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**NON-PHARMACOLOGICAL INTERVENTIONS IN THE PROMOTION
OF SLEEP QUALITY IN OLDER ADULTS:
A SYSTEMATIC LITERATURE REVIEW**

**INTERVENÇÕES NÃO FARMACOLÓGICAS NA PROMOÇÃO
DA QUALIDADE DO SONO NA PESSOA IDOSA:
REVISÃO SISTEMÁTICA DA LITERATURA**

**INTERVENCIONES NO FARMACOLÓGICAS EN LA PROMOCIÓN
DE LA CALIDAD DEL SUEÑO EN LA PERSONA MAYOR:
REVISIÓN SISTEMÁTICA DE LA LITERATURA**

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Abstract

Introduction: Population ageing is associated with a high prevalence of sleep disorders, particularly insomnia, with an impact on the functionality and quality of life of older people. Given the risks of pharmacological therapies in this population, non-pharmacological interventions have been valued as relevant strategies in the management of sleep disorders. **Objective:** To analyse the available scientific evidence on non-pharmacological interventions aimed at improving sleep quality in people aged 65 years or older. **Methodology:** A systematic literature review was conducted in accordance with the recommendations of the Joanna Briggs Institute. The search was carried out in Scopus, RIASE, SciELO and in the CINAHL and MEDLINE databases via EBSCOhost, considering studies published between 2020 and 2025, with previously defined eligibility criteria. The selection followed the PRISMA recommendations, and seven publications were included. **Results:** The included publications allowed the identification of four categories of analysis: Cognitive Behavioural Therapy for Insomnia, sleep hygiene education, multimodal interventions and observational studies. Most studies reported improvements in sleep quality, including reduced insomnia severity, decreased sleep latency, increased sleep efficiency and reduced daytime dysfunction. Interventions based on Cognitive Behavioural Therapy for Insomnia presented more consistent results, although with methodological heterogeneity. **Conclusion:** The evidence suggests that non-pharmacological interventions may contribute to improving sleep quality. However, the methodological diversity of the studies reinforces the need for more robust and homogeneous future research.

Keywords: Aged; Cognitive Behavioral Therapy; Sleep; Insomnia.

Resumo

Introdução: O envelhecimento populacional associa-se a uma elevada prevalência de perturbações do sono, particularmente a insónia, com impacto na funcionalidade e na qualidade de vida da pessoa idosa. Face aos riscos das terapêuticas farmacológicas nesta população, as intervenções não farmacológicas têm sido valorizadas como estratégias relevantes na abordagem das perturbações do sono. **Objetivo:** Analisar a evidência científica disponível sobre intervenções não farmacológicas dirigidas à melhoria da qualidade do sono em pessoas com idade igual ou superior a 65 anos. **Metodologia:** Realizou-se uma revisão sistemática da literatura, de acordo com as recomendações do Joanna Briggs Institute. A pesquisa foi conduzida na Scopus, RIASE, SciELO e nas bases CINAHL e MEDLINE via EBSCOhost, considerando estudos publicados entre 2020 e 2025, com critérios de elegibilidade previamente definidos. A seleção seguiu as recomendações do PRISMA, tendo sido incluídas sete publicações. **Resultados:** As publicações incluídas permitiram identificar quatro categorias de análise: Terapia Cognitivo-Comportamental para a Insónia, educação para a higiene do sono, intervenções multimodais e estudos observacionais. A maioria dos estudos reportou melhorias na qualidade do sono, incluindo redução da gravidade da insónia, diminuição da latência, aumento da eficiência do sono e redução da disfunção diurna. As intervenções baseadas na Terapia Cognitivo-Comportamental para a insónia apresentaram resultados mais consistentes, embora com heterogeneidade metodológica. **Conclusão:** A evidência sugere que as intervenções não farmacológicas podem contribuir para melhorar a qualidade do sono. Contudo, a diversidade metodológica dos estudos reforça a necessidade de investigação futura mais robusta e homogênea.

Palavras-chave: Idoso; Insónia; Sono; Terapia Cognitivo-Comportamental.

