

Influence of Physical Activity on Sleep Quality and Daytime Functioning in Individuals Suffering from Depression - A Literature Review

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Abstract: Background: Depression is a multifactorial mental disorder frequently accompanied by sleep disturbances, including insomnia symptoms and poor subjective sleep quality. The relationship between sleep and depression is bidirectional, and persistent sleep problems often remain as residual symptoms despite treatment, contributing to impaired daytime functioning. Aim: This review aims to synthesize the current evidence regarding the effects of physical activity on subjective sleep quality and evaluate its potential impact on daytime cognitive and psychosocial functioning in individuals with depression. Material and methods: A structured literature review was conducted using PubMed, Scopus, Web of Science, and Google Scholar. Studies published between January 2016 and February 2026 were included. The review followed the PRISMA Statement for study identification and selection. Eligible studies involved adults with depression, examined physical activity or structured exercise, and assessed subjective sleep outcomes using validated instruments (PSQI, AIS, ISI). Both interventional and observational studies, as well as systematic reviews and meta-analyses, were included. Data were synthesized using a qualitative narrative approach. Results: Most included studies indicate that regular physical activity is associated with improvements in subjective sleep outcomes in individuals with depression. Reported effects include reductions in insomnia severity, improved perceived sleep quality, and increased sleep satisfaction. Moderate-intensity aerobic exercise was the intervention most consistently associated with beneficial outcomes. Improvements in sleep were frequently accompanied by reduced daytime fatigue, decreased sleepiness, and enhanced cognitive and psychosocial functioning. Conclusion: Physical activity appears to be an effective non-pharmacological adjunct for improving subjective sleep quality and daytime functioning in individuals with depression. By addressing persistent sleep-related symptoms, exercise may support broader functional recovery. Further high-quality studies are required to determine optimal exercise parameters and long-term effects.

Keywords: Depression; Physical activity; Sleep quality; Insomnia; Subjective sleep quality; Daytime functioning

1. Introduction

Depression is among the most prevalent and disabling mental disorders worldwide, imposing a substantial burden on individuals, healthcare systems, and society. It is characterized not only by persistent low mood, anhedonia, and reduced motivation, but also by a wide range of somatic, cognitive, and behavioral symptoms that significantly impair quality of life and functional capacity. Among these, sleep disturbances are particularly common and clinically significant, as they may exacerbate the course of the disorder and complicate treatment outcomes.

Sleep disturbances in depression may manifest as difficulty initiating sleep, frequent nocturnal awakenings, early morning awakening, non-restorative sleep, and poor subjective sleep quality. The relationship between sleep disturbances and depressive symptoms is widely recognized as bidirectional. On the one hand, depression may disrupt sleep through emotional distress, rumination, and dysregulation of biological rhythms. On the other hand, chronic insomnia and poor sleep quality may increase vulnerability to the onset, persistence, and recurrence of depressive episodes. Importantly, sleep disturbances often

persist even after partial remission of mood symptoms, making them one of the most common residual symptoms in individuals treated for depression. This is clinically important because persistent sleep problems are associated with impaired daily functioning, poorer treatment response, and an increased risk of relapse.

In both research and clinical practice, increasing emphasis is placed on the subjective experience of sleep. Although objective measures such as polysomnography and actigraphy provide valuable physiological data, they do not always fully capture the patient's perception of sleep quality, restfulness, or next-day functioning. Therefore, self-reported sleep measures play a central role in the assessment of treatment outcomes in psychiatric populations. Instruments such as the Pittsburgh Sleep Quality Index (PSQI), Athens Insomnia Scale (AIS), and Insomnia Severity Index (ISI) are widely used to assess perceived sleep quality and insomnia severity. These subjective indicators are particularly relevant in depression, where perceived sleep quality may directly influence motivation, concentration, emotional regulation, and psychosocial functioning.

The standard treatment of depression typically includes pharmacotherapy, psychotherapy, or a combination of both.

Volume 15 Issue 8, August 2026

Fully Refereed | Open Access | Double Blind Peer Reviewed Journal

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However, although these treatments are effective in alleviating core mood symptoms, these approaches do not always adequately address coexisting sleep disturbances. In many patients, insomnia and poor sleep quality persist despite treatment, contributing to residual symptom burden and incomplete functional recovery. This has led to increasing interest in adjunctive non-pharmacological interventions.

Among these interventions, physical activity has emerged as a particularly promising strategy. Regular exercise has consistently been associated with improvements in depressive symptoms and overall psychological well-being, while also demonstrating potential benefits for sleep quality and daytime functioning. The mechanisms underlying these effects are likely multifactorial and include the regulation of circadian rhythms, reduction of physiological and psychological hyperarousal, improvements in mood and anxiety, thermoregulatory effects, and enhancement of sleep drive. Exercise may also serve as a behavioral *zeitgeber*, helping to stabilize daily biological rhythms that are often disrupted in depression.

