

The Effect of Acupuncture Point Therapy on Insomnia: A Systematic Review and Meta-Analysis

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Abstract: Born in a society where traditional as well as modern medication is used equally on daily basis, it is puzzling yet intriguing to find how, albeit the lack of scientific evidence, the traditional ways are widely adopted in every Chinese family. Various studies are conducted in search for the mechanisms as well as the relative effectiveness of the traditional acupoint therapy as opposed to the Western medicines, yet individually viewing, it is hard to reach a conclusion. Therefore, a meta-analysis is done by collecting and analyzing results from research from multiple reliable databases, trying to determine the strength of acupoint therapy in treating insomnia, a common yet frustrating disease. In this meta-analysis, the methods and results of 13 studies are included, all of which focus on treating primary or secondary (specific causes are analyzed in subgroups) insomnia in humans using randomized control trials. After being selected from four main medical databases, including PubMed, Embase, Psycinfo, and Wanfang, the data were sorted and processed using the Reviewing Manager. Papers that lack credibility or have a low level of relevance were excluded, and the remaining studies showed that all experimental groups using real acupoints yielded a statistically significant improvement in sleep quality in the patients than those in the control group, and finally, a conclusion is drawn that the acupuncture therapy is as, if not more, effective as modern western medicine on treating insomnia.

Keywords: Insomnia; Acupuncture; Systematic review; Meta-analysis; Randomized controlled trial

Online publication: January 19, 2022

1. Introduction

As technology advances, discoveries about the human body and breakthroughs in novel treatments are made every day. While western medical techniques are widely studied and practiced, the traditional medical techniques are usually largely overlooked in the scientific field, to the point of being called “unscientific,” or “unorthodox.” One of the many examples is the traditional Chinese acupuncture point therapy. Most, if not all, children born in Chinese families, may have had the experience of catching a fever or having a stomachache. In these incidents, taking medication and going to the hospital are often not the first solutions, instead, parents may rub the acupoints for easing the pain: massaging the temple is for curing headache, massaging *zusanli* can alleviate stomachache ^[1]. The methods may lack scientific proof or systematic testing, yet they always are able to alleviate the symptoms, if not curing the illness on its own. Except for relieving pain for young children, acupuncture point therapy is also frequently used in everyday life by people of all ages and can be used for a variety of complaints. Based on only folk’s knowledge and experiences, however, many aspects of acupoint therapy remain in doubt, which leads us to a long-lasting question: is the traditional treatment just a placebo, or is it a trustworthy way of curing diseases?

To further analyze this question, it is necessary to first understand the “mechanism” and main purpose of acupuncture therapy. Unlike Western medication or vaccines, acupoint therapy does not target or destroy antigens that may cause the disease, instead, it is more widely used for treating malaise or unease in the body. In most cases, the stimulation applied on the acupoint is said to regulate the flow of *qi* and blood [2], and thus restore the body to a balanced state. Though the specific mechanism behind it may not be clear, numerous studies have been done focusing on the effectiveness of acupuncture point treatment, and one of the many illnesses being analyzed is insomnia.

Insomnia, regardless of the cause, has been a nightmare that plagues a large percentage of the population all around the world. Patients not only suffer from the annoyance and anxiety from sleepless nights, but also endure the negative effect that lack of rest brings to their body, such as depression or inability to concentrate [3]. Various medications and therapy are dedicated towards solving this torturous illness, including the traditional acupuncture point therapy. Relative to the modern medicines, acupoint therapy has been used for thousands of years, yet it is not until lately that their strengths are compared.

In this paper, the research about the effectiveness of acupuncture point therapy on curing insomnia against various other techniques were collected and sorted into further subgroups according to their respective methods and controls.

2. Methods

2.1. Research design

The studies analyzed in this paper are randomized controlled trials (RCTs) with parallel design. Only studies that have an impact factor greater than or equal to 2 were considered relevant enough to be included.

