

Original Paper


# The Role of Complementary Therapy to Reduce Insomnia in Older Adults



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## ABSTRACT

**Introduction:** Insomnia in older people results from aging and declining body function. However, no studies have identified the proper therapy to reduce insomnia in older adults.

**Objective:** This study aimed to examine the complementary therapies commonly used to lessen insomnia in older adults.

**Materials and Methods:** A systematic review was conducted based on PRISMA (the preferred reporting items for systematic reviews and meta-analyses), and quantitative and randomized controlled trials were searched in PubMed, Science Direct, Google Scholar, Lilacs, SciELO, DOAJ, ProQuest, and GARUDA. The methodological quality of the included studies was assessed using the EPHPP QAT (the effective public health practice project for quality assessment tool) for quantitative studies. Only studies of moderate and strong quality were included.

**Results:** We analyzed 11 studies with a sample of 2495 older people. The significance of therapeutic effects on elderly insomnia had a strong influence with a P of 0.05 and Cohen's kappa of 0.80 in four studies. We identified 11 articles that found complementary therapies appropriate and recommended in reducing insomnia in older adults, including Tai Chi, cognitive behavior therapy, lavender aroma, and digital cognitive therapy. The results of the insomnia score were more than 50% positive changes, without adverse effects, including improvement in sleep efficiency (57%), total sleep time (60%), and insomnia rating scale score (75%).

**Conclusion:** The application of complementary therapy has put forward alternative treatments for older adults to reduce insomnia problems, improve their quality of life, and enhance the qualifications of nurses in other applied fields.

Keywords:

Complementary therapy, Insomnia, Sleep disorders, Older adults

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## Highlights

- This study provided original data on the effectiveness of complementary therapy on sleep disturbances in older adults, consisting of exercise frequency, duration, and time.
- We identified the proper type of complementary therapy for older adults to overcome their insomnia problem.
- Complementary therapy is an additional qualification for nurses in conducting interventions and one of the programs for older adults to develop “healthy and productive aging.”

## Plain Language Summary

Insomnia is a condition caused by degenerative processes in older people. As a result, they do not get enough sleep, feel tired every so often, or frequently wake up in the middle of the night. This condition can affect their quality of life. One way to overcome insomnia is to use complementary therapies. However, there are no studies that explore what type of therapy is suitable to lessen insomnia in older people. Based on the results of this study, several complementary therapies, such as Tai Chi, cognitive behavior therapy, lavender aroma, and digital cognitive therapy, can be recommended to reduce insomnia problems in older people.

### Introduction

**B**ased on world population aging, the number of older people is increasing, more than 962 million each year [1, 2]. The Central Bureau of Statistics [3] estimates that the number of elderly aged 60 years and over will continue to increase until 2045 because of demographic transition [4]. This rising trend cannot be separated from the aging process, which causes a decline in health conditions; one of the most common complaints by older adults is sleep disturbances [5, 6]. Insomnia is a symptom in which older adults lack enough sleep, feel tired when they wake up, or frequently wake up at night. It is caused by degenerative processes in older people [7-9], which decreases neurotransmitter function by inhibiting melatonin production as a sleep hormone. This deficiency makes older people awake or experience sleep disturbances [9]. Thus, insomnia results from aging in older adults as a process of decreasing body function.

Insomnia in older adults will cause many health problems and, if left untreated, will impact their quality of life [10]. Thus, effective interventions are needed for dealing with the problem of insomnia in older adults. Complementary therapy is one of the best interventions because it is cheap, has many benefits, and lacks harmful side effects, especially in older adults [10]. Holistically, complementary therapy can stimulate the hypothalamus-pituitary-axis (HPA) mechanism to improve blood circulation, help metabolism work optimally, and

relay neurotransmitters throughout the body, thereby reducing reactions to pain, stress, and depression—creating a feeling of relaxation that can make the elderly sleep soundly [12, 13]. Thus, complementary therapy is an appropriate intervention in reducing the problem of sleep disturbances in older adults and improving their quality of sleep.

Although there are many types of complementary therapies, such as massage, music therapy, relaxation techniques, acupuncture, and physical exercises recommended in nursing interventions, the problem of insomnia in older adults is still largely unnoticed [14-16]. In other words, no studies have examined the nature of complementary therapies to alleviate insomnia in older adults, only the quality of his sleep. Therefore, this systematic review examined the complementary therapies commonly used to reduce insomnia in older adults.