From a clinical perspective, this issue is especially important because improvements in sleep may extend beyond nighttime outcomes. Better sleep quality and fewer insomnia symptoms may contribute to improved daytime cognitive functioning, increased energy, enhanced emotional resilience, and better participation in social and occupational roles. In individuals with depression, such improvements are of considerable clinical importance, as functional impairment often persists even when mood symptoms improve.

Therefore, the aim of this review is to synthesize the current evidence on the role of physical activity in improving subjective sleep outcomes in individuals with depression, with particular emphasis on insomnia symptoms, perceived sleep satisfaction, and their relationship with daytime cognitive and psychosocial functioning.

Figure 1 illustrates the conceptual framework underlying the present review illustrating the proposed relationships between depression, sleep disturbances, physical activity, and daytime functioning.

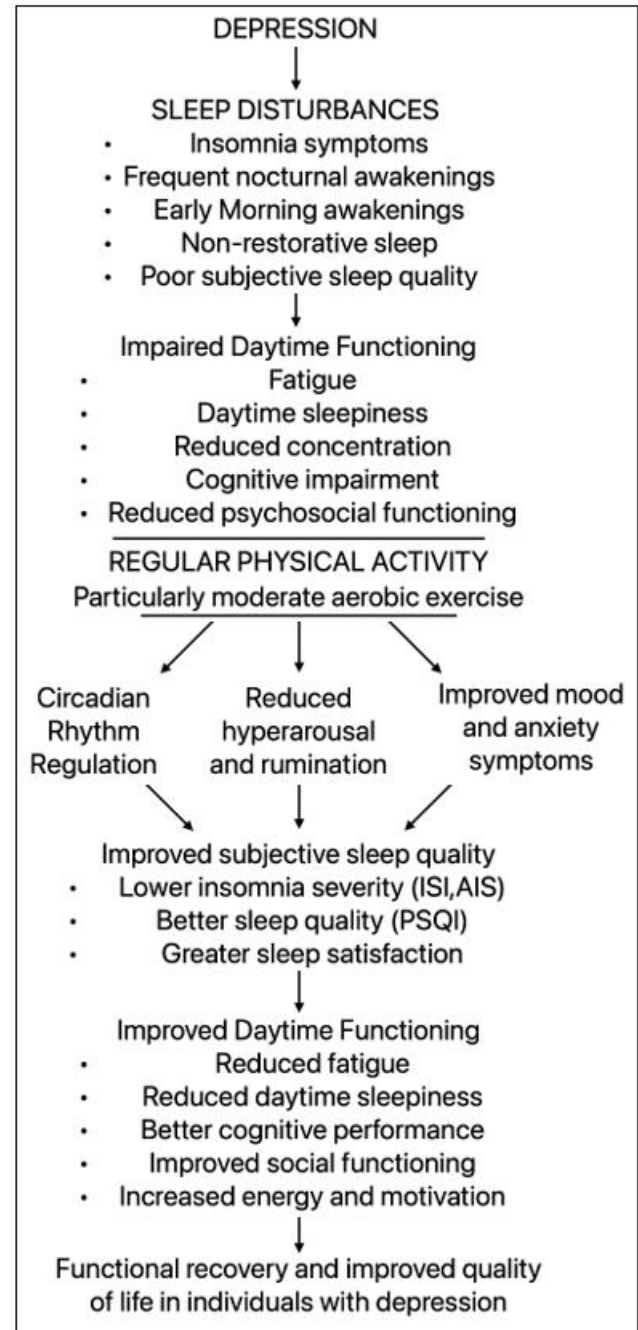


Figure 1: Conceptual model of the relationship between physical activity, sleep quality, and daytime functioning in depression

2. Discussion

The present review synthesizes the current evidence indicating that regular physical activity is consistently associated with improvements in subjective sleep quality and selected domains of daytime functioning in individuals with depression. Across the included studies, exercise interventions were most commonly associated with reductions in insomnia severity, enhanced perceived sleep quality, and increased overall sleep satisfaction. These findings are clinically significant because sleep disturbances represent one of the most persistent and functionally impairing features of depressive disorders and frequently remain unresolved despite standard treatment.

A major finding of the reviewed literature is the consistent improvement in subjective sleep outcomes following physical activity. In depression, sleep impairment is rarely limited to isolated nocturnal symptoms; rather, it is often experienced as non-restorative sleep, insufficient recovery, and reduced readiness for daytime activities. Improvements observed using validated self-report instruments—such as the Pittsburgh Sleep Quality Index (PSQI), Athens Insomnia Scale (AIS), and Insomnia Severity Index (ISI)—therefore capture changes that are directly meaningful to patients. This finding underscores the importance of incorporating patient-reported outcomes into both research and clinical practice, because they reflect dimensions of recovery that extend beyond objective physiological sleep parameters.

