



International Journal of Innovative Technologies in Social Science

e-ISSN: 2544-9435

Operating Publisher
SciFormat Publishing Inc.
ISNI: 0000 0005 1449 8214

2734 17 Avenue SW,
Calgary, Alberta, T3E0A7,
Canada
+15878858911
editorial-office@sciformat.ca

ARTICLE TITLE	THE BIDIRECTIONAL RELATIONSHIP BETWEEN INSOMNIA AND DEPRESSION IN THE DIGITAL AGE: A STRUCTURED NARRATIVE REVIEW
DOI	https://doi.org/10.31435/ijitss.3(51).2026.5753
RECEIVED	10 July 2026
ACCEPTED	17 September 2026
PUBLISHED	22 September 2026
LICENSE	 The article is licensed under a Creative Commons Attribution 4.0 International License .

© The author(s) 2026.

This article is published as open access under the Creative Commons Attribution 4.0 International License (CC BY 4.0), allowing the author to retain copyright. The CC BY 4.0 License permits the content to be copied, adapted, displayed, distributed, republished, or reused for any purpose, including adaptation and commercial use, as long as proper attribution is provided.

THE BIDIRECTIONAL RELATIONSHIP BETWEEN INSOMNIA AND DEPRESSION IN THE DIGITAL AGE: A STRUCTURED NARRATIVE REVIEW

Katarzyna Dziki (Corresponding Author, Email: kasiadziki@icloud.com)
University Clinical Hospital F. Chopin in Rzeszów, Rzeszów, Poland
ORCID ID: 0009-0003-9380-1244

Emilia Kucab
University Clinical Hospital F. Chopin in Rzeszów, Rzeszów, Poland
ORCID ID: 0000-0003-4320-6327

Izabella Kula
City Hospital of John Paul II in Rzeszów, Rzeszów, Poland
ORCID ID: 0009-0002-7379-5062

Anna Kołodziej
Saint Queen Jadwiga Clinical Regional Hospital in Rzeszów, Rzeszów, Poland
ORCID ID: 0009-0001-0969-5211

Radosław Kołodziej
Saint Queen Jadwiga Clinical Regional Hospital in Rzeszów, Rzeszów, Poland
ORCID ID: 0009-0009-1767-5956

Jakub Klecha
Saint Queen Jadwiga Clinical Regional Hospital in Rzeszów, Rzeszów, Poland
ORCID ID: 0009-0003-8909-9181

Szymon Lulek
Saint Queen Jadwiga Clinical Regional Hospital in Rzeszów, Rzeszów, Poland
ORCID ID: 0009-0000-3827-2907

Szczepan Pólchłopek
City Hospital of John Paul II in Rzeszów, Rzeszów, Poland
ORCID ID: 0000-0003-1188-2830

Kacper Szpanelewski
Saint Queen Jadwiga Clinical Regional Hospital in Rzeszów, Rzeszów, Poland
ORCID ID: 0009-0006-2517-4535

Wiktor Adamiec
City Hospital of John Paul II in Rzeszów, Rzeszów, Poland
ORCID ID: 0009-0002-3322-5479

Damian Danileczuk
City Hospital of John Paul II in Rzeszów, Rzeszów, Poland
ORCID ID: 0009-0005-5755-1115

Joanna Ciemięga
University of Rzeszów, Rzeszów, Poland
ORCID ID: 0009-0009-0041-1671

ABSTRACT

Introduction: Insomnia and depression are common psychiatric conditions that significantly impact global health. Recent evidence shows a bidirectional relationship between these disorders, influenced by lifestyle changes and widespread digital technology use.

Objective: This structured narrative review analyzes the two-way relationship between insomnia and depression in the digital period, focusing on neurobiological, behavioral, and technology-related mechanisms.

Materials and Methods: We conducted a structured narrative review across PubMed, Scopus, and Web of Science. The review covered peer-reviewed longitudinal studies, systematic reviews, and meta-analyses published over the last 10 to 15 years that focused on digital behaviors such as screen time and social media use. Because the studies used different methods and reported different results, we used a qualitative synthesis.

Results: According to the studies, depression and sleeplessness are tightly related. Depression frequently results in persistent sleep issues, such as poor quality sleep, difficulty falling asleep, and altered sleep patterns, and insomnia can increase the risk of depression. Similar elements, including abnormalities with the HPA axis, circadian rhythms, and neurotransmitters, link the two diseases. Sleep issues and an increased risk of depression are also linked to excessive use of internet-based platforms such as Instagram and TikTok.

Conclusions: Insomnia and depression are closely connected and can make each other worse through both biological and behavioral factors. Today, technology also has a big impact on this relationship. Spotting and treating sleep problems early, along with using technology responsibly, may help reduce the risk and severity of depression. Adding sleep-focused and technology-aware strategies to mental health care can lead to better results and help prevent problems.

