

Eye acupuncture therapy for insomnia

A systematic review and meta-analysis

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Abstract

Background: Insomnia is a common sleep disorder, and this meta-analysis aimed to systematically evaluate the effectiveness of eye acupuncture combined with other therapies in treating insomnia.

Methods: In this comprehensive meta-analysis, we conducted a systematic evaluation of the effectiveness of eye acupuncture as a treatment for insomnia, a widespread sleep disorder. Our literature search spanned multiple databases, including Wanfang, Chinese National Knowledge Infrastructure, Wipo Information Chinese Periodicals Service Platform, China Biology Medicine, PubMed, Cochrane Library, Web of Science, and Embase, covering the period from their inception to February 1, 2024, and including both Chinese and English publications. The article included randomized controlled trials comparing eye acupuncture combined with other treatments versus non-eye acupuncture treatments for insomnia. Data extraction was independently conducted by 2 evaluators, and the risk of bias was rigorously assessed using the Cochrane Risk of Bias Tool. The synthesis of data involved a meta-analysis using RevMan 5.3 software, complemented by sensitivity analysis comparing fixed and random effects models to enhance the robustness of our findings.

Results: This study involved 13 clinical studies involving 856 patients with insomnia.

The meta-analysis findings indicated that the combined eye acupuncture treatment exhibited significantly superior clinical efficacy compared to either drug treatment or non-drug treatment alone (odds ratio = 3.71, 95% confidence interval [CI]: 2.18–6.32, $Z = 4.82$, $P < .00001$). Compared with the control group, the intervention group exhibited a lower Pittsburgh Sleep Quality Index score (PSQI; mean difference [MD] = -2.46 , 95% CI [-3.07 , -1.85], $Z = 7.87$, $P < .00001$). Moreover, the Traditional Chinese Medicine Symptom Score (TCMSS) of the intervention group decreased more than that of the control group (MD = -1.51 , 95% CI [-2.80 , -0.22], $Z = 2.29$, $P = .02$). In the documentation of adverse reactions, a single study reported that 2 patients experienced mild subcutaneous hemorrhage following eye acupuncture treatment, which resolved spontaneously post-treatment.

Conclusion: The combination of eye acupuncture with other therapies in the treatment of insomnia can enhance clinical efficacy, reduce the TCMSS and the PSQI score, and effectively improve insomnia outcomes.

Abbreviations: CI = confidence interval, MD = mean difference, PSQI = Pittsburgh Sleep Quality Index, TCM = Traditional Chinese Medicine, TCMSS = Traditional Chinese Medicine Symptom Score.

Keywords: eye acupuncture, insomnia, meta-analysis, randomized controlled trial, systematic review

1. Introduction

Insomnia, the most prevalent sleep disorder, is characterized by recurrent difficulties in sleep initiation or maintenance.^[1] In severe cases, it may manifest as circadian rhythm disturbances. Beyond impairing quality of life, insomnia significantly contributes to psychological distress, including heightened tension and anxiety. Unfortunately, insomnia is becoming more prevalent around the world. Epidemiological studies estimate that approximately 30% to 35% of the global population

experiences insomnia symptoms.^[2] With its progressively chronic course, the population base of insomniacs and the prevalence of insomnia are increasing year by year, with a trend towards younger age groups. A meta-analysis incorporating 6 studies (2000–2014) revealed insomnia prevalence rates among international university students ranging from 9.4% to 38.2%, with a pooled prevalence of 11.5%.^[3] Chinese epidemiological data demonstrate a striking age disparity: younger populations exhibit significantly higher insomnia prevalence (20.4%) compared to older adults (11.6%).^[4] These findings underscore the

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The datasets generated during and/or analyzed during the current study are publicly available.

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imperative to address and prevent insomnia. While benzodiazepines and non-benzodiazepine hypnotics remain first-line pharmacological interventions in Western medicine, their chronic use raises significant safety concerns including tolerance development, dependency risks, cognitive impairment, and hepatorenal toxicity.^[5,6]

Acupuncture, as a non-pharmacological treatment, offers distinct advantages in addressing insomnia. Eye acupuncture therapy is a micro-needle therapy created by Professor Peng Jingshan. It is guided by the ancient Chinese doctrine of 5 wheels and 8 contours, and combined with the Chinese medicine organs, meridians, and collaterals, the core theory of which is “eight zones and thirteen points of the brain through the internal organs.”^[7] With the pupil as the center, the eye is evenly divided into 8 regions according to the clock, and each region is further divided into 16 sub-regions. Based on the theory of Eight Diagrams and zang-fu organs, these 13 points correspond to the zang-fu organs of the whole body.^[8] Acupuncture at these points can stimulate the corresponding organs and adjust the body's qi, blood, yin, and yang to treat insomnia. Compared with traditional acupuncture, eye acupuncture offers several advantages, including straightforward application, reduced adverse reactions, and prolonged retention time. Consequently, it has garnered increasing attention. Currently, numerous randomized controlled trials in China have explored the use of eye acupuncture for treating insomnia. However, there remains a deficiency in systematic and standardized evidence-based medical research. Therefore, this study conducts a meta-analysis and systematic assessment of randomized controlled trials addressing insomnia treatment through eye acupuncture. The aim is to observe the clinical effects of eye acupuncture in treating insomnia patients and to provide a more systematic evidence-based foundation for the treatment of insomnia using eye acupuncture.

2. Materials and methods

2.1. Protocol registration

The evaluation protocol has been published on the international prospective system evaluation registry website, PROSPERO (Registration number: CRD42024508944, URL: https://www.crd.york.ac.uk/prospero/display_record.php?ID=CRD42024508944).

2.2. Ethics

Since this procedure does not involve the recruitment of patients or the collection of personal information, ethical approval is not required.

2.3. Inclusion criteria

- (1) Literature type: studies were included if they were explicitly described as randomized controlled trials (RCTs), regardless of whether blinding was employed.
- (2) Study subjects: the diagnostic criteria for insomnia included any of the following: Chinese Classification and Diagnostic Criteria of Mental Disorders, 3rd edition (CCMD-3),^[9] International Classification of Sleep Disorders (ICSD),^[10] Neurology^[11] Chinese Medicine Diagnostic Efficacy Criteria (CMEDC)^[12] Chinese Medicine Internal Medicine (CMIM),^[13,14] Chinese Medicine Clinical Practice Guidelines on Insomnia (WHO/WPO),^[15] Chinese Medicine Diagnostics,^[16] and Guidelines for Clinical Research of New Chinese Medicines.^[17]
- (3) Interventions: the control group received standard treatment, which included Western medicine, Traditional

Chinese Medicine (TCM), and standard acupuncture. The treatment group received eye acupuncture in addition to the interventions provided to the control group.

- (4) Outcome indicators: The study included at least one of the following outcome measures: Pittsburgh Sleep Quality Index (PSQI), Traditional Chinese Medicine Symptom Score (TCMSS), clinical efficacy, and Self-assessment Scale of Sleep Status (SRSS).

