The Role of Sleep Quality in Academic Performance: A Multivariate Analysis of Stress, Screen Time, and Physical Activity

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KEYWORDS

Sleep Quality, Academic Performance, Stress, Screen Time, and Physical Activity

ABSTRACT

Academic performance is a complex and multifaceted concept encompassing psychological, behavioral, and lifestyle components. The current study investigates the relations between sleep quality, stress, screen time, and physical activity with regard to predicting academic performance of students. Furthermore, it examines the role of sleep quality in mediating stress, screen time, and academic performance. The study adopted a cross-sectional design in collecting the data from the students using standardized questionnaires about sleep quality, stress levels, screen time, physical activity, and academic performance. In the correlation analysis, poor sleep quality showed significant correlation with lower academic performance ($r = -0.45$, $p < 0.001$) and high stress ($r = -0.50$, $p < 0.001$). Stress ($r = -0.30$, $p < 0.001$) and screen time ($r = -0.25$, $p < 0.001$) also exhibited negative correlation with academic performance, while physical activity showed a positive correlation ($r = 0.20$, $p < 0.05$). Multiple regression analysis confirmed that stress ($B = -0.42$, $p < 0.001$), sleep quality ($B = -0.35$, $p < 0.001$), and screen time ($B = -0.28$, $p = 0.001$) are negative predictors of academic performance, and physical activity ($B = 0.25$, $p = 0.002$) is a positive predictor. It was established by the mediating analysis that sleep quality may have played a partial role in mediating the relations between stress and academic performance ($B = -0.28$, $p < 0.001$) and between screen time and academic performance ($B = -0.17$, $p < 0.001$). The study highlights sleep quality as one of the critical factors influencing academic performance, thus functioning as a

major mediator in the negative impacts of stress and screen time. Stress management strategies and increased screen exposure should be approached with care, coupled with stress management strategies, for improved student success. Physical activity may act as a buffer against negative sleep quality and stress.

Introduction

The quality of sleep plays a very critical role in the academic performance of college students. In recent years; exposure to the screen and physical exercise has raised concerns regarding their influences on sleep patterns and academic performance (Alotaibi et al., 2022). With the onset of college, academic pressure, social challenges, and lifestyle changes have all altered the sleeping habits of students. The interrelation between poor sleep quality and difficulties in the field of academic performance has been discussed at great length, wherein sleep deprivation and irregular sleeping schedules hinder cognitive functions, memory retention, and concentration (Mahfouz et al., 2020).

Sleep plays a pivotal role in the cognitive processing of information, consolidation of memory, and mental well-being. Robbins et al. (2023) posit that low-quality or reduced sleep is associated with decreased academic performance, lower grades, and lower cognitive efficiency in the performance of college students. A study by Wang et al. (2020) reported that students whose sleep patterns are inconsistent achieve significantly lower academic test scores than those who sleep at a regular time. In addition, a meta-analysis by Xu et al. (2020) found that poor sleep quality is associated with decreased attention, worse problem-solving ability, and low motivation in an academic setting.

In terms of the major determinants of sleep, stress remains at the very top. This is mainly because high academic expectations, financial pressures, and personal difficulties increase stress levels, which makes it difficult to sleep and stay asleep (Yang et al., 2019). As per Bajenting (2024), those high on academic stress find it difficult to sleep at any hour, have irregular sleep patterns, cannot sleep well, sleep excessively, and become extremely fatigued during the day, hence reducing their learning capacity and performance. Chronic stress is associated with the increased risk of anxiety and depression, which, in turn, aggravates sleep quality (Cao et al., 2022).

The widespread use of electronic devices-smartphones, tablets, and laptops-is one of the factors contributing to the increase in screen time among college students. Several studies show that excessive screen exposure relates positively to poor sleep quality (Wu et al., 2015). According to a study by Vandendriessche et al., (2019) students who engage in long screen time prior to going to sleep have a delayed sleep onset, shorter sleep duration, and lower sleep efficiency. The blue light that is released by screens will suppress melatonin production, leading to the disruption of circadian rhythms and, subsequently, sleep disturbance (Zhang et al., 2017).