### Materials and Methods

This systematic review was conducted according to PRISMA (the preferred reporting items for systematic reviews and meta-analyses). The study data were collected by searching indexed articles in databases and libraries, including PubMed, Science Direct, Google Scholar, Lilacs, SciELO, DOAJ, ProQuest, and GARUDA. To maximize the search, we hunted for articles discussing complementary therapies published between 2017 and 2022 for six years. Although there were too many studies, no one had explicitly discussed appropriate

complementary therapies in dealing with insomnia in older adults. The keywords used to search for resources were selected from the MeSH database with controlled descriptors and selected boolean operators (AND/OR) to broaden the search: “Therapy” AND “insomnia” AND “elderly,” OR “sleep disorder” AND “therapy” AND “elderly.” The studies were eligible for inclusion when they looked at the effects of physical activity programs or, more specifically, exercise programs on the mental health of adults older than 60. To be included in this review, studies must meet the following criteria. First, the study population included older adults living in the community or in residential care centers aged over 60 years. In this review, older adults must be free from pre-existing major chronic diseases, such as cardiovascular disorders, cancer, and mental or psychiatric disorders. Second, the interventions or programs included complementary therapies or more specialized types of therapy (complementary therapies are categorized into five parts: Biological-based practice, mind-body techniques, manipulative and body-based practice, energy therapies, and ancient medical systems) [17]. Third, the study results should include complementary therapies

that can ease insomnia in older adults. Fourth, the study design should include intervention studies, randomized controlled trials (RCTs), full-text articles, and research exploring complementary therapies for insomnia in older adults. Cross-sectional, qualitative studies, reviews, meta-analyses, and guidelines were excluded. Three researchers carried out the process of finding and selecting studies independently. The duplicates were removed after loading all notes from different databases in Endnote software, Version 8.1. Irrelevant articles were excluded based on “title” screening. The search strategy is reported in the PRISMA flowchart (Figure 1).

Study quality was assessed using the standard EPHPP QAT (effective public health practice project quality assessment tool for quantitative studies) recommended by the Cochrane collaboration [18]. This tool consists of 8 items addressing data bias, study design, confounders, blinding, data collection methods, withdrawals and dropouts, intervention integrity, and analysis. When making judgments about each component, raters should base their opinion on information contained in the study rather than making inferences about what the authors intended. Each item is assessed and put in

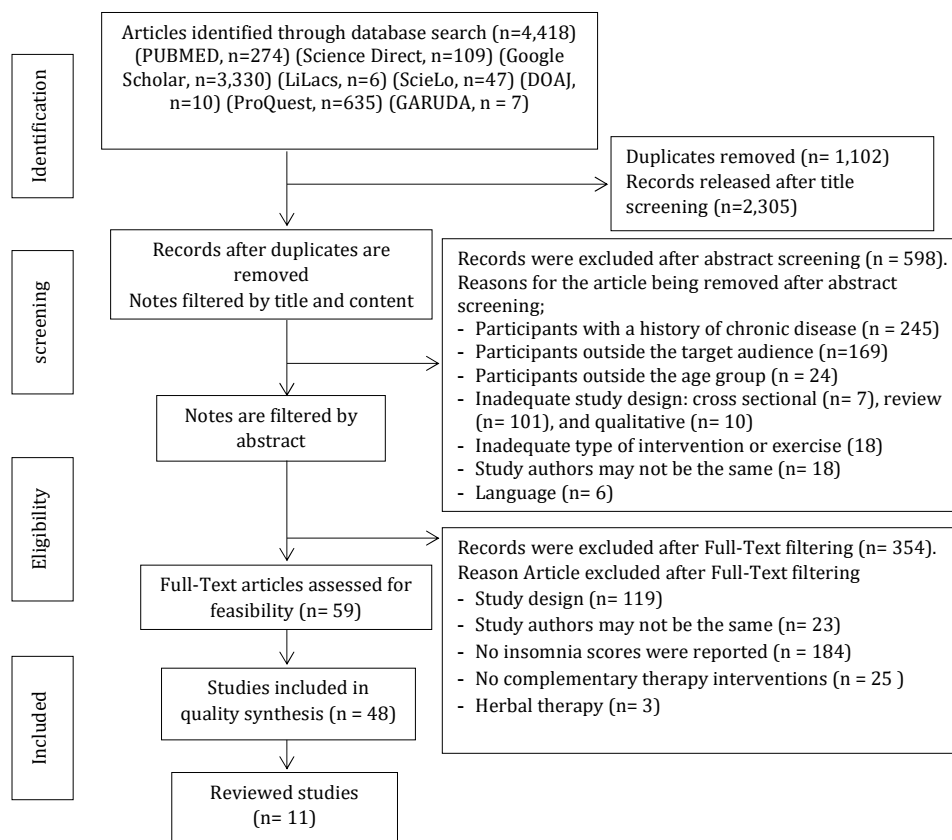


Figure 1. Prisma flow diagram of study

strong, moderate, and weak categories, each with a different explanation for the assessment and then a rating for all items. The total ratings for this instrument are strong (no weak ratings), moderate (one weak rating), or weak (two or more weak ratings), with both reviewers discussing the ratings [19].