2.4. Exclusion criteria

- (1) Exclusion of non-randomized controlled trials, including case reports, reviews, animal experiments, and mechanism studies.
- (2) The treatment group did not use eye acupuncture combined therapy, or the intervention measures in the control group were mixed.
- (3) Studies focusing primarily on the treatment of complications associated with insomnia.
- (4) Studies with obvious errors in data or incomplete data records.
- (5) Repeated publications or inability to access the full text of the literature.
- (6) Non-Chinese and non-English literature.

2.5. Literature search methods

A digitalized exploration was conducted across multiple databases, including English-language databases such as PubMed, Cochrane Library, Web of Science, and Embase, as well as Chinese databases like the Chinese National Knowledge Infrastructure, Wanfang Data Knowledge Service Platform (Wanfang), China Biology Medicine disc and Wipo Information Chinese Periodicals Service Platform. The search spanned from the inception of each database up to February 1, 2024. The search methodology encompassed both subject and free-word searches. Chinese search terms included expressions such as eye acupuncture therapy, insomnia, chronic insomnia, primary insomnia, secondary insomnia, sleep disorders, and others. The English search terms included eye acupuncture, various types of insomnia terms, and various expressions of randomized controlled trials. Taking PubMed as an example, the specific search method is presented in Table 1.

2.6. Literature screening and data extraction

Literature screening and data extraction were independently conducted by 2 researchers. In the event of discordant outcomes, a third researcher was consulted to review the results. The extraction included details such as the author's name, publication year, sample size, patient age, disease duration, treatment duration, specifics of controls and interventions, as well as the completeness of outcome indicator data and information related to the risk of bias assessment.

2.7. Literature quality assessment

Two independent examiners assessed the potential bias in all incorporated randomized controlled trials (RCTs) using the Cochrane Risk of Bias Assessment Tool. The assessment included verification of various aspects, such as the generation of random sequences, allocation concealment, blinding of investigators and participants, blinding of outcome assessment, completeness of outcome data, selective reporting of study results, and identification of other potential biases. If consensus could not be reached, the issue was referred to a third independent researcher for arbitration.

Table 1
Search strategy of PubMed.

Number	Search items
#1	"Sleep Initiation and Maintenance Disorders"[Mesh]
#2	(((((Disorders of Initiating and Maintaining Sleep[Title/Abstract]) OR (DIMS[Title/Abstract]) OR (Early Awakening[Title/Abstract]) OR (Awakening, Early[Title/Abstract]) OR (Nonorganic Insomnia[Title/Abstract]) OR (Insomnia, Nonorganic[Title/Abstract]) OR (Primary Insomnia[Title/Abstract]) OR (Insomnia, Primary[Title/Abstract]) OR (Transient Insomnia[Title/Abstract]) OR (Insomnia, Transient[Title/Abstract]) OR (Rebound Insomnia[Title/Abstract]) OR (Insomnia, Rebound[Title/Abstract]) OR (Secondary Insomnia[Title/Abstract]) OR (Insomnia, Secondary[Title/Abstract]) OR (Sleep Initiation Dysfunction[Title/Abstract]) OR (Dysfunction, Sleep Initiation[Title/Abstract]) OR (Dysfunctions, Sleep Initiation[Title/Abstract]) OR (Sleep Initiation Dysfunctions[Title/Abstract]) OR (Sleeplessness[Title/Abstract]) OR (Insomnia Disorder[Title/Abstract]) OR (Insomnia Disorders[Title/Abstract]) OR (Insomnia[Title/Abstract]) OR (Insomnias[Title/Abstract]) OR (Chronic Insomnia[Title/Abstract]) OR (Insomnia, Chronic[Title/Abstract]) OR (Psychophysiological Insomnia[Title/Abstract]) OR (Insomnia, Psychophysiological[Title/Abstract]))))
#3	#1 OR #2
#4	"Eye acupuncture"[Mesh]
#5	(((((ocular acupuncture[Title/Abstract]) OR (ocular acupuncture therapy[Title/Abstract]) OR (the therapy of eye-acupuncture[Title/Abstract]) OR (ophthalmic acupuncture[Title/Abstract]) OR (eyes acupuncture[Title/Abstract]) OR (eye acupuncture therap[Title/Abstract]) OR (oculo-acupuncture therapy[Title/Abstract]) OR (eye acupuncture therapy[Title/Abstract]))))
#6	#04 OR #05
#7	Randomized controlled trial[Publication Type] OR randomized[Title/Abstract] OR placebo[Title/Abstract]
#8	#3 AND #6 AND #7

