4): 309-339.	Narrative review
Jackson ML, et al	Sleep Medicine, 2019: 22-28.	Contains original study
Janssonfrojmark M, et al	Sleep Medicine Reviews, 2018: 19-36.	Without meta-analysis
Jarrin DC, et al	Sleep Medicine Reviews, 2018: 3-38.	Without meta-analysis
Julliandesayes I, et al	Sleep Medicine Reviews, 2015: 23-38.	Narrative review
Junna MR, et al	Sleep Medicine Clinics, 2013, 8(1): 43-58.	Narrative review
Kaditis AG, et al	Sleep Medicine Reviews, 2016: 96-105.	Without meta-analysis
Kajeepeta S, et al	Sleep Medicine, 2015, 16(3): 320-330.	Without meta-analysis

Kapur VK, et al	Journal of Clinical Sleep Medicine, 2017, 13(3): 479-504	Clinical guideline
Kastoer C, et al	Journal of Clinical Sleep Medicine, 2016, 12(10): 1411-1421	Narrative review
Kendzerska T, et al	Sleep Medicine Reviews, 2014, 18(1): 49-59.	Without meta-analysis
Kim E, et al	Behavioral Sleep Medicine, 2007, 5(4): 256-278.	Narrative review
Kirkpatrick B, et al	Sleep Medicine, 2019, 53:141-152	Without meta-analysis
Klingman KJ, et al	Sleep Medicine Research, 2018, 9(2): 110-114	Narrative review
Klingman KJ, et al	Sleep Medicine Reviews, 2017: 37-44.	Without meta-analysis
Kohler M, et al	Nature and Science of Sleep, 2010: 159-185.	Narrative review
Kolla BP, et al	Sleep Medicine Reviews, 2017: 131-140.	Narrative review
Konjarski M, et al	Sleep Medicine Reviews, 2018: 47-58.	Without meta-analysis
Kotagal S, et al	Sleep, 2012, 35(11): 1451-1466.	Without meta-analysis
Kovacevic A, et al	Sleep Medicine Reviews, 2017: 52-68.	Without meta-analysis
Krietsch KN, et al	Sleep Medicine Reviews, 2019: 87-96.	Without meta-analysis
Kudchadkar SR, et al	Sleep Medicine Reviews, 2014, 18(2): 103-110.	Narrative review
Kudlow P, et al	Sleep Medicine, 2013, 14(10): 943-949.	Overview
Kuhle S, et al	Sleep Medicine Reviews, 2009, 13(2): 123-131.	Without meta-analysis
Kwon M, et al	Sleep Health, 2019, 5(4): 382-394.	Without meta-analysis
Lancee J, et al	Journal of clinical sleep medicine, 2008, 4(5): 475-480.	Without meta-analysis
Lerner I, et al	Sleep Medicine Reviews, 2019: 39-50.	Narrative review
Levine AC, et al	Sleep, 2010, 33(8): 1043-1053.	Without meta-analysis
Li G, et al	Sleep, 2017, 40(4). 10.1093/sleep/zsx028	Contains original study
Liu R, et al	Sleep Medicine, 2017: 119-124.	Contains original study
Locihova H, et al	Journal of Sleep Research, 2018, 27(3).	Narrative review
Madsen MT, et al	Journal of clinical sleep medicine, 2013, 9(4): 387-394.	Narrative review
Madsen MT, et al	Sleep Medicine Reviews, 2015: 73-83.	Without meta-analysis
Madsen MT, et al	Journal of clinical sleep medicine, 2019, 15(3): 489-504.	Without meta-analysis
Magee L, et al	Sleep Medicine Reviews, 2012, 16(3): 231-241.	Narrative review
Maqbali MA, et al	Journal of Sleep Research, 2020, 29(1): 1-12.	Narrative review
Marshall NS, et al	Sleep Medicine Reviews, 2019. 10.1016/j.smrv.2019.101218	Without meta-analysis
Massimo T, et al	Sleep and Breathing 2014; 18(1): 195-206.	Without meta-analysis
Matricciani L, et al	Sleep, 2011, 34(5): 651-659.	Without meta-analysis
Matricciani L, et al	Sleep Medicine Reviews, 2012, 16(3): 203-211.	Without meta-analysis
Matthews EE, et al	Sleep Medicine Reviews, 2013, 17(6): 453-464.	Without meta-analysis
Matthews EE, et al	Sleep Medicine Clinics, 2018, 13(3): 395-417.	Without meta-analysis
Maurer LF, et al	Sleep Medicine Reviews, 2018: 127-138.	Without meta-analysis
Mcdowall PS, et al	Sleep Medicine Reviews, 2017: 39-47.	Narrative review
Mclay L, et al	Sleep Medicine Reviews, 2019: 54-63.	Narrative review

