Interplay Between Sleep Quality, Academic Pressure and Use of Social Media in Adolescents: A Review

Tung Fong Esta Deng *

New Channel, Shenzhen, 518000, China

* Corresponding Author Email: estadeng2777@hotmail.com

Abstract. Adolescent sleep quality is a critical topic for contemporary research. Understanding the causes and potential short-term and long-term effects of sleep restriction is key in setting public policies to mitigate these effects. Researchers have found that sleep can be affected by multiple factors such as stress and use of electronic devices, yet there is still no uniform explanation as to why these factors may influence adolescents in different ways. Therefore, by reviewing papers in the fields of sleep quality, academic stress and social media use, this report investigates the correlation between the three variables and discusses the role of promotion of public health education as a means to curb adolescent sleepiness. Study shows that academic stress and the use of social media are both positively correlated with sleep quality. This indicates that higher levels of academic stress and more time spent on social media is associated with poorer sleep quality.

Keywords: Adolescent sleep quality; academic pressure; social media use.

1. Introduction

Increasing numbers of teenagers are facing issues with sleep, including frequent awakenings and even insomnia. There have been a considerable number of articles aiming to expand on this topic, revealing certain correlations with other possible mediators, two of them being academic stress and use of social media. In certain parts of the world, academic performance is highly valued and vigorously supported. Adolescents are put in high pressure settings in which they compete for places in further education against their peers, putting large amounts of stress upon their shoulders. Moreover, with the universality of electronic devices, the threshold for access to the Internet is lowered. The Internet has become an irreplaceable part of modern life, and young individuals have learned to use it for a variety of purposes, one of which being accessing social media. Teenagers socialise with both friends and strangers on these platforms, chasing the latest trends. According to previous research, more than 75% of US teenagers are on social media [1].

Though there are objective items for measuring sleep quality and stress, the combined effects of academic stress and social media use on adolescent sleep quality is still unclear. By investigating the correlations between these factors, this article places the problem of adolescent sleep issues under objective measures. Sleep quality is defined as the satisfaction of a person to their complete sleep experience, and four key attributes are identified. Academic stress is a student's psychological state resulting from pressure in a school environment, and social media is defined as websites or computer programs that allow people to communicate and share information on the Internet. Since adolescence is a stage of great biological change and maturity, it is essential to understand the potential reactions between the three variables.

2. Core Concepts

2.1. Sleep Quality

Sleep quality is a complex and multidimensional concept. Defining it requires moving beyond simplistic indicators such as sleep duration or subjective judgements of "good" or "bad". Sleep quality is defined as "an individual's self satisfaction with all aspects of the sleep experience" [2]. Key attributes identified include sleep efficiency (the ratio of the amount of total time asleep to the total time in bed), sleep latency (the time it takes to transition from wakefulness to sleep), sleep duration

(total amount of time asleep subtracting any arousals) and wake after sleep onset (the total amount of wake time after sleep onset until final awakening). This comprehensive view positions sleep quality as a holistic indicator of sleep health, linking physiological processes with psychological well-being and daytime functioning.

This multidimensional nature of sleep quality is particularly evident when examining adolescent populations. The biological shift in circadian rhythm during puberty often directly compromises the 'sleep latency' dimension, while academic and social pressures can negatively influence juveniles' self-evaluation of their sleep and impact their daytime performance, creating an intricate interplay specific to this developmental stage.

2.2. Academic Pressure

Academic pressure is defined as a student's psychological state resulting from external, social and internal, self-imposed pressure in a school environment which builds up over time [3]. Students experience academic pressure throughout their academic career, from secondary school to higher education. Sources of academic pressure include both external pressure such as examination scores and ranking, competition for higher education, family expectations and peer competition, and internal pressure such as self expectations and anxiety.

2.3. Use of Social Media

According to Cambridge Dictionary, social media are forms of electronic communication that allow people to share information using the Internet or mobile phones. Examples of social media platforms include Instagram, TikTok, and Facebook. Three modes of use of social media were identified. Passive usage, referring to the act of scrolling and viewing without active interaction; active usage, referring to posting, commenting and interacting; and nighttime usage, which specifically refers to using social media before bed or in bed. Nighttime usage, in particular, plays a crucial role in disrupting sleep patterns [4].

3. The Relation Between Adolescent Sleep Quality and Academic Pressure

3.1. Research Subject Characteristics

3.1.1. Regional and cultural backgrounds

The research papers selected and reviewed all come from China's mainland. This correlation is particularly salient in East Asian contexts, where educational systems emphasize high achievement and long study hours. The high academic expectations and fierce competition for advancement in education may be the cause for high academic pressure.

3.1.2. Age and education

Research studies were aimed at middle and high school students who were enrolled in full time school. The age range was between 12 and 18 years of age. This is a crucial period of puberty, where great biological and mental changes occur and academic stress continues to go high.

