Acupuncture for insomnia: a scoping review of clinical studies

Acupuntura para insônia: revisão de escopo de estudos clínicos

Acupuntura para el insomnio: una revisión del alcance de los estudios clínicos

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ABSTRACT
The use of complementary medicine in the treatment of sleep disorders has been increasing and the insomnia is one of the most common sleep disorders in modern society. The aim of this scoping review was to map the literature on the use of acupuncture for insomnia treatment. This scope review was prepared according to the 5 steps of the methodology proposed by Arksey and O’Malley (2015) and was registered in the Open Science Framework. The following databases were searched: PubMed/MEDLINE, Scopus, Embase, Web of Science and Cochrane Library. Studies that evaluated the use of acupuncture in insomnia treatment, published in peer-reviewed journals, were included. The bibliographic survey was carried out between November and December 2023 and 21 studies were selected for inclusion in the analysis. The review demonstrated that acupuncture is a safe and effective alternative for treating insomnia, with fewer side effects compared to pharmaceutical methods.

Keywords: acupuncture, insomnia, sleepless.

RESUMO
O uso de medicamentos complementares no tratamento de distúrbios do sono tem aumentado e a insônia é um dos distúrbios do sono mais comuns na sociedade moderna. O objetivo desta revisão de escopo foi mapear a literatura sobre o uso da acupuntura para o tratamento da insônia. Esta revisão do âmbito foi preparada de acordo com as 5 etapas da metodologia proposta por Arksey e O’Malley (2015) e foi registrada no Open Science Framework. Foram pesquisadas as seguintes bases de dados: PubMed/MEDLINE, Scopus, Embase, Web of Science e Biblioteca Cochrane. Foram incluídos estudos que avaliaram o uso da acupuntura no tratamento da insônia, publicados em revistas revisadas por pares. O levantamento bibliográfico foi realizado entre novembro e dezembro de 2023 e 21 estudos foram selecionados para inclusão na análise. A revisão demonstrou que a acupuntura é uma alternativa segura e eficaz para tratar a insônia, com menos efeitos colaterais em comparação com métodos farmacêuticos.
Palavras-chave: acupuntura, insônia, insônia.

RESUMEN
El uso de la medicina complementaria en el tratamiento de los trastornos del sueño ha ido en aumento y el insomnio es uno de los trastornos del sueño más comunes en la sociedad moderna. El objetivo de esta revisión del alcance fue mapear la literatura sobre el uso de la acupuntura para el tratamiento del insomnio. Esta revisión de alcance se preparó de acuerdo con los 5 pasos de la metodología propuesta por Arksey y O'Malley (2015) y se registró en el Open Science Framework. Se buscaron las siguientes bases de datos: PubMed/MEDLINE, Scopus, Embase, Web of Science y Cochrane Library. Se incluyeron estudios que evaluaron el uso de la acupuntura en el tratamiento del insomnio, publicados en revistas revisadas por pares. La encuesta bibliográfica se realizó entre noviembre y diciembre de 2023 y se seleccionaron 21 estudios para su inclusión en el análisis. La revisión demostró que la acupuntura es una alternativa segura y eficaz para tratar el insomnio, con menos efectos secundarios en comparación con los métodos farmacéuticos.

Palabras clave: acupuntura, insomnio, insomnio.

1 INTRODUCTION

Disturbed sleep often involve changes on sleep patterns or habits that may negatively affect health (Awick et al, 2017; Pauletto et al. 2022). The prevalence of an insatisfactory sleep in the general population oscilate between 6% and 30%². Fatigue, inefficiency, cognitive decline, social anxiety, tension and anxiety, which affect social harmony and stability are commonly present in those patients (Peixoto et al. 2021).

Insomnia is one of the most common sleep disorders in modern society, representing about 45% of the worldwide population (Lin et al. 2018). Clinically, insomnia can be defined as the difficulty in initiating sleep, maintaining it continuously during the night or waking up before the desired time despite the opportunity and adequate conditions (Lin et al. 2018; Pereira et al. 2021; Kuang et al. 2022). Although cognitive behavioral approaches are primarily recommended, successful treatment often require the use of medications, such as benzodiazepines, antidepressants, melatonin receptor agonists and other sedatives (Hashembeigi et al. 2015, Yu et al. 2020). The satisfactory short-term
efficacy, contrast with some long-term conflicts (Abanes et al. 2021). Therefore, routine and prolonged use of sedative medication is not recommended mainly due to the tolerance, dependence and withdrawal problems, residual daytime sedation, risk of rebound insomnia, memory and cognitive impairments, and motor disturbances (Hashembeigi et al. 2015).