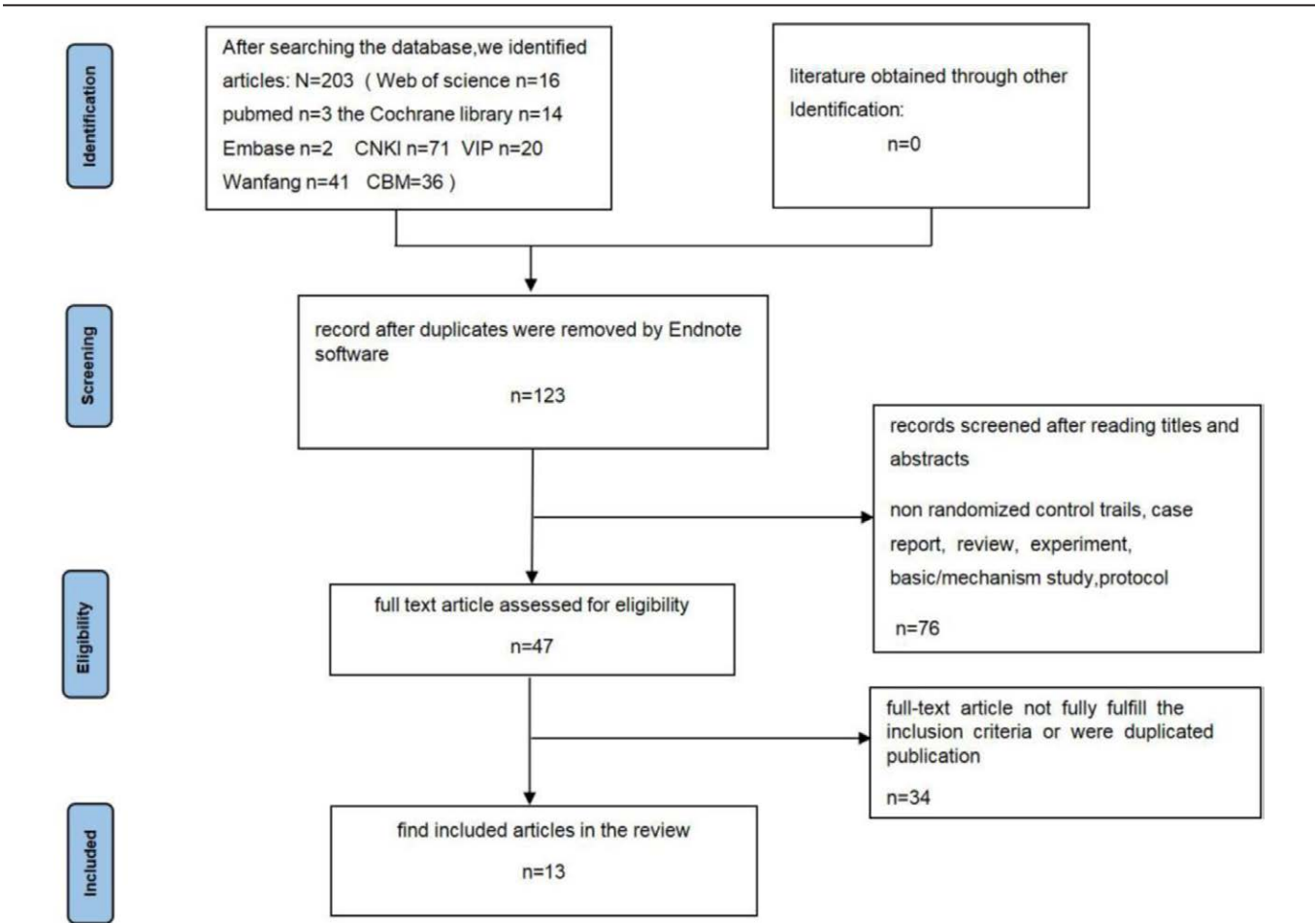


Figure 1. Flowchart of study screening process. CBM = China Biology Medicine, CNKI = Chinese National Knowledge Infrastructure, VIP = Wipo Information Chinese Periodicals Service Platform.

2.8. Statistical processing

The extracted data were analyzed using Review Manager 5.3 software. The effectiveness indicators were transformed into binary outcome data, with statistical metrics including the odds ratio and 95% confidence interval (95% CI). The mean difference (MD) and 95% confidence interval (95% CI) were used as statistical measures for continuous data, such as the PSQI score

and TCM evidence points. If the units of continuous data varied, the standardized mean difference and 95% confidence interval (95% CI) were used as statistical parameters. Heterogeneity was assessed using the *Q* test and *I*² statistic. If *P* < .05 or *I*² > 50%, heterogeneity was considered significant, and a random-effects model was used. Conversely, if *P* ≥ .05 and *I*² ≤ 50%, heterogeneity was not considered significant, and a fixed-effects model

Table 2
Basic characteristics of the included trials.

Study ID	Age, (yr)		Sample size		Duration of illness		Intervention		Treatment period		Outcome measure	
	T	C	T	C	T	C	T	C	T/C	T/C	T/C	T/C
N												
Zhao 2022 ^[30]	52.17 ± 12.769 (19–64)	49.07 ± 10.010 (27–64)	30	30	6.37 ± 2.414 mo (1–11)	5.37 ± 2.385 mo (1–10)	EA + Eszopiclone	Eszopiclone	4 wk	PSQI, TCMSS, CE		
Li 2022 ^[23]	56.29 ± 7.64	55.93 ± 7.52	42	42	16.47 ± 4.26 mo	15.89 ± 4.37 mo	EA + OA	OA	4 wk	PSQI, TCMSS		
Bai and Hai 2021 ^[19]	50.24 ± 6.14 (36–63)	50.52 ± 5.91 (33–64)	40	40	1.50 ± 0.30 yr (0.5–3)	1.48 ± 0.10 yr (0.5–3)	EA + TCM	TCM	3 wk	PSQI, CE		
Bai 2021 ^[18]	42.20 ± 7.48 (32–55)	43.57 ± 6.77 (33–57)	30	30	12.47 ± 4.79 wk (5–22)	12.70 ± 4.49 wk (4–21)	EA + TCM	TCM	21 d	PSQI, TCMSS, CE		
Luo 2020 ^[25]	60.23 ± 2.16	61.67 ± 2.73	30	30	40.37 ± 2.50 d	41.12 ± 1.32 d	EA + OA	OA	10 d	PSQI, CE		
Wu 2019 ^[27]	38.17 ± 11.573 (19–56)	38.83 ± 11.114 (20–55)	30	30	8.43 ± 3.892 mo (3–16)	8.90 ± 3.818 mo (4–17)	EA + OA	OA	15 d	PSQI		
Xie 2018 ^[28]	49.5 ± 6.6 (22–78)	49.6 ± 6.5 (23–76)	30	30	2.1 ± 0.3 yr (1 mo–3 yr)	2.2 ± 0.4 (2 mo–3 yr)	EA + OA	OA	20 d	PSQI		
Wang 2018 ^[26]	50.50 ± 17.80 (20–76)	49.10 ± 13.62 (24–74)	30	30	7.56 ± 4.15 mo (0.67–15)	7.70 ± 3.56 mo (0.67–15)	EA + TCM	TCM	28 d	PSQI, CE		
Guo 2018 ^[22]	65.233 ± 11.285	63.500 ± 10.925	30	30			EA + Diazepam	Diazepam	10 d	PSQI		
Li 2017 ^[24]	34.73 ± 10.62 (18–57)	34.2 ± 10.22 (19–56)	30	30	9.00 ± 2.51 mo (5–14)	9.03 ± 2.48 mo (5–13)	EA + OA	OA	12 d	PSQI, SAS, TCMSS		
Cheng 2015 ^[20]	48.58 ± 13.47	47.22 ± 13.35	36	36	12.94 ± 8.62 mo	9.17 ± 2.88 mo (5–14)	EA + OA	OA	20 d	SRSS, CE		
Zhang 2013 ^[28]	45.43 ± 2.66 (18–69)	49.23 ± 2.50 (21–70)	30	30	7.53 ± 2.36 yr (1–20)	8.27 ± 2.70 yr (1–20)	EA + TCM	TCM	14 d	CE		
Cui 2011 ^[21]	45 (20–75)	42 (18–75)	40	40	15 d–18 yr	18 d–16 yr	EA + TCM	TCM	10 d	CE		

C = control group, CE = clinical efficacy, EA = eye acupuncture, MF = male and female, OA = ordinary acupuncture, PSQI = Pittsburgh Sleep Quality Index, SAS = Self-Rating Anxiety Scale, SRSS = Self-Rating Scale of Sleep, T = treatment group, TCM = Traditional Chinese Medicine, TCMSS = Traditional Chinese Medicine Symptom Score.

was used. If the comparison of combined effect sizes between groups resulted in $P < .05$, it indicated a significant difference in effect values between the observation and control groups. If the 95% CI of the combined effect size included 1 or 0, it indicated that the difference between the 2 groups was not statistically significant. Conversely, if the 95% CI did not include 1 or 0, it indicated a statistically significant difference between the 2 groups. Subgroup analyses were conducted based on treatment duration. Funnel plots were created to assess potential publication bias.

3. Results

3.1. Results of literature search

The initial literature search yielded 203 documents. After eliminating duplicates, 123 documents remained. Following full-text reading and rescreening, 13 documents were ultimately included in the study, encompassing a total of 856 patients. The process of literature screening is illustrated in Figure 1.

