

# The Impact of Smartphone Use before Bedtime on Sleep Quality among College Students: A Review

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**Abstract:** With the widespread use of smartphones, smartphone use before bedtime has become a common behavior among college students, closely linked to their sleep quality issues. This review aims to systematically synthesize existing research to explore the impact of smartphone use before bedtime on college students' sleep quality and its underlying mechanisms, and to propose targeted intervention strategies. A comprehensive analysis of relevant literature shows that sleep problems such as delayed sleep onset, insufficient sleep duration, and poor sleep quality are prevalent among Chinese college students. There is a significant negative correlation between smartphone use before sleep and sleep quality: the blue light emitted by smartphone screens inhibits melatonin secretion and disrupts circadian rhythms; continuous psychological arousal and cognitive stimulation from new media content, combined with “revenge bedtime procrastination” and sleep delay caused by poor self-control, collectively form a complex pathway that impairs sleep quality. To address these issues, interventions should be implemented at both the individual and school levels. College students should maintain regular routines, avoid electronic devices before bedtime, and optimize sleep environments; colleges and universities need to construct a multi-dimensional sleep health support system through campus cultural activities, dormitory management, and health education. This review emphasizes the importance of reducing smartphone use before bedtime and building a multi-stakeholder collaborative intervention system, which is crucial for helping college students develop healthy sleep habits and promoting their academic progress and physical and mental well-being.

**Keywords:** College students; Smartphone use before bedtime; Sleep quality; Intervention strategies

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## 1. Overview

The “2024 White Paper on Sleep Health of Chinese Residents” shows that in China, 64% of residents experience sleep quality problems, and 22% of them have poor sleep quality. This report also shows that 56% of college students use their smartphones for more than 8 hours daily and go to sleep after midnight, while 19% fall asleep past 2 a.m.<sup>[1]</sup>. With the development of technology, smartphone addiction has become a significant risk factor affecting the sleep quality of college students. College students face diverse academic pressures, including heavy

course loads and tight study schedules. These factors may lead some students to alleviate stress through excessive use of smartphones and then develop into some smartphone dependence behaviors<sup>[2]</sup>. This kind of negative impact on sleeping has also attracted widespread attention. Therefore, this study aims to review the relevant research and examine the impact of smartphone use before bedtime on the sleep quality of college students and its mechanism of action.

In this study, sleep quality refers to an individual's subjective assessment of their own sleep status, which is a comprehensive indicator, reflecting issues such as sleep efficiency and sleep duration<sup>[3]</sup>. The quality of college students' sleep is significantly correlated with their condition the following day. As the future driving force of society, college students' sleep issues should be addressed. Based on the biopsychosocial medical model, this article analyzes the complex pathways through which pre-sleep smartphone use affects sleep from multiple dimensions, including physiological mechanisms, psychological factors, and social environment, aiming to help students plan their smartphone use time appropriately, promote healthy sleep habits, and provide guidance on dormitory management<sup>[4]</sup>.

## **2. Sleep quality**

### **2.1. Concepts of sleep quality**

Sleep quality refers to an individual's overall satisfaction with their sleep experience, and its main components include the speed of falling asleep and sleep duration<sup>[5]</sup>. Sleep quality is a multi-dimensional, complex concept that integrates subjective and objective components. It is not merely about "how many hours you sleep"—instead, it constitutes a comprehensive evaluation of both an individual's subjective perceptions and objective physiological metrics, centered on sleep integrity, efficiency, and satisfaction. Sleep quality is a core pillar of health. High-quality sleep not only means an adequate amount of sleep, but also represents an ideal state in terms of sleep structure, process, and recovery effect. In contrast, long-term poor sleep quality is closely associated with a range of physical and mental health issues, including impaired cognitive function, weakened immune function, emotional problems, and increased risk of cardiovascular disease. Therefore, it is essential to improve college students' sleep quality through targeted measures, which begins with identifying the factors that lead to their poor sleep. Given the close link between sleep quality and their academic performance, mental health, and overall development, clarifying these influential factors is crucial for designing interventions that effectively address their sleep problems.