In this context, the use of complementary medicine in the treatment of sleep disorders has been increasing in several countries (Tu et al. 2012; King et al. 2015; Bergdahl et al. 2016). The acupuncture one of the most popular and safest therapies, with a history of more than 4,000 years in China, where it has been used to treat sleep problems since antiquity (Sateia et al. 2019).

According to the American Academy of Sleep Medicine, cognitive behavioral therapy as a non-pharmacological treatment including relaxation and acupuncture, are first-choice recommendations for insomnia treatment (Sateia et al. 2019). The limitations of Cognitive Behavioral Therapy are related to the wide variety of techniques and application protocols, as it is not yet known the number of sessions to be carried out and whether the therapy should be administered individually or in groups, in person, by self-administration or online (Garner et al. 2018; Chung et al. 2018). Still, some studies have already demonstrated a significant effect of acupuncture for insomnia treatment (TU et al. 2012; Bergdahl et al. 2016; Zhang et al. 2018) and found benefits in terms of sleep duration and quality (Cha et al. 2017).

Evidence suggests that a scoping review is more appropriate than a systematic review when exploring a wide range of questions related to, for example, the type of research design used, the concepts and characteristics of existing literature, or the identification knowledge gaps (Zhang et al. 2018). Given the absence of research that addresses non-pharmacological action, such as acupuncture, our research team sought to carry out a scoping review that would provide a broader view of the relevant field.

This scoping review on the use of acupuncture in the treatment of insomnia was motivated by limitations identified in previous systematic reviews on the subject. These reviews presented design limitations, significant heterogeneity in
results (inconsistency), indirectness of evidence (comparisons or outcomes evaluated without the study having been proposed to them), studies with few participants, and publication bias. Therefore, the aim of this scoping review is to map the existing literature on the use of acupuncture for insomnia treatment.

2 METHODS

This scope review was prepared according to the 5 steps of the methodology proposed by Arksey and O'Malley (2015): identification of the research question; identifying relevant studies; studies selection; map the data; and analyze, summarize and report the results; the Preferred Reporting Items for systematic reviews and meta-analyses extension to scoping checklists (MOHER et al. 2009; TRICCO et al. 2018) and the JBI Manual for Evidence Synthesis (PETERS, 2020). The protocol was registered in the Open Science Framework on March 6, 2022 (https://osf.io/rfn2q/).

Step 1: Identification of the research question

The research question of a scoping review should be broad and comprehensive. The primary aim is to comprehensively map the existing literature on a specific topic to identify knowledge gaps and present an overview of the available information. To achieve this goal, the research team conducted a thorough search for relevant articles to identify the most appropriate research questions. The areas of interest pertaining to the application of acupuncture in insomnia treatment included the following inquiries: [1] Which clinical research designs were used in previous studies? [2] Which populations were targeted in previous acupuncture studies? [3] What were the most frequently used acupuncture types for insomnia? [4] What risk factors are associated with insomnia? [5] What clinical outcomes were adopted in previous studies? [6] What are the benefits of treating insomnia with acupuncture? These questions were formulated by the research team, and, after a process of consensus, the overarching research query emerged as follows: "What exists in the literature concerning the use of acupuncture for insomnia treatment?"
Step 2: Identifying relevant studies

Two independent researchers (SSS; HCRA) used the following bibliographic databases: MEDLINE (via PubMed), Scopus, Embase, Web of Science and The Cochrane Central Register of Controlled Trials. The bibliographic survey was carried out between November and December 2023. There was no language restriction or publication period. The search strategy used the association of descriptors and Boolean operators, as follows: #1 (acupuncture [Mesh] OR acupuncture therapy [Mesh] OR acupuncture points) and #2 (Sleep Initiation and Maintenance Disorders”[Mesh] OR insomnia OR insomnia disorder OR insomnia disorders) #1 AND #2. The search strategies were adapted considering each database specifics (Table 1).

<table>
<thead>
<tr>
<th>Database</th>
<th>Search strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cochrane</td>
<td>Acupuncture OR AND insomnia OR insomnia disorders</td>
</tr>
<tr>
<td>Embase</td>
<td>Acupuncture AND insomnia OR insomnia disorders OR insomnia disorder</td>
</tr>
<tr>
<td>PubMed</td>
<td>((“Acupuncture”[Mesh]) OR “Acupuncture Therapy”[Mesh]) AND “Sleep Initiation and Maintenance Disorders”[Mesh]</td>
</tr>
<tr>
<td>Scopus</td>
<td>Acupuncture AND insomnia OR insomnia disorders OR insomnia disorder</td>
</tr>
<tr>
<td>Web of Science</td>
<td>(((TS=(acupuncture)) OR TS=(acupuncture Therapy)) AND TS=(insomnia)) OR TS=(insomnia disorders) OR TS=(insomnia disorder)</td>
</tr>
</tbody>
</table>

Source: Authors.