3.1.3. Sample size

Most researches adopted a large sample cross-sectional study method, and the sample sizes ranged from several hundred to several thousand. For instance, one study included over 1500 juveniles [5], ensuring that the studies had sufficient reliability and statistical power.

3.2. Research Methods

3.2.1. Research design

A cross-sectional study method was used in all reviewed papers, which meant collecting all required data at the same time. Though it reveals correlations between variables, it cannot confirm

cause-effect relations. It is not known whether academic pressure leads to poor sleep quality or vice versa.

3.2.2. Measurement tools for core variables

Sleep quality was measured via the Pittsburgh Sleep Quality Index (PSQI), which is a self-rated questionnaire that assesses sleep quality and disturbances. Other tools included one item adopted from the Nation Survey of Children's Health from the U.S. Census Bureau. For academic pressure, tools were more diverse, including the educational stress scale for adolescents, which is a 16-item test on a five-point Likert scale and the Academic Stress Questionnaire for Chinese Middle School Students [5-7]. This allowed for a more comprehensive assessment of stress dimensions among adolescents.

3.3. Conclusions and comparison

All studies confirmed the positive correlation between academic pressure and sleep quality, indicating that higher academic pressure is associated with poorer sleep quality. This fundamental finding was repeatedly verified under East Asian backgrounds.

It is worthy to note that some articles revealed mediators between academic stress and sleep quality. One specifically pointed out that higher levels of academic stress are associated with higher levels of anxiety, which leads to poorer sleep quality. School burnout could also partially mediate the association between academic stress and sleep quality by intensifying emotional exhaustion and reducing coping efficiency [5]. Another highlights the addiction pathway, where academic stress aggravates mobile phone addiction, which leads to worsened sleep quality, and at last depression [3]. This reveals that adolescents may turn to their mobile phones for relieving or even evading excessive academic stress, but this takes up time for sleep and disturbs the circadian rhythm, ultimately leading to emotional problems. From these studies, it is found that the relation between academic pressure and sleep quality is not a simple, one-way association, but a vicious cycle that strengthens and worsens through mediators such as anxiety and mobile phone addiction. An example of this would be: Academic stress first leads to anxiety, then it in turn worsens sleep quality, which causes daytime dysfunction and worsens academic performance, leading to an increase in academic stress.

3.4. Limitations

3.4.1. Method

All studies were conducted with a cross-sectional study method, which is unable to establish a clear cause-and-effect route between the variables. The above mediation models are more of a theoretical prediction, and longitudinal studies or experiments are needed to confirm them.

3.4.2. Sample

Participants were mainly sampled via convenience sampling, suggesting that future research should adopt random or stratified sampling to improve representativity. Randomized sampling was rarely adopted, and the conclusions may only stand for a certain area, in this case China's mainland. Moreover, these studies were focused on cultural backgrounds which promote high academic achievement. China's mainland in particular is a notable region where academic performance is prioritized, and the main findings of the studies may not be as prominent in areas with relatively low academic pressure.

3.4.3. Measurement tools

Most studies rely on self-report data, which comes from the subjects' questionnaires. There may be a bias in social desirability or common method. Participants experiencing low mood may report high academic pressure and poor sleep quality at the same time, whereas a student in relatively good mood may overestimate their sleep quality and underestimate their academic stress.

3.4.4. Variable control

Many of the researches fail to control confounding variables such as puberty stage or family economic status, which may simultaneously influence stress and sleep quality. In early stages of puberty, physical changes are not yet obvious, and adolescents' mentality may not yet be fully mature. Hormonal shifts also influence emotions, which lead to mood changes. These factors may affect both academic stress and sleep quality, suggesting that future studies should control for demographic and developmental factors.

4. The Relation between Adolescent Sleep Quality and Use of Social Media

4.1. Research subject characteristics

4.1.1. Regional and cultural backgrounds

The reviewed research papers originated from a wide range of cultural backgrounds, ranging from Western nations to the Middle East, highlighting the cross-cultural validity of the relationship between social media use and sleep quality. This suggests that the correlation exists across different cultural contexts, where variations in family traditions, parenting styles, and technology access may moderate this relationship.

4.1.2. Age

Research studies were aimed at adolescents from normal secondary schools or the local community, ranging from 10 to 19 years old. One specifically administered measures to those in 7^{th} and 8^{th} grade [8]. Subjects within this age range are in the crucial stage for physical and mental development, as well as the most active and prolonged period of social media use, and the most unstable stage of the circadian rhythm. This makes them highly suitable subjects for researching this correlation.

4.2. Research methods

4.2.1. Research design

A cross-sectional study method was used in all reviewed papers, which meant that data was collected at the same time. This can effectively reveal correlations between the included variables, but fails to confirm the direction of cause-and-effect.