2.2. Participants and data collection

All the participants included in the studies suffered from either primary or secondary insomnia, which degree of severity are measured primarily (studies) by PSQI (Pittsburgh Sleep Quality Index), as well as various other ancillary tests including the [number] articles using ISI (Insomnia Severity Index); [number] using AIS (Athens Insomnia Scale); using SDRS; using SRSS (self-rating sleeping situation scaling), and using sleep hours. Studies focusing on participants with insomnia as secondary complaints were sorted and further analyzed in subgroups according to their primary disorders.

2.3. Interventions

The experimental groups are treated with interventions of inserting specialized needles at various insomnia points. The acupoints that are most commonly used are: *shenmen* (HT7), *baihui* (GV 20), and *neiguan* (PC6); other acupoints are also often included, though vary among different studies. The control groups, which were further analyzed in subgroups based on their treatment, were simply sorted into studies that use sham acupoints or placebo, and groups that use other common treatments. The sham acupoints are either points located several centimeters above the real acupoints, or are acupoints that have different functions than those used in the treatment groups; the placebo treatments include inserting needles in sham acupuncture points, and other common treatments include applying medication of various kinds.

2.4. Results

The primary outcome was measured by the score of the PSQI, which is a recognized and standardized self-rating questionnaire used to evaluate the sleep quality of an individual [4]. An improvement of [score to be added] is considered to be effective in alleviating insomnia. Secondary outcomes include scores of ISI, AIS, and SDRS, as well as various other scaling systems. If the patients showed a statistically significant increase in the test they took, the treatment was concluded to be effective. Some studies also recorded sleep hours

before and after the treatment application, and the results, though not in the form of standardized test, were included in this paper.

2.5. Search method

Four major databases were searched from 2008 to 2021. English databases included PubMed, Embase, and PsycINFO. The Chinese database included Wanfang. Search terms are listed as following ("insomnia s"[All Fields] OR "sleep initiation and maintenance disorders"[MeSH Terms] OR ("sleep"[All Fields] AND "initiation"[All Fields] AND "maintenance"[All Fields] AND "disorders"[All Fields]) OR "sleep initiation and maintenance disorders"[All Fields] OR "insomnia"[All Fields] OR "insomnias"[All Fields]) AND ("acupoint s"[All Fields] OR "acupuncture points"[MeSH Terms] OR ("acupuncture"[All Fields] AND "points"[All Fields]) OR "acupuncture points"[All Fields] OR "acupoint"[All Fields] OR "acupoints"[All Fields])

2.6. Literature selection

The resulting studies were further selected through manual and filtering selection, which specific processes are shown in **Figure 1**. In the end, 13 research papers were included in this analysis.

2.7. Data extraction and data management

The study extracted the following data as standard of literature selection and data management:

- Information about the study methods includes the study's randomization method, allocation concealment method, and blinding method;
- Information about the participants includes the diagnosis standard, inclusion/exclusion criteria, number of participants in each group, age and sex distribution, and associated diseases;
- Information about the intervention and control includes duration of treatment, the type of acupuncture, employed acupoints, details of co-interventions, the type of control, and details of control treatment including drug dosage;
- Information about follow-up includes the duration of follow-up, withdraw rates, and withdraw reasons;
- Information about primary and secondary outcome; and
- Information about data analysis.

Data were entered into the Review Manager 5 software (RevMan 2021) by one reviewing author and then checked by the second reviewing author.

3. Results

3.1. Description of studies

The author reviewed 107 full-text references of which 13 RCTs with 1026 participants were included (**Table 1**). Acupuncture alone was used in 11 studies ^[4-14]; acupuncture plus ear acupressure in one ^[15]; and acupuncture plus moxibustion in one ^[16].

Sham acupuncture was used as control in 7 studies, and pharmacotherapies were used as control in 5 pharmacotherapies including estazolam (2), diazepam (1), alprazolam (2), and oryzanol (1). Cognitive behavioral therapy was not used in any of the studies.

Treatment duration ranged from 20 days to 9 weeks. Follow-ups were included in most of the studies, but not considered in this review.