A manual search was carried out in specific journals of the scientific literature that address the topic: Sleep Medicine, Sleep & Breathing, Brazilian Oral Research, Sleep Science, Journal of Clinical Sleep Medicine, Sleep (New York, NY), for each periodical there was no time restriction. A search was also performed in the articles’ references included in this review.

Step 3: Study Selection

Studies that evaluated the use of acupuncture in insomnia treatment, published in peer-reviewed journals, were included. The inclusion criteria were (I) type of studies: clinical and randomized clinical trials, blinding and allocation were not limited; (II) types of participants: diagnosis of insomnia, age >18 years, gender and origin of the case were not limited; (III) types of interventions: acupuncture (including electroacupuncture and auriculotherapy) for the treatment
group and placebo or medication use for the control group; (IV) types of outcomes: the primary outcome was PSQI, and the secondary outcomes were results monitoring. Exclusion criteria were review articles, letters, congress abstracts and editorials; pilot studies, reported conflict of interest; clinical studies in which the acupuncture technique is not described and unavailability of a full copy.

For this study, the population, concept and context strategy were as follows: population (insomnia patients), concept (acupuncture treatment), context (insomnia improvement).

Search results for each database were exported and downloaded in CIW or RIS format. The files were imported into the Rayyan QCRI online platform (https://www.rayyan.ai/ RRID:SCR_017584) and the duplicates were removed.

Applying the eligibility criteria, two independent reviewers (SSS and HCRA) evaluated titles and abstracts (blind process). Agreement between reviewers was determined by the Kappa index $^{23}$, indicating almost perfect agreement (0.86) on all bases. To determine inclusion, each article was read in its entirety by both reviewers. One author collected the information (SSS), and another author (HCRA) reviewed the results.

At all stages, disagreements were resolved through discussion with a third reviewer (MVH).

**Step 4: Map the data**

The variables collected from the selected articles were: author/year/country, sample/age group/study design/objective/methodology/results/conclusion. From the data extraction, a synthesis was constructed through a thematic analysis, related to this review guiding question. Coding and initial analysis were performed by two reviewers, who discussed the themes and subthemes content, reaching consensus after the second meeting.

**Step 5: Collect, summarize and report the results**

The studies selection was presented in a flowchart form, proposed by the PRISMA - ScR screening and enrollment flowchart showing the articles selection
for scoping review. PRISMA, Preferred reporting Items for Systematic reviews and Meta- Analyses extension for scoping reviews (Figure 1).

Figure 1 – Process flowchart bibliografic accomplished in selected databases

Source: Authors.

3 RESULTS

The bibliographic survey was carried out between November and December 2023, based on published records and indexed in the used databases. Database searches and manual searches identified a total of 4,373 articles. After removing duplicate studies, titles and abstracts were reviewed for eligibility. Finally, the full text of 126 articles was read, of which 21 were selected for inclusion in the analysis. The characterization of the studies is described in table 2.
A consistency analysis was performed between the examiners (SSS and HCRA) for each of the databases, with the following results: PubMed (0.92), Cochrane Library (1.0), Scopus (0.90), Web of Science (0.86) and Embase (1.0), suggesting a high degree of agreement between the examiners. Data are presented in a table with each study individual results (Table 2).

The studies included in this scoping review were published between 2007 and 2021. Among the 21 articles included, 19 were randomized clinical trials, 1 clinical study and 1 descriptive correlation study. The largest study sample was 244 participants and the smallest was 20 participants. The age range considered in the intervention and control groups ranged from 18 to 75 years.

Four studies compared acupuncture and chemical drugs (Guo et al. 2013; Hashembeigi et al. 2015; Bergdahl et al. 2016; Yin et al. 2017). The remaining studies evaluated acupuncture in comparison with CBT, Placebo or another acupuncture technique. In only two studies (Bergdahl et al. 2016; Zhang et al. 2020), acupuncture was not found to be effective and safe for treating insomnia.
Table 2. Characterization of the included studies