3.2. Basic characteristics and quality assessment of included literature

This meta-analysis included 13 studies.^[18–30] A total of 856 individuals with insomnia were included in the analysis, comprising 428 in the intervention group and 428 in the control group. Six studies^[20,23–25,27,28] used standard acupuncture as the control intervention; 5 studies^[18,19,21,26,29] used TCM treatment as the control; and 2 studies^[22,30] used Western medication therapies as the control. Eight studies^[18–21,23,26,29,30] developed clinical efficacy criteria based on the “Protocols for Clinical Investigation of Novel Chinese Medications (Pilot Implementation),” using the clinical effectiveness rate as the efficacy assessment criterion. Ten studies^[18,19,22–28,30] used the PSQI score as an efficacy assessment criterion. Four studies^[18,23,24,30] used the TCM symptom score as an efficacy assessment criterion. Five studies^[18,19,23,26,29] used the randomized numeric table method, while 8 studies^[20–22,24,25,27,28,30] reported random assignment without specifying the method of randomization. All 13 studies failed to provide information on blinding. However, all outcome indicator data were complete, and there was no selective reporting of study results, resulting in a low risk of bias for all studies. No other sources of bias were identified. For further details, see Table 2 and Figure 2.

3.3. Results of meta-analysis

Eight studies^[18–21,25,26,29,30] reported clinical efficacy rates. These were statistically examined and showed no heterogeneity ($P = 1.00$, $I^2 = 0\%$). Meta-analysis using the fixed-effects model yielded an odds ratio of 3.71 (95% CI: 2.18–6.32). This indicates that the clinical efficacy rates were significantly higher in the treatment group compared to the control group ($Z = 4.82$, $P < .00001$). For more details, see Figure 3.

Ten studies^[18,19,22–28,30] used PSQI scores, with 322 cases in each of the treatment and control groups, totaling 644 cases. The statistical test results indicated significant heterogeneity ($P = .005$, $I^2 = 62\%$). Therefore, a random-effects model was used for meta-analysis, revealing a MD of -2.46 (95% CI: -3.07 to -1.85), with $P < .00001$, indicating a statistically significant difference. The results suggested that the PSQI score was lower in the treatment group than in the control group, indicating that eye acupuncture was effective in reducing the PSQI score. For more details, see Figure 4.

Four studies^[18,23,24,30] utilized the Traditional Chinese Medicine (TCM) syndrome score, with 132 cases in each of the treatment and control groups, totaling 264 cases. The statistical test results indicated substantial heterogeneity ($P = .07$, $I^2 = 58\%$). Consequently, the random-effects model was employed for

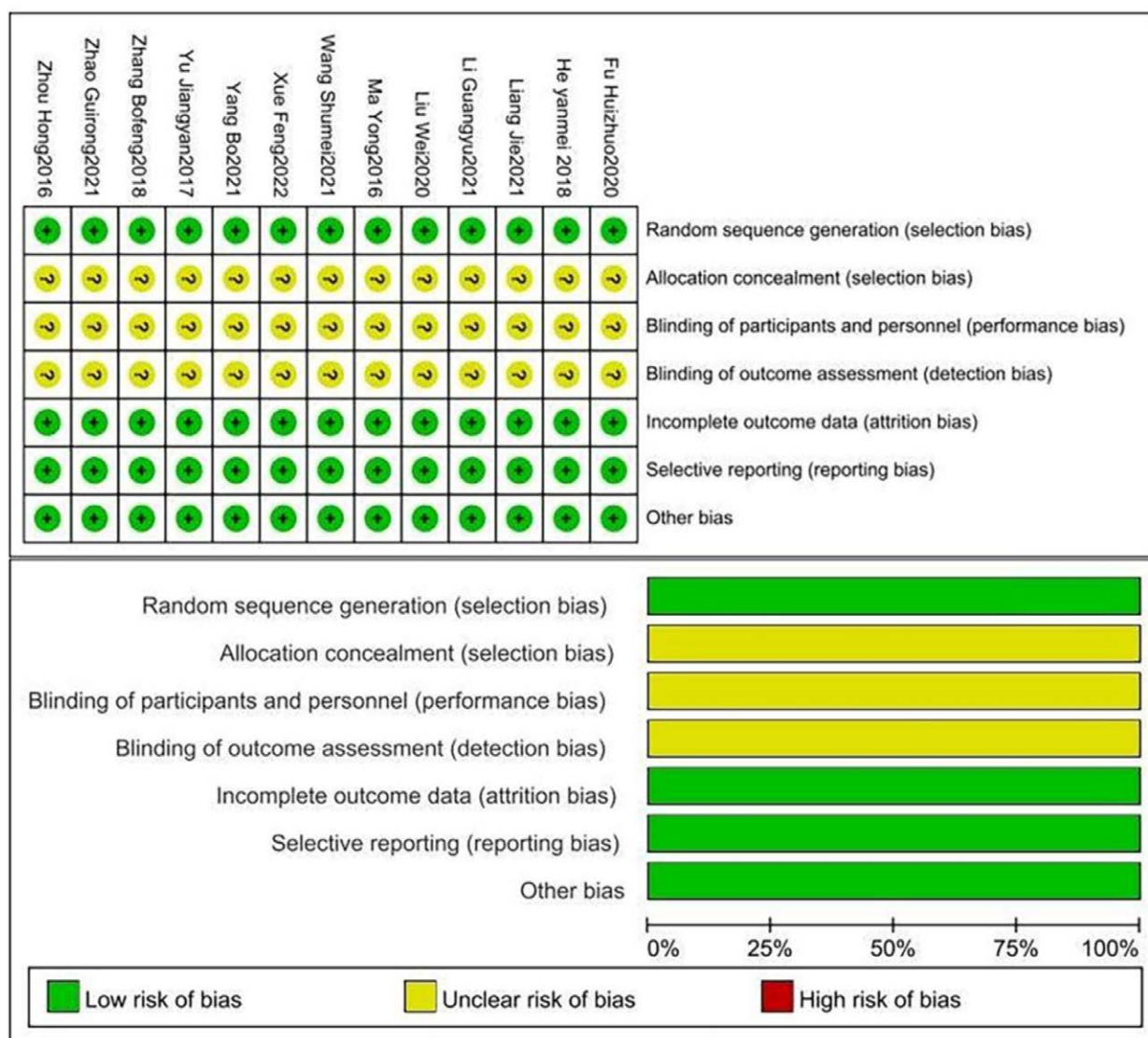


Figure 2. Graph depicting the risk of bias, providing a summary of the assessment of methodological quality across the included studies.

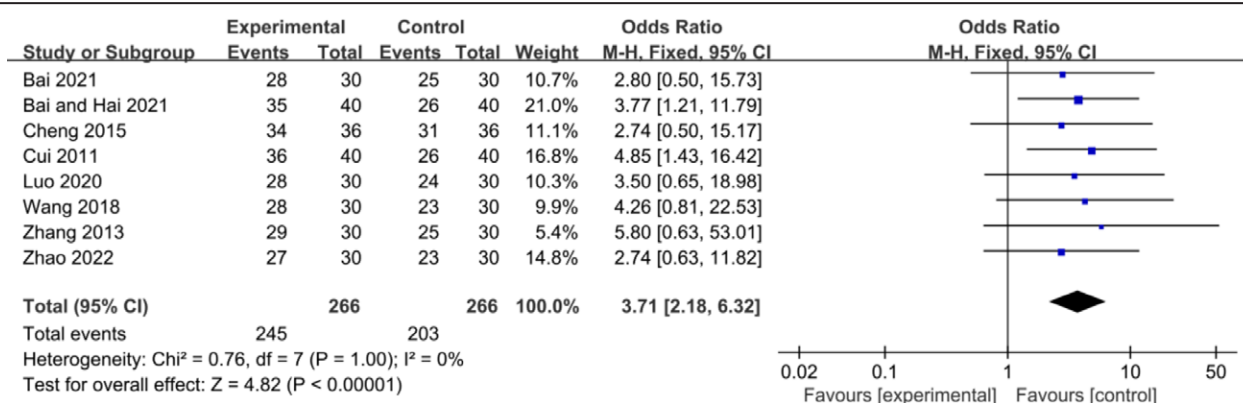


Figure 3. Shows the clinical efficacy of eye acupuncture therapy for insomnia.

meta-analysis, revealing a MD of -1.5 (95% CI: -2.80 to -0.22), with $P = .002$. This indicates that the TCM syndrome scores in the intervention group were significantly lower than those in the control group post-treatment, suggesting that eye acupuncture was effective in reducing TCM syndrome scores. For details, see Figure 5.