Eleven of all studies used the PSQI, and 2 of all used the ISI.

3.2. PSQI & ISI results from meta-analyses

Two meta-analyses based on comparator were produced according to PSQI and ISI, respectively (**Table 2** and **Table 3**).

Acupuncture compared with controls showed a statistically significant result in meta-analysis of PSQI, mean difference (MD) $-1,13$ and 95% confidence interval (CI) $-1.65, -0.61$, $p = 0.00001$. Meta-analysis showed considerable heterogeneity, $I^2 = 91\%$.

Acupuncture compared with controls showed a statistically significant result in meta-analysis of ISI, mean difference (MD) -1.90 and 95% confidence interval (CI) $-1.37, -0.53$, $p = 0.001$. Meta-analysis showed considerable heterogeneity, $I^2 = 78\%$.

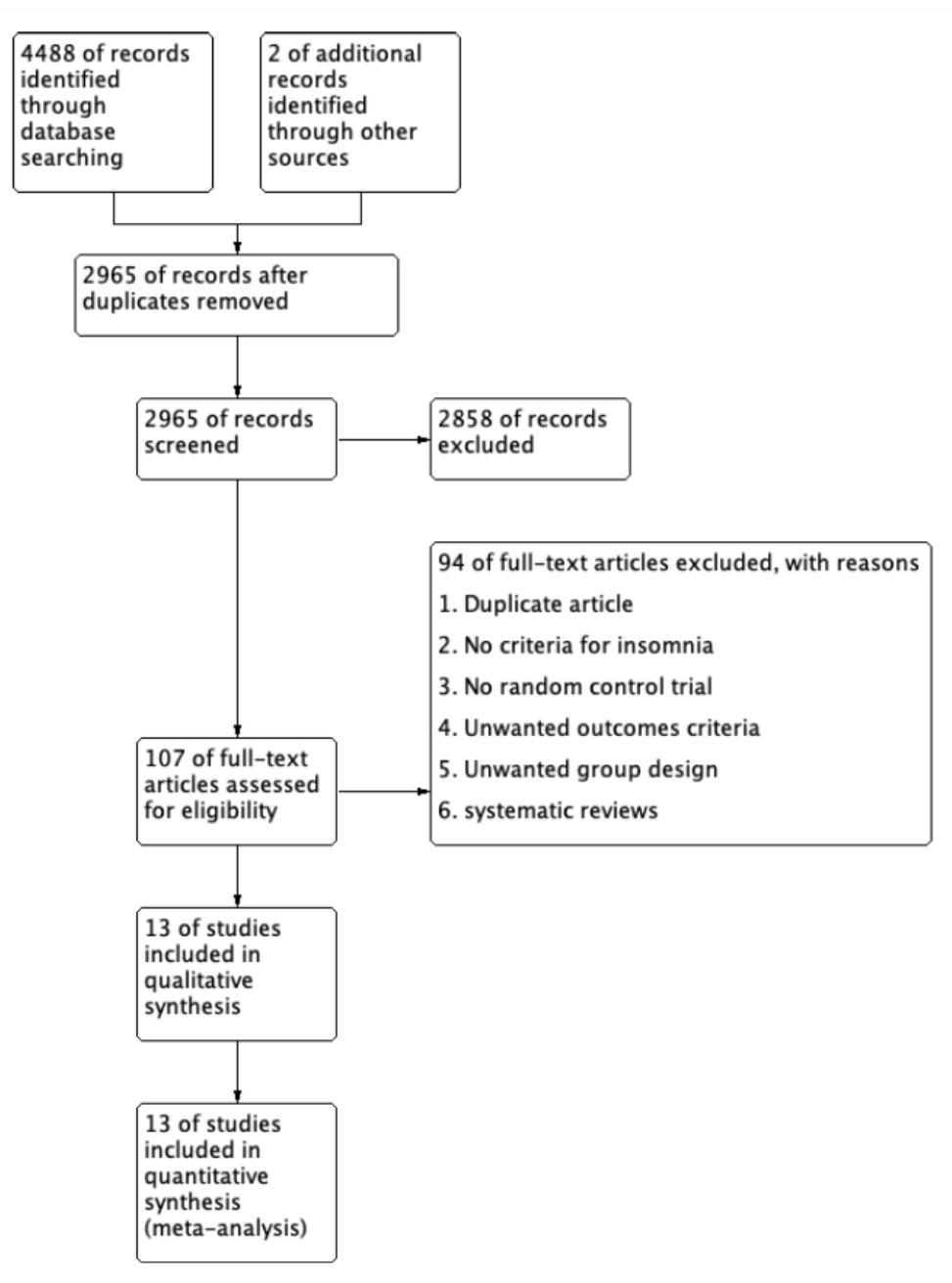


Figure 1. Flow diagram of study selection

Table 1. Characteristics of the 30 included studies

Author, Year	Participants (I/C)	Interventions	Acupuncture Points	Controls	No. of treatment / duration	Primary Outcomes
Fu C 2017	38/38	Acupuncture	BL23, BL18, LR14, GB 25	sham	10/3 weeks	PSQI, ISI