4.2.2. Measurement tools for core variables

As stated above, sleep quality was also measured using the PSQI. Some studies measured sleep quality with single items such as sleep duration, sleep latency and symptoms of insomnia, or with these items combined. Social media use was measured with diverse indicators, most commonly duration of use, which may influence comparability and interpretation across studies. Others included frequency and mode of use, such as the interval between checking social media and nighttime usage, and addictive use of social media. One specific study used the social media addiction scale for measuring the participants' addictive use of social media [9].

4.3. Conclusions and comparison

All studies confirmed the positive correlation between use of social media and sleep quality, indicating that longer and more frequent use of social media, especially during nighttime, is associated with poorer sleep quality. This is reflected also in adolescents' behaviour, such as falling asleep later, sleeping less and being more fatigued in the day.

Social media use affects sleep quality in multiple ways. The first is sleep delay, where time spent on using social media directly takes up time for sleep. This leads to delayed time for falling asleep and reduced sleep duration, leading to fatigue in the day. Moreover, the continuous flow of information, social interaction and content on social media keeps the brain in a hyperactive state, limiting melatonin secretion and in turn increasing sleep latency. Exposure to blue light emitted from electronic devices suppresses melatonin secretion by stimulating intrinsically photosensitive retinal

ganglion cells, thereby disrupting the natural circadian rhythm of the human body. Finally, social media addiction leads to a fear of missing out, where users are afraid of missing out any status or interaction others post. This anxiety drives the user to continuously check their phone at night, even though they are aware that it severely impacts their sleep, falling into a vicious cycle of obsessive usage.

It is noted that studies not only focus on the correlation between social media use and sleep quality, but also stresses the consequences. Sleep quality is used as a mediator variable to link the use of social media to psychological disorders, such as anxiety and depression. Studies have also moved from focusing solely on duration to distinguish nighttime use, active and passive use and addictive use, leading to a more precise and reliable conclusion.

4.4. Limitations

4.4.1. Method

All reviewed studies were conducted with a cross-sectional study method. Studies were unable to confirm whether use of social media leads to poor sleep quality, or teenagers who face issues with sleep are more inclined to using social media. None of the possibilities of the two directions can be confirmed or eliminated.

4.4.2. Measurement tools

Most studies rely on self-report data. For instance, one study simply asked the participants about the duration of social media use without any objective measurement [10]. Subjects may incorrectly remember specific details or be prone to a bias of social desirability, leading to inaccurate data. In addition, rarely do studies use actigraphy to objectively observe subjects' sleep, or use applications which track screen time to measure the exact use of social media. Though one of the two mentioned may be used in prior studies, it has not yet been observed that the two tools have been used in the same study.

4.4.3. Research delays on the rapid development of social media

Social media platforms and user behavior are ever-changing, such as the transition to text and photo-based platforms like Facebook to short video platforms like TikTok. However, there is a delay for the publications for academic research, which means that conclusions may not be able to reveal the impact the most recent modes of social media have on sleep quality.

4.4.4. Variable control

Many of the researches fail to control confounding variables such as puberty stage, academic stress, baseline mental health and family economic status, which may simultaneously influence social media use and sleep quality.

5. Discussion and Suggestions

5.1. Overall conclusions of the current studies

Adolescent sleep quality, academic pressure and social media use do not exist independently. Instead, they form an interrelated, mutually reinforcing and complex system. There is a vicious cycle between sleep quality and academic pressure, where academic stress aggravates sleep quality by increasing anxiety, and insufficient sleep harms cognitive functions and emotional regulation, making students less capable of coping with academic demands, thus increasing stress. Moreover, the negative correlation underscores the role of cognitive arousal and emotional engagement as mediators linking social media use to disturbed sleep. Social media use hinders sleep quality by replacing sleep time, blue light emission and psychological awakening, whereas adolescents with poor sleep quality may be more reliant on social media for nighttime relaxation and mood regulation.

From the above, it is seen that sleep quality, academic pressure and use of social media each play a role in this intricate relation. It is also worthy to mention that social media is not only a saboteur of sleep, but may also be a magnifier or buffer for academic stress. Adolescents may experience heightened stress due to social comparison on social media, which can foster feelings of inadequacy and amplify academic pressure. They may also be able to relieve academic stress through supportive social interactions. The three create a crucial component in influencing adolescent physiological and psychological health and academic performance.

Mediators were also identified in the reviewed studies. Perceived stress bridges the gap between sleep quality and school burnout, whereas anxiety, depressive emotions and the fear of missing out play key roles in the relation of social media use and sleep problems. Social media addiction's impact goes far more than just usage duration.

5.2. Suggestions

5.2.1. Suggestions for individual adolescents

It is advised that adolescents raise awareness of sleep hygiene. It is important to realize that sleep is the foundation to learning, physiological and mental health. Following good sleep habits, such as going to bed at the same time each day can effectively improve sleep quality. Teenagers can also learn to cope with academic stress through healthier methods, such as exercise, meditation and communicating with friends and family instead of using social media.