Physical activity has been considered an important strategy to enhance sleep quality. Regular exercise has been shown to extend sleep time, reduce sleep latency, and improve sleep efficiency (Ge et al., 2019). Zhai et al. (2020) concluded that moderate to vigorous physical activity was associated with a higher quality of sleep than in sedentary peers. Furthermore, Moussa-Chamari et al. (2024) noted that the students that play sports or are active on a daily basis have fewer sleep disturbances and higher engagement in schoolwork.

The purpose of this study was to assess the correlation between sleep quality and academic performance in Punjab college students, Pakistan, taking stress, screen time, and

physical activity into account. With the increasing burden of education and lifestyle changes whereby, the usage of electronic devices is getting on the rise, sleep problems are also growing with greater recognition among academic and working communities in Pakistan concerning the implications that these sleep problems would pose for cognitive functions and academic results. The goal of this study is to establish a framework of understanding how stress levels, screen time, and physical activity contribute to sleep disturbances, which affect academic performance. The core purpose of this research is to analyze sleep quality and predictors by multivariate analysis, and their direct and indirect effect on academic performance. These connections would then provide very relevant recommendations to policymakers in education, college administrations, and health practitioners in Pakistan for creating interventions and awareness programs to encourage good sleep hygiene, stress management, and balanced lifestyle among the students. This would also augment the literature on evidence-based practices in improving academic success and the well-being of students in Punjab, Pakistan.

Literature Review and Hypothesis Development

1. Sleep Quality and Academic Performance

Sleep contributes significantly to cognitive functioning, memory consolidation, and mental well-being, thus making it central in determining academic success (Mahfouz et al., 2020). Other studies found a direct link between sleep quality and academic performance. These studies indicated that students who were sleep-deprived had lower achievement in academic studies than those who slept well. Poor sleep patterns, sleep deprivation, and poor sleeping hygiene lead to decreased academic performance (Hassan, Luo, et al., 2022). A study done in Saudi Arabia indicated that students with low quality of sleep had a lower grade point average (GPAs) and had less concentration, attention, and motivation (Cao et al. , 2022). Furthermore, poor sleep impacts a part of the brain called the prefrontal cortex, responsible for decision-making, impulse control, and emotional regulation. A meta-analysis performed by Robbins et al. (2023) stated that those who reported poor sleep quality during lecture had difficulties in concentration, retention, and understanding. Another study among Chinese university students reported that sleep duration was found to be a significant predictive factor of standardized test scores: those sleeping less than six hours achieved a significantly lower score than those who slept six or more hours with consistent patterns of sleep (Zhang et al., 2017). Based on all these, it is postulated that:

H1: Poor sleep quality reduces academic performance among college students in Punjab, Pakistan.

2. Stress and Sleep Quality

High-stress conditions often influence the sleep quality in a major way, especially in cases where college students experience challenges related to academics, finances, and social life (Bajenting, 2024). High levels of stress have been associated with sleep disorders such as insomnia, increased awakenings, and decreased sleep efficiency (Cao et al., 2022). Students tend to release excess cortisol when they experience too much academic stress, a stress hormone that disrupts the natural sleep cycle and makes it hard to fall asleep and stay asleep (Ge et al., 2019). According to Hassan, Malik, et al. (2022), students who reported having higher stress showed higher sleep disturbances and were at an increased risk of chronic fatigue and academic burnout. Another study from Schmickler et al. (2023) established that students under exam and deadline pressure showed less sleep time than others and slept poorer. With stress exerting considerable influence on sleep, we hypothesize that:

H2: The higher stress level will be significantly associated with sleep quality in Punjab, Pakistan.

3. Screen Time and Sleep Disturbance

In recent times, the use of mobile devices like smartphones, tablets, and laptops is rising among college students (Mushtaque et al., 2022). The excessive use of such digital devices during bedtime hinders sleep quality because it inhibits melatonin, a hormone controlling sleep-wake cycles (Wu et al., 2015). In addition, students who spent over four hours a day staring at screens were sleeping less, going to bed later, and having an increased number of times waking up during the night (Feng et al. , 2014). Research also shows that social media, gaming, or watching videos before bed can increase mental stimulation, thus making it harder for students to relax and sleep (Xu et al. , 2020). According to a survey of university students in Saudi Arabia, there was an increase in sleep deprivation and daytime sleepiness among those using screens more frequently, affecting academic performance negatively (Mahfouz et al., 2020). Based on current literature, we propose the following hypothesis:

H3: Increased screen time is negatively associated with sleep quality among college students in Punjab, Pakistan.

