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Is physical activity an effective remedy for insomnia? - a review

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Abstract

Introduction and purpose

This article explores the impact of physical activity on insomnia and sleep quality. It reviews existing research to clarify how exercise affects sleep patterns, identifies mechanisms through which exercise improves sleep, and evaluates practical recommendations for integrating physical activity into insomnia treatment. The goal is to offer valuable insights for individuals and healthcare professionals on using exercise as a non-pharmacological method to manage insomnia.

State of knowledge

The article reviews the literature on sleep, with a particular focus on the issue of insomnia. By understanding the causes of sleep disorders, it is possible to implement targeted diagnostics and subsequent treatment. The impact of physical activity on the overall problem of insomnia is also highlighted.

Material and Methods

A review of literature from 2004 to 2024 was conducted using databases such as PubMed, Science Direct, and Google Scholar. Keywords included "insomnia," "sleep disorder," and "sleep impairment." The review focused on English-language primary research articles from peer-reviewed journals.

Summary
The review highlights the role of physical activity in managing insomnia, emphasizing its positive effects. Evidence indicates that regular exercise significantly reduces the risk and severity of insomnia and improves sleep quality. This underscores the effectiveness of physical activity as a valuable non-pharmacological approach to enhancing sleep and overall well-being.

Keywords
Insomnia; physical activity; sleep disorders; quality of sleep; sport

Introduction
Insomnia is the most common sleep disorder, affecting up to 12% of the population with chronic symptoms. This prevalence underscores its significance as a major public health issue. [1] Insomnia is closely linked to a range of health problems, from hypertension to depression. As a result, the potential health consequences of insomnia have garnered growing attention in recent decades. [2]

Purpose
The purpose of this article is to explore how physical activity influences insomnia and sleep quality. By reviewing existing research, the article aims to clarify the impact of exercise on sleep patterns, identify the mechanisms through which exercise improves sleep, and evaluate practical recommendations for incorporating physical activity into insomnia treatment. It seeks to provide valuable insights for both individuals and healthcare professionals on using exercise as an effective, non-pharmacological approach to manage insomnia.

Materials and methods
This review was conducted by searching for articles published from 2004 to 2024 from databases including PubMed, Science Direct, and Google Scholar databases, using keywords such as „insomnia", "sleep disorder" and "sleep impairment". The Inclusion criteria were articles in English, primary research and articles in peer review journals.

Results
Our review provides a comprehensive overview of diagnostic techniques and the most recent treatment options for insomnia, emphasizing the role of physical activity. By evaluating numerous studies, we highlight the positive impact of regular exercise on managing insomnia. Our findings indicate that engaging in physical activity can significantly lower the risk of developing insomnia, mitigate its severity, and reduce symptoms in individuals who are already struggling with sleep disturbances. This growing body of evidence underscores the effectiveness of physical activity as a valuable, non-pharmacological approach to enhancing sleep quality and improving overall health and well-being.

Insomnia

Insomnia is a condition when there are symptoms in the form of an inability to fall asleep, or situations when moving into a state of sleep is achievable, but there are awakenings during its course, or when it is not of sufficiently high quality. The end result is a lack of adequate rest and the consequences of this condition during the day, significantly worsening the patient's quality of life. The time criterion for diagnosis is based on the occurrence of the above-mentioned abnormalities in a time frame of at least three times a week for at least one month. [3,4]

Epidemiology

In cross-sectional population studies, insomnia symptoms are reported by 30 to 50% of adults. Insomnia-related complaints that reduce the quality of functioning are reported by about 10% of adults surveyed. [5,6] Chronic insomnia is estimated to affect 10-15%. Women are at higher risk. And the overall incidence increases with age. [7,8,9,10]

Diagnosis

In diagnosing sleep problems, difficulty falling asleep within 30 minutes of lying down is identified as sleep latency. Additionally, intervening wakefulness is characterized by waking up during the night and remaining awake for at least 30 minutes before falling back asleep.

The appropriate duration of sleep is highly individual, but it is generally recommended that adults aim for at least six hours of sleep per night to ensure sufficient rest. This baseline can vary depending on personal needs and health conditions. [11]

Before making a diagnosis of insomnia, it is necessary to perform general examinations to look for somatic complaints and rule out psychiatric disorders. A sleep diary is helpful in diagnosing insomnia. In this, the patient records information on the time when he goes to sleep and gets up, the time he waits for sleep, the time of interfered wakefulness and the total time of sleep. A device that allows monitoring the phases of sleep, measuring its length, is the actigraphy. [12] This device is worn by the patient usually on the wrist, ankle or waist height. Another test used is polysomnography which collects information about the body's parameters during sleep. The diagnosis itself is based on the patient's subjective assessment of sleep. Additional tests are considered as auxiliary to the diagnosis. [7,13]

Classification and causes

Insomnia can be classified in various ways. According to the ICD-10 classification, commonly used in Poland, insomnia is divided into organic and non-organic types. Organic insomnia is linked to underlying medical conditions, while non-organic insomnia occurs without identifiable physical or psychiatric issues.

