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Investigating How Technology May Negatively Affect the Academic Performance and Sleep Quality of Students

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Abstract: Students have been utilizing IT services such as social media, video games, and streaming services for entertainment, communication and even for coping mechanism to stress and academic workload. However, improper and heavy usage of these services can lead to bad habits and practices that can negatively affect their physical well-being particularly the quality of sleep and academic performance. It is important to investigate how to protect the students from the negative impact of excessive use of technology. This study aims to investigate how high usage rate of IT services such as social media, video games, and streaming services, can negatively affect the academic performance and sleep quality of high school students. Thirty (30) STEM high school students participated in this study over 3 different periods of academic workload. The results of this study show that IT services have no negative impact on the academic performance of the respondents and even beneficial since they are used as coping mechanism when faced with stress and heavy workload. However, most believe that such services have negative impact on their quality of sleep.

Keywords: Information technology, Sleep Quality, Academic Performance, Academic Workload

1. Introduction

A person's sleep plays a crucial role in their overall lifestyle, with the average individual requiring 8 hours of sleep to maintain good health. Poor sleep quality can have a detrimental impact on physical health, emotions, and cognitive thinking of students. Sleep disorders, like sleep deprivation and excessive daytime sleepiness, are common among college students, impairing their attention span, cognitive abilities, and academic performance (Gaultney, 2010). Sleep and stress are closely related, with stress influencing sleep quality, and vice versa, affecting academic performance (Han et al., 2012). Poor sleep quality may lead to chronic fatigue, depression, stress, and lower quality of life (Fuller et al., 2017), impacting their ability to learn and overall health. Addressing sleep-related issues in students is vital for promoting their well-being and academic success.

Sleep deprivation can lead to emotional and behavioral issues that may affect a student's academic performance (Suni & Truong, 2023), making it crucial to analyze the factors contributing to such problems among students. The existence of rapidly developing IT platforms has driven adolescents to use these services for educational, entertainment, and social purposes, leading to both positive changes, such as improved visual reasoning and creativity, and potential negative effects on sleep quality (Rose, N. et al., 2022).

Technology has continuously evolved to meet our needs and provide entertainment. IT services, including streaming platforms, social media, and video games, have greatly enhanced our efficiency and entertainment. However, the improper use of technology remains a common issue, particularly among adolescents. During puberty, teenagers

prioritize socialization, making friends, and expressing themselves, leading to extensive use of IT services that can disrupt their sleep patterns. This excessive usage can result in poor sleep quality or, in more severe cases, sleep disorders. The study of Al Kazhali et.al.(2023) suggests that social media use may be linked to poor sleep quality. Electronic social media use and its associations with insomnia, daytime sleepiness, mood, and sleep duration in adults is investigated in the work of Bhat (2018). The use of electronic social media in bed is found to be associated with sleep and mood dysfunction in adults (Bhat, 2018). According to Charmaraman et al. (2021), there is a significant relationship between the quantity of social technology use (e.g., checking social media, problematic internet behaviors, mobile use), content viewed (e.g., emotional or violent videos, risky behaviors), and social context (e.g., bedtime behaviors, starting social media at an early age) and later bedtimes and fewer hours of sleep on school nights.

While technology has undoubtedly improved our lives, it is important to investigate how to protect the students from the negative impact of prolonged use of technology for entertainment purposes. This study aims to analyze the impact of technology such as social media, video games, and streaming services on high school students' academic performance and sleep quality.

2. Related Works

The widespread use of technology, such as smartphones, social media, gaming, and streaming services, has influenced students' lifestyles and has the potential to negatively affect their sleep quality. The study of Fuller (2017), suggests that children who use technology around bedtime had 30 minutes to an hour less sleep than those who did not, with a substantial influence on sleep quality. Increased tablet and mobile phone screen time before bed would have a negative influence on sleep quality and attentiveness in children, resulting in morning tiredness and a lower likelihood of eating breakfast (Fuller, 2017). Additionally, a study by Olson et al. (2014) found that a significant number of adolescents brought their phones to bed, continued texting past their bedtime, and were frequently awakened by text messages during the night. These findings suggest a decline in sleep quality and quantity among adolescents who engage in electronic device use before bedtime.