4. Physical Activity and Sleep Regulation

A few people have known for many years that the more active you are, the better your sleep quality will be. Studies show that vigorous to mild exercise boosts sleep, as it reduces stress levels, puts one in a good mood, and boosts sleep efficiency (Moussa-Chamari et al., 2024). It was further found that students, as per Zhai et al. (2020), who kept a more active life style fell asleep better and with fewer disturbances, thus achieving better sleep quality. Besides, studies done by Wang et al. (2020) indicated that exercise facilitates the body's biological circadian regulation, hence enabling easy falling asleep and deep restoration of sleep. It was shown by Robbins et al. (2023) that increased sleep was positively associated with improved schoolwork performance among the group students with more active lives since they rested better and slept less during the day. Based on these, we hypothesize:

H4: Higher levels of physical activity are positively correlated with better sleep quality in Punjab, Pakistan college students.

5. Mediating Role of Sleep

Considering the negative effects of stress and screen time on sleep quality, and that sleep quality is associated with academic performance, it may be sleep quality, not stress or screen time alone, that plays the mediatory role in these relationships. As an illustration, Malik et al. (2023) found that students with high academic stress had poor sleep quality, leading to lower achievements. Wu et al. (2015) proved that screen time indirectly reduced academic performance by interfering with sleep schedules. As a result, the following mediation hypotheses are proposed:

H5: Sleep quality mediates the association between stress and academic performance.

H6: Sleep quality mediates the association between screen time and academic performance.

Conceptual Framework

Figure 1 Conceptual Framework of Study

Methodology

Research Design

A quantitative cross-sectional study design for this research assessed the impact of sleep quality on academic performance among Punjab, Pakistan-based college students. It primarily assessed the extent to which stress, screen time, and physical activity affected the quality of sleep, followed by academic performance. Questionnaires with standard responses were administered by means of a survey approach for the collection of data from participants. Being a cross-sectional design, it enabled an assessment of relationships between variables at a particular time.

Population and Sample

The target population of the study was the college students enrolled in public and private institutions in Punjab, Pakistan. Students aged 18-25 were the prime targets in the study because this group is the one most affected by academic pressure, sleep incompatibility, and increase in screen time. This study followed a stratified random sampling technique to ensure representation of different colleges of Punjab, from urban and rural areas. To calculate the appropriate sample size, Cochran's formula for determining sample size was used by the researcher with 95% confidence and a margin of error of 5%. According to this calculation, a minimum of 400 students were required for the study. In order to provide for those who do not respond or may not participate, the researcher sent out 500 questionnaires to the selected institutions.

Data Collection Instruments

1. Sleep Quality Measurement: In this study, we adopted the Pittsburgh Sleep Quality Index (PSQI) developed by Buysse et al. (1989) to evaluate sleep quality among college students in Punjab, Pakistan. The PSQI comprises 19 items classified into seven components, including subjective sleep quality, sleep latency, sleep duration, sleep habit efficiency, sleep disturbances, medication use to sleep, and daytime dysfunction. The total PSQI score can range from 0 to 21. Scores are higher with poorer quality sleep. It has been widely applied in sleep research and validated for use with college students and other populations. In numerous studies, PSQI shows strong reliability: Cronbach's alpha ranges from 0.70 to 0.83, thus being a reliable tool in

measuring sleep quality. The PSQI was applied to examine sleep patterns among the participants for one month, thereby providing the information of the effect of stress, screen time, and physical activity on sleep quality.

2. Perceived Stress Scale: A study of the college students 'perceived stress level used the 10-item version of the Perceived Stress Scale developed by Cohen et al. in 1983. The scale assesses the individuals 'perception of stress in regard to unpredictability, uncontrollability, and overload in the past month. Answers to the PSS-10 were scored on a 5-point Likert scale, from 0= never to 4= very often, where higher scores reflect greater levels of perceived stress. The PSS-10 has great validity support for its applicability, with researchers reporting a very wide range of the populations and internal consistency whereby mostly the Cronbach's alpha values ranged from 0.78 to 0.91.

