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THE IMPACT OF NIGHTTIME SOCIAL MEDIA USE ON SLEEP QUALITY IN ADOLESCENTS: A NARRATIVE REVIEW

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ABSTRACT

Sleep is a fundamental physiological process regulated by circadian rhythms and hormonal mechanisms, crucial for adolescents' cognitive, emotional, and physical development. Modern lifestyles, including evening social media use, increasingly disrupt these processes. This narrative review examines how nighttime engagement with social media affects adolescent sleep through behavioral, psychological, and physiological pathways.

A structured literature research was conducted using PubMed and Google Scholar to identify peer-reviewed studies, systematic reviews, and meta-analyses published between 2016 and 2026. Keywords included "social media", "adolescents", "sleep quality", "circadian rhythm", "sleep duration" and "blue light exposure". Foundational studies and relevant reports from international organizations were also included to provide context. Studies were selected if they investigated the relationship between social media or digital device use and sleep outcomes in adolescents.

Evening social media use is consistently associated with delayed sleep onset, shorter sleep duration, and poorer sleep quality. Behavioral factors such as habitual device checking and fear of missing out displace sleep, while psychological arousal from emotionally salient content further delays sleep initiation. Physiologically, exposure to blue light disrupts melatonin secretion and circadian timing. These mechanisms interact, forming a reinforcing cycle that contributes to daytime fatigue and potential mental health risks.

Nighttime social media use adversely affects adolescent sleep through interconnected behavioral, psychological, and physiological pathways. Interventions targeting the timing and context of device use, alongside sleep hygiene education, may mitigate these effects. Longitudinal and experimental studies are needed to clarify causal relationships and inform effective strategies for promoting healthy adolescent sleep.

KEYWORDS

Adolescents, Social Media, Sleep Quality, Circadian Rhythm, Blue Light, Nighttime Screen Use

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Introduction

Sleep is a physiological state characterized by two main phases: NREM (non-rapid eye movement) sleep and REM (rapid eye movement) sleep. NREM sleep includes stages of progressively deeper sleep, during which metabolic rate decreases, whereas REM sleep is associated with increased brain activity. These phases alternate cyclically, approximately every 90 minutes. According to Liew and Aung (2021), the recommended sleep duration is up to 9 hours for children and adolescents and 7–8 hours for adults. Adequate sleep is essential for maintaining homeostasis, supporting cognitive function, regulating emotions, and promoting overall well-being. Both sleep duration and quality are therefore of significant social and health importance.

During adolescence, profound neurobiological changes occur, including synaptic pruning and the strengthening of neural networks, particularly within the prefrontal cortex and limbic system, which are critical for the maturation of executive functions, emotional regulation, and decision-making abilities (Blakemore & Choudhury, 2006; Tarokh et al., 2016). Sleep plays a central role in facilitating these developmental processes by supporting neuroplasticity and promoting the consolidation of newly acquired information (Diekelmann & Born, 2010; Walker, 2017). Importantly, distinct stages of sleep contribute differentially to cognitive and emotional functioning, with NREM sleep primarily involved in declarative memory consolidation, and REM sleep supporting procedural learning and emotional processing (Diekelmann & Born, 2010; Walker, 2017).

In addition to its role in brain development, sleep is essential for endocrine regulation and somatic growth. The secretion of growth hormone peaks during slow-wave sleep, underscoring the importance of sufficient and high-quality sleep for physical development (Van Cauter & Plat, 1996; Tarokh et al., 2016).

Furthermore, sleep contributes to metabolic regulation and immune functioning, highlighting its broad systemic impact on adolescent health (Tarokh et al., 2016).

Importantly, insufficient sleep during adolescence has been associated with a wide range of adverse outcomes, including impaired academic performance, increased emotional reactivity, and a heightened risk of mental health disorders such as depression and anxiety (Dahl & Lewin, 2002; Hershner & Chervin, 2014). Given the complex interplay between sleep, brain maturation, and psychosocial development, sleep should be considered a fundamental component of adolescent health rather than a secondary lifestyle factor.

The sleep–wake cycle is regulated by the circadian rhythm, which is influenced by external factors, primarily light. The circadian rhythm is a cycle of physiological and behavioral processes that allows organisms to anticipate and adapt to regular environmental changes, such as the alternation between day and night. The suprachiasmatic nucleus (SCN) of the hypothalamus serves as the central pacemaker, coordinating peripheral clocks throughout the body. This coordination is based mainly on light information received by retinal photoreceptors. Exposure to short-wavelength (blue) light inhibits melatonin secretion by the pineal gland, promoting wakefulness, whereas the absence of light in the evening triggers melatonin synthesis, facilitating sleep onset (Czeisler et al., 1999; Foster & Kreitzman, 2017).