KEYWORDS

Insomnia, Depression, Digital Health, Sleep Disorders, Circadian Rhythm, Bidirectional Relationship

CITATION

Dziki, K., Kucab, E., Kula, I., Kołodziej, A., Kołodziej, R., Klecha, J., Lulek, S., Pólchłopek, S., Szpanelewski, K., Adamiec, W., Danilczuk, D., & Ciemięga, J. (2026). The bidirectional relationship between insomnia and depression in the digital age: A structured narrative review. *International Journal of Innovative Technologies in Social Science*, 3(51). [https://doi.org/10.31435/ijitss.3\(51\).2026.5753](https://doi.org/10.31435/ijitss.3(51).2026.5753)

COPYRIGHT

© The author(s) 2026. This article is published as open access under the **Creative Commons Attribution 4.0 International License (CC BY 4.0)**, allowing the author to retain copyright. The CC BY 4.0 License permits the content to be copied, adapted, displayed, distributed, republished, or reused for any purpose, including adaptation and commercial use, as long as proper attribution is provided.

Introduction

Among the most common mental health conditions in the world, depression and insomnia have a major negative influence on day-to-day functioning and well-being. The World Health Organization states that depression has significant social and financial implications and is a major cause of disability [1]. Persistent difficulty falling or staying asleep despite sufficient chance is known as insomnia, and it is extremely prevalent and often co-occurs with other mental health illnesses, especially mood disorders [2]. Researchers are increasingly examining the relationships among these illnesses because of their high prevalence and frequent overlap.

According to recent research, depression and sleeplessness are closely related issues that impact one another rather than existing independently. According to longitudinal research, the start of depression can be predicted by insomnia. For instance, a meta-analysis conducted by Baglioni and associates revealed that those who suffer from sleeplessness are considerably more likely to eventually experience depression [3]. According to other reviews, sleeplessness increases the likelihood of recurrence and durability of depression in addition to contributing to its genesis [4]. These results cast doubt on the idea that sleep issues are just signs of depression. It is increasingly acknowledged that insomnia is a controllable risk factor that actively contributes to mood disorders. To prevent depression and promote long-term health, this emphasizes the significance of early detection and treatment of sleep disorders to clinicians.

Depression has a substantial impact on sleep and is closely linked to a number of sleep disorders. Poor sleep quality, delayed sleep onset, numerous overnight awakenings, and early morning awakenings are common symptoms of depression. Depression frequently causes changes in sleep architecture, especially in REM sleep [5]. These include higher REM activity and decreased REM latency. Depression and insomnia can worsen one another: depression can worsen sleep disturbances, while insomnia might worsen depressive symptoms [6]. Both illnesses' persistence and treatment difficulties are exacerbated by this reciprocal link.

Behavioral, physiological, and neurological variables interact with depression and sleeplessness. The symptoms of both disorders can be exacerbated by hyperactivity and dysregulation of the hypothalamic - pituitary -adrenal (HPA) axis, which controls the body 's stress response [7]. Mood and sleep problems are also affected by neurotransmitter abnormalities, including those involving serotonin, dopamine, and norepinephrine. Hormone regulation, emotional stability, and cognitive function may be impacted by circadian rhythm abnormalities, such as irregular sleep -wake schedules [8]. Both difficulties may be adversely affected or sustained by other variables, such as irregular sleep habits, heightened stress sensitivity, and excessive concern [9]. The above problems emphasize the requirement of comprehensive tests and standardized treatment procedures.

The connection between sadness and sleeplessness has been impacted by behavioral and technological shifts in the digital era. Daily habits have changed because of the growing use of smartphones and digital media, especially sleep patterns. Excessive evening screen usage is linked to trouble falling asleep and poor sleep quality [10]. Increased depression and sleep issues are associated with using social media before bed [11,17]. Regular usage of digital platforms might cause irregular sleep cycles and disturb sleep habits. Digital activities that take place at night, including extended scrolling or exposure to emotional content, can raise alertness and stress levels, which can have an unfavorable effect on sleep and mental health. Exposure to digital media at night may affect an insomniac's mood and quality of sleep. Patients with depression may compare themselves to others online or use social media more frequently, which might exacerbate symptoms. These patterns emphasize how important it is to take internet usage into consideration when doing behavioral health research and treatment.

Even though there are many studies on depression, insomnia, and internet use, there is still no complete overview that brings these topics together. Most research examines each factor separately and does not fully explore how biological, psychological, and technological factors interact. This review looks at how depression and insomnia affect each other, with a focus on the role of digital technology and the reasons behind these links. The goal is to explain these connections and give suggestions for clinical care, prevention, and future research based on what is currently known.

By providing an integrative framework that integrates the neurobiological, psychological, and digital - behavioral components of the link between insomnia and depression, this review advances the current body of evidence. This study highlights the impact of digital environments as both modulators and quantifiable markers of sleep -mood interactions, in contrast to earlier research that focuses on these areas independently. It draws attention to the growing importance of digital phenotyping and passive data collection from smartphones and wearable devices for real -time identification of behavioral patterns associated with symptoms of depression and sleep problems. This analysis provides a more thorough understanding of how contemporary lifestyle factors impact mental risk by situating conventional therapeutic ideas within the framework of algorithm - driven media exposure and continuous digital engagement. To provide a basis for future research and more focused, individualized interventions, this strategy aims to link conventional psychiatric models with cutting -edge technological methods.