Guan TX 2019	40/39	Acupuncture	CV12, CV10, CV6, CV4, GV20	Estazolam	12/4 weeks	PSQI, ISI
Guo J 2016	44/44	Acupuncture	Du-20, DU-24, GB-13, EX-HN1, SP-6, PC6 and HT-7	sham	12/4 weeks	PSQI
He Q 2019	30/30	Acupuncture +ear-acupoint	EX-HN3, EX-HN16, LR2, LR3 + ear acupoint	Alprazolam	30/30days	PQSI
Huo ZJ 2013	30/30	Acupuncture	EX-HN22, GB20, TE17, LI3, DU20, ST36, PC6, HT7, SP6, LR3, KI1	meridian acupoints	14/4 weeks	PSQI
Lee SY 2009	27/25	Acupuncture	He-7, EH-6	sham	NS/3 days	ISI
Li OJ 2018	60/62	Acupuncture	BL13, BL15, BL20, BL18, BL23, BL17, HT7	Alprazolam	45/9 weeks	PSQI
Li SS 2020	42/42	Acupuncture	GV20, GV24, GV29, CV6, CV4, EX-HN22, SP6, HT7	sham	18/8 weeks	PSQI, ISI
Liu Y 2017	31/30	Acupuncture	EX-HN1, EX-HN22, HT7, SP6, KI6, BL62	estazolam	20/4weeks	PSQI
Vagharseyyedin SA 2018	38/38	Acupuncture	PC6 and the Yin Tang	sham	12/4 weeks	PSQI
Yin X 2018	36/36	Acupuncture	Du-20, GV24, GV29, HT 7, EX-HN22, SP 6	sham	12/4 weeks	ISI
Zhag LX 2020	48/48	Acupuncture	EX-HN22, PC6, HT7, LI4, ST36, KI6, BL62, LR3	sham	NS/2 weeks	PSQI
Zhang WR 2018	50/50	Acupuncture + moxibustion	Zhongwan, Xiawan, Qihai, Guanyuan, KI 1	diazepam and oryzanol	20/20 days	PSQI