<table>
<thead>
<tr>
<th>Author/Year/Country</th>
<th>Sample/Age Group</th>
<th>Drawing</th>
<th>Objective</th>
<th>Methodology</th>
<th>Results</th>
<th>Safety of acupuncture therapy for insomnia</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abanes (2022) USA</td>
<td>70 patients of both sexes, aged between 18 and 65 years.</td>
<td>Randomized Clinical Trial</td>
<td>To compare the effectiveness of standardized manual acupuncture associated with CBT alone for sleep disorders treatment.</td>
<td>IG (37): Acupuncture + CBT. GC (33): TCC</td>
<td>There was no difference between the intervention group and the control group for insomnia improvement (p=0.480), sleep quality, sleep duration, sleep efficiency and use of sleeping medications, there was no significant difference between the groups (p=0.241).</td>
<td>Yes</td>
<td>Although there was no difference between the groups, the Acupuncture and CBT groups reported improvement in sleep quality, sleep duration, sleep efficiency, and a reduction in the sleeping medications use.</td>
</tr>
<tr>
<td>Study (Year)</td>
<td>Country</td>
<td>Sample Size</td>
<td>Study Design</td>
<td>Objective</td>
<td>Interventions</td>
<td>Results</td>
<td>Conclusion</td>
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<tr>
<td>Peixoto (2021)</td>
<td>Brazil</td>
<td>60 patients of both sexes, aged between 18 and 65 years.</td>
<td>Randomized Clinical Trial</td>
<td>To compare Chinese scalp acupuncture with traditional therapies for the treatment of pain, sleep and quality of life (QoL) in patients with temporomandibular disorders (TMD).</td>
<td>GI (15): Scalp acupuncture (SA) GC1 (15): Counseling GC2 (15): Occlusal splint (OS). GC3 (15): Manual therapy (TM).</td>
<td>SA improved pain (P=0.015) OS improved pain (0.01); sleep (0.002); QOL-psychological domain (p=0.012) MT improved pain (0.014); sleep (0.029); QV-physical domain (P=0.011)</td>
<td>Yes</td>
</tr>
<tr>
<td>Wang (2021)</td>
<td>China</td>
<td>82 patients of both sexes aged between 18 and 75 years.</td>
<td>Randomized Clinical Trial</td>
<td>To evaluate the efficacy and safety of acupuncture in HT 7 (Shenmen) and KI 7 (Fuliu) for chronic insomnia.</td>
<td>GI (41): Acupuncture GC (41): Simulated acupuncture</td>
<td>The intervention group showed a statistically significant difference (p&lt;0.013).</td>
<td>Yes</td>
</tr>
<tr>
<td>Yu (2021)</td>
<td>China</td>
<td>50 patients of both</td>
<td>Randomized Clinical Trial</td>
<td>To evaluate the clinical efficacy of the IG (25): electroacupuncture</td>
<td>Combination therapy significantly</td>
<td>Yes</td>
<td>The combination of</td>
</tr>
<tr>
<td>Study</td>
<td>Country</td>
<td>Patients</td>
<td>Type of Intervention</td>
<td>Points Used</td>
<td>Outcomes</td>
<td>Effectiveness</td>
<td></td>
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</tr>
<tr>
<td>Fernandes (2020)</td>
<td>Brazil</td>
<td>40 patients of both sexes aged between 20 and 45 years.</td>
<td>Randomized Clinical Trial</td>
<td>Combination of electroacupuncture and auricular point pressure for insomnia treatment</td>
<td>The Hegu point (LI4) + Zusanli point (S36) + pressure from the auricular point at the Shenmen point GC (25): ear point only.</td>
<td>Improved sleep quality on the PSQI subscales: subjective sleep quality (P &lt; 0.05) and sleep latency (P &lt; 0.05).</td>
<td>Electroacupuncture with auricular point pressure has been shown to be highly effective in improving sleep quality and decreasing insomnia symptoms.</td>
</tr>
</tbody>
</table>