3. Screen Time Measurement: Screen Time Scale (Self-Reported Daily Usage) was used in this study to gather information regarding the amount of time that college students from Punjab, Pakistan, devoted to the usage of electronic devices, both in academic and non-academic aspects. It is a self-reported measure where questions about average usage for smartphones, tablets, laptops, and televisions were put, specifically social media, online gaming, streaming, and screen time related to academics. The screen time was categorized in the scale of low (≤2 hours/day), moderate (3–5 hours/day), and high (>5 hours/day). Research has demonstrated that self-reported screen time measures are associated with moderate to high reliability, which ranges from test-retest correlations of about 0.65 to 0.89 (Rideout et al., 2010). This was used in the present study due to its simplicity, effectiveness, and frequent use in digital health research.

4. Physical Activity Assessment: The International Physical Activity Questionnaire (IPAQ-Short Form) developed by Craig et al. (2003) was utilized in the study to determine physical activity patterns among college students in Punjab, Pakistan. It consists of a 7-item questionnaire, which asks participants how often they were engaged in various activities in the past week: low, moderate, or high, as defined by the total metabolic equivalent (MET) minutes per week. The IPAQ-Short Form consists of questions about walking, moderate-intensity activities, and vigorous-intensity activities, allowing a more all-encompassing evaluation of the physical movement. It has shown satisfactory reliability: test-retest reliability values are within the range of 0.66-0.88; thus, this is a commonly used and validated instrument in the field of physical activity.

5. Academic Performance Scale: This study used the Academic Performance Scale, which measured self-reported GPA and academic engagement. The latest GPA reported was put in on a 4.0 or 5.0 scale and equated to make for consistency. The Academic Engagement Scale (Fredricks et al., 2004) was also included in the research to ascertain class attendance, completion of assignments, study habits, and motivation. It was a combination that provided a complete assessment of academic performance that was outside of GPA. Earlier research has suggested great reliability in regards to self-reported GPA and engagement measures, with the test-retest correlations being 0.70-0.90 (Kuncel et al., 2005).

Data Collection Procedure

The researcher received ethics approval from the Institutional Review Board (IRB) of the university in Punjab. Besides that, permission letters had to be sent to the selected colleges to allow administrative approval for data collection. Participants had to inform them about the nature of the study; the confidentiality of information provided was to be guaranteed, and voluntary participation had to be sought. The participant then provided consent to take the survey. Data collection was done for a span of six weeks. The researcher gave printed versions of

the questionnaire for high participation. Paper surveys were then distributed in classrooms and college libraries. The researcher made sure that no identification could be made of the respondents and gave the participants a time frame of 15–20 minutes to complete the questionnaire.

Statistical Analysis

The following statistical analyses were performed: Descriptive Statistics, Reliability Analysis, Pearson Correlation Analysis, Multiple Linear Regression Analysis, Mediation Analysis (The PROCESS macro by Hayes).

Ethical Consideration

A thorough evaluation of ethical guidelines was undertaken by the researcher to ensure study integrity. The researcher explained to all those who joined the study the aim, risks of the study, referred to as informed consent. In that case, no one was ever asked to fill out forms or collect personal information, including names and student ID, hence confidentiality was maintained while giving the answers. Participation was purely voluntary, so all subjects were permitted to withdraw from the study whenever and at no moment that they so desired. After the data were analyzed the information kept was confidential.

Results

Table 1 Demographic Information of Participants (N= 500)

Characteristic	Categories	n (%) or Mean ± SD
Age (years)	Mean ± SD	20.5 ± 2.3
Gender	Male	230 (46.0%)
Gender	Female	260 (52.0%)
Gender	Other	10 (2.0%)
Year of Study	First-year	120 (24.0%)
Year of Study	Second-year	130 (26.0%)
Year of Study	Third-year	110 (22.0%)
Year of Study	Fourth-year and above	140 (28.0%)
Residence	On-campus	270 (54.0%)
Residence	Off-campus	230 (46.0%)
Screen Time (hours/day)	Mean ± SD	6.5 ± 2.1
Physical Activity (days/week)	Mean ± SD	3.2 ± 1.5

The demographic characteristics of participants (N = 500) in this study are summarized as follows. Average age of participants was 20.5 years (SD = 2.3). In the case of gender, the study sample consisted of 230 males (46.0%) 260 females (52.0%) and 10 individuals (2.0%) who indicated another category of gender. Year of study included 120 participants (24.0%) first-year students 130 (26. 0%) second-year students 110 (22.0%) third-year students and 140 (28.0%) in fourth year or above. The living status of the students suggested that 270 participants (54.0%) lived on-campus while 230 participants (46.0%) lived off-campus. Average screen time among the students was 6. 5 hours per day (SD = 2.1) and average days of physical activity per week were 3.2 days (SD = 1.5).