Resumen

Introducción: El envejecimiento poblacional se asocia con una elevada prevalencia de trastornos del sueño, particularmente el insomnio, con impacto en la funcionalidad y en la calidad de vida de la persona mayor. Frente a los riesgos de las terapias farmacológicas en esta población, las intervenciones no farmacológicas han sido valoradas como estrategias relevantes en el abordaje de los trastornos del sueño. **Objetivo:** Analizar la evidencia científica disponible sobre intervenciones no farmacológicas dirigidas a mejorar la calidad del sueño en personas de 65 años o más. **Metodología:** Se realizó una revisión sistemática de la literatura, de acuerdo con las recomendaciones del Joanna Briggs Institute. La búsqueda se llevó a cabo en Scopus, RIASE, SciELO y en las bases CINAHL y MEDLINE a través de EBSCOhost, considerando estudios publicados entre 2020 y 2025, con criterios de elegibilidad previamente definidos. La selección siguió las recomendaciones PRISMA, habiéndose incluido siete publicaciones. **Resultados:** Las publicaciones incluidas permitieron identificar cuatro categorías de análisis: Terapia Cognitivo-Conductual para el Insomnio, educación sobre higiene del sueño, intervenciones multimodales y estudios observacionales. La mayoría de los estudios reportó mejoras en la calidad del sueño, incluyendo reducción de la gravedad del insomnio, disminución de la latencia, aumento de la eficiencia del sueño y reducción de la disfunción diurna. Las intervenciones basadas en la Terapia Cognitivo-Conductual para el Insomnio presentaron resultados más consistentes, aunque con heterogeneidad metodológica. **Conclusión:** La evidencia sugiere que las intervenciones no farmacológicas pueden contribuir a mejorar la calidad del sueño. Sin embargo, la diversidad metodológica de los estudios refuerza la necesidad de investigaciones futuras más robustas y homogéneas.

Descriptores: Anciano; Insomnio; Sueño; Terapia Cognitivo-Conductual.

Introduction

Population ageing constitutes one of the greatest current challenges for healthcare systems, as it is associated with an increase in the prevalence of chronic conditions, among which insomnia stands out. It is estimated that around 30–40% of people aged 65 years or older have a diagnosis of clinical insomnia, while symptoms of subclinical insomnia, such as difficulty falling asleep or staying asleep, early awakenings and non-restorative sleep, are even more common^(1,2). These sleep disturbances should not be viewed as an inevitable consequence of ageing, as they are associated with significant and potentially modifiable clinical consequences.

From a pathophysiological perspective, ageing is associated with changes in sleep architecture, namely a reduction in slow-wave sleep, increased fragmentation, decreased efficiency, and alterations in circadian rhythm⁽³⁾. However, in addition to these intrinsic changes, extrinsic factors such as multimorbidity, polypharmacy, chronic pain, mood disorders and changes in the psychosocial context contribute significantly to the development and maintenance of insomnia in older adults⁽⁴⁾. The coexistence of insomnia with other conditions is particularly relevant in a clinical context, as it exacerbates symptoms, compromises treatment adherence and negatively impacts overall functioning.

Recent evidence shows that insomnia in older adults is associated with significant clinical consequences, including an increased risk of falls, cognitive impairment, worsening of depressive and anxiety symptoms, greater use of healthcare services, and poorer quality of life^(5,6). Observational and longitudinal studies also suggest an association between sleep disorders and cognitive decline, as well as a possible role for insomnia as a modifiable risk factor for dementia⁽⁷⁾. In this context, the clinical management of insomnia in older adults is of particular relevance in the context of secondary prevention and the promotion of healthy ageing.

Traditionally, the treatment of insomnia in older adults has frequently relied on pharmacological interventions, namely benzodiazepines and non-

benzodiazepine hypnotics. However, the literature has consistently demonstrated that these drugs present an unfavourable risk profile in this population, being associated with adverse effects such as daytime sedation, cognitive impairment, increased risk of falls, fractures and drug dependence^(8,9). For this reason, the main international guidelines recommend that non-pharmacological interventions be considered the first-line treatment for insomnia in older adults^(10,11).

Among non-pharmacological approaches, Cognitive Behavioural Therapy for Insomnia (CBT-I) stands out as the intervention with the strongest evidence of efficacy, demonstrating sustained improvements in the severity of insomnia, sleep efficiency and quality of life, even in older adults with multimorbidity^(10,12). In addition to CBT-I, other behavioural and educational interventions, such as sleep hygiene education, relaxation techniques, music therapy and multi-component programmes, have been explored as complementary or alternative strategies, particularly in community and institutional settings⁽¹³⁾. More recently, digital solutions have emerged as a promising avenue for overcoming barriers to access to specialist care, while maintaining clinical efficacy⁽¹⁴⁾.

