

Social Media Use and Sleep Quality among Adolescents

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Abstract. Under the background of the rapid popularization of digital media, short videos rely on personalized recommendation algorithms to widely penetrate the daily life of teenagers. The sleep health of adolescents is deeply affected by the media environment, and related communication and public health issues have gradually attracted the attention of the academic community. This study takes the short video recommendation algorithm as the entry point, uses literature analysis to sort out relevant empirical literature at home and abroad, and systematically analyses the intrinsic mechanism of short videos affecting the sleep of adolescents. The study found that short videos can interfere with the secretion of melatonin through blue light on the screen to form physiological sleep disturbances. At the same time, negative emotions such as fear and loneliness can constitute a psychological intermediary path to damage sleep quality, and there are obvious differences in gender and intensity of use. The existing research still has shortcomings such as geographical limitations of samples, mostly cross-sectional research, and lack of special discussion of short video algorithms. This study suggests that platforms, families, and schools should work together to develop effective interventions and help adolescents establish healthy media-use habits. These efforts may provide a useful theoretical reference for protecting adolescent sleep health.

Keywords: Short video, recommendation algorithms, adolescent, sleep health, social media

1. Introduction

This study focusses on the realistic background of the rapid development of short video media in the digital era and the increasingly common behavior of adolescents' bedtime media use. It is of great practical significance to clarify how short video algorithms play a role in adolescents' sleep, which is of great practical significance to the protection of adolescents' physical and mental health, media literacy education and network platform regulation. This study is mainly carried out from the three aspects of physiological influence mechanism, psychological intermediary path, and research controversy of group heterogeneity. The literature analysis method is used to find and read relevant information and literature. The advantage of this method is that it can integrate different empirical research conclusions and sort out the correlation logic between variables, which is conducive to the promotion of qualitative research. The final research goal of this study is to sort out the complete conduction path of short video algorithms affecting the sleep of adolescents, point out the gaps and limitations of existing research, and put forward multi-party collaborative optimization

countermeasures to provide reference for adolescent health media management. In order to achieve the goal, this study systematically collates, summarizes and compares many relevant empirical literatures abroad.

With the development of the Internet and digital media, social media has gradually integrated into the daily life of teenagers and become an important way for them to obtain information, social interaction and leisure entertainment. Among them, the short video platform relies on fast-updated content, fragmented video forms and personalized recommendation mechanisms to provide continuous content stimulation for teenagers. At the same time, teenagers are in an important stage of physical and mental development. Adequate and regular sleep is of great significance to brain development, cognitive function and emotional regulation. Therefore, with the increasing use of social media by teenagers, the relationship between social media use and sleep has gradually become an important issue of concern for psychological research. Existing studies generally show that higher levels of social media use or problematic social media use are associated with shorter sleep duration and more sleep difficulties among adolescents. Why does social media affect adolescents' sleep quality? Through which pathways might social media use influence adolescent sleep?

One important factor may be the prolonged and excessive use of social media before bedtime, which can negatively affect adolescents' sleep health. Screen exposure before bedtime may have physiological effects on adolescents. The continuous visual stimulation and flow of information from short videos may keep the brain in an alert state, delay sleep onset, shorten sleep duration, and reduce sleep quality. Long-term late-night media use and insufficient sleep may further contribute to a range of physical and psychological problems, including difficulty maintaining attention, reduced learning efficiency, emotional instability, anxiety, and fatigue. These effects may negatively affect adolescents' physical and psychological development.

However, screen exposure alone may not be sufficient to keep adolescents engaged with short-video content for extended periods. At present, many studies in the academic community have confirmed that there is a significant correlation between the use of social media and adolescent sleep disorders. Most studies focus on analyzing the relationship between the duration of use, frequency of use and sleep quality. However, existing studies often ignore the inducing nature of the short video algorithm recommendation mechanism itself, and less deeply explore how the algorithm's infinite push, traffic feeding, and immersive closed loop can continue to induce teenagers to stay up late at the mechanism level, which is also an obvious gap in the current research.

Based on this, this study takes the short video algorithm mechanism as the core entry point, systematically analyses the physiological and psychological impact of short video algorithms on adolescent sleep, summarizes the causes of current adolescent sleep problems, and puts forward feasible improvement strategies from the three perspectives of platform supervision, family education and adolescent self-management, aiming to provide reference and reference for improving the sleep health of contemporary adolescents and standardizing the use of short videos.

2. The physiological effects of social media use on the sleep of teenagers

The high-frequency use of bedtime social media can change the physical function of adolescents before going to bed from the physiological level, disrupt the inherent circadian rhythm system of the human body, and become a fundamental cause of the decline in the quality of sleep of adolescents. The smooth falling asleep of the human body depends on the regular secretion of melatonin to regulate the time of falling asleep, sleep depth and routine cycle. The short-wave blue light released by electronic screens such as mobile phones and tablets will directly interfere with this physiological

operation mechanism. Dilloian et al. reported in their review of screen use and sleep health among adolescents that prolonged exposure to electronic screen light at night can suppress melatonin production in the brain [1]. Experimental evidence suggests that three hours of continuous electronic device use at night can suppress melatonin levels by nearly 30%, significantly prolonging sleep onset latency. Even when night mode is enabled, the negative effects of screen light on the circadian rhythm cannot be completely eliminated. Other studies on bedtime electronic device use provide further evidence that prolonged screen exposure before sleep may contribute to sleep fragmentation, frequent nighttime awakenings, daytime sleepiness, and other sleep-related problems [2].