Regarding sleep disorders, no difference was observed between the times (before and after) for the control and intervention groups (> 0.05), nor between the groups (> 0.05). Regarding anxiety, there was a difference between the IG (20): Point of Auriculotherapy with the use of photobiomodulation GC (20): Control and the treatment of TMD-related anxiety. However, it was not effective for SD and TMD symptoms. |
<table>
<thead>
<tr>
<th>Study (Year)</th>
<th>Country</th>
<th>Sample Size</th>
<th>Study Design</th>
<th>Intervention</th>
<th>Comparator Intervention</th>
<th>Randomization</th>
<th>Significant Difference in Effectiveness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zhang (2020)</td>
<td>China</td>
<td>96 patients of both sexes aged between 18 and 65 years.</td>
<td>Randomized Clinical Trial</td>
<td>To compare the clinical efficacy of active acupuncture (AA) and placebo acupuncture (AP) in the insomnia and mood disorders treatment</td>
<td>GI (48): Traditional Chinese Acupuncture CG (48): simulated acupuncture</td>
<td>No</td>
<td>Active acupuncture was effective in reducing insomnia and clinical efficacy was maintained for at least 6 weeks.</td>
</tr>
<tr>
<td>Gao (2020)</td>
<td>China</td>
<td>70 patients of both sexes aged between 18 and 52 years.</td>
<td>Randomized Clinical Trial</td>
<td>To compare the clinical effects of the intradermal needle at the auricular point with conventional acupuncture for the insomnia treatment.</td>
<td>GI (35): Intradermal needle at the auricular point GC (35): conventional acupuncture</td>
<td>Yes</td>
<td>Both intradermal needle at the auricular acupuncture point and conventional acupuncture therapy improve insomnia.</td>
</tr>
<tr>
<td>Garner (2018)</td>
<td>Germany</td>
<td>45 patients of both sexes and aged between 18 and 65 years.</td>
<td>Randomized Clinical Trial</td>
<td>To assess the credibility of auricular acupuncture treatment and the effects of auricular acupuncture</td>
<td>GI (22): Auricular acupuncture with semi-permanent acupuncture needles</td>
<td>Yes</td>
<td>Ear acupuncture reduced pain and insomnia compared with usual care.</td>
</tr>
</tbody>
</table>

GI (48): Traditional Chinese Acupuncture CG (48): simulated acupuncture After 2 weeks of treatment, the therapeutic effect of GI was better than in the control group (p<0.05), and remained superior after one month (p<0.01).

Gao (2020) China
70 patients of both sexes aged between 18 and 52 years.

Randomized Clinical Trial
To compare the clinical effects of the intradermal needle at the auricular point with conventional acupuncture for the insomnia treatment.

GI (35): Intradermal needle at the auricular point GC (35): conventional acupuncture

There was no significant difference between the groups, either in the total PSQI score or in the treatment of patients with insomnia (P>0.05).

Garner (2018) Germany
45 patients of both sexes and aged between 18 and 65 years.

Randomized Clinical Trial
To assess the credibility of auricular acupuncture treatment and the effects of auricular acupuncture

GI (22): Auricular acupuncture with semi-permanent acupuncture needles

The standard auricular acupuncture protocol reduced pain intensity and pain intensity scores within and
<table>
<thead>
<tr>
<th>Study</th>
<th>Country</th>
<th>Participants</th>
<th>Design</th>
<th>Intervention</th>
<th>Outcome</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zhang (2018) China</td>
<td>68 patients of both sexes with an average age of 51.3 years.</td>
<td>Randomized Clinical Trial</td>
<td>To assess the effect of acupuncture with low-frequency repetitive transcranial magnetic stimulation (rTMS) on chronic insomnia</td>
<td>CG (23): Usual care (drugs and physical therapy). GC (37): Placebo</td>
<td>Between groups compared to the Usual Care group (P = 0.001). The interaction was significant for the insomnia severity index (p = 0.002).</td>
<td>Yes</td>
</tr>
<tr>
<td>Chung (2018) China</td>
<td>244 patients of both sexes aged over 18 years.</td>
<td>Randomized Clinical Trial</td>
<td>Comparing acupuncture with acupuncture + auricular acupuncture for</td>
<td>IG (96): acupuncture + auricular acupuncture for</td>
<td>There was no significant difference between acupuncture and combination</td>
<td>Yes</td>
</tr>
</tbody>
</table>