Despite the growing body of evidence on non-pharmacological interventions targeting insomnia and improving sleep quality, the available findings remain scattered, particularly when specifically considering the population aged 65 years or older. This fragmentation stems from the diversity of application contexts, methodological designs, assessment tools and types of intervention analysed, making it difficult to compare approaches such as CBT-I, sleep hygiene education, multimodal strategies and other complementary therapies. In this regard, it is pertinent to synthesise recent evidence on these interventions in order to clarify their contribution to improving sleep in older adults and to support more informed, evidence-based clinical practice. Thus, this systematic literature review aimed to analyse the available scientific evidence on non-pharmacological interventions to improve sleep quality in people aged 65 years or older.

Methodology

A systematic literature review was conducted to analyse the available scientific evidence on non-pharmacological interventions aimed at improving sleep quality in older adults. The methodology followed the Joanna Briggs Institute (JBI) recommendations for systematic reviews, as well as the PRISMA guidelines for the identification, selection and inclusion of studies.

The review protocol was previously registered on the PROSPERO platform under number CRD420261291407, allowing the research question, eligibility criteria, methodological strategy, and study selection and analysis procedures to be documented in advance.

The research question was formulated based on the PICOS strategy: P (Population): older adults aged 65 years or older, with sleep disturbances and/or insomnia; I (Intervention): non-pharmacological interventions aimed at improving sleep quality; C (Comparison): usual care, absence of specific intervention or other approaches; O (Outcomes): improvement in sleep quality and/or reduction in the severity of insomnia, reduction in sleep latency, increase in sleep efficiency and reduction in daytime dysfunction; S (Study): primary studies and relevant supporting publications. Thus, the following research question was defined: “Which non-pharmacological interventions, compared with usual care, contribute to improved sleep quality in people aged 65 years or older?”.

The search was conducted on 17 December 2025 in the following databases: SciELO, CINAHL Ultimate, MEDLINE, Scopus and RIASE. Combinations of descriptors and keywords in English were used with Boolean operators, in accordance with the following search strategy: (“sleep quality” OR “insomnia”) AND (“older adults” OR “elderly”) AND (“sleep hygiene” OR “cognitive behavioural therapy” OR “light therapy” OR “multicomponent intervention”). Where necessary, the strategy was adapted to the specific characteristics of each database.

The following filters were applied: full-text available, articles published between 2020 and 2025, and studies in Portuguese, English and Spanish. The

defined inclusion criteria were: intervention studies, observational/descriptive studies and supporting articles relevant to the topic, provided they related to people aged 65 years or older; studies addressing sleep disturbances or insomnia; studies analysing non-pharmacological interventions aimed at improving sleep quality; publications available in Portuguese, English or Spanish; and access to full text. Studies involving participants under the age of 65, studies whose primary focus was not related to sleep, studies focusing exclusively on pharmacological interventions, literature reviews, editorials, letters to the editor, study protocols and articles without access to the full text were excluded.

The study selection process took place in successive stages. Initially, records were identified in the selected databases. Subsequently, titles and abstracts were screened according to the predefined eligibility criteria. Potentially eligible articles were assessed by reading the full text, and studies that did not meet the defined criteria were excluded. The selection of studies was carried out by one reviewer, with cases of doubt being analysed by reapplying the inclusion and exclusion criteria. The process of identifying, screening, assessing eligibility and including studies was systematised using the PRISMA flowchart.

Following the selection of studies, systematic data extraction was carried out. The following parameters were considered: author, year, country, study design, population/sample, intervention, assessment tools and main results.

The methodological quality of the included studies was assessed using the Joanna Briggs Institute’s critical appraisal tools, selected according to the methodological design of each study. This assessment allowed for an evaluation of methodological rigour, the appropriateness of procedures, the clarity of inclusion criteria, the validity of the methods used, and the consistency of the presentation of results. Table 1 presents the critical appraisal of the methodological quality of the included studies, according to the JBI tools.

Table 1: Critical appraisal of the methodological quality of the included studies, according to the JBI tools.