The details of the physical exercise and mental health programs for older adults are reported descriptively. Most of the assessment of insomnia is derived from insomnia instruments. Effect sizes were calculated for all studies that reported relevant data. A Cohen's  $d \geq 0.80$  indicates a significant effect size, and a  $P \leq 0.05$  indicates a strong influence on the intervention.

## Results

We analyzed 11 studies with a total sample of 2495 older people when 4418 potential studies were initially identified through an electronic database search. Most articles were excluded in this phase because the study population or design did not meet the eligibility criteria. Also, 598 articles were excluded after screening their "abstracts." The most frequent reasons for exclusion in this phase were 1) The population did not meet the inclusion criteria, 2) The study design did not meet the inclusion criteria, and 3) No insomnia score. After reading the full text of the remaining 59 articles, they were excluded for the following reasons: 1) Being a cross-sectional study, 2) No peer-reviewed articles, 3) No insomnia score, 4) There was no complementary therapy intervention, and 5) Alluded to herbal therapy. Based on screening moderate and strong quality studies, 11 studies were included in this review. From this study, 6 were of 'moderate' quality, and 5 'strong' quality of review (Table 1).

The design of the included studies comprised one pre-test-post-test and ten randomized controlled trials. Studies were conducted in Japan ( $n=1$ ), China ( $n=3$ ), the USA ( $n=2$ ), and Indonesia ( $n=5$ ). Sample sizes ranged from 12 to 1711 participants. The average age of the study samples ranged from 60 to 80 years. These 11 studies have explored aromatherapy inhalation [19], Tai Chi [20], cognitive therapy [21], low-frequency transcutaneous electric nerve stimulation (LF-TENS) [22], gymnastics [23], progressive muscle relaxation therapy [24], back massage [25], finger hold and music therapy [26], lavender aroma therapy [15], digital cognitive behavioral therapy [27], and brief behavioral therapy (28) with a  $P < 0.05$ , indicating that all studies showed a positive effect on the elderly insomnia without adverse outcomes. After carrying out complementary therapy,

which is shown based on the results of the insomnia questionnaire, namely (international classification of sleep disorder) ICSD and insomnia rating scale, 11 different insomnia digests were reported without significant adverse effects. It was found that there were 5 studies of strong quality [20-27] with 50% significant results on changing insomnia scores, and 6 were of moderate quality [26-28]. From strong quality studies, 5 have high effect sizes on interventions with Cohen's  $d$  values  $\geq 0.80$ , indicating a strong therapeutic effect on insomnia, and are recommended. These interventions were Tai Chi, cognitive therapy, lavender therapy, and digital cognitive therapy. Without adverse effects, the results of the insomnia score were found to be  $\geq 50\%$  significant positive changes: Sleep efficiency (57%), total sleep time (60%), and insomnia rating scale (IRS) score (75%) (Table 2).

## Discussion

This study aimed to systematically review the literature on the complementary therapies commonly used to reduce insomnia in older adults. Eleven studies, including 10 RCTs and one pre-test-post-test study, were entered in this systematic review: 5 of strong and 6 of moderate quality describing the effects of the exercise program. Effect sizes were calculable and considered important out of the 5 studies because they produced significant results. However, although 4 RCTs in this review had a more robust methodological design than the one pretest-posttest study, they did not significantly differ in reported insomnia outcomes or significant effects.

The proportion between the effects of complementary therapy is reported to be higher in the 5 studies of strong quality compared to the 6 studies of moderate quality. This is evidenced by all high-quality studies reporting  $\geq 50\%$  positive results [15-20, 22-27]. In addition, 5 out of 11 high-quality studies reported strong effects of complementary therapies on older adults, while no studies with moderate quality ratings reported effect sizes that exceeded Cohen's  $d \geq 0.80$ . Thus, more methodologically robust studies are more likely to report more significant effects and larger effect sizes. This finding aligns with research conducted by Hempel et al., which reported that the higher the quality of an article in proving the effectiveness of the intervention used, the greater the influence of the article in determining the size of a subject [29].