The table shows studies investigating the efficacy of acupuncture, with or without additional treatments like rTMS, on chronic insomnia. Zhang's study in China showed significant improvement over usual care. Chung's study in China compared acupuncture to a combination of acupuncture and auricular acupuncture, but no significant difference was observed between the groups.
Cha (2017)  
South Korea  
67 female patients aged between 40 and 60 years.  
Randomized Clinical Trial  
To assess the effect of auricular acupressure therapy on stress and sleep status of middle-aged women in South Korea  
IG (35): Therapy with the use of an auricular acupressure needle on the applied skin paper tape  
GC (32): Placebo  
There were significant differences in stress (physical: t = 2.170, P < 0.033; psychological: t = 2.117, P < 0.037), blood cortisol level (t = 2.277, P < 0.025) and sleep status (t = -3.127, P < 0.004)  
Yes  
Acupressure therapy was effective in relieving stress and sleep.
<table>
<thead>
<tr>
<th>Author</th>
<th>Country</th>
<th>Sample Size</th>
<th>Study Design</th>
<th>Intervention</th>
<th>Outcome Measures</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yin (2017)</td>
<td>China</td>
<td>72 patients of both sexes aged between 18 and 65 years.</td>
<td>Clinical study</td>
<td>To assess the efficacy and safety of using acupuncture for primary insomnia.</td>
<td>GI (36): Traditional Chinese Acupuncture GC (36): Acupuncture simulation</td>
<td>One-way analysis of adjusted covariance for baseline scores indicated that Insomnia Severity Index improved in the acupuncture group 2 weeks after treatment ($F = 11.3$, $p = 0.001$), 4 weeks after treatment ($F = 33.6$, $p &lt; 0.001$), 2 weeks of follow-up ($F = 39.4$, $p &lt; 0.001$) and 4-week follow-up ($F = 34.1$, $p &lt; 0.001$). Yes</td>
</tr>
<tr>
<td>Bo (2016)</td>
<td>Mongolia</td>
<td>80 patients of both sexes aged between 20 and 75 years.</td>
<td>Randomized Clinical Trial</td>
<td>Evaluate the effectiveness of acupuncture in the insomnia treatment.</td>
<td>GI (40): Acupuncture GC (40): Estazolam</td>
<td>The clinical efficacy result showed that the effective rate in the acupuncture group (85%) was higher than in the drug group (70%). The total PSQI scores of Yes</td>
</tr>
<tr>
<td>Study (Year)</td>
<td>Country</td>
<td>Participants</td>
<td>Study Design</td>
<td>Intervention</td>
<td>Outcome Measures</td>
<td>Results</td>
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<tr>
<td>Bergdahl (2016)</td>
<td>Sweden</td>
<td>59 patients of both sexes aged between 18 and 70 years.</td>
<td>Randomized Clinical Trial</td>
<td>GI (27): TCC</td>
<td>Significant improvements between the groups occurred in favor of CBT for insomnia treatment at post-treatment ($p &lt; 0.001$) and at 6-month follow-up ($p &lt; 0.05$).</td>
<td>Compared to CBT, ear acupuncture cannot be considered an effective stand-alone treatment for people with insomnia.</td>
</tr>
</tbody>
</table>

Both groups were approximated. The sleep quality rates of both groups significantly decreased ($p < 0.05$).
<table>
<thead>
<tr>
<th>Study</th>
<th>Sample Size</th>
<th>Study Design</th>
<th>Objective</th>
<th>Group 1 (12):</th>
<th>Group 2 (8):</th>
<th>Results</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>King (2015)</td>
<td>20 patients of both sexes aged between 18 and 50 years.</td>
<td>Randomized Clinical Trial</td>
<td>To examine the feasibility and acceptability of AA for insomnia among veterans with PTSD and sleep disorders.</td>
<td>IG (12): Auricular Acupuncture (AA)</td>
<td>GC (8): Placebo</td>
<td>Significant differences between groups were found in the sleep quality and daytime dysfunction components of the Pittsburgh Sleep Quality Index ($p = 0.003$, $p = 0.004$).</td>
<td>Yes. An AA regimen improves insomnia, sleep quality, and daytime dysfunction among veterans with post-traumatic stress disorder.</td>
</tr>
<tr>
<td>Hashembeig (2015)</td>
<td>120 patients of both sexes, aged between 20 and 40 years.</td>
<td>Correlational type descriptive study</td>
<td>To observe the acupuncture influence on sleep quality and anxiety.</td>
<td>GI (60): Traditional Chinese Acupuncture</td>
<td>GC (60): Chemical Drugs</td>
<td>Acupuncture treatment outperforms drug-based medication in lowering people's anxiety level ($p &lt; 0.001$).</td>
<td>The acupuncture method has the best sleep quality and anxiety prediction.</td>
</tr>
<tr>
<td>Study</td>
<td>Country</td>
<td>Participants</td>
<td>Design</td>
<td>Purpose</td>
<td>Group 1</td>
<td>Group 2</td>
<td>Group 3</td>
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<tr>
<td>Guo (2013) China</td>
<td>180 patients, of both sexes, aged between 25 and 75 years</td>
<td>Randomized Clinical Trial</td>
<td>To investigate the acupuncture influence on sleep quality and daytime functioning in primary insomnia</td>
<td>GI (60): Acupuncture verum, GC1 (60): Simulated acupuncture</td>
<td>The three groups showed significant improvement compared to the pre-treatment baseline. Compared with the other two groups, the verum group reported improved sleep quality (SQ) and vitality (VT), decreased daytime dysfunction (DD) and sleepiness (ESS score). P&lt;0.05</td>
<td>Yes</td>
<td>Verum acupuncture improved sleep quality and daytime functioning from insomnia compared to estazolam and sham acupuncture.</td>
</tr>
<tr>
<td>Tu (2012) Taiwan</td>
<td>33 patients of both sexes aged between 18 and 75 years</td>
<td>Randomized Clinical Trial</td>
<td>To determine the acupuncture relative effectiveness and zolpidem in insomnia treatment.</td>
<td>IG (19): Acupuncture</td>
<td>Both groups significantly improved in terms of insomnia (p = 0.046).</td>
<td>Yes</td>
<td>Acupuncture can be used as an alternative strategy to Zolpidem for the primary insomnia treatment.</td>
</tr>
<tr>
<td>Zhang (2010) China</td>
<td>92 patients of both</td>
<td>Randomized Clinical Trial</td>
<td>To observe the clinical therapeutic</td>
<td>GI (52): Acupuncture and</td>
<td>For moderate insomnia cases, the treatment</td>
<td>Yes</td>
<td>The therapeutic effect in the</td>
</tr>
<tr>
<td>Yeung (2009) China</td>
<td>60 patients of both sexes aged between 18 and 65 years.</td>
<td>Randomized Clinical Trial</td>
<td>Evaluate the electroacupuncture short-term efficacy and safety for primary insomnia treatment</td>
<td>G1 (30): Electroacupuncture GC (30): Placebo Acupuncture</td>
<td>No significant differences were observed between groups in the Insomnia Severity Index (p=0.18).</td>
<td>Yes</td>
<td>Although there was no difference between the groups, after the intervention, the proportion of individuals with less than 30 minutes of wakefulness and a sleep efficiency of at least 85% was higher.</td>
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<tr>
<td>sexes aged between 18 and 25 years.</td>
<td>effect of acupuncture associated with cupping therapy in insomnia treatment of university students</td>
<td>Cupping Therapy GC (40): Placebo</td>
<td>group was better than the control group (P&lt;0.05) and the interventions number was lower for mild/moderate insomnia (P&lt;0.01).</td>
<td>treatment group was better than in the control group, showing superiority in cases with moderate insomnia with fewer treatments and higher cure rates.</td>
<td></td>
<td></td>
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<tr>
<td>Hansson (2007) Sweden</td>
<td>144 patients of both sexes aged between 18 and 70 years.</td>
<td>Randomized Clinical Trial</td>
<td>To compare the effectiveness of periosteal acupuncture and intramuscular acupuncture on sleep quality.</td>
<td>GI (55): Periosteal acupuncture GC1 (59): Intramuscular acupuncture GC2 (30): Placebo</td>
<td>There were neither significant differences between groups GI and GC1, nor between groups (p=0.26).</td>
<td>Yes</td>
<td>No differences were found regarding the treatment efficiency with periosteal and intramuscular acupuncture. However, both treatment groups had a better response to sleep quality in the long term.</td>
</tr>
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</table>