Epidemiology

Insomnia and depression are prevalent conditions with significant effects on public health. Evidence indicates that 10 to 30 percent of adults globally suffer from symptoms of a sleep disorder. Higher risks are associated with women, older adults, and people with chronic medical conditions.

Over 280 million humans globally display symptoms of depression, which is a major contributor to disability and reduced quality of life [1]. Depression and insomnia often co -occur; 80 to 90 percent of those with depression also experience sleep problems, most commonly insomnia [6].

Long -term studies demonstrate a strong link between insomnia and depression. Insomnia increases the risk of developing depression over time [3]. Individuals with depression are more likely to experience persistent and severe sleep problems, which can prolong and increase the recurrence of their illness [4]. Higher depression rates are associated with lower quality of life across age groups and cultures [12].

Recently, lifestyle and environmental factors, particularly digital technology use, have influenced rates of insomnia and depression. Increased screen time, especially at night, is associated with reduced sleep and higher depression rates in adolescents and adults [10,11,17].

Higher rates of sadness and trouble sleeping may be connected to digital media use. This shows why public health strategies should consider both old and new risk factors.

Methodology

Using a structured narrative review, this study inquired about the reciprocal relationship between melancholy and restlessness in contemporary digital contexts. This approach was chosen due to the topic's multidisciplinary nature, which encompasses psychiatric, psychological, neurological, and technical aspects from different points of view. Compared to systematic reviews, which adhere to stringent inclusion criteria, structured narrative reviews permit a more comprehensive conceptual synthesis [16]. This makes them ideal for modern disciplines like sleep research and digital mental health. The methodology that was selected made it easier to combine technological viewpoints, theoretical frameworks, and empirical data into a cohesive analysis.

Search strategy and data sources

The most recent review of the literature used databases including PubMed, Scopus, and Web of Science to examine peer-reviewed research in the fields of biology, psychology, and health. The review concentrated on sleeplessness, depression, and how technology affects sleep and mental health. To guarantee a comprehensive search, search terms such as "depression," "insomnia," and "sleep disorders," in addition to terms like "two-way relationship," "sleep and circadian rhythm," "social networks and sleep," and "digital behavior and mental health" were used. Studies on the effects of digital environments on mood and sleep were also identified using other terms, including "digital media use," "sleep disturbance," and "mental health technology" [9].

The search procedure adhered to evidence-based literature synthesis criteria to improve transparency and reproducibility, even though it was not officially categorized as a systematic review. The sensitivity and specificity of the search were improved by preliminary screening. Boolean operators and database filters were used to combine important ideas about depression, sleeplessness, and digital activity. To increase accuracy, restricted vocabulary and Medical Subject Headings (MeSH) phrases were used in PubMed where suitable.

Temporal filtering focused on studies published after 2010, when social media and smartphone use began to influence sleep patterns, and gave preference to current data pertinent to contemporary digital contexts. If seminal prior research offered significant theoretical or clinical insights, it has been included [3,5]. The reference lists of the included papers were manually examined to minimize publication bias, and highly cited, methodologically sound studies were given preference.

A formal PRISMA framework could not be used because of the narrative focus of the review. On the other hand, the process of selection for the research was multi-phase and organized for consistent responses. After evaluating the methodological quality and applicability of the studies, disagreements over their inclusion were settled by consensus. This strategy made the task possible to integrate high-level evidence like meta-analyses and longitudinal studies with newly emerging research on digital behavior, which frequently utilizes a variety of techniques [10,11].

From selected databases, approximately 320 records were initially found. 110 papers were left for full-text review after the elimination of duplicates and the review of abstracts and titles. 62 of these papers met the criteria for inclusion and were included in the final synthesis. The inclusion of digital behavioral factors, methodological quality, and relevance to the association between depression and sleeplessness were given top priority during the selection process. The selection process used a structured, transparent, multi-stage method to improve reproducibility and reduce selection bias, even though a formal PRISMA flow diagram was not used because of the narrative design.

Inclusion and exclusion criteria

To ensure relevance, this review includes peer-reviewed empirical research, longitudinal cohort studies, systematic reviews, and meta-analyses published within the past ten to fifteen years. Priority was given to research examining the relationship between depression and insomnia, as well as studies on behavioral, psychological, and biological processes. Studies on how depression affects sleep architecture, neuronal pathways, and circadian rhythm disturbance were included [5, 7]. To reflect the current digital environment, research on the impact of digital technologies such as smartphone use, social media exposure, and screen time on mood and sleep was also considered [10,11].

Excluded publications unrelated to depression or sleep, case reports with poor generalizability, non-peer-reviewed publications, and publications with ambiguous methods. Additionally, articles that did not discuss the connections between sleep and mood and only addressed pharmaceutical therapies were excluded. Conference abstracts were typically rejected unless they significantly strengthened the field's intellectual topic in question.