With the growing popularity of social media and increased access to mobile devices at younger ages, evening engagement with these platforms has emerged as a significant concern. Evening engagement with social media can negatively affect sleep quality and duration (Scott, Biello, & Woods, 2019; Ndubisi, Agyapong-Opoku, & Agyapong, 2025). These sleep disturbances may, in turn, affect other aspects of daily functioning. Adolescents tend to spend more time on social media than other age groups, and these platforms may have a stronger emotional impact, potentially contributing to problematic or addictive behaviors (Alonzo et al., 2021; Kuss & Griffiths, 2017). Due to these risks, the World Health Organization has identified problematic patterns of digital technology use as an emerging global health concern (World Health Organization, 2019).

Social media use also increases exposure to blue light emitted by smartphones, tablets, and computers. Blue light refers to short-wavelength visible light (approximately 400–500 nm) that is naturally emitted by the sun and artificially generated by electronic devices. It constitutes a portion of the visible light spectrum characterized by relatively high energy and short wavelength (Cajochen, 2007). Evening use of light-emitting devices, especially when used shortly before bedtime, can suppress melatonin secretion and delay circadian timing, which may negatively affect sleep onset and quality (Chang et al., 2015; Wang et al., 2020). While some studies report mixed findings regarding the magnitude of these effects in naturalistic settings, the overall evidence suggests that screen use in the evening is a risk factor for circadian rhythm disruption and poorer sleep outcomes in adolescents and young adults (Hale & Guan, 2015; Exelmans & Van den Bulck, 2016).

Engagement in online social interactions and exposure to notifications may heighten nervous system arousal, thereby delaying sleep onset. These disruptions can contribute to dysregulation of the sleep–wake cycle, and over time, this can result in a misalignment between endogenous circadian rhythms and social obligations, a phenomenon often referred to as “social jet lag” (Roenneberg & Merrow, 2005). Although the mechanisms are complex and partially individual-dependent, the evidence indicates that evening social media use can have both behavioral and physiological consequences for adolescent sleep.

The aim of this narrative review is to examine the relationship between social media use, blue light exposure and sleep disturbances in adolescents, focusing on underlying behavioral, psychological and physiological mechanisms.

Methodology

This narrative review examines the impact of nighttime social media and digital device use on sleep quality in adolescents, with a focus on behavioral, psychological, and physiological mechanisms. A structured literature search was conducted to identify relevant studies, primarily using the PubMed database, with additional sources identified through Google Scholar. The search focused on studies published between 2016 and 2026, prioritizing peer-reviewed original research articles, systematic reviews, and meta-analyses.

The search strategy included combinations of keywords such as “social media,” “screen time,” “adolescents,” “sleep quality,” “sleep duration,” “circadian rhythm,” and “blue light exposure,” combined using Boolean operators (AND, OR) to refine the search.

Studies were included if they met the following criteria: peer-reviewed original research articles, systematic reviews, or meta-analyses; focused primarily on adolescents; and investigated the relationship between social media use, digital device exposure, or screen time and sleep outcomes, including sleep duration,

sleep onset latency, and sleep quality. Studies focusing exclusively on clinical populations with sleep disorders unrelated to social media or screen use were excluded. Only publications in English were considered.

Following the initial search, titles and abstracts of a total of 24 identified publications were screened for relevance. Full texts were subsequently reviewed, and key information including study design, sample characteristics, main findings, and proposed mechanisms was extracted. Selected studies were synthesized narratively rather than quantitatively.

To provide a comprehensive understanding of the topic, foundational studies published prior to 2016 were also included when offered relevant context on sleep physiology, circadian rhythm regulation or mechanisms of screen use (e.g., Czeisler et al., 1999; Van Cauter & Plat, 1996) as well as influential empirical studies on screen use and sleep behavior (Hale & Guan, 2015). Reports from international organizations, including the World Health Organization (2019), were also considered where appropriate.

This narrative review does not aim to conduct a meta-analysis; rather it provides a qualitative synthesis of current evidence, identifies research gaps and highlights directions for future research on the impact of nighttime social media and digital device use on adolescent sleep.

Results

The reviewed studies consistently show that nighttime social media use negatively affects adolescent sleep through behavioral, psychological and physiological pathways. The evidence suggests a multidimensional relationship in which behavioral habits, emotional processes, and biological mechanisms interact to negatively influence sleep quality.