### **2.2. Existing research on sleep quality**

#### **2.2.1. Sleep quality status**

The "2025 White Paper on China Sleep Health Research" shows that the average nighttime sleep duration for individuals aged 18 to 25 is less than 7 hours, with college students constituting the primary demographic. Among them, 25% of college students go to sleep after 2 a.m., 39% of college students use smartphones for more than 8 hours a day, and with the increase in daily smartphone usage time, both the time of falling asleep and the time of waking up are constantly delayed<sup>[6]</sup>. Currently, the status of sleep quality among college students in China is generally not optimistic. It exhibits a typical characteristic of "delayed sleep, insufficient sleep duration, and poor sleep quality." Moreover, whether or not to use a smartphone before going to sleep directly affects sleep quality. Using a smartphone before going to sleep can easily cause individuals to remain in a state of information alertness, exacerbating prolonged sleep latency and sleep fragmentation, resulting in poor sleep quality among college students<sup>[6]</sup>. It is increasingly common for college students to practice revenge bedtime procrastination nowadays.

Following a busy schedule of classes, they tend to extend their entertainment time by staying up late, even though they must get up around 8 a.m. the next morning. This repetitive vicious cycle of “late sleep and early rising” further worsens their already compromised sleep quality.

### **2.2.2. College students’ perception of sleep quality**

Nowadays, many college students consider staying up late as a “standard part” of their college life. College students generally believe that sacrificing sleep time for studying (doing homework, preparing for exams), socializing (participating in club activities, meeting up with friends), and entertainment (playing games, watching short videos) is worthwhile and even inevitable. Some college students, believing they are young and in good health, dismiss the consequences of shortened sleep as insignificant. They assume that catching up on sleep later can make up for it, lacking awareness that chronic sleep deprivation will accumulate health risks over time. Meanwhile, there is still a large number of college students who erroneously equate “getting 8 hours of sleep” with good sleep quality, overlooking the impact of sleep regularity (i.e., whether they go to bed and wake up on time) and sleep depth (e.g., whether they dream frequently or wake up easily) on overall sleep quality. Due to such erroneous cognitions, some students still experience unexplained excessive daytime sleepiness even after getting adequate sleep. Moreover, there is also some evidence suggesting that sleep problems are associated with an increased risk of death <sup>[7]</sup>, and a variety of adverse health outcomes, such as mental health issues, cardiovascular and metabolic diseases, as well as cancers <sup>[8-10]</sup>. Therefore, establishing college students’ accurate perceptions of sleep quality is a key factor in safeguarding their health.

## **3. Smartphone use prevalence**

According to data from the China Internet Network Information Center (CNNIC), as of December 2023, the netizen population in China reached 1.079 billion, with mobile netizens accounting for 1.076 billion. Meanwhile, the number of active mobile phone models monitored in China’s domestic market surged to 2.6 million (including Android and Apple App Stores) <sup>[11]</sup>. Smartphones offer a wide range of functionalities, such as accessing the Internet, managing emails, playing online games, engaging with social networks, and making online payments <sup>[12]</sup>. The massive amount of information constantly pushed by new media, precise algorithmic recommendations, and real-time feedback mechanisms—while drawing college students’ attention—has fostered their psychological and behavioral reliance on smartphones. This may even lead to uncontrolled usage in scenarios such as academic learning and social interactions <sup>[13]</sup>. The 21st century’s exponential growth of mobile communication technology has restructured human socialization. Smartphones, the most permeating digital medium, have evolved into core tools that college students carry daily and utilize frequently, with the prevalent usage trait of “seamless human-machine synergy and non-stop companionship” <sup>[14]</sup>.

Contemporary college students are “smartphone natives”—born amid the vigorous development of smartphones. This is an era where smartphones have radically transformed the ways college students live, study, and socialize <sup>[15]</sup>. Contemporary college students’ smartphone usage exhibits distinct characteristics of long duration, high frequency, and diverse scenarios. Nearly half of their waking hours are spent interacting with smartphones, which have been deeply integrated into their study, socialization, and entertainment. Smartphones also serve college students in multiple ways: receiving real-time school notifications and course adjustment information, searching for learning materials and academic papers, maintaining interpersonal ties via diverse social

media and instant messaging tools, and alleviating stress and regulating moods through short videos, music, and gaming. This also makes smartphones an indispensable “electronic organ” in their daily lives.