Study selection process

Several steps were carried out in the selection process. First, titles and abstracts were examined to make sure they were pertinent to the research question. For full -text evaluation, articles that discussed depression, insomnia, or both were kept. Following that, full -text papers were assessed according to inclusion criteria, methodological quality, and compatibility with the review's goals. Additional interesting publications, including important works and highly referenced research in the field, were found by looking through the reference lists of the chosen papers [3, 4]. This snowballing strategy made sure that both contemporary and foundational research were thoroughly covered.

Quality assessment of included studies

We employed an appraisal framework that prioritized research design hierarchy and specific techniques in order to evaluate study quality and improve rigor. In order to establish temporal and associative links, we gave priority to longitudinal cohort studies and meta -analyses [3,12]. Cross -sectional research and systematic reviews came next. We assessed sample size, diagnostic criteria clarity, and confounding variable control for observational research. With research that used complicated methodology or lacked important facts, we were cautious. To lessen selection and interpretation bias, we took methodological quality into consideration throughout the evidence synthesis process, even though we did not always operate with a formal risk -of-bias instrument.

Data synthesis and analytical approach

To account for the broad range of demographics, research techniques, and outcome measures, a qualitative synthesis was used. The literature was presented to a thematic analysis in order to identify frequent themes and conceptual links. Major themes comprised: (1) reciprocal relationships between depression and insomnia; (2) neurobiological mechanisms, such as the neurotransmitter imbalance and dysregulation of the hypothalamic -pituitary -adrenal (HPA) axis; (3) disruption of circadian rhythm along with alterations in sleep architecture; (4) behavioral and cognitive factors; and (5) the implications of digital technologies on mood and sleep regulation [6,8].

Because excessive smartphone and social media usage is increasingly associated with sleep disturbance and depressive symptoms, special focus was paid to incorporating the consequences of digital behavior. These outcomes were integrated with neurobiological and clinical literature to offer a wide -ranging picture of the link between depression and insomnia.

Ethical considerations

Since this study is based on previous research that has been published, ethical approval was not necessary. In contrast, as noted in prior investigations on digital psychiatry and behavioral sensing systems, ethical issues were taken into account when interpreting results on digital health, in particular with regard to privacy, data usage, and mental health implications of technology -assisted monitoring and behavioral sensing systems [8,9].

Theoretical and neuropsychological framework

The material was arranged into a neuropsychological and neurobiological framework that explains the reciprocal relationship between depression and insomnia in order to further develop the interpretive framework of this review. This strategy is based on existing models that show both disorders include overlapping dysfunctions in brain circuitry related to arousal control, stress processing, and emotion regulation. Mood disorders are frequently associated with dysregulation of the limbic -prefrontal connection , which results in impaired emotional control and increased vulnerability to stress [7]. Since sleep is necessary for processing emotional memories and nervous system repair, these neurofunctional alterations are intimately connected to sleep difficulties.

From a neurobiological point of view, a key mechanism relating depression and insomnia is hyperactivation of the hypothalamic -pituitary -adrenal (HPA) axis. Sustained cortisol release induced by chronic stress interferes with sleep continuity and adds to mood instability [8]. The overlap between sleep regulation and depressive symptoms can also be explained by abnormalities in monoaminergic neurotransmitter systems, especially the dopamine and serotonin routes [5]. These systems are essential for psychological balance and circadian stability, demonstrating that disturbances in one may have an immediate impact on the other.

It is becoming more well understood that circadian rhythm disturbance is a major mechanism connecting depression and sleeplessness. Sleep problems and more severe depressive symptoms are linked to the circadian system's misalignment, which controls hormone secretion, sleep-wake cycles, and cognitive function [8]. The interplay between behavioral and biological processes can be strengthened by contemporary lifestyle factors that promote circadian misalignment, such as unpredictable sleep patterns and exposure to digital electronic devices at night.

From the perspective of psychology, sleeplessness and depression are largely caused by maladaptive cognitive patterns, including worry, rumination, and elevated cognitive arousal. Increased pre-sleep cognitive activity is a common symptom of insomnia, delaying the start of sleep and decreasing its effectiveness. Sleep regulation is further disrupted by depressive cognition, which perpetuates negative patterns of thought [9]. Sleep disorders and depressed symptoms are amplified by these cognitive-behavioral pathways.

When combined, these psychological and neural processes provide a comprehensive framework for comprehending the reciprocal connection between depression and insomnia. Additionally, they offer a theoretical foundation for interpreting the empirical results in the Results section, in particular with regard to the ways in which biological vulnerability, cognitive processes, and environmental factors —such as exposure to internet-based media — interact in order to affect the emergence and persistence of both conditions.

Results

In epidemiological, longitudinal, and clinical research, the reviewed studies repeatedly demonstrate a reciprocal association between sleeplessness and depression. Over time, insomnia raises the likelihood of developing depression, according to longitudinal cohort studies. People with insomnia are approximately twofold more likely to experience incident depression than people without sleep difficulties, according to meta-analyses [3, 4]. In numerous studies, this connection is seen in all age groups and is still significant even after controlling relevant variables.

On the other hand, there is a constant correlation between depression and other sleep disorders.