Mellman TA	Sleep Medicine Reviews, 2019, 48: 101220	Letter
Melo MC, et al	Sleep Medicine Reviews, 2017: 46-58.	Narrative review
Milevaseitz V R, et al	Sleep Medicine Reviews, 2017: 4-27.	Narrative review
Minges KE, et al	Sleep Medicine Reviews, 2016: 86-95.	Without meta-analysis
Molano JRV, et al	Current Sleep Medicine Reports, 2017, 3(3): 173-178	Narrative review
Mollayeva T, et al	Sleep Medicine, 2013, 14. 10.1016/j.sleep.2013.11.508	Without meta-analysis
Moorman JD, et al	Current Sleep Medicine Reports, 2019, 5(3):164-172	Narrative review
Morin CM, et al	Sleep, 1999, 22(8): 1134-1156	Narrative review
Morin CM, et al	Sleep, 2006, 29(11): 1398-1414.	Without meta-analysis
Moyer CA, et al	Sleep Medicine, 2001, 2(6): 477-491.	Narrative review
Nigam G, et al	Sleep and Breathing, 2016, 20(3): 957-964.	Narrative review
Nishiyama T, et al	Sleep Medicine, 2014, 15(4): 422-429.	Contains original study
Nishiyama T, et al	Sleep, 2019, 42(6).10.1093/sleep/zsz046	Pooled analysis
Okuno K, et al	Sleep Medicine Reviews, 2016: 25-33.	Without meta-analysis
Olds T, et al	Sleep Medicine Reviews, 2010, 14(6): 371-378.	Without meta-analysis
Olson K.	Sleep Medicine, 2014, 15(5): 496-501.	Narrative review
Ong AD, et al	Sleep Medicine Reviews, 2017: 21-32.	Without meta-analysis
Patil SP, et al	Journal of Clinical Sleep Medicine, 2019, 15(2): 335-343	Clinical guideline
Patterson PD, et al	Sleep Health, 2019, 5 (4): 359-369	Without meta-analysis
Pattyn N, et al	Sleep Medicine Reviews, 2018: 159-172.	Narrative review
Peracchia S, et al	Sleep Science, 2018, 11(4): 302-314.	Narrative review
Peres BU, et al	Sleep Medicine Reviews, 2019: 48-57.	Without meta-analysis
Plante DT, et al	Journal of Sleep Research, 2017, 26(3): 255-265.	Contains original study
Popp R, et al	Sleep Medicine Reviews, 2017: 95-108.	Narrative review
Porrassegovia A, et al	Sleep Medicine Reviews, 2019: 37-47.	Overview
Radwan A, et al	Sleep Health, 2015, 1(4): 257-267.	Without meta-analysis
Raghuram A, et al	Journal of Clinical Sleep Medicine, 2014, 10(10): 1155-1160.	Without meta-analysis
Ramar K, et al	Journal of Clinical Sleep Medicine, 2015, 11(7): 773-828	Clinical guideline
Reynaud E, et al	Journal of Sleep Research, 2018, 27(3):e12636	Without meta-analysis
Riemann D, et al	Sleep Medicine Reviews, 2009, 13(3): 205-214.	Overview
Rifkin DI, et al	Sleep Medicine Reviews, 2018: 3-9.	Without meta-analysis
Rigney G, et al	Sleep Medicine Reviews, 2018: 244-254.	Without meta-analysis
Roth T, et al	Sleep and Breathing, 2008, 12(1): 53-62.	Pooled analysis
Rousseau A, et al	Sleep Medicine Reviews, 2017: 122-133.	Narrative review
Russell C, et al	Sleep Medicine Reviews, 2017, 33:101-110	Without meta-analysis
Russell K, et al	Sleep Medicine Reviews, 2019: 58-69.	Without meta-analysis
Sakkas GK, et al	Sleep Med Rev. 2015 Jun;21:39-49.	Narrative review
Saksvik IB, et al	Sleep Medicine Reviews, 2011, 15(4): 221-235.	Narrative review
Salles C, et al	Sleep Science, 2013, 6(3): 112-119.	Without meta-analysis