Additionally, insomnia is categorized based on its duration. Transient insomnia lasts for a few days, short-term insomnia persists for up to four weeks, and chronic insomnia extends beyond one month. [14]

The primary causes of chronic insomnia are diverse. Mental disorders are responsible for 36% of cases, while primary psychophysiological insomnia accounts for 15%.

Substance dependence, including drugs and alcohol, contributes to 12% of chronic insomnia cases, as does restless legs syndrome. Subjective insomnia makes up 9%, and sleep apnea syndrome and medication side effects each account for 6%. Other causes make up the remaining 4%. [15,16]

Treatment

Treatment begins by looking for somatic or psychological factors that can cause insomnia, and once identified, we try to eliminate them.

The basis of treatment of chronic insomnia is cognitive-behavioral therapy. It helps unlearn patients' bad habits that cause insomnia. Bad habits include spending too much time in bed unrelated to sleep, staying in bed after a sleepless night, taking naps during the day, worrying about a sleepless night, waiting anxiously for sleep, taking sleep medications for too long, abusing alcohol, getting little physical activity during the day, falling asleep "by force," consuming caffeine 6 hours before bedtime. [17,18]

Pharmacological treatment, in Poland the drugs of choice for insomnia are benzodiazepine derivatives and sleeping medications. Sleeping drugs, which include zolpidem, should be taken for a maximum of 4 weeks, then the drug should be discontinued.

If there are contraindications to the use of sleeping pills or benzodiazepine derivatives, in the treatment can be used drugs: antihistamines, antipsychotics, antidepressants. [19,20,21]

Health effects

Insomnia, like any other sleep disorder, has far-reaching effects on human well-being. It impacts not only the professional and social aspects of an individual's life but also their physical health and mental state. It has been clinically proven that the impact of sleep deprivation is especially severe on one's medical condition and can harm various body systems.

The initial symptoms observed in patients with insomnia include daytime cognitive impairments, which primarily affect attention, working memory, and various aspects of executive function. These cognitive issues can manifest as difficulty concentrating, short-term memory problems, and challenges in planning, organizing, and executing tasks. Insomnia impairs daytime cognition by disrupting sleep, which affects attention and memory, and by increasing stress hormones that hinder mental performance. [22,23]

Insomnia significantly affects mental health. Previously, it was considered merely a symptom of depression. However, numerous studies have demonstrated that insomnia is a medical condition in its own right, exhibiting a high comorbidity with depression. [24] There is evidence that insomnia-specific interventions, such as cognitive behavioral therapy for insomnia, may lead to improvements in depression. The precise mechanism by which treating insomnia improves mood remains unclear. However, strong evidence suggests that it primarily involves correcting neurotransmitter imbalances, restoring REM sleep essential for emotional regulation, and reducing elevated cortisol levels that affect mood-regulating brain areas. [25] Another neuropsychiatric disorder closely associated with sleep deprivation is anxiety. The mechanisms linking anxiety to sleep deprivation are similar to those found in depression. [26]

Insomnia is commonly linked to a range of cardiovascular diseases. Numerous observational studies have identified a connection between insomnia and elevated rates of cardiovascular morbidity and mortality.

The collective evidence indicates that insomnia, especially when accompanied by short sleep duration, is associated with an increased risk of developing hypertension, coronary heart disease, recurrent acute coronary syndrome, and heart failure. [27,28] Insomnia and other sleep disorders contribute to cardiovascular morbidity through mechanisms such as heightened sympathetic activity, systemic inflammation, and metabolic dysregulation. Addressing these sleep disorders through effective diagnosis and treatment can help mitigate these risks and enhance cardiovascular outcomes. [29]

Insomnia affects metabolic health by disrupting glucose metabolism and increasing the risk of obesity, diabetes, and metabolic syndrome. [30]

It also weakens the immune response, making the body more susceptible to infections and impairing overall immune function. [31]