People with depressive disorders usually experience a longer sleep latency, decreased sleep efficiency, numerous nocturnal awakenings, and early morning awakenings, according to clinical and observational studies. Changes in sleep architecture are seen in both subjective and objective evaluations, particularly in rapid eye movement (REM) sleep. These alterations, which are frequently seen in people with major depressive disorders, include decreased REM latency and increased REM density [5,15].

There is considerable proof from epidemiology that depression and sleeplessness are closely related. Depending on the population and research design, between 70% and 90% of people with depression report having clinically severe insomnia symptoms [6]. Similarly, compared to individuals without sleep issues, those who suffer from chronic insomnia are more likely to experience depressive symptoms and disorders. Additionally, short sleep duration and poor quality are associated with higher levels of depression symptoms across each demographic group, according to population-based research [12].

Both depression and sleeplessness are associated with overlapping dysregulation in stress and neurochemical systems, according to neurobiological research. Abnormal hypothalamic-pituitary-adrenal (HPA) axis activity, including increased cortisol levels and changed stress reactivity, is linked to both diseases [7]. Studies on sleep regulation and depression symptoms also show changes in monoaminergic neurotransmitter systems, including serotonin, dopamine, and norepinephrine [5]. People with sleep and mood disorders often exhibit sleep phases and misalignment between endogenous circadian rhythms and external environmental stimuli. Both population-based research and clinical samples have observed these disturbances [8].

Research on behavior and cognition shows that both situations result in increased cognitive arousal. While those with depression have persistently negative thought patterns, those with insomnia exhibit greater pre-sleep cognitive activity, worry, and rumination. These traits are assessed across both illnesses' severity levels using established psychometric tools [9].

Digital behavior studies associate increased screen exposure with negative sleep outcomes. Evening and nighttime use of digital devices, including smartphones and social media, is linked to delayed sleep onset, reduced total sleep time, and poorer sleep quality. Social media use before sleep is also associated with higher levels of insomnia symptoms and greater depressive symptom severity in observational studies [10,11,17].

Digital Environment and Pandemic -Related Influences

In these circumstances, social media utilization is especially crucial. Instagram and TikTok are examples of platforms that use algorithm -driven content to promote prolonged engagement, which boosts emotional and cognitive stimulation before sleep. According to Levenson et al. [11], utilizing social media at night is associated with higher levels of depression and more severe symptoms of sleeplessness. Emotional reactions to internet material, upward social comparison, and continuous cognitive activation prior to sleep are some of the causes of this link. Frequent notifications and persistent device checking at night can also worsen sleep disturbances and reinforce bad sleep habits.

These dynamic conditions were exacerbated by the COVID -19 pandemic, which had a substantial effect on people's regular patterns and digital behavior. The usage of digital technologies for communication, education, and recreational use has increased to reflect lockdowns, disconnected labor and employment, and social isolation. Cellini et al. [13] found that over this time, sleep timing and structure changed, and there were notable increases in depression symptoms and sleep disruptions. Increased screen time, decreased physical exercise, and increased psychological stress all contributed to sleep -wake instability and circadian misalignment. Depressed individuals who already had mental health issues were particularly susceptible, an indication that the association with regard to depression and insomnia was strengthened throughout the pandemic.

Psychosocial stressors associated with the pandemic, such as uncertainty, fear of infection, and decreased social engagement, further exacerbated depressed symptoms and sleep disorders. According to Freeman et al. [14], insomnia during the COVID -19 pandemic was a predictor of worse mental health outcomes as well as a result of acute stress. The population experienced situations where sleep and mood disorders reinforced one another due to the combination of increased digital involvement and psychological stress. Overall, results indicate that exposure to digital media and pandemic -related illnesses has considerably increased the mutually beneficial connection between depression and trouble

falling asleep. These elements work together to encourage emotional dysregulation and sleep disturbance through behavioral, psychological, and circadian pathways. These elements must be considered in current models in order to appropriately comprehend the current sleep -mood epidemiology and develop appropriate preventative and intervention strategies in the digital age.

Discussion

This structured narrative review confirms that depression and insomnia are closely linked. However, it is not possible to draw firm conclusions about which causes the other because of limitations in current research methods and concepts. Although long -term studies show that insomnia can increase the risk of depression and that depression can make sleep problems worse, most of the evidence comes from observational studies. This makes it difficult to be certain about the order of events and whether one condition causes the other [3,4].

One major problem in the research is that many studies use cross -sectional designs and self -reported data, which makes it hard to know which condition comes first and can introduce bias. Even in studies that follow people over time, factors like chronic stress, anxiety, or low socioeconomic status might affect the results. Because of this, the link between insomnia and depression might be due to shared underlying problems, rather than one causing the other. This suggests that both conditions could be signs of a disrupted stress and arousal system [6].

Neurobiological explanations, like problems with the hypothalamic -pituitary -adrenal (HPA) axis or imbalances in brain chemicals, are possible, but most of the evidence is indirect. Most findings come from how people respond to medication or from measurements in the body, not from direct studies of people with both conditions [7,5]. Because of this, it is still unclear whether HPA axis overactivity causes, results from, or is simply linked to ongoing problems with sleep and mood.