Table 2. Forest plot comparing acupuncture to control in terms of PSQI

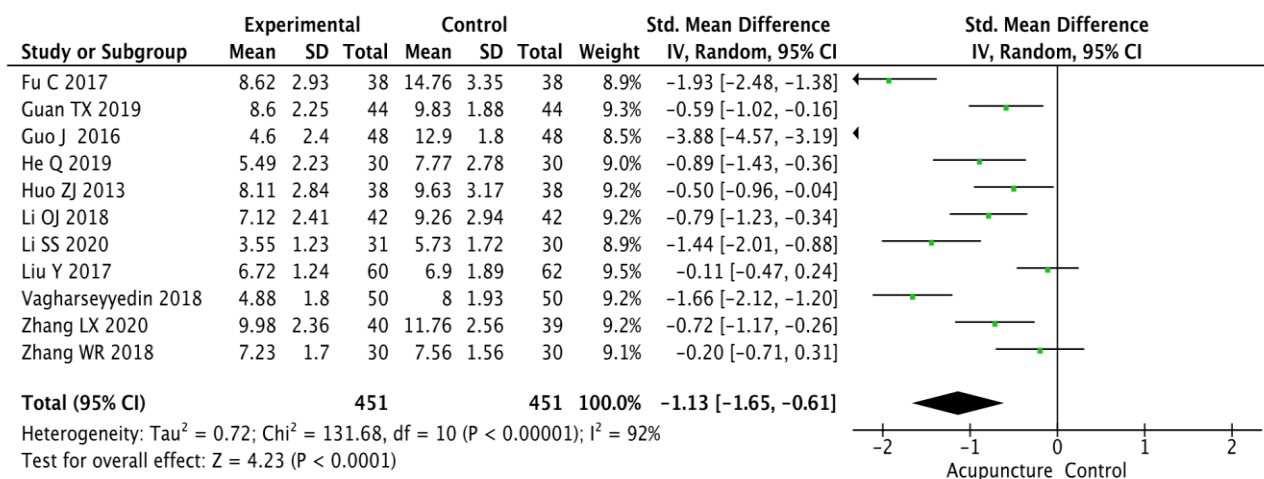
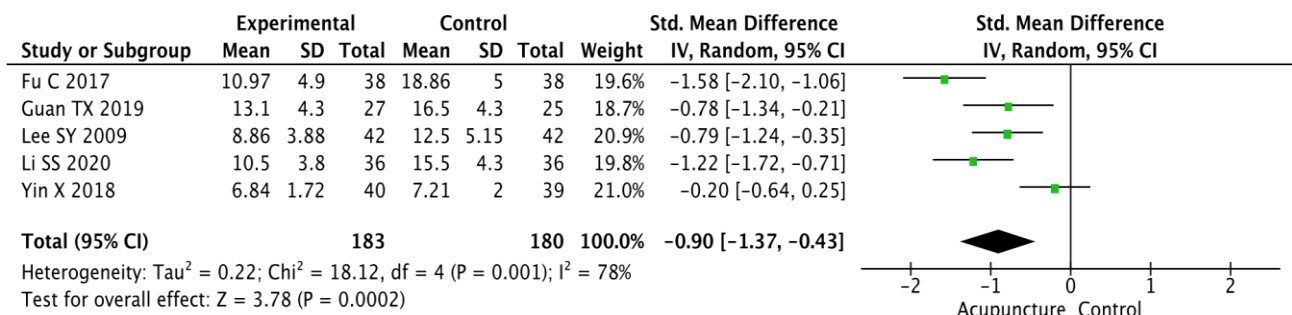