Study	Design	JBI tool	Overall appraisal
Ferreira MRM, Nunes ACP ⁽¹⁶⁾ . 2021, Portugal.	Non-experimental descriptive study, cross-sectional in nature.	JBI Critical Appraisal Checklist for Analytical Cross Sectional Studies.	Moderate.
Hafizoglu M, Gurin P, Okyar Bas A, Kayabas C, Karaduman D, Atbag C, <i>et al</i> ⁽¹⁷⁾ . 2025, USA.	Pre-post quasi-experimental study, single group, without a control group.	JBI Critical Appraisal Checklist for Quasi-Experimental Studies.	Moderate.
Amirzadeh Iranagh J, Mohammadi F, Safi Salem P, Ayoughi V, Sedghiani A, Razi S ⁽¹⁸⁾ . 2023, Iran.	Randomised controlled clinical trial, with three groups: music + sleep hygiene, sleep hygiene and control.	JBI Critical Appraisal Checklist for Randomized Controlled Trials.	High.
Winegar, R ⁽¹⁹⁾ . 2024, USA.	Narrative review/ opinion article with practical recommendations.	JBI Critical Appraisal Checklist for Text and Opinion Papers.	Moderate.
Kohn JN, Troyer E, Guay-Ross RN, Wilson K, Walker A, Spoon C, <i>et al</i> ⁽²⁰⁾ . 2020, USA.	Analytical cross-sectional study.	JBI Critical Appraisal Checklist for Analytical Cross Sectional Studies.	Moderate.
Hinrichsen GA, Leipzig RM ⁽²¹⁾ . 2024, USA.	Quasi-experimental study/pre-post clinical implementation study, without a control group.	JBI Critical Appraisal Checklist for Quasi-Experimental Studies.	Moderate.
Turnai KA, Miller CB, Magill N, Emsley R, Robinson W, Kyle SD, <i>et al</i> ⁽²²⁾ . 2025, United Kingdom, USA, Ireland.	Secondary analysis of individual participant data from three randomised clinical trials.	JBI Critical Appraisal Checklist for Randomized Controlled Trials.	High.

The study selection process followed the PRISMA recommendations (Preferred Reporting Items for Systematic Reviews and Meta-Analyses), as presented in Figure 1.

During the identification phase, 429 records were found across the different databases. After removing 5 duplicates, a total of 424 records remained for screening. In the first stage, titles were screened, and 344 studies were excluded for not meeting the defined criteria. Of the 80 studies initially considered for further analysis, 35 publications were excluded, resulting in 45 articles assessed for eligibility. After full-text review, 38 studies were excluded, mainly because they involved populations under the age of 65 or did not fit the scope of the study. Ultimately, 7 studies were included, forming the basis of this systematic review.