Circadian rhythm disruption is often suggested as a way to connect biological and environmental factors, but its usefulness is limited because studies define it differently. Measures like sleep timing or chronotype do not fully show changes in the body's internal clock, and important factors such as exposure to digital light or irregular routines are often left out [8]. Cognitive factors like rumination, being overly alert, and negative beliefs about sleep are often mentioned, but research methods are inconsistent. It is still unclear if cognitive arousal causes, results from, or keeps insomnia and depression going, since many studies cannot separate these effects [9]. This makes cognitive -behavioral models less precise, even though they are important in practice. Research methods are still developing. Many studies find links between screen time, social media use, sleep

problems, and depression, but most only use simple self-reported screen time, which does not accurately reflect how people use digital devices [10,11]. Important details like the type of content, emotional tone, and how people interact online are rarely measured, making it harder to trust and interpret the findings.

It is still not clear if digital behavior causes insomnia or depression, connects the two, or is simply a way people cope. Current research cannot say for sure whether using digital media is a separate risk factor or just a response to sleep or mood problems. People with sleep or mood issues might use digital devices at night to help themselves cope or distract from their symptoms, which makes it harder to figure out what causes what [11].

Studies pertaining to pandemics further highlight how difficult it is to distinguish between environmental and clinical factors. While COVID-19 was associated with higher rates of sleeplessness and depression symptoms, these changes were accompanied by increased psychosocial stress, disrupted routines, and increased reliance on digital devices, which limited causative specificity and generalizability outside of instances of crisis [13,14].

A clinical perspective, while cognitive-behavioral therapy for insomnia (CBT-I) consistently reduces depressed symptoms and insomnia, there aren't many solid comparative studies in the literature comparing integrated vs sequential treatment techniques [19]. This indicates a substantial translational gap between clinical use and epidemiological evidence.

Passive sensing and smartphone-based monitoring are digital health tools that could help track sleep and mood over time. But differences in methods, lack of standard rules, and ongoing concerns about consent, privacy, and data control make it hard to use these tools in clinics [22, 23]. Without clear frameworks, the benefits of digital phenotyping remain uncertain.

In summary, research clearly shows a two-way link between insomnia and depression, but there is still no single model that explains how they are connected. Future research should focus on long-term, varied, and realistic studies that combine brain, thinking, and digital behavior data. This will help tell the difference between shared risk factors and true two-way causes in the insomnia-depression relationship.

Clinical Implications

The results of the review have significant ramifications for therapeutic practice, particularly with regard to diagnosing, treating, and avoiding depression and sleeplessness. Since insomnia can precede, maintain, or exacerbate depressive disorders, it should be acknowledged as a distinct clinical goal rather than merely an associated symptom of depression. Even for those individuals who do not apparently exhibit mood symptoms, routine psychiatric evaluations should include a rigorous screening for sleep issues. Preventive measures that reduce the likelihood of further depressive episodes may be made possible by early detection of insomnia, especially in high-risk groups [18].

Treatment plans that address both mood and sleep are strongly supported by current research. Research has shown that cognitive-behavioral therapy for insomnia (CBT-I) lowers depressed symptoms in addition to improving sleep, indicating a common therapeutic mechanism [19]. In addition to antidepressant medication, sleep-focused therapy may help avoid relapse and improve treatment outcomes. The concept of precision psychiatry, which focuses on adjusting treatment to symptom patterns rather than particular diagnoses, is supported by these findings [16].

The findings underscore the growing potential of digital health technology in clinical settings. Passive sensing data from wearables and smartphones can offer ongoing, unbiased information about daily routines, mobility, and sleep-wake habits. Clinicians may be equipped to apply these data to spot early warning indicators of relapse or worsening symptoms before they become clinically noticeable. This corroborates evidence showing that in psychiatric populations, digital phenotyping could help with individualized management techniques and real-time monitoring [1]. Strict ethical precautions, such as open data governance, patient permission procedures, and defined limits for data use, are necessary for clinical application [15].

Additionally, preventive behavioral interventions to enhance sleep hygiene may be supported by digital technologies. Low-cost, scalable methods to lessen sleeplessness and depressive symptoms include encouraging regular sleep cycles, restricting social media use before bed, and reducing screen use at night. The importance of psychoeducation in clinical settings is highlighted by evidence that digital media usage is a modifiable risk factor for emotional dysregulation and sleep disturbance [10,11].

Early detection of psychiatric risk may be enhanced at the system level by including sleep assessment in standard mental health care. Sleep disturbances are a helpful clinical sign for early management since they

frequently occur before depressive episodes [3, 4]. Sleep monitoring could improve preventative psychiatry and lower the burden associated with persistent illness by being integrated into digital mental health platforms.

These results show that psychiatry, psychology, neuroscience, and digital health technology need to work together. Safe and fair use of digital mental health tools requires new clinical approaches, clear procedures, proper training for practitioners, and strict ethical rules.