3.4. Sensitivity analysis

For the sensitivity analysis of PSQI and TCM evidence points, respectively, the results showed that the heterogeneity of the meta-analysis results of PSQI (Fig. 6) was significantly reduced after excluding the study of Li^[3] ($P = .31$, $I^2 = 15\%$), indicating

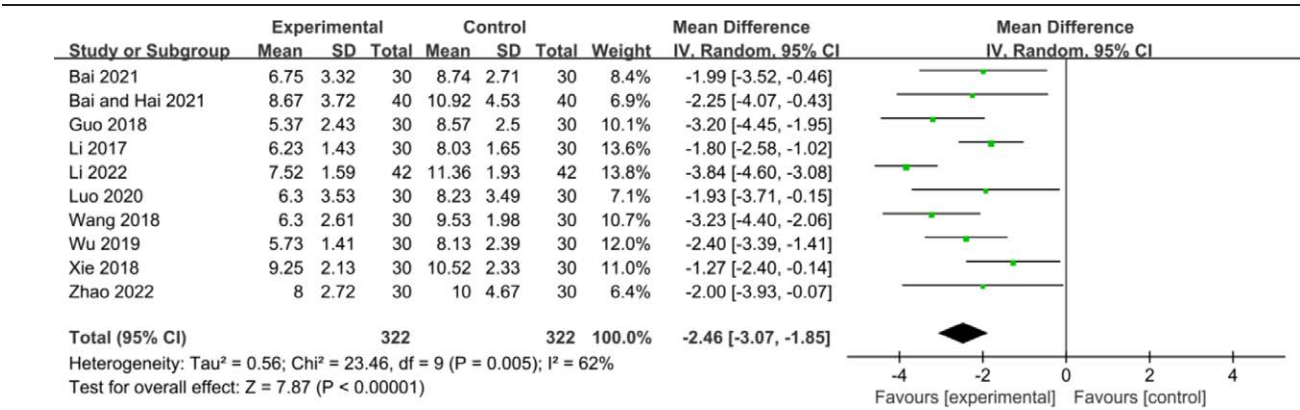


Figure 4. Shows the effects of eye acupuncture therapy on PSQI scores in patients with insomnia. PSQI = Pittsburgh Sleep Quality Index.

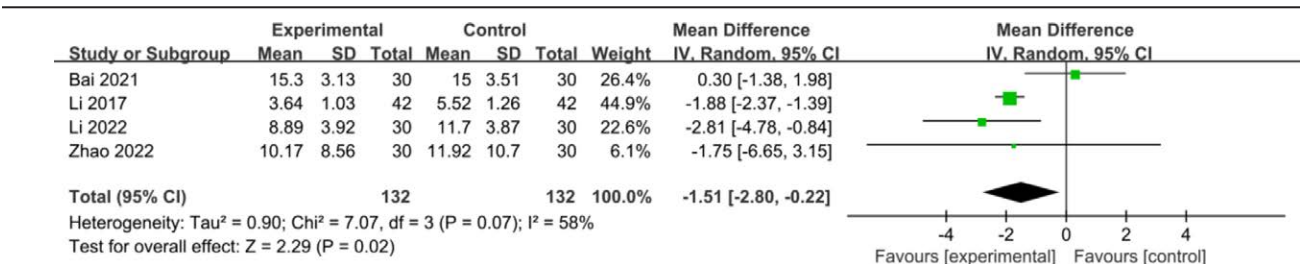


Figure 5. Shows the effects of eye acupuncture therapy on TCMSS scores in patients with insomnia. TCMSS = Traditional Chinese Medicine Symptom Score.

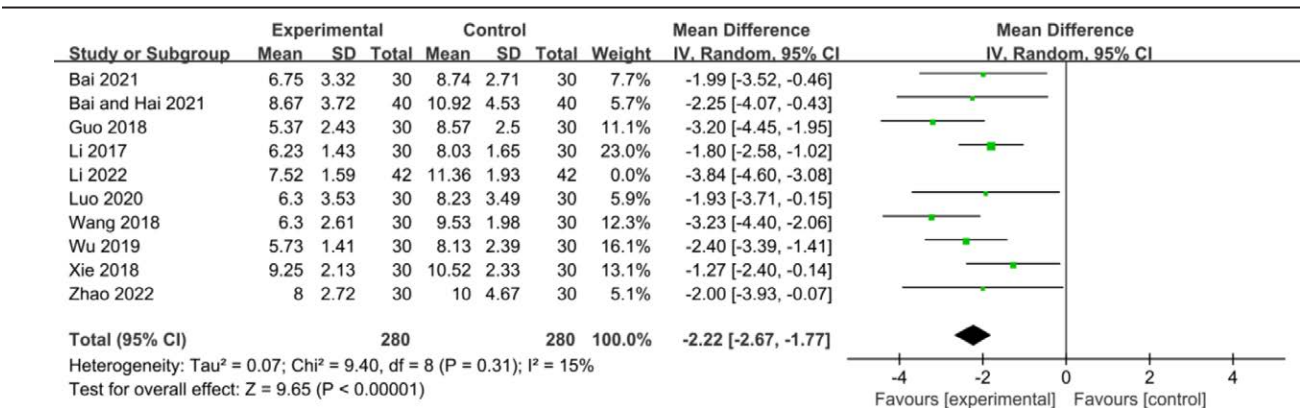


Figure 6. Sensitivity analysis on PSQI scores. PSQI = Pittsburgh Sleep Quality Index.