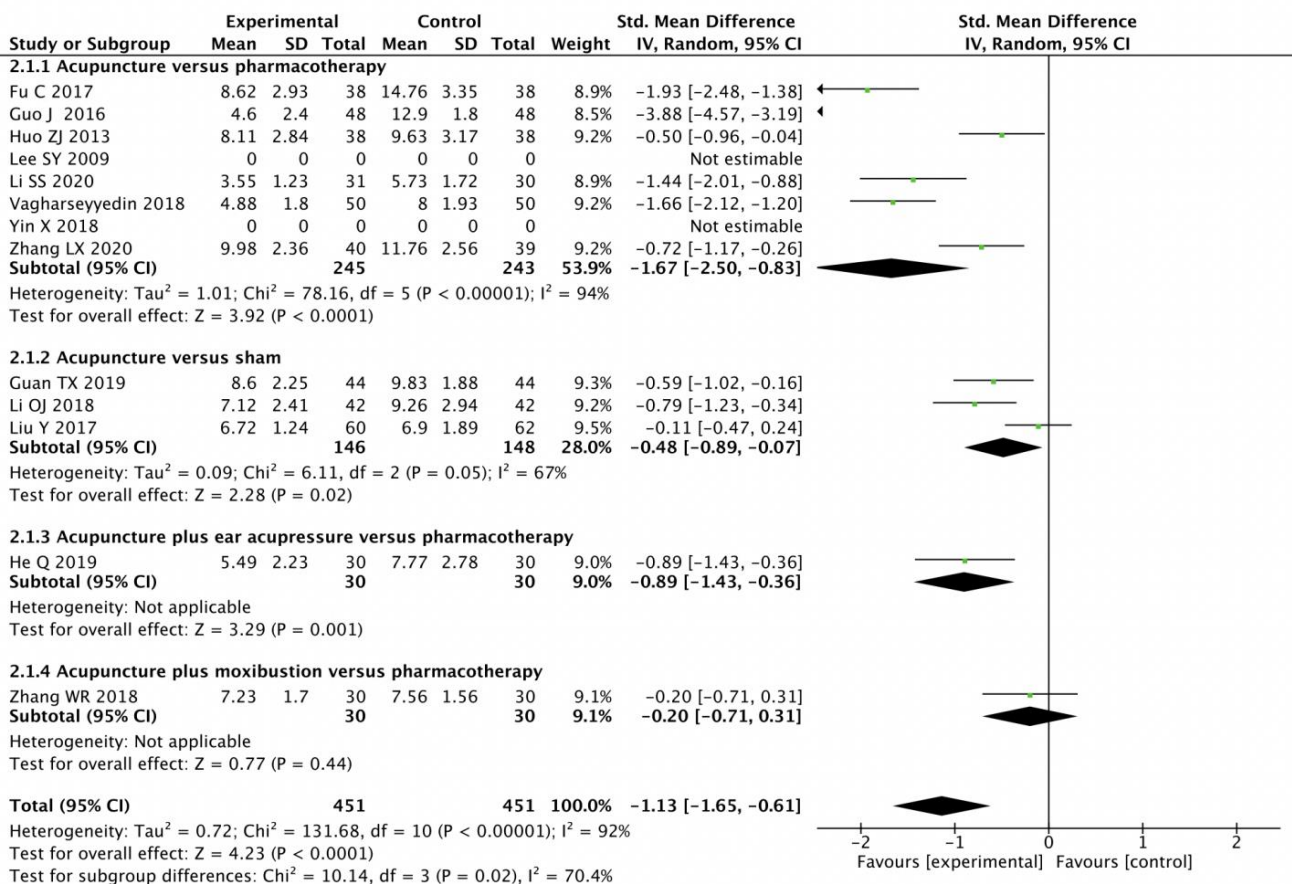
Table 3. Forest plot comparing acupuncture to control in terms of ISI



3.3. Subgroup analyses

Subgroups of 11 studies with PSQI data was divided according to the intervention designs and control design. The subgroup analysis as demonstrated by **Table 4** showed acupuncture is slightly more effective than pharmacotherapy, MD -1.67 (95% CI -2.50, -0.83), p < 0.00001, yet studies were heterogeneous, I² = 94%; acupuncture, compared with sham acupuncture, was significantly more effective, MD -0.48 (95% CI -0.89, -0.07), p < 0.05, I² = 67%. Acupuncture combined with ear acupressure or moxibustion versus pharmacotherapy showed a small but statistically significant effects, MD -0.89 (95% CI -1.43, -0.36) and MD -0.20 (95% CI -0.71, -0.31). However, considering that only one study was included in each of these two subgroups in the primary pool, the subgroup of acupuncture combined with ear acupressure or moxibustion versus pharmacotherapy could not be tested in heterogeneity.

Table 4. Analysis of PSQI in subgroups



3.4. Adverse effect

Of the 13 studies examined, four studies recorded and reported in detail about the adverse effects that occurred in their participants. In the three studies, a total of 16 cases of adverse events were recorded, in which 8 cases happened in the intervention groups, and 8 cases happened in the control groups. Of all the adverse events, none of them were reported as severe cases and no participants dropped out from the experiment. The adverse events that happened in the intervention groups include hematoma (3), dizziness (2), sharp needling pain (1), bleeding (1), and mild pain (1). The adverse events in the control group include dizziness (2), gastrointestinal reactions (2), rash (1), pain at needle site (2), and mild pain (1). Most of the study included χ^2 tests on the adverse events, and no apparent relationship between the aversion and treatment is found.