Smartphones do provide some conveniences for college students. However, it is worth emphasizing that a considerable number of college students turn to smartphones for non-academic pursuits—including short video consumption, gaming, social media scrolling, and novel reading—while in class. Such in-class distractions not only hinder their mastery of course content but also lead to a noticeable drop in subsequent learning efficiency.

#### **4. The correlation between smartphone use before bedtime and sleep quality**

The correlation between smartphone use before bedtime and sleep quality is a research area of interest to many researchers. Some existing studies show that having enough sleep is important for improving students’ academic performance. Therefore, the factors that deeply affect sleep quality have drawn the attention of researchers, such as the stress from studying and the use of electronic devices before going to sleep. Sleep quality has a significant impact on cognitive abilities and physical strength, while poor sleep quality may lead to serious consequences, such as depression, impaired work performance, work-related motor vehicle accidents, and poor overall quality of life <sup>[16]</sup>. Poor sleep quality has been reported to be closely associated with mobile phone addiction. Some empirical studies suggest that if an individual is exposed to the light emitted by a smartphone for a long time, the secretion of human melatonin may be suppressed, thereby damaging sleep quality. Specifically, excessive use of smartphones may disrupt an individual’s sleep and prolong the time to fall asleep <sup>[17]</sup>. During the COVID-19 pandemic, a study on excessive smartphone use among medical students indicates that such use may reflect inappropriate means of emotional coping. This not only severely impacts their quality of life and academic performance, but also potentially compromises sleep quality <sup>[18]</sup>.

A study has shown that both male and female participants who are addicted to smartphones experience disrupted sleep and a significant decline in sleep quality <sup>[19]</sup>. The issue with smartphone use is attributed to time displacement, where excessive smartphone use delays bedtime when individuals are engaged in media content. Currently, the brightness of a mobile phone screen can affect sleep quality has also been widely proved. However, whether the duration of content usage on various media platforms has an impact on sleep quality remains to be studied, and it can only be stated that there may be a potential relationship.

The Chinese Academy of Social Sciences released the “China Sleep Report 2023” on World Sleep Day, in which a survey of college students’ sleep conditions found that nearly 80% of college students went to sleep after 11:30 p.m., and 16.96% of college students went to bed after 1:30 a.m. Even though 85.57% of college students have sleepiness as they sleep (including “occasionally have” and “sometimes have”), while only 3.07% of them did not stay up late <sup>[20]</sup>. This study has shown that the more severe your smartphone dependency is, the poorer your sleep quality becomes <sup>[21]</sup>, which indicates that smartphone use during college increases the risk of poor sleep quality <sup>[22]</sup>. For college students, smartphone dependency not only directly impacts sleep quality but also indirectly affects it by causing bedtime procrastination <sup>[23]</sup>. Individuals with low self-control are prone to being distracted by electronic devices and recreational activities before going to sleep. Such behaviors often lead to misperception of time when college students are immersed in these activities before going to sleep, inadvertently triggering sleep procrastination and consequently resulting in sleep disturbances. These individuals indulge in the immediate rewards and temporary pleasures brought by games. Even more concerning, some repeatedly activate their physical and neural systems for gaming, forcing themselves to stay awake and reversing their day-night rhythms,

which ultimately leads to severe sleep disorders <sup>[24]</sup>.

## **5. Healthy sleep habits and suggestions on proper smartphone use before bedtime**

World Sleep Day is observed annually on March 21. This setting reflects the increasing emphasis on sleep in society. The National Health Commission of the People's Republic of China has issued eight practical people-centered initiatives for the entire health system in 2025, with the second one specifically focusing on national sleep health. This evidence shows that sleep is very important and needs the attention of the whole society. Cultivating healthy sleep habits is fundamental to safeguarding physical and mental health, as well as boosting daily energy and productivity. High-quality sleep is the cornerstone of healthy sleep, typically characterized by falling asleep within 30 minutes, waking no more than three times nightly, and falling back asleep within 20 minutes of each awakening, and waking up feeling refreshed, in a positive mood, energetic, and focused <sup>[25]</sup>. However, many college students still pay insufficient attention to their sleep issues. The causes of sleep disorders in this population are complex, diverse, and interrelated. Therefore, it is essential to prioritize sleep health education for college students, actively explore effective intervention measures, innovate sleep disorder treatment methods, monitor college students' sleep status, and detect issues and intervene promptly <sup>[26]</sup>.