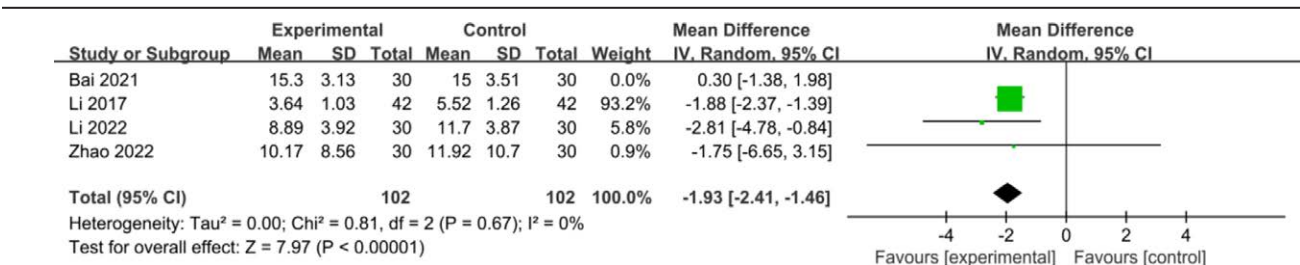


Figure 7. Sensitivity analysis on TCMSS scores. TCMSS = Traditional Chinese Medicine Symptom Score.

that Li’s study^[23] had a notable impact on the heterogeneity within the meta-analysis. This emphasizes the need for caution when interpreting the findings of this study. For the sensitivity analysis of TCM evidence points, the heterogeneity of the meta-analysis results of TCM evidence points (Fig. 7) was significantly lower ($P = .67$, $I^2 = 0\%$) after excluding Bai’s study,^[18] indicating that Bai’s study had a notable impact on the

heterogeneity of the meta-analysis. Caution is warranted when interpreting the results of this study.

3.5. Subgroup analysis

Due to substantial heterogeneity, subgroup analyses of PSQI scores based on treatment duration (Fig. 8) revealed significantly

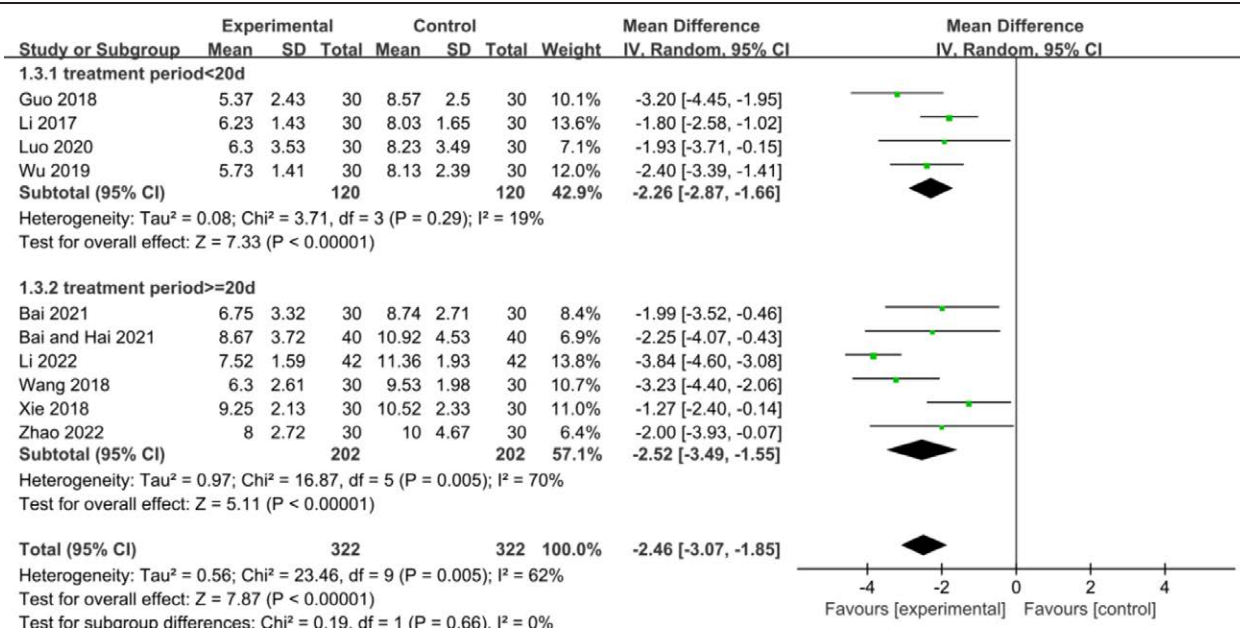


Figure 8. Subgroup analysis on the results of PSQI scores based on treatment duration. PSQI = Pittsburgh Sleep Quality Index.

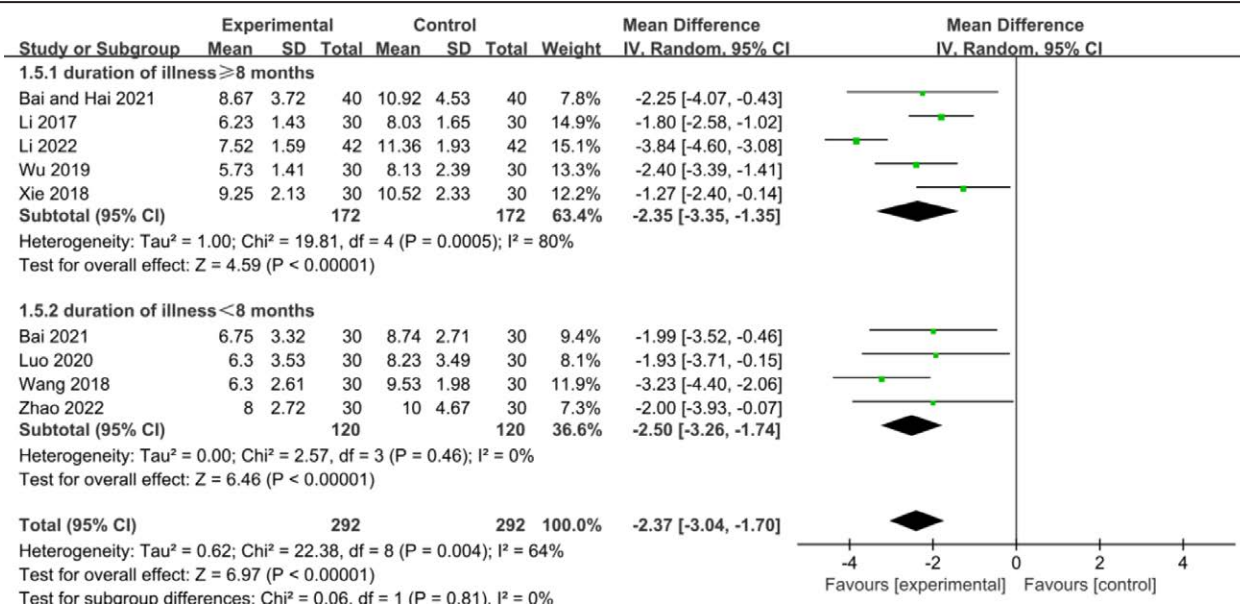


Figure 9. Subgroup analysis on the results of PSQI scores based on illness of duration. PSQI = Pittsburgh Sleep Quality Index.

lower heterogeneity in subgroups with treatment durations of <20 days ($P = .29$, $I^2 = 19\%$). In these subgroup analyses, the PSQI scores were significantly lower in the treatment group than in the control group, with a MD of -2.23 (95% CI: -2.76 to -1.70), $Z = 8.30$, and $P < .00001$. In contrast, higher heterogeneity was observed in the subgroup with treatment durations of ≥ 20 days ($P = .005$, $I^2 = 70\%$), with an MD (95% CI) of -2.52 (-3.49 to -1.55), $Z = 5.11$, and $P < .00001$. The results indicate that treatment duration is a significant source of heterogeneity in the meta-analysis findings. Subgroups with treatment durations of <20 days exhibited lower bias, providing valuable insights.