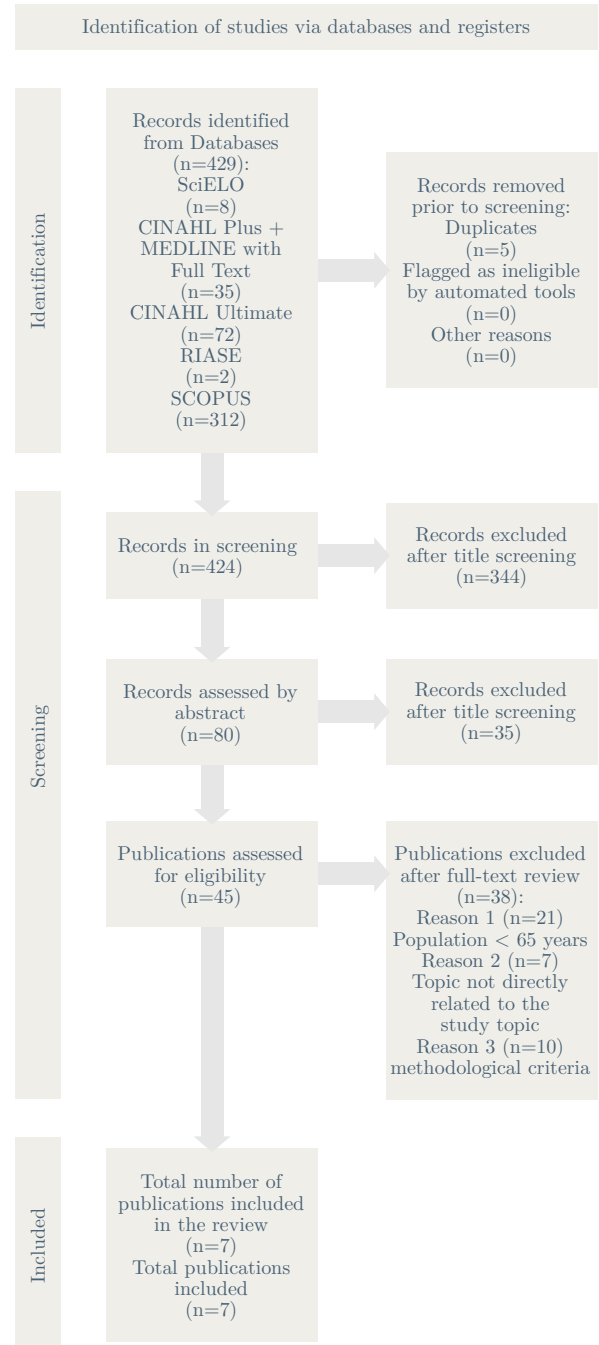


Figure 1: PRISMA flowchart of the selection process for publications included in the systematic review. Adapted from the PRISMA Statement (2020)⁽¹⁵⁾.

Results

Seven studies were included in this systematic review, published between 2020 and 2025. The studies had different methodological designs, including randomised clinical trials, quasi-experimental studies, observational/cross-sectional studies, and a supporting article with practical recommendations aimed at promoting healthy sleep in older adults. This diversity was taken into account in the analysis, as not all included studies directly evaluated non-pharmacological interventions.

The studies were conducted in different international contexts, namely Portugal, the United Kingdom, the United States of America, Iran, Ireland and Turkey.

The application settings also varied, including day centres, the community, primary healthcare, geriatric hospital consultations and digital environments. Table 2 presents the characteristics of the included studies, considering author, year, country, methodological design, population/sample, intervention or focus of the study, assessment tools and main results.

The interventions and areas of analysis identified in the included studies were essentially grouped into four main categories: (i) CBT-I-based interventions, including face-to-face and digital formats, focused on modifying dysfunctional sleep-related behaviours, cognitive restructuring, stimulus control and sleep restriction; (ii) sleep hygiene education, focused on promoting healthy sleep habits, often integrated into

Table 2: Characteristics of the studies included in the review.

Authors/Year/Country	Study design	Sample	Intervention	Assessment tools	Main results
Ferreira MRM, Nunes ACP ⁽¹⁶⁾ , 2021, Portugal.	Observational, descriptive and cross-sectional study.	30 older adults aged ≥ 65 years, attending a day centre.	Assessment of sleep quality and associated factors in older adults attending a day centre.	Assessment of sleep quality and associated factors in older adults attending a day centre.	A high frequency of sleep disturbances was identified, notably poor overall sleep quality, night-time awakenings and non-restorative sleep. An association was also observed between poorer sleep quality and factors such as advanced age, the presence of comorbidities and lifestyle habits.
Hafizoğlu M, Gürün P, Okyar Baş A, Kayabaşı C, Karaduman D, Atbaş C, <i>et al</i> ⁽¹⁷⁾ , 2025, Turkey.	Quasi-experimental pre-post intervention study, without a control group.	102 older adults with insomnia, aged between 65 and 87 years, in a hospital outpatient setting.	Face-to-face sleep hygiene education session + information leaflet; reassessment carried out 4 weeks after the intervention.	Pittsburgh Sleep Quality Index; Sleep Hygiene Index; Epworth Sleepiness Scale; Jenkins Sleep Scale.	A statistically significant improvement was observed in all scales administered after the intervention: PSQI, SHI, ESS and Jenkins Sleep Scale, all with $p < 0.001$. The results indicated improvements in sleep quality, sleep hygiene behaviours and daytime sleepiness.
Amirzadeh Iranagh J, Mohammadi F, Safi Salem P, Ayoughi V, Sedghiani A, Razi S ⁽¹⁸⁾ , 2023, Iran.	Randomised controlled clinical trial.	150 older adults.	Participants were divided into three groups: sleep hygiene education combined with music therapy; sleep hygiene education alone; and a control group, with no specific intervention. The intervention lasted for two months. The music therapy component consisted of listening to music according to individual preference for 30 to 45 minutes before bedtime.	Pittsburgh Sleep Quality Index.	An improvement in sleep quality was observed in the intervention groups, with superior results in the group that received sleep hygiene education combined with music therapy, compared with sleep hygiene education alone. Improvements were observed in dimensions such as sleep latency, duration, habitual sleep efficiency and use of sleep medication.
Winegar, R ⁽¹⁹⁾ , 2024, United States of America.	Intervention study.	Community-dwelling adults aged 65 years or older.	Promotion of healthy sleep in older adults, focusing on sleep changes associated with ageing and on environmental, behavioural and lifestyle strategies.	Athens Insomnia Scale.	Provides practical recommendations for promoting healthy sleep in older adults. Highlights the importance of assessing sleep habits, providing individualised education and guidance, and adapting environmental and behavioural factors.
Kohn JN, Troyer E, Guay-Ross RN, Wilson K, Walker A, Spoon C, <i>et al</i> ⁽²⁰⁾ , 2020, United States of America.	Cross-sectional observational study.	Adults aged 65 years or older with hypertension.	Assessment of self-reported sleep disturbances and their association with cognitive performance.		Self-reported sleep disturbances were associated with poorer global and executive cognitive performance. The study did not evaluate an intervention, but reinforces the clinical relevance of sleep assessment in older adults with hypertension.
Hinrichsen GA, Leipzig RM ⁽²¹⁾ , 2024, United States of America.	Implementation and effectiveness study, with a pre-post design, without a control group.	Older adults aged ≥ 65 years.	Face-to-face implementation of CBT-I. The intervention included sleep restriction, stimulus control, sleep hygiene and cognitive components.	PROMIS Sleep Disturbance Scale.	An improvement in insomnia symptoms and sleep efficiency was observed among participants who completed the intervention. A reduction in the use of hypnotic medication was also reported in some participants, with some gains maintained at follow-up.
Tarnai KA, Miller CB, Magill N, Emsley R, Robinson W, Kyle SD, <i>et al</i> ⁽²²⁾ , 2025, United Kingdom, United States of America, Ireland.	Secondary analysis of individual participant data from three randomised clinical trials.	315 older adults with insomnia, aged between 65 and 89 years.	Digital intervention based on CBT-I, consisting of six sessions. It included techniques such as sleep restriction, stimulus control, sleep hygiene and cognitive restructuring.	Insomnia Severity Index, as the primary instrument; standardised sleep diary. Insomnia Severity Index; Sleep Condition Indicator.	Digital CBT-I showed an improvement in insomnia symptoms compared with the control groups. The post-treatment remission rate was 60% in the intervention group and 17% in the control group. The benefits were maintained at the 24-week follow-up.