5.2.2. Suggestions for families and schools

Family members can work together to lay down solid rules for use of social media, such as limiting social media usage to a certain time of day. Parents should be aware of the child's emotional and sleep condition, rather than solely focusing on academic performance. Open communication helps with early detection and intervention.

Schools can educate students about the importance of sleep and rational use of social media throughout their curriculum, and lessen academic stress by avoiding assigning too much homework and examinations. Schools can also ensure that students can receive professional mental counselling, to cope with stress, anxiety and addiction.

5.2.3. Suggestions for the society and policy makers

Policy makers should promote public health education by using public information channels to educate the masses about the consequences of insufficient sleep and ways to curb this issue. Corporates should also fulfill their social responsibilities by designing functions which benefit adolescent health, such as mandatory break reminders, stricter nighttime push restrictions and easier parental control.

6. Conclusion

The current review examines the interplay between adolescent sleep quality, academic stress and social media use. Studies suggest that higher academic stress and increased social media use is associated with poor sleep quality. The reviewed cross-sectional studies cite more mediators and effects between the three variables. These findings may have public health implications such as a need for public health education on sleep and stress, improvements for applications and communication between the family and the child given the high prevalence of sleep problems in adolescents, the popularisation of social media and increased reports of academic pressure in current societies.

References

[1] Vogels, E. A., Gelles-Watnick, R., & Massarat, N. (2022). Teens, Social Media and Technology 2022. Pew Research Center. https: // www.pewresearch.org/internet/ 2022 / 08/ 10/ teens-social-media-and-

technology-2022/?gad_source = 1&gad_campaignid= 22378837192&gbraid = 0AAAAA-ddO9G2Vx8nWHQO1LGx7C72nOj4W&gclid=Cj0KCQjwvJHIBhCgARIsAEQnWlBVFAD5_PcIQ8eRArWtXfhLU2pUs8axChg04PAjxH_r-faQZgCOQcUaAnCYEALw_wcB.

[2] Nelson, K. L., Davis, J. E., & Corbett, C. F. (2021). Sleep quality: An evolutionary concept analysis. Nursing Forum, 57(1), 144–151. https://doi.org/10.1111/nuf.12659.

[3] Zhang, X., Gao, F., Kang, Z., Zhou, H., Zhang, J., Li, J., Yan, J., Wang, J., Liu, H., Wu, Q., & Liu, B. (2022). Perceived academic stress and Depression: The mediation role of mobile phone addiction and sleep quality. Frontiers in Public Health, 10. https://doi.org/10.3389/fpubh.2022.760387

[4] Woods, H. C., & Scott, H. (2016). #Sleepyteens: Social media use in adolescence is associated with poor sleep quality, anxiety, depression and low self-esteem. Journal of Adolescence, 51(1), 41–49. https://doi.org/10.1016/j.adolescence.2016.05.008

[5] Zhu, X., Haegele, J. A., Liu, H., & Yu, F. (2021). Academic Stress, Physical Activity, Sleep, and Mental Health among Chinese Adolescents. International Journal of Environmental Research and Public Health, 18(14), 7257. https://doi.org/10.3390/ijerph18147257

[6] Wang, H., & Fan, X. (2023). Academic Stress and Sleep Quality among Chinese Adolescents: Chain Mediating Effects of Anxiety and School Burnout. International Journal of Environmental Research and Public Health, 20(3), 2219. https://doi.org/10.3390/ijerph20032219

[7] Yan, Y., Lin, R., Su, Y., & Liu, M. (2018). The relationship between adolescent academic stress and sleep quality: A multiple mediation model. Social Behavior and Personality an International Journal, 46(1), 63–77. https://doi.org/10.2224/sbp.6530

[8] Lee, Y., Blebea, J., Janssen, F., & Domoff, S. E. (2023). The Impact of Smartphone and Social Media Use on Adolescent Sleep Quality and Mental Health during the COVID-19 Pandemic. Human Behavior and Emerging Technologies, 2023, 1–6. https://doi.org/10.1155/2023/3277040

[9] Masoed, E. S., Omar, R. a. E. a. T., Magd, A. N. a. E., & Elashry, R. S. (2021). Social media addiction among adolescents: Its relationship to sleep quality and life satisfaction. International Journal of Research in Paediatric Nursing, 3(1), 69–78. https://doi.org/10.33545/26641291.2021.v3.i1b.59

[10] Pirdehghan, A., Khezmeh, E., & Panahi, S. (2021). Social Media Use and Sleep Disturbance among Adolescents: A Cross-Sectional Study. Iranian Journal of Psychiatry. https://doi.org/10.18502/ijps.v16i2.581