The subgroup analysis of PSQI scores based on disease duration (Fig. 9) was not conducted because the disease duration of the subjects was not reported in Guo's study.^[22] The results indicated no heterogeneity in the subgroup with a disease duration of <8 months ($P = .46$, $I^2 = 0\%$). The PSQI scores were

significantly lower in the treatment group than in the control group, with a MD of -2.50 (95% CI: -3.26 to -1.74), $Z = 6.46$, $P < .00001$. However, high heterogeneity was observed in the subgroup with a disease duration of ≥ 8 months ($P = .0005$, $I^2 = 80\%$), with an MD (95% CI) of -2.51 (-2.94 to -2.08), $Z = 11.52$, $P < .00001$. These results suggest that disease duration is a significant source of heterogeneity, with no heterogeneity observed in subgroups with shorter disease durations. These findings are clinically instructive.

3.6. Safety evaluation

No related adverse reactions were reported in 12 studies.^[18–21,23–30] One study^[22] documented 2 cases of adverse reactions in the treatment group; however, the symptoms were mild and spontaneously resolved by the end of the treatment. Additionally, no other serious adverse reactions were reported.

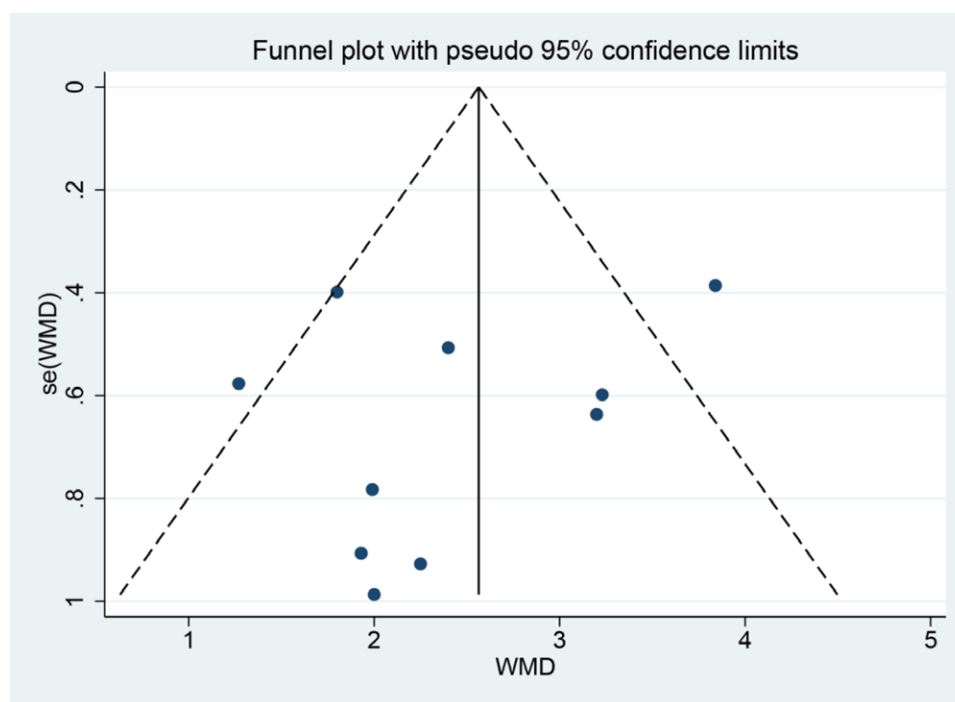


Figure 10. Funnel plot was used to assess publication bias in reporting PSQI scores during meta-analysis. PSQI = Pittsburgh Sleep Quality Index.

3.7. Publication bias

The funnel plot was constructed using the PSQI score, which had the largest number of included studies, and the bias test was performed using StataMP14 software. The Egger's test resulted in $P = .404$, with a symmetrical graphical representation (Fig. 10), indicating the absence of potential publication bias.

4. Discussion

Modern research indicates that insomnia may be associated with cerebral hypoperfusion and disrupted neurotransmitter levels. Studies have found that patients with insomnia exhibit relatively lower peak systolic velocities in the vertebral and basilar arteries.^[31,32] The periorbital subcutaneous tissues are rich in blood vessels and nerves.^[33] Stimulation of nerves and muscles in relevant acupoint areas can induce direct and/or indirect neural conduction, leading to cerebral vasodilation and increased cerebral blood flow. Additionally, stimulation of tissues within these acupoint areas can enhance synaptic transmission activity in brain neurons, thereby affecting neurotransmitter release and regulating cerebral blood flow through neurovascular coupling mechanisms.^[34] Therefore, eye-acupuncture therapy can promote sleep by regulating neurotransmitter levels and cerebral blood flow through the stimulation of periorbital acupoints.

As a non-pharmacological treatment, eye-acupuncture therapy, compared with traditional acupuncture, has the following characteristics: fewer acupoints are selected; the needles are smaller and the manipulation is lighter, resulting in less pain during treatment and longer needle retention time; the treatment area is exposed, making the procedure more convenient; it is cost-effective. Eye acupuncture has been practiced at the Liaoning University of Traditional Medicine for over 4 decades, benefiting numerous insomnia patients and demonstrating significant clinical significance.^[35]

A total of 13 studies were included in this meta-analysis. According to the available evidence, eye acupuncture treatment for insomnia can improve clinical efficacy by increasing clinical efficiency and decreasing the TCMSS and PSQI

score. To analyze the source of heterogeneity, this study conducted subgroup analyses of the PSQI score based on treatment duration and disease duration. The results showed that subgroups with a treatment duration of < 20 days had significantly reduced heterogeneity, suggesting that these subgroups had minimal bias and that shorter treatment durations appear to be more effective in lowering the PSQI score in insomnia patients. Additionally, subgroups with a disease duration of < 8 months had zero heterogeneity, indicating that these results are clinically instructive and that shorter illness durations are associated with more significant efficacy in insomnia patients.

Limitations of the present study: Since acupuncture is an invasive treatment method, it is challenging to implement single-blind, double-blind, or multi-blind trial designs. Consequently, none of the studies included in this meta-analysis described the blinding method, which directly impacted the quality assessment of the included studies. Secondly, although the subjects included in this systematic evaluation were intended to meet international or national diagnostic criteria for insomnia, they were not fully standardized, and the specific subtypes of insomnia patients included were diverse. The lack of standardization in the subjects' conditions and illness duration may also be a source of heterogeneity. Additionally, the assessment of therapeutic efficacy was based on the integrated application of eye-acupuncture with other treatments, rather than the isolated effect of eye-acupuncture alone. This limitation precludes definitive conclusions regarding the independent contribution of eye-acupuncture therapy to the observed outcomes. Future research should consider conducting randomized controlled trials that specifically evaluate the efficacy of eye-acupuncture as a standalone treatment, providing more robust evidence for its application in insomnia management.

In summary, eye acupuncture combined therapy is more effective in improving insomnia than drug or ordinary acupuncture alone. However, more high-quality, standardized, and multi-country collaborative research is needed to provide robust evidence, thereby offering more scientific treatment options and standardized guidelines for clinical practice.

Author contributions

Data curation: Shuxuan Wang, Sheng Li.

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Resources: Shuxuan Wang, Mengjiao Li.