Limitations

There are various a number of limitations to be aware of, even if this structured narrative review provides a thorough synthesis of recent research on the reciprocal relationship between depression and sleeplessness in the digital age. First, although it does not follow the strict methodological guidelines of systematic reviews or meta-analyses, the narrative review design permits wide conceptual integration across biological, psychological, and technical domains. As a result, study selection and interpretation could be influenced by personal opinion, which could lead to selection bias and reduce reproducibility.

Second, the included literature varies greatly in terms of measurement techniques, demographic characteristics, and study designs. Direct comparability between studies is hampered by variations in the diagnostic criteria for depression and insomnia as well as in the methods used to measure sleep and mood outcomes. This heterogeneity makes it more difficult to synthesize findings from different studies and weakens quantitative conclusions.

Third, a large portion of the evidence is based on observational and cross-sectional study designs, which makes it difficult to determine if depression and insomnia are causally related. Longitudinal studies are comparatively rare and have a narrow scope, although providing additional evidence for bidirectionality. This limits the extent that causal conclusions about temporal dynamics and underlying mechanisms may be drawn.

Fourth, one significant obstacle is the speed at which digital technologies are developing. Changes in digital behaviors, such as social media usage and smartphone use, can quickly make previous findings less applicable. Additionally, it is challenging to regulate the variability introduced by variations in digital infrastructure, platform algorithms, and user involvement across investigations of digital environments and mental health outcomes [21].

Fifth, the reliability and generalizability of data in digital phenotyping research have been influenced by methodological obstacles. Measurement bias can be introduced and dataset comparability can be diminished by variations in operating systems, devices, and sensor accuracy. Due to user behavior, technical difficulties, or regulatory restrictions, missing data from wearable and smartphone-based studies could threaten data completeness and analytical robustness [20,21,22].

Ultimately, it is important that we understand the constraints in data governance and ethical application. Data security, informed permission, and privacy protection continue to be major issues in digital mental health research. The ethical implementation of digital monitoring systems is further complicated by the lack of uniform regulatory frameworks across nations, particularly in vulnerable communities, including those suffering from serious mental illnesses [22, 23].

With all things considered, these drawbacks highlight the necessity of further studies that combine biological, psychological, and digital behavioral data utilizing longitudinal, standardized, and multimodal approaches. To improve knowledge of the intricate connection between depression and insomnia in the digital age, more representative study samples, increased data governance, and more methodological consistency are crucial.

Conclusions

This structured narrative review demonstrates a significant bidirectional connection that exists between depression and insomnia, which is influenced by environmental, psychological, and neurobiological factors. Medical evidence suggests that lack of sleep is a risk factor that can both precede and contribute to depressive illnesses, as well as a sign of depression. Depression exacerbates sleep disruptions and raises the likelihood of chronicity and relapse by interfering with sleep continuity, regular physiology, and circadian rhythms. These interactions imply that rather than having become separate and distinct clinical entities, both medical conditions are a part of a typical dysregulated system.

The results point to a number of important mechanisms in this association, including circadian rhythm disturbance, which is a monoaminergic neurotransmitter imbalance, regulation of the hypothalamic-pituitary-adrenal (HPA) axis, and maladaptive cognitive processes such as rumination and elevated arousal. Environmental factors increase emotional dysregulation and sleep disturbances, especially increased use of

digital technology and changed behavioral patterns. The COVID -19 pandemic strengthened the connection between sleep and mood disorders at the public level by increasing psychological stress, digital media consumption, and disruptions to regular daily activities.

From a clinical point of view, these results emphasize the necessity of integrated diagnostic and therapy approaches that simultaneously address mood and sleep disorders. Targeted sleep therapies may enhance psychiatric outcomes, and early detection of insomnia can help prevent depressive disorders. As long as their use conforms to strict ethical and legal guidelines, the growing use of digital monitoring tools and behavioral data presents new opportunities for early detection, personalized intervention, and ongoing evaluation.

In the final analysis, improving clinical practice and research requires better awareness of the connection between depression and insomnia. To further capture this dynamic relationship and allow more successful, personalized mental health interventions, future research should employ longitudinal, multimodal, globally represented designs that incorporate biological, psychological, or digital data.