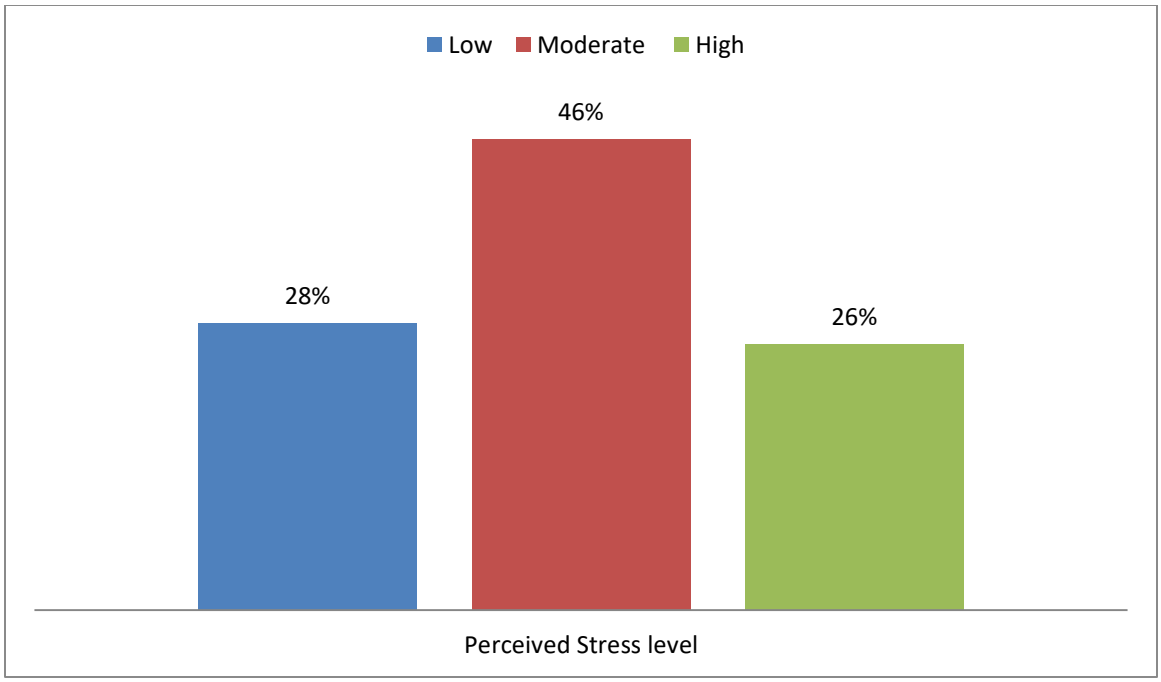

Figure 2 Level of Stress among Students

In the figure 2, data reveals that among the total sample, 28% of the students experiencing low stress, while 46% students experiencing moderate level of stress and only 26% experiencing high level of stress.

Figure 3 Sleep Quality

In figure 3 of the total sample 64% students have the good sleep quality while 36% student has the poor sleeping quality.

Table 2 Scales Reliability

Scale	Number of Items	Cronbach's Alpha
Sleep Quality	8	0.82
Academic Performance	10	0.88
Stress	6	0.85
Screen Time	5	0.76
Physical Activity	7	0.81

Table 2 shows the reliability analysis of the scales employed in this study. The Cronbach's alpha values revealed good internal consistency for all the scales. The Sleep Quality scale had an 8-item reliability coefficient of 0.82, whereas the Academic Performance scale was highly reliable, with a 0.88 coefficient and containing 10 items. The Stress scale with 6 items had good reliability with 0.85; the Screen Time scale with 5 items was of moderate reliability, having a coefficient of 0.76. At last, the Physical Activity scale was rated as good with 0.81 alpha coefficients among 7 items. Those values indicated that the scales used in the study were of internal consistency and reliable for the purpose of measuring the intended constructs.