Software: Zhenyu Shi.

Supervision: Yaqun Wang.

Writing – original draft: Shuxuan Wang, Zhenyu Shi.

Writing – review & editing: Shuxuan Wang, Yaqun Wang.

References

- [1] Su L, Lu Z. Interpretation of the 2017 Chinese guidelines for the diagnosis and treatment of insomnia. *World Clin Drug*. 2018;39:217–22.
- [2] Morin CM, Drake CL, Harvey AG, et al. Insomnia disorder. *Nat Rev Dis Primers*. 2015;1:15026.
- [3] Jiang XL, Zheng XY, Yang J, et al. A systematic review of studies on the prevalence of insomnia in university students. *Public Health*. 2015;129:1579–84.
- [4] Cao XL, Wang SB, Zhong BL, et al. The prevalence of insomnia in the general population in China: a meta-analysis. *PLoS One*. 2017;12:e0170772.
- [5] Dou W, Zhao ZX. Research progress on the tolerance of sedative hypnotic drugs. *Chin J Neurol*. 2004;79–82.
- [6] Zhang P, Zhao ZX. Interpretation of Chinese adult insomnia diagnosis and treatment guidelines. *Chin J Contemp Neurol Neurosurg*. 2013;13:363–7.
- [7] Ding SY, Wang QG, Luan ZY, Shao Y, Wang PQ. Peng 's academic thought of eye acupuncture. *Chin Arch Tradit Chin*. 2023;41:112–5.
- [8] Liu GH, Bai L, Wang EL, Wang Y, Zhang M. Systematic review and meta-analysis of randomized controlled trials of eye acupuncture for insomnia. *Chin J Integr Med Cardio Cerebrovasc Dis*. 2018;16:2457–65.
- [9] Psychiatric Branch of Chinese Medical Association. CCMD-3 Chinese Classification and Diagnostic Criteria of Mental Disorders. 3rd edition. Jinan: Shandong Science and Technology Press; 2001:118–119.
- [10] Thorpy M. International Classification of Sleep Disorders. Springer New York; 2017:475–484.
- [11] Jia JP, Chen SD. Neurology. 8th edition. Beijing: People 's Health Publishing House; 2018:462.
- [12] State Administration of Traditional Chinese Medicine. TCM syndrome diagnostic efficacy criteria. Nanjing: Nanjing University Press; 1994:19–20.
- [13] Zhang BL, Wu MH. Chinese medicine internal medicine. 4th edition. Beijing: China Traditional Chinese Medicine Publishing House; 2017:109.
- [14] Zhou ZY. Chinese medicine internal medicine. 2nd edition. Beijing: China Traditional Chinese Medicine Publishing House; 2007.
- [15] Psychiatric Branch of Chinese Medical Association. CCMD-3 Chinese Classification and Diagnostic Criteria of Mental Disorders. 3 version. Jinan: Shandong Science and Technology Press; 2001:118–119.
- [16] Deng TT. Diagnostics of traditional Chinese medicine. Shanghai: Shanghai Science and Technology Press; 2005:125.
- [17] Zheng XY. Guiding Principles for Clinical Research of New Drugs of Traditional Chinese Medicine (Trial). Beijing: China Pharmaceutical Science and Technology Press; 2002:1.
- [18] Bai HW. Observation on efficacy of eye acupuncture combined with Wendan Anmian decoction in treating insomnia of phlegm-fire disturbing heart type. Master's degree. Liaoning University Of Traditional Chinese Medicine; 2021.
- [19] Bai HW, Hai Y. Clinical observation on modified Suanzaoren decoction combined with eye acupuncture in the treatment of insomnia of heart and liver blood deficiency type. *China's Naturopathy*. 2021;29:79–81.
- [20] Cheng Y. Clinical study on eye acupuncture combined with body acupuncture in the treatment of insomnia of heart and spleen deficiency type. Master's degree. Changchun University of Chinese Medicine; 2015.
- [21] Cui J, Hai Y. Eye acupuncture treatment of primary insomnia 40 cases. *J Pract Tradit Chin Intern Med*. 2011;25:87–8.
- [22] Guo SS. Randomized controlled study of eye acupuncture therapy for insomnia after stroke. Liaoning University Of Traditional Chinese Medicine; 2018.
- [23] Li CL, Sun SJ, Lin FS, Wu GL. A randomized controlled study on the efficacy of eye acupuncture in the treatment of insomnia of heart-kidney disharmony type. *J Extern Ther Tradit Chin Med*. 2022;31:87–9.
- [24] Li DY. Clinical comparative observation of eye acupuncture in the treatment of liver fire disturbing heart insomnia. Master's degree. Heilongjiang University of Chinese Medicine; 2017.
- [25] Luo YY, Yang S. Clinical observation of eye acupuncture combined with body acupuncture in the treatment of insomnia after stroke. *Liaoning J Tradit Chin Med*. 2020;47:171–3.
- [26] Wang DX, Wang PQ. Clinical observation on 30 cases of insomnia of yin deficiency and fire excess type treated by eye acupuncture combined with Baihe Dihuang decoction. *Hunan J Tradit Chin Med*. 2018;34:89–90.
- [27] Wu R. Clinical observation of eye acupuncture combined with body acupuncture in the treatment of heart and spleen deficiency insomnia. Master's degree. Liaoning University Of Traditional Chinese Medicine; 2019.
- [28] Xie HQ, Wei W. Effect of eye acupuncture combined with body acupuncture on clinical signs and sleep quality of insomnia patients with heart and spleen deficiency type. *Health Way*. 2018;17:221.
- [29] Zhang SW, Tian WZ. Randomized parallel controlled study on the treatment of insomnia with Tianweizhu eye acupuncture combined with Wendan Decoction. *J Pract Tradit Chin Intern Med*. 2013;27:24–5.
- [30] Zhao JW. Clinical study on eye acupuncture therapy for insomnia of heart and spleen deficiency type. Master's degree. Liaoning University Of Traditional Chinese Medicine; 2022.
- [31] Lei ZQ, Feng WX, Yang B, Niu XM, Li Y, Wang WG. Effect of Tiaoxin Anshen acupuncture on cerebral blood flow velocity in patients with insomnia and its curative effect observation. *J Basic Chin Med*. 2014;20:811–2.
- [32] Zhang XL, Zhang GC, Wang N, Lin XW. Effect of Tiaoxin Anshen acupuncture on insomnia and its effect on cerebral blood flow velocity and neurotransmitters. *Mod J Integr Tradit*. 2020;29:2316–9+24.
- [33] Gao YT, Hai Y. Study on the body surface location and anatomical structure of the eye acupuncture point area. *Mod Chin Med*. 2019;39:42–4.
- [34] Liu WJ, Wang PQ. Study on the mechanism of eye acupuncture affecting cerebral blood flow. *J Liaoning Univ Tradit Chin Med*. 2024;26:190–4.
- [35] Yi ZX, Xian NX, Wang Z, Tian WZ, Ma XD, Zhang W. "Observing the eyes and recognizing diseases, and treating all diseases"-the origin, characteristics and inheritance of eye acupuncture therapy. *Acta Chin Med Pharmacol*. 2023;51:46–50.