1. Behavioral mechanisms.

1.1 Delayed bedtime and sleep displacement.

Evidence indicates that increased time spent on social media is associated with delayed bedtime, reduced sleep duration, and poorer sleep quality among adolescents. In a cross-sectional study of 11,872 adolescents aged 13-15 years, Scott et al. (2019) found that higher levels of social media use were significantly correlated with later bedtimes, shorter sleep duration and poorer sleep quality. Adolescents classified as high users (social media usage more than 5 hours a day) reported more difficulty falling asleep and returning to sleep after nocturnal awakenings. Systematic reviews and meta-analyses support these findings demonstrating a negative association between overall screen time and sleep outcomes (Hale & Guan, 2015; Wang et al., 2020; Carter et al., 2021).

1.2 Nighttime engagement.

Another important factor contributing to sleep disruption is nighttime engagement with social media. Notifications and constant connectivity create opportunities for immediate interaction, increasing the likelihood of prolonged use and delayed sleep onset (Fiore et al., 2025). Nighttime notifications may also interrupt sleep and induce cognitive and emotional arousal, further impairing sleep continuity. Across studies, adolescents frequently report engaging in bedtime social media use driven by social motivations, habitual checking, and fear of missing out (FOMO), which reinforce prolonged screen exposure and bedtime procrastination (Scott et al., 2019; Kuss & Griffiths, 2017). Problematic or excessive use is particularly associated with difficulties disengaging from devices, reflecting patterns similar to behavioral addiction (Kuss & Griffiths, 2017).

2. Psychological mechanisms.

Studies indicate that social media use, particularly in the evening, is associated with increased psychological arousal and adverse mental health outcomes. Higher levels of use have been linked to elevated symptoms of anxiety, depression and psychological distress (Liew & Aung, 2021). Mechanisms described include social comparison, validation-seeking behaviors and fear of missing out (FOMO) all of which are associated with increased cognitive and emotional activation before sleep (Scott et al., 2019; Carter et al., 2021). Adolescents reporting negative online experiences also exhibit greater sleep disturbances and higher levels of internalizing symptoms, suggesting a bidirectional relationship between emotional distress and sleep problems (Carter et al., 2021). Sleep disruption appears to play a mediating role in this relationship. Evening social media use contributes to delayed circadian timing and “social jetlag,” which are associated with emotional dysregulation and poorer mental health outcomes (Tordjman et al., 2017). Furthermore, evidence suggests that problematic or addictive patterns of social media use have a stronger association with mental health difficulties than general usage alone (Kuss & Griffiths, 2017).

3. Physiological mechanisms.

The findings highlight several physiological mechanisms linking social media use with sleep disruption, particularly those related to circadian rhythm regulation and light exposure.

Exposure to blue light emitted by electronic devices suppresses melatonin secretion, a hormone critical for regulating the sleep–wake cycle, and delays circadian timing (Chang et al., 2015; Silvani et al., 2022). This effect is especially pronounced during evening and nighttime use, when endogenous melatonin production is naturally increasing. Disruptions in circadian rhythms have been linked to delayed sleep onset, reduced sleep efficiency, and increased daytime sleepiness (Roenneberg & Merrow, 2005; Czeisler et al., 1999).

However, it is important to note that blue light does not exert exclusively negative effects. Under controlled conditions, it may enhance alertness, improve reaction time, and support cognitive performance. These effects depend on the timing, intensity, and duration of exposure, with negative consequences primarily associated with evening use (Silvani et al., 2022). Experimental evidence also suggests that the timing of light exposure is critical: evening exposure to light-emitting devices delays sleep onset and reduces next-morning alertness, whereas controlled daytime exposure may have beneficial effects on alertness and performance (Chang et al., 2015; Silvani et al., 2022; Fiore et al., 2025).

In addition to light exposure, the type of device plays a significant role. Evidence suggests that smartphones are particularly disruptive to sleep due to their portability, accessibility, and frequent notifications, which promote continuous engagement. Compared to other devices, smartphone use is more strongly associated with delayed sleep onset, shorter sleep duration, and poorer sleep quality (Fiore et al., 2025).

Overall, these physiological and behavioral mechanisms contribute to shorter and more fragmented sleep, increased daytime sleepiness, and reduced cognitive functioning (Wang et al., 2020; Liew & Aung, 2021). Emerging evidence also links these sleep disturbances to broader health behaviors, including reduced physical activity and poorer overall well-being.

Summary of results.

Taken together, the results indicate that social media use before bedtime negatively affects adolescent sleep through interacting behavioral, psychological, and physiological mechanisms. Evening engagement leads to delayed sleep and reduced sleep duration, increased emotional and cognitive arousal, and disruption of circadian processes. These combined effects result in poorer sleep quality, greater daytime fatigue, and increased risk of mental health difficulties.