In addition to the physiological effects of screen light, short-video platforms are designed with features such as autoplay and continuous algorithmic recommendations of new content. These features may lead adolescents to unintentionally extend their screen use before bedtime, continuously reduce the time available for sleep, and develop habitual late-night use patterns [3]. The review of the media use of adolescents also points out that the fragmented content of short videos continues to stimulate the brain's senses, maintain the nervous system's arousal level, and hinder the body from entering a state of rest. A large sample of transnational research data shows that adolescents who use social media for a long time every day are less likely to get enough sleep by about 50% [4].

At the broader review level, some scholars have carried out a systematic meta-analysis of social media, mental health and sleep. After summarizing a number of empirical studies, they confirmed that there is a significant negative correlation between the duration of screen use and adolescent sleep disorders [5]. The systematic review also draws a similar conclusion, which is recognized that the use of electronic media at night is an important variable in predicting poor sleep in adolescents [6]. For teenagers whose self-control ability is not fully mature, unrestrained short video browsing behavior breaks the natural sleep conditions of the body. Overall, the light stimulation of the electronic screen and the long-term browsing behavior driven by short video algorithms continue to shake the stability of adolescents' sleep rhythm, which constitutes the physiological basis for social media to affect sleep.

3. Factors affecting social media on sleep disorders in adolescents

Compared with intuitive physiological interference, the negative psychological state caused by the use of social media and short videos is a more critical indirect influence path that induces adolescent sleep disorders. Excessive immersion in social networks at night will cause psychological problems such as loneliness, anxiety and fear of missing, which will continue to activate the cognitive awakening state of the brain and hinder teenagers from falling asleep smoothly. A study conducted with 41 female adolescents aged 16 to 19 as a sample provides a key empirical basis for understanding this psychological path [7]. The research results show that teenagers with social media disorders have a higher level of loneliness, and the sleep time on weekdays is significantly shortened. At the same time, the study distinguishes the differences brought about by different usage patterns. The negative impact on sleep is much higher than that of passive browsing content. On this basis, many scholars have further improved the complete logical chain of psychological mediation. Studies have verified the independent intermediary role of missing fear. Teenagers are worried about missing online social dynamics and will repeatedly refresh the social platform before going to bed, which makes the brain remain excited for a long time, making it difficult to relax and fall asleep [8]. A cross-sectional survey data conducted in Iran proves that excessive use of social media is significantly related to loneliness, and persistent loneliness will increase the probability of light sleep and night wake-up [9]. Some scholars have built a chain intermediary model, and the

quantitative results show that social media addiction positively predicts the use of nocturnal media ($\beta=0.54$, $p<0.001$), and the use of social software at night negatively predicts sleep quality ($\beta=-0.35$, $p<0.001$), forming a conduction chain of "media excessive use - night media use - sleep damage" [10].

The study on psychiatric adolescent groups has expanded the boundaries of discussion. The study found that for adolescents with their own emotional problems, excessive use of social media and sleep disorders have obvious comorbidities, and psychologically vulnerable groups are more likely to fall into a vicious circle [11]. Based on the background of the epidemic, the tracking research supplemented the scenario variables. Teenagers in the home quarantine stage have more free time at night, the time spent on social software has increased significantly, and the cyclical effect between media, negative emotions and sleep deterioration continues to be amplified [12]. Based on the above empirical evidence, it can be found that simple physiological stimulation is not enough to fully explain sleep problems. Psychological emotion is an indispensable core intermediate variable that connects the use of social media and adolescent sleep disorders.

4. Analysis

The negative effects of social media and short-video use on adolescent sleep are not uniform across all adolescents. The strength of these effects may vary depending on gender, psychological state, and intensity of media use. At the same time, the association between social media use and poor sleep among adolescents remains a subject of debate in the current literature, and significant gaps remain in the existing research.

At the level of population heterogeneity, a cross-national study of 212,613 adolescents from 40 countries provided strong evidence of gender differences. Sleep-onset difficulties were more common among girls than boys (27.1% vs. 20.8%). Problematic social media use was associated with higher odds of sleep-onset difficulties among both girls (OR = 2.20, 95% CI: 2.04–2.38) and boys (OR = 1.88, 95% CI: 1.73–2.04) [4]. Findings from studies focusing specifically on female adolescents suggest that they may be more sensitive to online social comparison and negative online environments. After using social media at night, they may be more likely to experience anxiety and loneliness, which may in turn contribute to more severe sleep problems [7]. The same cross-national study also highlighted that addictive and intensive problematic media use is a key predictor of poorer sleep, whereas brief and moderate recreational use has relatively limited negative effects on sleep [4]. Findings from relevant meta-analyses support this view. General social media use shows a relatively weak association with sleep problems, while problematic or addictive use is more strongly associated with an increased risk of sleep difficulties [5].