Targeting the phenomenon of college students using smartphones before bedtime, interventions for college students' sleep should be carried out at both the student and school levels. In terms of immediate actions individuals can take, it is necessary to stay away from electronic devices, such as smartphones and PCs, at least 30–60 minutes before bedtime, as the blue light emitted by screens can suppress the secretion of melatonin and interfere with sleep <sup>[27]</sup>. Instead of using the smartphone, it is better to use this time for reading physical books, listening to music, or meditating. Additionally, before going to bed, it is a good idea to avoid carrying smartphones to the bedroom. For example, we can place them outside the bedroom for charging, or at least in a location where we cannot easily reach them without getting up. At the same time, turn off all non-essential app notifications and set the device to silent or “Do Not Disturb” mode, thus creating a period of undisturbed rest for us. Moreover, college students can utilize the built-in screen time management tools on their phones to set daily usage limits, receive reminders, or even have their device locked when the limit is exceeded. Furthermore, to promote high-quality sleep, college students can actively create a suitable sleep environment. For example, ensure the environment is dark by installing blackout curtains or using eye masks to promote the natural secretion of melatonin.

From the perspective of universities, a multi-dimensional sleep health support system can be established. Universities can organize diverse campus cultural activities and encourage students to participate by increasing the value of extracurricular activity practice points. They can also utilize campus bulletin boards to publicize the dangers of mobile phone dependency. Furthermore, universities can strengthen dormitory management, implement regular power cuts, conduct inspections, and incorporate these into dormitory assessment criteria <sup>[23]</sup>. Universities should emphasize the importance of regular sleep patterns from the first year of college, viewing it as an equally important aspect of academic success, and help students establish correct health concepts from the beginning. In classes, students can be elected to train as class psychological committee members, and in dormitories, dormitory heads can be appointed as “sleep health promotion committee members,” allowing them to spread healthy sleep concepts among classmates, promptly identify and care for peers with severe sleep problems. Through the joint efforts of the school and individuals, students can be helped to value and improve their sleep conditions.

Last but not least, we need to pay attention to long-term healthy sleep development for college students. It is noticeable for college students to maintain a regular sleep schedule, stabilize their “biological clock,” and ensure they get 7–9 hours of sufficient sleep every night. That is to say, it is important to try to fall asleep at the same time every night and get up at the same time every morning, even on holidays. Physical training can help us gradually establish a good “biological clock”<sup>[28]</sup>, enabling it to form a virtuous cycle, making it easier to fall asleep and wake up naturally. In addition, it is a good idea for college students to participate in various sports clubs, volunteer services, and so on. These outdoor activities not only help them exercise, cultivate hobbies and social skills, but also help improve mood and reduce stress, thereby reducing dependence on smartphones and improving quality of life<sup>[29]</sup>.

## 6. Conclusion

To conclude, smartphone use before bedtime is a key risk factor contributing to poor sleep quality among college students. A significant negative correlation exists between the two, and the underlying influencing mechanisms are complex and multifaceted, requiring comprehensive interventions at the individual, school, and even social levels. First, some current research reveals that sleep problems among Chinese college students are prevalent and severe, with high-frequency smartphone use closely linked to these issues. Smartphone use before bedtime prolongs sleep latency, which results in reduced sleep duration and compromised daytime mental state. Second, the blue light emitted by smartphone screens inhibits melatonin secretion and disrupts circadian rhythms. In addition, new media content on smartphones induces sustained psychological arousal and cognitive stimulation; “Revenge bedtime procrastination”—a behavior to compensate for lost personal time—and sleep delay caused by poor self-control collectively constitute a complex pathway influencing sleep. Smartphones are no longer merely tools but have evolved into “disruptors” that encroach on sleep time and impair sleep quality. To address college students’ sleep issues, the primary objective is to “reduce smartphone use before bedtime” by establishing a multi-stakeholder collaborative system, fostering healthy sleep awareness, enhancing health education, and consistently emphasizing the significance of sleep health. This will help college students reshape healthy daily routines and lay a solid foundation for their academic progress and physical and mental well-being.

## Disclosure statement

The authors declare no conflict of interest.

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