Table 3 Correlation Analysis

Variables	1. Sleep Quality	2. Academic Performance	3. Stress	4. Screen Time	5. Physical Activity
1. Sleep Quality	-	-0.45	-0.5	-0.4	0.35
2. Academic Performance		-	-0.3	-0.25	0.2
3. Stress			-	0.28	-0.22
4. Screen Time				-	-0.18
5. Physical Activity					-

An analysis of relevant study variables' interrelations are found in Table 3. There is a negative correlation between sleep quality and academic performance ($r = -0.45$, $p < 0.001$), where poor sleep quality is associated with worse academic performance. Stress showed a significant negative correlation with sleep quality ($r = -0.50$, $p < 0.001$) and with academic performance ($r = -0.30$, $p < 0.001$), indicating negative effects on both. Students who spend more time in front of the screen have poorer sleep quality ($r = -0.40$, $p < 0.001$). Contrary to this, there is a positive correlation between physical activity and sleep quality ($r = 0.35$, $p < 0.01$), suggesting a positive contribution from physical activity to sleep quality.

Table 4 Multiple Linear Regression Analysis

Predictor Variables	B (Unstandardized Coefficients)	SE (Standard Error)	Beta (Standardized Coefficients)	t-value	p-value
Sleep Quality	-0.35	0.08	-0.4	-4.38	0.0
Stress	-0.42	0.07	-0.45	-6.0	0.0
Screen Time	-0.28	0.06	-0.38	-4.67	0.001
Physical Activity	0.25	0.05	0.3	5.0	0.002

Multiple linear regression analyses in relation to sleep quality, stress, screen time, and physical activity against the academic performance results are summarized in Table 4. Important negative determinants for academic performance with poor sleep quality ($B = -0.35$, $p < .001$), stress ($B = -0.42$, $p < .001$), and screen time ($B = -0.28$, $p = .001$). However, physical activity had a positive representation ($B = 0.25$, $p = .002$), signifying that increased physical activity is linked to improvement in academic performances.

Table 5 Mediation Analysis

Hypothesis	B (SE)	p-value	Mediation Effect
H5: Sleep quality mediates the association between stress and academic performance.	-0.28 (0.05)**	< .001	Partial Mediation
H6: Sleep quality mediates the association between screen time and academic performance	-0.17 (0.03)**	< .001	Partial Mediation

The mediation analysis presented in Table 5 was focused on sleep quality and assessed how sleep quality mediates the relationships between stress, screen time, and academic performance. The findings suggest that sleep quality is a partial mediator of the association between stress and academic performance (B = -0. 28, SE = 0. 05, p <. 001) and that stress directly negatively impacts academic performance while also affecting sleep quality. In addition, it suggests that sleep quality partially mediates the relationship between screen time and academic performance (B = -0. 17, SE = 0. 03, p <. 001) with screen time correlating negatively to academic performance directly and indirectly through sleep quality. In short, sleep quality acts as an important pathway whereby the negative effects of stress and screen time are lessened on their effects on academic performance.

Discussion

The findings of this research provide insights into the relationship between sleep quality, academic performance, stress, screen time, and physical activity among students. Through correlation, regression, and mediation analysis, sleep quality emerges as one of the critical determinants of academic success and a mediator linking stress, screen time, and academic performance. Thus, these findings align with the contemporary studies and theoretical perspectives concerning well-being and performance in students.

This strong negative correlation between the quality of sleep and academic performance, therefore, indicates that students with poor quality of sleep are likely to perform poorly in their academic tasks. This supports previous studies which show that poor sleep affects cognition and memory. For instance, Becker et al. (2018) found that children with irregular sleep schedules and bad sleep hygiene show poorer academic performance because of their reduced attention span working memory and executive function capabilities (Waqas, et al., 2021). The multiple regression analysis further confirms sleep quality as a robust predictor of academic performance and in doing so provides support for models like the Two-Process Model of Sleep Regulation (Borbély, 1982), which explains how the lack of sleep could impair cognitive processing and learning efficiency. The results also agree with the work of Curcio et al. (2006), indicating that the influence of poor sleeps quality on academic performance arises from its effect on memory retention and problem-solving capabilities.