Santos M, et al	Journal of clinical sleep medicine, 2017, 13(11): 1345-1348.	Overview
Sarris J, et al	Sleep Medicine Reviews, 2011, 15(2): 99-106.	Without meta-analysis
Sateia MJ, et al	Journal of Clinical Sleep Medicine, 2017, 13(2): 307-349	Clinical guideline
Sawyer AM, et al	Sleep Medicine Reviews, 2011, 15(6): 343-356.	Narrative review
Sawyer E, et al	Journal of Sleep Research, 2019, 28(6):e12839	Without meta-analysis
Schreier D, et al	Sleep Medicine Reviews, 2017, 38: 86-100.	Without meta-analysis
Schwichtenberg AJ, et al	Sleep Medicine Reviews, 2019: 103-111.	Narrative review
Sedky K, et al	Journal of clinical sleep medicine, 2014, 10(4): 403-409.	Narrative review
Seixas A, et al	Current Sleep Medicine Reports, 2019, 5(3):156-163 10.1007/s40675-019-00150-1	Without meta-analysis
Senaratna CV, et al	Sleep Medicine Reviews, 2017: 70-81.	Without meta-analysis
Sharpless BA, et al	Sleep Medicine Reviews, 2011, 15(5): 311-315.	Narrative review
Shaughnessy G, et al	Journal of Clinical Sleep Medicine, 2019, 15(05): 769-777.	Without meta-analysis
Shawon SR, et al	Sleep Medicine Reviews, 2017: 58-68.	Without meta-analysis
Shechter A.	Sleep Medicine Reviews, 2017: 59-69.	Without meta-analysis
Shochat T, et al	Sleep Medicine Reviews, 2014, 18(1): 75-87.	Narrative review
Slopen N, et al	Sleep Medicine, 2016: 88-95.	Narrative review
Smagula SF, et al	Sleep Medicine Reviews, 2016: 21-30.	Narrative review
Smith JP, et al	Sleep Health, 2019, 5(1): 49-57.	Without meta-analysis
Smith LA, et al	Sleep Medicine Reviews, 2018: 4-13.	Narrative review
Smith MT, et al	Journal of Clinical Sleep Medicine, 2018, 14(7): 1231-1237	Clinical guideline
Snyder E, et al	Sleep Medicine, 2016: 93-100.	Pooled analysis
Spruyt K.	Sleep Medicine, 2019: 3-12.	Overview
Stallman HM, et al	Sleep Medicine Reviews, 2018: 105-113.	Narrative review
Steffen A, et al	Journal of Sleep Research, 2018, 27(4).10.1111/jsr.12628	Pooled analysis
Steine IM, et al	Sleep Medicine Reviews, 2012, 16(1): 15-25.	Narrative review
Stevinson C, et al	Sleep Medicine, 2000, 1(2): 91-99.	Without meta-analysis
Sudbrackoliveira P, et al	Sleep Medicine, 2019: 22-27.	Without meta-analysis
Taibi DM, et al	Sleep Medicine Reviews, 2007, 11(3): 209-230.	Without meta-analysis
Tanioka K, et al	Sleep, 2019.10.1093/sleep/zsz232	Narrative review
Thompson W, et al	Sleep Medicine, 2016: 13-17.	Without meta-analysis
Tomfohr LM, et al	Sleep Medicine Reviews, 2012, 16(3): 243-249.	Narrative review
Totterdell P, et al	Sleep, 1994, 17(5): 466-475.	Pooled analysis
Treur JL, et al	Journal of Sleep Research, 2018, 27(5).10.1111/jsr.12695	Pooled analysis