CBT: Cognitive Behavioral Therapy; AA: Auricular Acupuncture; IG: Intervention Group; CG: Control Group; PSQI: Pittsburgh Sleep Quality Index.

Source: Authors.
4 DISCUSSION

This review focused on mapping the scientific evidence on the use of acupuncture for insomnia treatment. The mechanism by which acupuncture works in insomnia are still unknown. However, scientific studies clarified some physiological basis to support the effects of this therapy in increasing the levels of endogenous opioids and melatonin in the body, substances involved in the sleep-wake cycle (King et al. 2015; Fernandes et al. 2020).

Acupuncture interfere in sympathetic nervous system modulation with a positive effect on insomnia, through the stimulation of the serotonergic and noradrenergic systems evoking a state of hypnosis (Garner et al. 2018; Zhang et al. 2020; Gao et al. 2020). In addition to improving insomnia, it acts in the regulation of a healthy mental state and in the general well-being of the patient (Yin et al. 2017).

Several papers were published showing that Traditional Chinese medicine (TCM) has been successful in treating insomnia (BO et al. 2016; Cha et al. 2017; Yin et al. 2017; Zhang et al. 2018; Garner et al. 2018; Abanes et al. 2021) and acupuncture has well-established therapeutic effects in the treatment of insomnia related complaints, In addition, some insomnia associated risk factors, as stress reduction, muscle tension, sleep deepiness and disturbed mood were shown to respond positively to acupuncture (Yin et al. 2017).