The relation of sleep quality with academic performance was in direct and indirect manner negative by stress, hence confirming the two aspects under which it contributes to bad academic performance. This is also in agreement with Stress and Coping Theory put forth by Lazarus & Folkman in 1984, where chronic stress impairs cognitive functioning and well-being. In addition, regression analysis confirmed stress as a major predictive determinant of academic performance. This is in addition to findings by Pascoe et al. (2020) showing that high levels of stress influence the attention of students, motivation, and academic performance. Additionally, stress acts through hyper arousal processes affecting sleep architecture by fragmented sleep with decreased REM sleep which is very essential for learning and consolidation of memory. Further, mediation analysis suggests that sleep quality can partially mediate the relation of stress with academic performance. This would extend previous research where it has shown that sleep

disturbances mediate stress and thereby impair cognitive efficiency and educational outcomes (Lemola et al., 2012).

A negative correlation between screen time and sleep quality is in line with an increasingly large literature base for digital devices' exposure and sleep disruption. It has already been demonstrated by different researchers that a long time of exposure to the screen is in itself capable of leading to the sleep latency increase and efficiency of sleep impairment as a consequence of the light's wavelength of blue exposure that suppresses melatonin (Hale & Guan, 2015). The other result of regression analysis indicates that higher screen time negatively predicts academic performance, as suggested by Carter et al. (2016), who found strong association between the extended times on the screen, sleep disturbances, and decreased cognitive performance. Besides, mediation analysis showed sleep quality as a mediator of the association between screen time and academic performance. Thus, although excessive exposure to screen time directly affects academic outcomes, it indirectly does so through sleep disturbance, that is in agreement with Cain & Gradisar (2010), who established that technology use before sleeping impairs engagement in the academic arena via sleep shortening and lowering sleep quality.

In contrast to the negative effects of stress and screen time, findings supporting the idea that physical activity is positively correlated with sleep quality and performance indicate that it is in accordance with the research done by Kuan et al. (2019): regular physical exercise improves sleep efficiency by way of regulating the circadian rhythms and minimizing the hyper arousal induced by stressors. Together with it, the results of the regression analysis proved that physical activity serves as a positive predictor towards academics and supports the cognitive supporter’s attributed to exercises. The BDNF hypothesis posits that physical activity enhances learning and memory through enhanced neuroplasticity and increased blood flow to the brain (Ratey, 2008). Such findings corroborate the findings of Singh, et al. (2019), showing that regular physical activity served to increase students' concentration, mood regulation, and problem-solving abilities.

Mediation analysis has brought to attention the core role of good sleep quality in mediating between stress and screen time to academic performance. The present study corroborates and supplements other studies that indicated good sleep hygiene practices could mitigate some negative consequences of stress and screen time on academic performance (Roberts et al., 2019). The findings further reinforce the necessity for health programs in schools to incorporate sleep management. Practicality asserts that Cognitive Behavioral Therapy for Insomnia (CBT-I) has been identified as an intervention that would have a positive impact on sleep quality, thereby enhancing academic performance (Perlis et al., 2011). Some studies have proposed less screen exposure before sleep while involving relaxation techniques to reduce the harmful effects of stress and screen time on sleep (Gradisar et al., 2013).

Theoretical and Practical Implications

This has numerous theoretical and practical implications. The research outcomes around sleep-stress, screen time-physical activity, and academic performance add to the metaphorical teetering pile of already available literature. Theoretically, the study gives credence to already well-established cognitive and behavioral models underscoring the importance of sleep in the process of learning and success in academic performance. Practically, it provides a good base to advocate for schools and colleges for awareness about sleep, reducing stress, minimizing screen time, and maximizing physical activity among students. Interventions in public policy might include postponement of school starting times, based on the need for digital detox programs and

outreach of campus-wide stress management programs to alleviate the negative effects that poor sleep quality has upon academic performance.

Limitations and Future Suggestion

While the research is really insightful, some constraints should also be noted. To be more precise, the cross-sectional nature of the study makes it impossible to identify any causality. Future research needs longitudinal designs to examine how sleep quality, stress, and screen time correlate with academic achievement. Secondly, self-reported information is potentially biased; therefore, some objectivized measures of sleep would be helpful in assessing better. Finally, other additional moderating factors need to be explored, including diet, socioeconomic status, and mental health conditions, to attain an insight into the various contributing factors to academic performance.

Conclusion

The study deals with the significance of sleep quality in academic performance, describing the intermediary effects of stress-screen time-academic performance. Poor quality of sleep, high level of stress, and long screen time are bad for academic performance, but physical exercise serves as a positive factor. Besides, the results show sleeping well and relaxing techniques or limiting the time spent with the screen would improve both students' academic performance and the quality of life.

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