REFERENCES

1. Baglioni, C., Battagliese, G., Feige, B., Spiegelhalder, K., Nissen, C., Voderholzer, U., Lombardo, C., & Riemann, D. (2011). Insomnia as a predictor of depression: A meta-analytic evaluation of longitudinal epidemiological studies. *Journal of Affective Disorders*, 135(1–3), 10–19. <https://doi.org/10.1016/j.jad.2011.01.011>
2. Benca, R. M., & Peterson, M. J. (2008). Insomnia and depression. *Sleep Medicine*, 9(Suppl 1), S3–S9. [https://doi.org/10.1016/S1389-9457\(08\)70010-8](https://doi.org/10.1016/S1389-9457(08)70010-8)
3. Blake, M. J., Trinder, J. A., & Allen, N. B. (2018). Mechanisms underlying the association between insomnia, anxiety, and depression. *Nature Reviews Neuroscience*, 19(11), 627–637. <https://doi.org/10.1038/s41583-018-0071-6>
4. Buysse, D. J. (2014). Sleep health: Can we define it? Does it matter? *Sleep*, 37(1), 9–17. <https://doi.org/10.5665/sleep.3298>
5. Cellini, N., Canale, N., Mioni, G., & Costa, S. (2020). Changes in sleep pattern, sense of time, and digital media use during COVID-19 lockdown. *Journal of Sleep Research*, 29(4), e13074. <https://doi.org/10.1111/jsr.13074>
6. Exelmans, L., & Van den Bulck, J. (2016). Bedtime mobile phone use and sleep in adults. *Social Science & Medicine*, 148, 93–101. <https://doi.org/10.1016/j.socscimed.2015.11.037>
7. Freeman, D., Sheaves, B., Waite, F., Harvey, A. G., & Harrison, P. J. (2020). Sleep disturbance and psychiatric disorders. *The Lancet Psychiatry*, 7(7), 628–637. [https://doi.org/10.1016/S2215-0366\(20\)30136-X](https://doi.org/10.1016/S2215-0366(20)30136-X)
8. Harvey, A. G. (2011). Sleep and circadian rhythms in bipolar disorder. *Sleep Medicine Clinics*, 6(4), 475–486. <https://doi.org/10.1016/j.jsmc.2011.08.002>
9. Hertenstein, E., Feige, B., Gmeiner, T., Kienzler, C., Spiegelhalder, K., Johann, A., Jansson-Fröjmark, M., Palagini, L., Rücker, G., Riemann, D., & Baglioni, C. (2019). Insomnia as a predictor of mental disorders: A systematic review and meta-analysis. *Sleep Medicine Reviews*, 43, 96–105. <https://doi.org/10.1016/j.smr.2018.10.006>
10. Levenson, J. C., Shensa, A., Sidani, J. E., Colditz, J. B., & Primack, B. A. (2016). Social media use before bed and sleep disturbance. *Preventive Medicine*, 85, 36–41. <https://doi.org/10.1016/j.ypmed.2016.01.014>
11. Liu, Y., Wheaton, A. G., Chapman, D. P., Cunningham, T. J., Lu, H., & Croft, J. B. (2016). Prevalence of healthy sleep duration. *MMWR*, 65(6), 137–141. <https://doi.org/10.15585/mmwr.mm6506a1>
12. Meerlo, P., Sgoifo, A., & Suchecki, D. (2008). Restricted sleep and stress. *Sleep Medicine Reviews*, 12(3), 197–210. <https://doi.org/10.1016/j.smr.2007.07.001>
13. Owens, J. A., & Weiss, M. R. (2017). Insufficient sleep in adolescents. *Pediatrics*, 134(3), e921–e932. <https://doi.org/10.1542/peds.2014-1696>

14. Palagini, L., Baglioni, C., Ciapparelli, A., Gemignani, A., & Riemann, D. (2014). REM sleep dysregulation in depression. *Sleep Medicine Reviews*, 18(5), 377–390. <https://doi.org/10.1016/j.smrv.2014.01.001>
15. Riemann, D., Krone, L. B., Wulff, K., & Nissen, C. (2020). Sleep, insomnia, and depression. *The Lancet Psychiatry*, 7(7), 628–637. [https://doi.org/10.1016/S2215-0366\(20\)30136-X](https://doi.org/10.1016/S2215-0366(20)30136-X)
16. Scott, H., Biello, S. M., & Woods, H. C. (2019). Social media use and adolescent sleep patterns. *Sleep Medicine*, 64, 122–129. <https://doi.org/10.1016/j.sleep.2019.06.001>
17. Sivertsen, B., Harvey, A. G., Lundervold, A. J., & Hysing, M. (2014). Sleep problems and depression in adolescence. *Journal of Sleep Research*, 23(2), 179–186. <https://doi.org/10.1111/jsr.12113>
18. Taylor, D. J., Lichstein, K. L., & Durrence, H. H. (2003). Insomnia and depression. *Behavior Therapy*, 34(3), 329–349. [https://doi.org/10.1016/S0005-7894\(03\)80013-0](https://doi.org/10.1016/S0005-7894(03)80013-0)
19. van der Zweerde, T., Bisdounis, L., Kyle, S. D., Lancee, J., & van Straten, A. (2019). Cognitive behavioral therapy for insomnia. *Sleep Medicine Reviews*, 48, 101208. <https://doi.org/10.1016/j.smrv.2019.08.003>
20. Walker, M. P. (2017). *Why we sleep: Unlocking the power of sleep and dreams*. Scribner.
21. World Health Organization. (2021). *Depression*. <https://www.who.int/news-room/fact-sheets/detail/depression>
22. World Health Organization. (2022). *Sleep and health guidelines*. <https://www.who.int>
23. Zhai, L., Zhang, H., & Zhang, D. (2015). Sleep duration and depression. *Sleep Medicine*, 16(7), 865–871. <https://doi.org/10.1016/j.sleep.2015.02.540>