interdisciplinary approaches or comprehensive geriatric assessments; (iii) multimodal interventions, resulting from the combination of sleep education with other strategies, such as music therapy, professional support or digital support; and (iv) observational or supporting studies, which did not directly evaluate interventions but contributed to contextualising the prevalence of sleep disturbances, their association with other health domains, and practical recommendations aimed at promoting healthy sleep in older adults.

In most studies, outcomes were assessed using validated self-report instruments. Various questionnaires were used, including the Pittsburgh Sleep Quality Index, Insomnia Severity Index, Sleep Condition Indicator, Epworth Sleepiness Scale and Sleep Hygiene Index. Some studies supplemented the subjective assessment with functional and psychosocial indicators, such as depressive symptoms, anxiety and cognitive performance.

In studies focusing on CBT-I, the results indicated favourable changes in insomnia symptoms and sleep efficiency. Hinrichsen and Leipzig⁽²¹⁾ evaluated the implementation of CBT-I in geriatric primary care. A total of 70 people were enrolled, of whom 34 started the intervention and 29 completed the treatment. Among these, two-thirds met the criteria for a therapeutic response on the Insomnia Severity Index and around three-fifths met the criteria for remission of insomnia. The study also noted a reduction or discontinuation of sleep medication in some participants.

Tarnai *et al*⁽²²⁾ analysed digital CBT-I in people aged 65 years or older, using individual participant data from three randomised clinical trials. The sample included 315 participants. When compared with the control groups, the digital intervention group showed better results for insomnia symptoms, both post-treatment and at follow-up. Remission of insomnia at post-treatment was 60% in the digital intervention group and 17% in the control group.

Sleep hygiene education was evaluated by Hafizoğlu *et al*⁽¹⁷⁾ in a study involving older adults with insomnia. Reassessment took place four weeks after the intervention. At that point, statistically significant differences were observed in the results. The Pittsburgh Sleep Quality Index, Sleep Hygiene Index, Epworth

Sleepiness Scale and Jenkins Sleep Scale all showed p -values < 0.001 . The data indicated improvements in sleep quality, sleep hygiene behaviours and daytime sleepiness.