There are still differences at the academic level. Some scholars have carried out laboratory control experiments and put forward different conclusions. In a standardised experimental environment without external interference, simple and short-term bedtime social software browsing does not significantly disturb the sleep of healthy youth groups [13]. The academic community generally believes that the difference stems from the difference between the research scenario and the sample conditions. The laboratory environment strips away real variables such as fragmented repeated mobile phone browsing, long-term emotional fluctuations, and media addiction in the home scenario. In contrast, large-scale research based on real-life scenarios is more effective and more suitable for the real state of teenagers' daily use of short videos and social software [6, 7].

Judging from the limitations and gaps of the research, many reviews have pointed out that most of the relevant foreign literatures at present focus on traditional graphic and text social platforms, and lack special discussions on short video platforms with strong personalized recommendation

algorithms and fragmented content characteristics [5, 14]. Secondly, the existing empirical evidence is mainly a cross-sectional survey, which can only verify the correlation between variables. It is difficult to clarify the causal direction, and it is impossible to determine whether excessive use of social media causes lack of sleep, or teenagers with poor sleep quality are more inclined to rely on social software to kill time at night. In addition, the existing research samples are concentrated in Europe, the United States and the Middle East, and there is a lack of empirical analysis of the current situation of the use of short videos by Chinese teenagers in China, which provides the necessary exploration space for this study to deeply explore the relationship between short video algorithms and the sleep of domestic teenagers.

5. Discussion

Based on the existing literature, this study analyses the relevant impact of short video algorithms on adolescent sleep, and sorts out the corresponding physiological and psychological mechanisms. Most of the existing foreign evidences take European and American teenagers as research samples, and the medium environment is different from that of the local one. Because this study did not carry out cross-regional sample control, it is difficult to compare the differences between Chinese and foreign teenagers affected by short video algorithms.

This study focusses on short videos. It is not compared horizontally with traditional social platforms, and it is impossible to distinguish the differences in the sleep mechanism of different social media. In addition, the argument of the article mainly relies on the conclusion of the cross-sectional investigation. There is a lack of objective physiological monitoring data in laboratory research, and it is difficult to separate the independent effects of screen light, usage time, psychological mood and other variables [13].

In terms of variable selection, the study mainly focusses on the two paths of screen blue light and dopamine stimulation. Transnational studies covering 40 countries show that multiple psychological factors such as loneliness, social comparison, and fear of missing can aggravate sleep problems in adolescents. This article fails to incorporate the above variables to build a more comprehensive analytical framework [4].

Comprehensive literature evidence shows that the use of problematic short videos is significantly related to the decline in the sleep quality of adolescents. Physiological interference and negative psychological experience overlap with each other, increasing the risk of sleep disorders. At the same time, there are group differences in the degree of influence in terms of gender and intensity of use. Follow-up research should not generalize the negative effects of short videos, and attention should be paid to group heterogeneity.

6. Conclusion

This article starts from the short video algorithm mechanism and sorts out the dual role of short videos on teenagers' sleep. On the one hand, short videos use the blue light of electronic screens to suppress melatonin secretion and produce direct physiological interference. On the other hand, they rely on algorithms to continuously push content, constantly stimulate dopamine secretion to prolong the browsing time of teenagers, and exert psychological intermediary effects through negative emotions such as loneliness, fear of missing, social comparison, etc., which eventually causes impaired sleep quality of teenagers. The harm of short videos to sleep is not equalized. Polemic and addictive use is the main cause of sleep disorder. Girls are more likely to suffer from sleep damage than boys, and the negative impact of short-term entertainment browsing is relatively limited. There

are also controversial views in existing studies, and the research results obtained in the controlled environment of the laboratory and the real home scenario are not exactly the same.

Comprehensively, it can be seen that there are obvious shortcomings in existing research. A large number of research subjects are overseas traditional graphic and text social platforms. Insufficient attention is paid to the mechanism of short video algorithms. Most of them are cross-sectional research, the ability to infer the cause and effect is limited, and there is a lack of first-hand research data of local teenagers in China. In response to the sleep risks caused by short videos, multi-party collaborative intervention is required. Families should help teenagers develop good habits of using media before going to bed and establish a lifestyle away from electronic screens before going to bed. Schools should promote media literacy education, popularise sleep health-related knowledge, and improve the self-control ability of teenagers. The short video platform needs to optimise the youth mode, adjust the night algorithm push strategy, and reduce the immersive induction of the algorithm.

Future relevant research can carry out field research for domestic teenagers, supplement local empirical data, combine with laboratory experiments on physiological monitoring, distinguish the independent role of different variables, compare the differences in the impact of short videos and traditional social platforms, and further clarify the complex intrinsic relationship between short video algorithms and adolescent sleep.

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