Tribl GG, et al	Sleep Medicine Reviews, 2013, 17(2): 133-142.	Narrative review
Upala S, et al	Journal of clinical sleep medicine, 2015, 11(11): 1347-1347.	Letter
Upala S, et al	Journal of clinical sleep medicine, 2015, 11(9): 1069-1070.	Letter
Vaessen TJ, et al	Sleep Medicine Reviews, 2015: 51-58.	Without meta-analysis
Valbuza JS, et al	Sleep and Breathing, 2010, 14(4): 299-305.	Without meta-analysis
Van Dalfsen JH, et al	Sleep Medicine Reviews, 2017: 187-194.	Narrative review
Vasu TS, et al	Journal of clinical sleep medicine, 2012, 8(2): 199-207.	Narrative review
Veiga DM, et al	Sleep Science, 2013, 6(3): 120-124.	Narrative review
Vonk PE, et al	Current Sleep Medicine Reports, 2017, 3(3): 113-121	Narrative review
Vonk PE, et al	Sleep and Breathing, 2019: 1-10.	Without meta-analysis
Walters AS, et al	Sleep Medicine, 2002, 3(2): 93-98.	Narrative review
Wang F, et al	Sleep Medicine Reviews, 2016, 30(30): 43-52.	Without meta-analysis
Warland J, et al	Sleep Medicine Reviews, 2018: 197-219.	Scoping review
Weaver TE, et al	Journal of Clinical Sleep Medicine, 2009, 5(6): 499-505.	Pooled analysis
Weymann BK, et al	Current Sleep Medicine Reports, 2017, 3(3): 179-192	Scoping review
Wischhusen J, et al	Nature and Science of Sleep, 2019: 59-67.	Narrative review
Wise MS, et al	Sleep, 2011, 34(3): 389-398.	Without meta-analysis
Xu Q, et al	Sleep Medicine Reviews, 2017: 39-49.	Without meta-analysis
Xu X, et al	Sleep Medicine Reviews, 2017: 158-167.	Narrative review
Yeung W, et al	Sleep Medicine, 2009, 10(7): 694-704.	Without meta-analysis
Yeung W, et al	Sleep Medicine Reviews, 2015: 75-83.	Without meta-analysis
Zhang W, et al	Sleep and Breathing, 2017, 21(4): 963-964.	Letter

**Table S1.** Descriptions of the different types of meta-analyses.

Type of meta-analysis	Definition	Example
Standard meta-analysis	Meta-analysis uses standard synthesis schedules for head-to-head comparison [1].	The efficacy of metformin in pregnancy to avert one outcome-incident gestational diabetes mellitus in women at high risk [2].
Diagnostic meta-analysis	A type of meta-analysis to estimate diagnostic accuracy of methods for disease diagnose, and generally used the bivariate meta-analytic model to pool the sensitivity and specificity from similar researches [3].	Presynaptic dopaminergic neuroimaging in REM sleep behavior disorder [4].
Dose-response meta-analysis	A type of meta-analytic method that combines dose-specific effects of various doses of exposure/intervention on outcome from conceptually similar researches to establish the potential dose-response relationship between them [5].	Sleep duration and risk of all-cause mortality [6].
Network meta-analysis	A type of meta-analysis to combines direct and indirect estimates for three or more interventions to inform comparative effectiveness of multiple interventions [7].	The effectiveness of behavioural and cognitive behavioural therapies for insomnia on depressive and fatigue symptoms [8].
Activation likelihood estimation meta-analysis	A meta-analysis uses a given spatial coordinate to determine a convergence of activation probabilities reported from different experiments by establish a three-dimension Gaussian distribution across studies, which was widely used in neuroimaging studies [9].	Functional brain alterations in acute sleep deprivation [10].
Meta-analysis of prevalence	A type meta-analysis that combines the population prevalence or incidence of certain disease [11].	Prevalence of Differentiated Thyroid Cancer in Autopsy Studies Over Six Decades [12].

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Meta-analysis of means	A type meta-analysis that combines the mean values of certain characters [13].	Normal sleep patterns, such as sleep duration, number of nightwakings, sleep latency, in infants and children [14].
Meta-analysis of correlations	A type meta-analysis that combines the Pearson correlation ( $r$ ) from each study of two or more variables to obtain a pooled of correlations [13].	The relationship between sleep quality, sleep duration and sleepiness on school performance in children and adolescents [15] .
Meta-analysis of nucleotide polymorphism	A type of meta-analysis to determine the relationship of allele genes to certain diseases, which involves dominant, recessive and codominant genetic models for analysis [16].	The relationship between HLA-DQB1*06:02 and narcolepsy with and without cataplexy [17].

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