In the study by Amirzadeh Iranagh *et al*⁽¹⁸⁾, the intervention combined sleep hygiene education with music therapy. This combination was compared with sleep hygiene education alone and with a control group. A total of 150 older adults participated, divided into three groups. Following the intervention, statistically significant differences were observed between the groups across the various dimensions of the Pittsburgh Sleep Quality Index. The parameters included subjective sleep quality, latency, duration, habitual efficiency, sleep disturbances, medication use and daytime sleepiness. The most favourable results were recorded in the group that received both music therapy and sleep hygiene education.

Two studies were observational in nature. Although they did not test interventions, they provided relevant information on sleep in older adults. Ferreira and Nunes⁽¹⁶⁾, in a study conducted at a day centre, identified frequent complaints, such as difficulty falling asleep, night-time awakenings, light sleep and daytime sleepiness. Kohn *et al*⁽²⁰⁾, in turn, studied older adults with hypertension and found an association between self-reported sleep disturbances and poorer cognitive performance, particularly in terms of executive function and memory.

Winegar's article⁽¹⁹⁾ presented practical recommendations for promoting healthy sleep in older adults. The text addressed environmental, behavioural, clinical and lifestyle factors. Although not an intervention study, it was included as it contributes to the framework of non-pharmacological strategies applicable in a geriatric context, particularly in health education and nursing practice.

Overall, the included intervention studies showed favourable results across various sleep indicators, particularly regarding the severity of insomnia, overall sleep quality, latency, sleep efficiency and daytime dysfunction. However, when interpreting these results collectively, one must take into account the diversity of methodological designs, the instruments used, the interventions evaluated and the follow-up periods.

Discussion

The studies included in this review demonstrate that sleep disturbances in older adults constitute a frequent and clinically relevant problem, with an impact extending beyond night-time rest. The observational studies by Ferreira and Nunes⁽¹⁶⁾ and by Kohn *et al*⁽²⁰⁾ help to contextualise this issue by highlighting, respectively, the presence of sleep complaints among older adults in day centres and the association between self-reported sleep disturbances and poorer cognitive performance in older adults with hypertension. Although these studies do not allow for the establishment of causal relationships or the evaluation of the effectiveness of interventions, they reinforce the importance of integrating sleep assessment into clinical and community practice.

Educational interventions, particularly education on sleep hygiene, emerge as an accessible and easily implementable strategy. In the study by Hafizoğlu *et al*⁽¹⁷⁾, the educational intervention was associated with significant improvements in various sleep indicators after four weeks. This finding is particularly relevant in primary and community healthcare settings, where brief, low-cost and easily replicable interventions can be of practical use. Nevertheless, these results should be interpreted with caution. The absence of a control group, the short follow-up period and the use of self-report instruments limit the robustness of the conclusions.

The inclusion of Winegar's article⁽¹⁹⁾ helps to reinforce the importance of practical recommendations aimed at promoting healthy sleep in older adults, particularly regarding environmental, behavioural, clinical and lifestyle factors. However, as this is not an empirical intervention study, its contribution should be understood as providing a framework and support for practice, rather than as direct evidence of efficacy. This aspect is important, given that the review included studies with distinct methodological approaches.

Multimodal interventions appear to add value when they combine complementary strategies. In the study by Amirzadeh Iranagh *et al*⁽¹⁸⁾, the combination of sleep hygiene education and music therapy yielded better results than education alone. This

combination may be particularly relevant for older adults, given that sleep disturbances tend to result from multiple factors, including anxiety, pain, emotional changes, polypharmacy, isolation, physical inactivity and changes in circadian rhythm. Nevertheless, although the randomised design lends greater robustness to the study, it is important to consider possible limitations related to the specific context of application and the generalisation of the results to other older adult populations.

The most consistent results were observed in studies evaluating CBT-I-based interventions. CBT-I, whether delivered in person or digitally, showed significant improvements in the severity of insomnia, in response and remission rates and, in the case of the study by Hinrichsen and Leipzig⁽²¹⁾, in the reduction of sleep medication use. These findings are consistent with the international literature, which recognises CBT-I as the preferred approach for chronic insomnia, particularly relevant in older adults, in whom prolonged use of hypnotics may be associated with falls, daytime sleepiness, cognitive impairment and dependence. These findings are consistent with international recommendations that identify CBT-I as a preferred approach in the treatment of insomnia in adults. Edinger *et al*⁽¹⁰⁾ give a strong recommendation for CBT-I compared with other types of behavioural and psychological therapies. Similarly, Qaseem *et al*⁽¹¹⁾ identify this intervention as the first-line treatment for insomnia in their study. This external evidence reinforces the consistency of the results found in this review.