The mechanisms underlying the beneficial effects of physical activity on sleep in depression are likely multifactorial and interdependent. One of the key mechanisms involves the regulation of circadian rhythms, which are frequently disrupted in depressive disorders. Irregular sleep–wake patterns, reduced exposure to environmental zeitgebers, and decreased daytime activity contribute to circadian misalignment. Physical activity may act as a powerful behavioral synchronizer, reinforcing temporal structure and thereby promoting alignment between internal biological rhythms and external environmental cues.

Additionally, exercise may attenuate physiological and psychological hyperarousal, a key mechanism underlying the persistence of insomnia. Heightened cognitive activity, rumination, and emotional distress—hallmarks of depression—interfere with sleep initiation and continuity. Regular physical activity has been shown to enhance stress regulation, enhance autonomic balance, and reduce anxiety symptoms, thereby indirectly facilitating sleep processes. These effects are likely to operate synergistically, reflecting the broad effects of exercise on neurobiological, psychological, and behavioral systems.

Importantly, the benefits of physical activity appear to extend beyond improvements in nocturnal symptoms and translate into measurable improvements in daytime functioning. Several studies reported reductions in fatigue and excessive daytime sleepiness, together with improvements in perceived cognitive performance and psychosocial functioning. This finding is particularly relevant in individuals with depression, in whom residual symptoms—such as impaired concentration, low energy, and reduced motivation—often persist even after mood symptoms have improved. By simultaneously addressing sleep disturbances and functional impairment, physical activity may support a more comprehensive and clinically meaningful recovery.

Despite these encouraging findings, several limitations should be acknowledged. The reviewed studies exhibited substantial heterogeneity in design, participant characteristics, exercise modalities, and outcome measures, thereby limiting direct comparability and precluding firm conclusions regarding optimal intervention parameters. Furthermore, the predominance of self-reported sleep assessments may introduce bias related to mood state and subjective perception. While these measures are essential for capturing patient experience, future research would benefit

from integrating objective sleep assessments (e.g., actigraphy or polysomnography) to provide a more comprehensive assessment of sleep outcomes.

Additionally, sleep outcomes were not always the primary outcomes of the included studies, and, in many cases, were reported as secondary outcomes. This may limit the depth and consistency of the available evidence. The lack of standardized exercise protocols further complicates identifying the optimal type, intensity, frequency, and timing of physical activity for individuals with depression.

Overall, although the current evidence supports the therapeutic value of physical activity, there remains a need for rigorously designed, adequately powered randomized controlled trials to refine these findings and facilitate their translation into precise clinical recommendations.

3. Conclusions

This review provides converging lines of evidence that regular physical activity represents a clinically meaningful, evidence-based adjunctive strategy for improving subjective sleep quality and daytime functioning in individuals with depression. Exercise interventions—particularly moderate-intensity aerobic activity—are consistently associated with reductions in insomnia symptoms, improvements in perceived sleep quality, and increased overall sleep satisfaction as assessed by validated self-report instruments.

Importantly, improvements in sleep are frequently accompanied by beneficial effects on daytime functioning, including reduced fatigue, decreased daytime sleepiness, and enhanced cognitive and psychosocial performance. These outcomes are of particular clinical importance, as residual symptoms related to sleep disturbance and functional impairment often persist despite standard pharmacological and psychotherapeutic treatment.

The mechanisms underlying these effects are likely multifactorial, involving circadian rhythm regulation, attenuation of physiological and psychological hyperarousal, improvements in mood and anxiety symptoms, and stabilization of daily behavioral patterns. Within this framework, physical activity may serve as a key behavioral regulator supporting both sleep processes and broader functional recovery.

Nevertheless, the current body of evidence is limited by methodological heterogeneity and a reliance on subjective outcome measures. Future studies should prioritize well-designed randomized controlled trials incorporating both subjective and objective sleep assessments, as well as standardized and well-characterized exercise protocols. Clarifying the optimal type, intensity, frequency, and timing of physical activity remains an essential objective for advancing clinical application.

From a clinical standpoint, integrating structured physical activity into standard treatment paradigms offers a safe, widely accessible, and cost-effective approach to addressing both sleep disturbances and residual functional impairment in depression. Considering its broad therapeutic potential and

low risk profile, physical activity should be considered a core component of comprehensive, patient-centered care in this population.

Disclosure and Declarations

Authors contribution:

Conceptualization: Małgorzata Jarząbek

Methodology: Małgorzata Jarząbek

Formal analysis: Małgorzata Jarząbek

Investigation: Małgorzata Jarząbek

Writing - Rough Preparation: Małgorzata Jarząbek

Writing-Review and Editing: Małgorzata Jarząbek

All authors have read and agreed with the published version of the manuscript.

Conflicts of Interest: The authors declare no conflicts of interest.

Funding Statement: No external funding was received to perform this review.

Board Statement: Not applicable – this review included an analysis of the available literature.

Statement of Informed Consent: Not applicable

Institutional Review Board Statement: Not applicable– this review analyzed previously published data.

Informed Consent Statement: Not applicable.

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