Table 1. Study sample and characteristics

Article	Sample Size	Meant±SD		Duration/Time	Intervention	Control	Instruments	P
		Age (y)	Age (y)					
Takeda et al. 2017 [18]	n=22 (intervention n=19, control n=3)	Age ≥65 (80.7±9.1)	Age ≥65 (80.7±9.1)	2 wk, 30 min	Aromatherapy inhalation	Activity as usual	ICSD	0.032
Siu et al. 2021 [19]	n=320 (intervention n=105, control n=110)	Age ≥60 (67.3±6.8)	Age ≥60 (67.3±6.8)	12 wk, 30 mins	Tai Chi	Activity as usual	IRS	0.004
McCrae et al. 2019 [20]	n=63 (intervention n=32, control n=30)	Age ≥65 (69.45±7.71)	Age ≥65 (69.45±7.71)	2 wk, 20 min	Cognitive therapy	Activity as usual	ICSD	0.001
Joo Lee et al. 2021 [21]	n=160 (intervention n=81, control n=79)	Age ≥60 (60.81±9.26)	Age ≥60 (60.81±9.26)	4 wk, 15-20 min	LF-TENS	Fake device	IRS	0.039
Nasa et al. 2018 [22]	n=60 (intervention n=30, control n=30)	Age ≥60	Age ≥60	1 mon, 30 min	Gymnastics	Not given therapy	IRS	0.004
Idris et al. 2020 [23]	n=28 (intervention n=14, control n=14)	Age ≥75	Age ≥75	4 wk, 10-15 min	Progressive muscle relaxation therapy	Laughter therapy	IRS	0.004
Mirawati et al. 2021 [24]	n=20 (intervention n=10, control n=10)	Age ≥65	Age ≥65	3 wk, 30 wk	Back massage	Activity as usual	IRS	0.0001
Septiyana et al. 2021 [25]	n=46 (intervention n=23, control n=23)	Age ≥60 (60.91±4.88)	Age ≥60 (60.91±4.88)	8 wk, 10 mins	Finger holds and music therapy	Not given therapy	IRS	0.038
Pasaribu, 2020 [14]	n=14	Age ≥60	Age ≥60	1 wk, 6 h	Lavender aroma therapy	-	IRS	0.0001
Espie et al. 2019 [26]	n=1711 (intervention n=858, control n=853)	Age ≥65 (65.7 ±13.6)	Age ≥65 (65.7 ±13.6)	12 wk per session	Digital cognitive behavioral therapy	Fake device	IRS	0.001
Chan et al. 2019 [27]	n=62 (intervention n=32, control n=30)	Age =65-75 (69.45±7.71)	Age =65-75 (69.45±7.71)	10 wk, 1 h	Brief behavioral therapy	Medication	IRS	0.004

Abbreviations: LF-TENS: Low-frequency transcutaneous electric nerve stimulation; ICSD: International classification of sleep disorder; IRS: Insomnia rating scale.

**Table 2.** Outcome report (assessment of effect of complementary therapies, quality of Ephpp study, and assessment of insomnia)

Variables	Article Assessment										Result Report/ Outcomes	
	Takeda et al. 2017 [18]	Siu et al. 2021 [19]	McCrae et al. 2019 [20]	Joo Lee et al. 2021 [21]	Nasa et al. 2018 [22]	Idris et al. 2020 [23]	Mirawati et al. 2021 [24]	Septiyana et al. 2021 [25]	Pasaribu, 2020 [14]	Espie et al. 2019 [26]		Chan et al. 2019 [27] 2022
Effect size	n	0.80	0.80	0.56	n	0.40	n	0.60	0.81	0.84	0.73	3.11
Select bias	Good	Good	Good	Good	Weak	Good	Good	Good	Good	Good	Good	Good
Study design	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good
Confounders	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good
Blinding	Weak	Good	Good	Good	Good	Weak	Good	Weak	Good	Good	Weak	Weak
Data collect	Good	Good	Good	Good	Good	Good	weak	Good	Good	Good	Good	Good
Withdrawals & dropout	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good
Study quality	Moderate	Strong	Strong	Strong	Moderate	Moderate	Moderate	Moderate	Strong	Strong	Moderate	5.11
Analysis insomnia assessment												
Sleep onset latency	v*	v	v*	v	v	v	v*	v	v	v*	v	2.5(40%)
Sleep efficiency	v	v*	v	v*	v	v	v*	v	v	v*	v*	4.7(57%)
Average build	v	v	v	v	v	v	v	v	v	v*	v*	1.5(2%)
Total sleep time	v	v	v*	v*	v	v	v	v	v	v*	v*	3.5(60%)
Nightmare								v				0.1(0%)
ICSD	v											0.1(0%)
IRS (ISI, PSQI, SCI)		v*			v*	v*	v	v*	v*	v*	v	6.8(75%)
Result/Outcome report	1.3(33%)	2.4(50%)	2.4(50%)	2.4(50%)	1.3(33%)	1.2(50%)	0.2(0%)	1.2(50%)	1.2(50%)	1.2(50%)	2.4(50%)	