The digital form of CBT-I, analysed by Tarnai *et al*⁽²²⁾, deserves particular attention. On the one hand, it can facilitate access to a structured intervention, particularly in contexts with geographical barriers, a shortage of specialised professionals, or limitations in face-to-face provision. This potential is noted by Huang *et al*⁽²³⁾, who consider that this modality can be a useful tool, particularly for older adults and healthcare professionals. On the other hand, the implementation of the digital modality cannot be assumed to be universally applicable. Digital literacy, sensory deficits, functional autonomy and the availability of technological resources may influence adherence and the results obtained. Thus,

although the data are favourable, the translation of digital CBT-I into practice must take into account the individual and contextual characteristics of the target population.

Sleep hygiene appears useful as an initial, educational or complementary intervention. Combined interventions, such as the combination of sleep hygiene and music therapy, may enhance effects by acting simultaneously on behavioural and emotional dimensions. Interventions based on CBT-I present the most consistent results in the studies analysed. However, this possible trend should be interpreted with caution, as the studies differ in terms of methodological design, sample size, assessment tools, duration of follow-up and context of application.

Recent evidence on the use of music therapy for sleep remains heterogeneous. Variations in the protocols used, the duration of interventions, the contexts of application and the assessment tools require caution when generalising the results^(24,25).

Despite the identified contributions, the analysed evidence presents significant limitations. The small number of included studies limits the scope of the synthesis. Furthermore, methodological heterogeneity was marked, including randomised, quasi-experimental and observational studies, secondary analyses and a supporting article. Some studies had small sample sizes, a lack of a control group, short follow-up periods and a predominant reliance on self-reported measures. These aspects reduce the possibility of direct comparison between studies and limit the strength of inferences regarding the effectiveness of the interventions.

The limitations identified in this review are also described in recent reviews on non-pharmacological interventions in older adults. Heterogeneity is identified in methodological designs, intervention contexts and the instruments used to assess sleep. This variability hinders the comparison of studies and limits the formulation of definitive recommendations for clinical practice^(24,26).

Thus, the results of this review suggest that non-pharmacological interventions may help improve sleep quality in people aged 65 years or older, with greater consistency found in studies based on CBT-I. However, further studies are needed with more robust

methodological designs, larger sample sizes, longer follow-up periods and greater standardisation of assessment tools. This development will allow for a better understanding of which interventions are most appropriate for which profiles of older adults and in which care settings.

Conclusion

This systematic review analysed the available scientific evidence on non-pharmacological interventions to improve sleep quality in adults aged 65 years or older. Despite the small number of studies included and the methodological diversity observed, the results suggest a positive contribution from these approaches, particularly in reducing the severity of insomnia and improving certain sleep quality indicators.

CBT-I was the intervention that showed the most consistent results in the studies analysed, in both face-to-face and digital formats. Nevertheless, these data should be interpreted with caution. The available evidence is not homogeneous, and not all included studies directly evaluated interventions. Sleep hygiene education and multimodal approaches, such as the combination of sleep hygiene education and music therapy, also showed favourable results but require confirmation in studies with greater methodological robustness.

In clinical practice, these findings reinforce the importance of including sleep assessment in care for older adults. Identifying modifiable factors, promoting sleep hygiene, and referring patients to structured interventions, such as CBT-I, may constitute useful strategies in primary and community healthcare.

It is also important to acknowledge the limitations of this review. Only seven studies were included, with distinct methodological designs. Some did not include a control group. Others had short follow-up periods or relied primarily on self-report instruments. Furthermore, the inclusion of observational studies and a supporting article limits the possibility of drawing firm conclusions about the effectiveness of the interventions. Therefore, the results should be interpreted with caution and not as definitive conclusions.

Future studies should prioritise well-designed clinical trials with larger samples, clearly defined control groups and longer follow-up periods. It would also be important to standardise sleep assessment tools and describe the interventions carried out in greater detail to allow for comparison between studies. Only then will it be possible to better understand which strategies are most appropriate for older adults and in which care settings.

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