In addition to the health issues already discussed, studies have shown that sleep deprivation and insomnia are linked to the pathogenesis, progression, and severity of other conditions - it can accelerate the progression of Alzheimer's disease, [32] amplify the pain and fatigue experienced in Fibromyalgia [33] or lead to more frequent and severe attacks in Asthma. [34]

Correlation between physical activity and insomnia

It has been repeatedly demonstrated that there is solid evidence for the effectiveness of regular physical activity in the primary and secondary prevention of many chronic diseases, such as cardiovascular diseases, diabetes, cancer, hypertension, depression, and osteoporosis, as well as in preventing premature death. [35] Evidence indicates a long-term (over 5 years) association between physical activity and weight gain, obesity, Alzheimer's disease, and dementia. [36] It has also been found that the WHO physical activity guidelines are sufficient to bring health benefits, especially for individuals who previously led a sedentary lifestyle. There appears to be a linear relationship between the level of physical activity and health status, meaning that further increases in physical activity and fitness lead to additional health improvements. [37]

Numerous studies have also demonstrated the beneficial impact of physical activity on insomnia. It has been shown that regular physical activity is associated with a lower incidence of insomnia and reduced difficulty in maintaining continuous sleep. Improvements in sleep quality were observed across all age groups. [38] Additionally, some studies have reported significant reductions in anxiety and depression levels. [39]

Regarding the type of physical activity, aerobic exercises have been the most thoroughly researched. The effects of such activity on treating insomnia were comparable to those achieved with sleep medications. Positive results were obtained with moderate physical activity exceeding 150 minutes per week. [40,41]

Interestingly, not all types of physical activity yielded positive effects in treating insomnia. A study conducted in 2018 found that a very high level of physical activity (over 300 minutes per week) was associated with an increased risk of insomnia. [42]

Moreover, the results of similar studies could be influenced by other factors affecting quality of life, such as smoking. [43] Individuals who had ever smoked were more likely to experience incidental insomnia despite exercising, compared to those who had never smoked, highlighting the importance of a healthy lifestyle. [44]

Another factor influencing similar studies was the presence of comorbid conditions. In individuals with conditions such as prediabetes, the impact of physical activity on insomnia was less pronounced. This could be due to the difficulty in adapting to an active lifestyle. [45] Exercise impacts insomnia through several mechanisms. One is the thermogenic effect, where exercise increases body temperature, which then drops and promotes sleep onset. This helps insomniacs who often have trouble regulating their body temperature. [46] Physical activity also reduces anxiety, a common cause of insomnia. Studies show that moderate aerobic exercise can lower pre-sleep anxiety in chronic insomniacs, improving sleep quality. [47] Additionally, exercise boosts serotonin levels, crucial for sleep regulation. By increasing serum free tryptophan, exercise enhances brain serotonin synthesis, potentially alleviating chronic insomnia related to serotonin deficits. Further research is needed to fully understand this relationship. [48]

Discussion

Insomnia has emerged as a major concern due to its significant impact on daily life and overall well-being. The rise in insomnia cases is often linked to factors such as stress, sedentary behavior, and poor sleep practices, which exacerbate sleep difficulties. Just as these factors can worsen insomnia, regular physical activity has been shown to offer substantial benefits in managing sleep issues. Lack of exercise frequently contributes to persistent sleep problems, while consistent physical activity helps improve sleep patterns, reduce insomnia symptoms, and enhance sleep quality. Promoting an active lifestyle is crucial in tackling insomnia. Encouraging regular exercise can be an effective strategy to improve sleep health and alleviate the severity of insomnia-related problems.

Conclusion

Regular physical activity significantly improves sleep quality and can be an effective tool in combating insomnia. However, to achieve optimal results, it is essential to consider the type, intensity, and duration of physical activity, as well as the individual characteristics and lifestyle of each person.

DISCLOSURE

Author's contribution

Conceptualization, Agnieszka Kosińska and Piotr Niedbał; methodology, Weronika Kahan; software, Dominika Poborowska; check, Katarzyna Polańska and Marta Wojaczek; formal analysis, Weronika Szafrańska and Katarzyna Lelek; investigation, Magdalena Kras and Marcin Łata; resources, Katarzyna Lelek; data curation, Katarzyna Polańska; writing - rough preparation, Magdalena Kras; writing - review and editing, Marcin Łata; visualization,Weronika Kahan; supervision and Marta Wojaczek, Dominika Pobrowska and Weronika Szafrańska; project administration, Agnieszka Kosińska and Piotr Niedbał; receiving funding - no specific funding.

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The data presented in this study is available upon request from the correspondent author.

Conflict of interest

The authors deny any conflict of interest

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