Table 1. Effects of different mechanisms on sleep disturbances in adolescents.

Mechanism	Description
Behavioral	Delayed bedtime, sleep displacement, bedtime procrastination, habitual checking, FOMO
Psychological	Increased emotional/cognitive arousal, social comparison, validation-seeking, anxiety, depression
Physiological	Blue light exposure, circadian rhythm disruption, melatonin suppression

Note: Own elaboration based on multiple sources (see References).

Discussion

The present findings provide strong evidence that social media use before bedtime negatively affects sleep among adolescents through interconnected behavioral, psychological, and physiological mechanisms. The results are consistent with existing literature and support a multidimensional model in which these factors interact and reinforce one another.

From a behavioral perspective, the findings confirm that adolescents who engage in social media use in the evening tend to delay bedtime and reduce total sleep duration. This supports previous research indicating that screen-based activities displace sleep and contribute to irregular sleep schedules (Hale & Guan, 2015; Wang et al., 2020). The concept of behavioral displacement appears particularly relevant, as time spent on social media replaces essential restorative behaviors such as sleep. Furthermore, the habitual and potentially addictive nature of social media use (Kuss & Griffiths, 2017) helps explain why adolescents experience difficulty disengaging from devices, especially in the absence of clear stopping cues.

Psychologically, the findings highlight the role of emotional and cognitive arousal in sleep disruption. Evening social media use exposes adolescents to stimulating and emotionally salient content, which increases alertness and interferes with the ability to fall asleep. This is consistent with research linking screen use to heightened arousal and poorer sleep quality (Scott et al., 2019). Moreover, the association between sleep deprivation and negative mental health outcomes, including depression and anxiety, suggests a bidirectional relationship in which poor sleep and psychological distress reinforce each other (Liew & Aung, 2021; Tordjman et al., 2017). Importantly, problematic patterns of use appear to be more strongly associated with these outcomes than general usage, indicating that not only the duration but also the nature of engagement is critical.

At the physiological level, the results support the role of circadian rhythm disruption as a key mechanism. Exposure to blue light in the evening suppresses melatonin production and delays sleep onset, as demonstrated in experimental studies (Chang et al., 2015; Silvani et al., 2022). This disruption affects the circadian timing system, which is fundamental for regulating the sleep–wake cycle (Czeisler et al., 1999; Foster & Kreitzman, 2017). The findings also suggest that smartphones may be particularly disruptive due to their constant accessibility and notification systems (Fiore et al., 2025), which combine physiological stimulation with behavioral reinforcement.

Importantly, the results indicate that these mechanisms do not operate independently. Instead, they form a reinforcing cycle: behavioral patterns (e.g., prolonged use) increase exposure to stimulating content and blue light, which in turn heightens psychological arousal and disrupts physiological sleep regulation. This leads to delayed sleep onset, shorter sleep duration, and poorer sleep quality, ultimately contributing to daytime fatigue and impaired functioning.

Implications.

These findings have important practical implications. Interventions aimed at improving adolescent sleep should address not only the duration of screen time but also the timing and context of use. Limiting nighttime notifications, promoting device-free periods before bedtime and implementing sleep hygiene education may help mitigate the negative effects on sleep. Educational programs should raise awareness of the interactions between digital behavior, sleep, and mental health.

Limitations and future research.

Despite the consistency of findings, several limitations should be acknowledged. Much of the existing research relies on self-reported data, which may be subject to bias. Additionally, many studies are cross-sectional, limiting the ability to draw causal conclusions. Future research should employ longitudinal and experimental designs to better understand causal relationships and underlying mechanisms.

Further investigation is also needed to differentiate between types of social media use (e.g., passive vs. active engagement) and their specific effects on sleep. The role of individual differences, such as susceptibility to addiction or emotional sensitivity, should also be explored.

Conclusions

In conclusion, the present study highlights the significant impact of social media use before bedtime on adolescent sleep. Nighttime social media use is consistently associated with poorer sleep outcomes in adolescents, primarily mediated through delayed bedtime, heightened emotional arousal and circadian disruptions due to blue light exposure. Behavioral patterns such as habitual device checking and FOMO interact with psychological and physiological mechanisms, reinforcing poor sleep quality and shorter sleep duration. Addressing the timing, context and patterns of social media use, alongside sleep hygiene education, may help mitigate these negative effects. Future research should focus on longitudinal and experimental designs to clarify causal pathways and identify effective strategies to support healthy adolescent sleep.

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

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