Abbreviations: EPHPP: The Effective public health practice project; ISR: Insomnia severity index; PSQIs: Pittsburgh sleep quality index; SCI: Sleep condition indicator.

Note: \*Effect sizes in bold, Cohen's effect size  $d \geq 0.80$ =Substantial, n=Data to calculate effect size are not available, v=Measurable results, v\*: There is a significant positive change, No negative results were reported..

Based on the research results, 4 studies of complementary therapy were found to be appropriate in reducing insomnia in older adults, namely Tai Chi, cognitive therapy, lavender aroma, and digital cognitive therapy. They are high-quality studies with significant measurement results of  $\geq 50\%$ . This finding aligns with research conducted by Pitaloka et al. [5], which reports that Tai Chi is a sport encompassing meditation, breathing, and physical movement. Tai Chi increases the release of nor-adrenaline, lowers cortisol levels, and reduces sympathetic nerve activity, which stimulates melatonin release, causing a feeling of sleepiness in older adults. This finding is in accordance with research conducted by Siu et al. [20], who reported that Tai-chi could significantly reduce insomnia in older adults with a  $P=0.004$  and Cohen's  $d \geq 0.80$ .

In addition, other studies also report that aromatherapy of lavender flowers, which contains linalool, functions as a sedative effect so that when people inhale aromatherapy of lavender flowers, the aroma released will stimulate the neuron receptors of the olfactory nerve located in the olfactory epithelium to transmit the aroma to the bulb via the olfactory nerve. The positive impact of aromatherapy on the quality of sound sleep will be felt more directly (inhalation) because the nose has direct contact with the parts of the brain responsible for stimulating the formation of the effects of aromatherapy [30, 31]. This finding is in line with Pasaribu's research [15], which states that the aroma of lavender significantly reduces insomnia in older adults.

From the results of this systematic study, it was also found that cognitive therapy, whether done manually or digitally, also positively impacted reducing elderly insomnia scores. According to the research, the cognitive therapy method can change cognitive distortion to produce new, more adaptive behaviors and relaxation skills, as well as an attempt to reduce feelings of anxiety, fear, and pressure that arise in each sufferer before bedtime because of thoughts that he would not be able to fall asleep like the nights before [31]. So, this finding is in line with the research of McCrae et al. and Espie et al., which reported that cognitive therapy significantly reduced insomnia in older adults [21, 27].

This study had some limitations. First, people who provide complementary therapy are nurses and physiotherapists for whom they have a license or training certificate. Second, the interventions used to measure insomnia do not focus on one tool. All of these things can result in a biased result, but the quality can be prov-

en because the article has gone through the process of evaluating the article.

This systematic review shows that complementary therapies positively affect insomnia in older people who are both generally healthy but have experienced a variety of symptoms. Based on the results of this review, complementary therapies that are appropriate and highly recommendable in reducing the problem of elderly insomnia are Tai Chi, cognitive behavior therapy, lavender aroma, and digital cognitive therapy, which reported the highest number of significant effects on elderly insomnia. In addition, studies using the RCT design strengthen the results found to affect insomnia significantly.

## Ethical Considerations

### Compliance with ethical guidelines

The local Institutional Review Board deemed the study exempt from review, and informed consent was obtained from all individuals included in this study.

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This study did not receive a specific grant from any funding agency, commercial, or non-profit sector.

### Authors' Contributions

Conceptualization: Sitti Musdalifah Ahmad; Study design: Sitti Musdalifah Ahmad and Yuliana Syam; Data analysis and the initial draft preparation: All authors; Supervision and final approval: Yuliana Syam and Ariyanti Saleh.

### Conflict of interest

The authors declared no conflict of interest.

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