Most of the articles included in this scoping review are from the Asian continent, three were carried out on the European continent, two in North America (Bergdahl et al. 2016; Abanes et al. 2021) and two in South America (Fernandes et al. 2020; PEIXOTO et al. 2021). The predominance of studies carried out on the Asian continent is probably due to the fact that this practice was born and perfected in this region (Guo et al. 2013). Findings from some research have shown that acupuncture is an effective alternative treatment for patients with insomnia. In addition, magnetic stimulation acupuncture techniques; Auricular acupuncture and electroacupuncture were also effective in reducing insomnia.
Contrasting findings were provided by the study of Fernandes et al. (2020) which did not found acupuncture to be effective for sleep disorders. It is worth noting, however, that the participants of this study had no complaints neither before or after treatment, which may have compromised the results interpretation and consequent conclusions. Likewise, Bergdahl et al. (2016) disagreed with the action of acupuncture in insomnia treatment and referred to cognitive behavioral therapy (CBT) as more efficient, stating that acupuncture cannot be an effective stand-alone treatment. In turn, Abanes et al. (2021) found no difference between acupuncture plus CBT or CBT alone. However, this study used a convenience sample, which suggests caution in interpreting these findings.

As for the pharmacological therapies’ comparison with acupuncture techniques, found benefits of acupuncture as an alternative to the use of drugs. In this context, Guo et al (2013) consider the selection of application points crucial and state that for clarity of results, this analysis should be complemented with sleep latency tests, polysomnography or actigraphy. Gao et al. (2020) further compared the type of needle used for the technique, that is, the intradermal needle at the auricular acupuncture point and conventional acupuncture therapy, and found no difference in the therapeutic effect.

It is important to highlight that insomnia treatment, in traditional medicine, is mainly based on hypnotic, sedative and antidepressant drugs, which can lead to dependence, cause some side effects such as mood changes and changes in cognitive processes (Zhang et al. 2020), in addition to the therapeutic effects gradually becoming ineffective. On the other hand, long-term acupuncture treatment, for patients with significantly altered physiological sleep indices, showed to be able to bring some sleep indices back to normal, such as REM sleep hours, sleep efficiency and wake-up time (Bo et al. 2016). Tu et al (2012), for example, found that acupuncture may be as effective as Zolpidem for the short-term treatment of primary insomnia. According to the authors, an alternative treatment for this disorder can be considered, especially for elderly patients, women and more educated patients. However, we should state that those
findings were based on a sample of 33 patients, indicating parsimony in data interpretation.

The inconsistencies may be caused by differences in the choice of acupuncture points (number and attributes), acupuncture manipulation, and study populations. Among the factors that could affect acupuncture treatment for insomnia, the selection of acupoints is the most important (Wang et al. 2021).

According to the theory of TCM, acupuncture point selection is based on three main strategies, namely corresponding meridian acupuncture points, experience points, and special combinations of acupuncture points (BO et al. 2016). Each study evaluated in this review has different acupuncture point selections according to different theories. According to TCM theory, heart and kidney comorbidity is an important factor in the occurrence of insomnia (Yeung et al. 2009; Zhang et al. 2010; Wang et al. 2021).

The heart belongs to fire and the kidney belongs to water. The relationship between the heart and the kidney is one of interaction and restriction. If the functional relationship between the heart and kidney is unbalanced, pathological changes will occur\(^3\). In addition to insomnia, symptoms of this imbalance include anxiety, depression and other unhealthy emotions (ABDI et al. 2017).

Several randomized controlled trials (RCTs) have shown that acupuncture is effective in lowering blood pressure in patients with hypertension (ABDI et al. 2017; Cheng et al. 2015) and meta-analyses have suggested that acupuncture may be an excellent adjunct therapy for hypertension (Zhao et al. 2015; Chen et al. 2018). Acupuncture also has been shown to be effective in reducing the risk of myocardial infarction and improving post-emergence recovery through mechanisms that promote neurotransmitter secretion in the central nervous system (Jung et al. 2020).

The use of acupuncture in the treatment of insomnia brings benefits to sleep, associated comorbidities, and reduces psychosocial stress factors (JUNG et al. 2020). In addition, the advantage of not using drugs for insomnia reduces the risk of depressing the respiratory system and worsening apnea, causing greater patient compliance (Chen et al. 2018).
As the most limiting factors within the present work is the heterogeneity of the articles included, either in terms of definitions, methodologies, study population and instruments used. Further, the wide variation in the methods used to assess the action of acupuncture for insomnia and other sleep disorders was a factor that made it difficult to compare different studies results. Methodological standardization would be beneficial for comparing studies and compiling them in future meta-analytic researches. Another limitation is related to the small number of literature included. and samples. In the future, a large number of rigorously designed, multicenter, randomized controlled trials with large samples will be needed to further verify the results of this study.

5 CONCLUSION

Based on the findings of this scoping review, the following conclusions were drawn:

a) Acupuncture is a safe and effective alternative for treating insomnia, with fewer side effects compared to pharmaceutical methods;

b) The studies employed varied methodologies, highlighting the need for randomized and controlled studies in the future to provide more robust validation for the findings presented in this study.

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