In the rest of the ten researches, one study marked the appearance of adverse events in graph, showing when the events happened, and no further description was provided; one mentioned the occurrence of adverse events without showing the detailed information; one had no adverse events recorded, yet four of the control group patients reported worsen of insomnia; and seven of the research did not mention whether or not adverse events had occurred.

4. Discussion

4.1. Summary of main results

There were a total of 13 RCTs included in the current review. They evaluated different forms of acupuncture therapy (acupuncture solely and acupuncture combined with ear acupressure or moxibustion) in comparison with controls (sham point or medication treatment). The results suggest that acupuncture may be superior to sham and pharmacotherapy for improving subjective sleep quality in patients with insomnia, which generally agree with the published results. From the primary outcome, it was found that when compared with sham or placebo, acupuncture therapy appeared to have considerable improvement in sleep quality. When evaluating the intervention as an adjunct to other treatment compared with other treatment alone, acupuncture shows a more significant effect on improving sleep quality. However, more research needs to be done on the comprehensive treatment, considering that the researches of acupuncture combined with ear acupressure or moxibustion are not enough in the primary pool to produce valid conclusion.

4.2. Overall completeness and applicability of evidence

Risk of bias of the 13 included studies is shown in **Table 5**.

4.3. Potential biases in the review process

The international and Chinese literature are extensively searched; therefore, this paper is more comprehensive than the existing papers, and it seems that most of relevant studies were identified. However, studies that were not published in English or Chinese might have been missed. Information contained in the published reports of included trials was often inadequate and only a few authors responded to the inquiries about the missing information. The missing information might potentially cause bias in this review. In addition, the authors tried to reduce the risk of bias in this paper by excluding quasi-randomized controlled trials which are at higher risk of bias compared to truly randomized controlled trials. In this paper, the study selection, data collection and analyses are fully adhered to the predefined protocol, which should have further reduced bias. However, a significant risk of bias was identified in most of the included researches, thus the results derived from meta-analyses of these trials were susceptible to bias.

Table 5. Cochrane grade table

Author, year	Sequence generation	Allocation concealment	Blinding	Incomplete outcome data	No selective outcome reporting	Other sources of bias
Fu C 2017	H	H	H	L	H	U
Guan T 2019	H	U	U	L	H	U
Guo J 2016	H	H	H	L	H	U
He Q 2019	H	U	U	L	H	U
Huo Z 2013	H	U	H	L	H	U
Lee S 2009	H	U	H	L	H	U
Li O 2018	H	U	U	L	H	U
Li S 2020	H	H	H	L	H	U
Liu Y 2017	H	U	L	L	H	U
Vagharseyyedin S 2018	H	H	H	L	L	U
Yin X 2018	H	H	L	L	L	L
Zhang L 2020	H	H	H	L	H	U
Zhang W 2018	H	U	L	L	H	U

5. Conclusion

Selecting and finally analyzing 13 independent researches, it can be concluded that in most circumstances, the use of acupuncture point therapy is effective in treating insomnia and improving sleep quality. Supported by the data collected, a statistically significant difference is found between the resulting scores of the experimental and control groups (using sham points or medication), the effect of acupuncture combined with ear acupressure or moxibustion shows slight advantages in treating insomnia compared with pharmacotherapy, yet more research needs to be done for verification.

However, various limitations and the potential bias of heterogeneity must also be considered. As most of the studies selected are conducted by Chinese researchers, from which country the acupuncture therapy originated, who might have high expectancy on the effect of acupoint therapy. This was not an intentional selection bias, however, as from the limited number of the research on such topics, only few were done by researchers from other countries.

Disclosure statement

The authors declare no conflict of interest.

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