Sleep is essential for memory consolidation and cognitive performance. Okano et al. (2019) investigated the association between sleep and academic performance. The study underlined the negative consequences of sleep deprivation on attention, cognition, and academic performance. Sleep deprivation has repeatedly been linked to increased fatigue, drowsiness, and poorer cognitive performance in controlled trials. Furthermore, the study found that poor sleep quality and shorter sleep duration are linked to worse levels of concentration and attention in the classroom.

3. Methodology

Thirty (30) STEM high school students (Grade 12) where there are 18 female, 11 male and 1 gender neutral, participated in this study. The respondents answered a survey through a Google Form. Consent forms were sent to the participants before they responded to the survey. The questions in the survey are based from the Pittsburgh Sleep Quality Index (PSQI) and The Cleveland Adolescent Sleepiness Questionnaire. Included in the questions are the IT platforms the students typically use such as social media, video games, and streaming services. Open-ended qualitative questions where the participants are asked about their thoughts on the effect of IT usage on their academic performance and sleep, are also included in the survey.

Data collection were performed in three (3) different periods of 2 school terms – end of the first term (PH), start of the second term (PL) and middle of the second term (PMH). Since PH covers the last 2 weeks of the term, most students have heavy workload due to submission of final requirements and preparation for the final exams. PL is described to be

the period with light workload since it covers the third to fourth week of the term where there are less academic requirements. Students have moderate to heavy workload during PMH which covers the fifth to sixth week of the term.

The students are divided into three(3) groups according to period. PH and PL periods were participated by eleven (11) students each while PHL was participated by 8 students.

4. Results and Discussions

4.1 Social Media Average Usage on Different Periods

In comparing the results from each period's average daily social media usage, PH group had a mode of 4-6 hours with only a few outliers being above it. The % of responses below 4-6 hours had a combined total of 45.5%. The expected outcome was that with a heavier schoolwork, students would have a higher average daily usage of social media probably in order to communicate to each other about their group tasks. However, another counter-argument could be made that most students are busy studying individually for their final exams. These may also be due to a small sample size.

The responses from PL group on the average daily social media usage shows a lot more hours compared to the PH group. The mode remains the same being 4-6 hours. However, the % of responses below 4-6 hours had a combined total of 36.4. This means that students choose to use social media during their free time and that social media is used primarily for entertainment.

Lastly, and most interestingly, the PMH group had the highest average social media usage with the mode being 6-8 hours from 50% of the respondents. Meanwhile, 4-6 hours and 8+ hours had 25% each. This result is interesting because midterms should be a time where most students should be studying instead of communicating with others, or at least this is the "normal" assumption. One reason for this could be the small sample size.

Students with heavy and light workload tend to have the same hours of social media usage i.e. 4-6 hours. However, those with moderate to heavy workload tend to use social media longer (6 or more hours) than the other groups (4-6 hours).

4.2 Gaming and Streaming Services Usage to Accumulated Grade Average and Sleep Quality

Table 1 shows that 63.3% of students (19 out of 30) spend only 0-2 hours of gaming per day and of which 5 (26.3%) had poor sleep quality i.e. 1-2, 8 (42.1%) had sleep quality of 3 and 6 (31.6%) had good sleep quality i.e. 4-5. Moreover, there is no correlation at all with a value of 0.04 between sleep quality and number of hours of gaming per day.

Table 1. Frequency of respondents based on sleep quality and hours of gaming use

		Sleep Quality (1-worst, 5 -best)					
		1	2	3	4	5	Total
Average number of hours for gaming use per day	0-2 hrs	1	4	8	6	0	19
	2-4 hrs	2	0	2	1	1	6
	more than 4 hrs	0	0	3	1	0	4

Table 2 shows that 70% of students spend only 0-4 hours of streaming per day and of which 5 (4.8%) had poor sleep quality i.e. 1-2, 8 (38.1%) had sleep quality of 3 and 8 (38.1%) had good sleep quality i.e. 4-5. Moreover, there is a negative correlation of -0.41 between the number of hours used of video streaming and the quality of sleep.

Table 2. Frequency of respondents based on sleep quality and hours of streaming use

		Sleep Quality (1-worst, 5 -best)					
		1	2	3	4	5	Total
Average number of hours for streaming use per day	0-2 hrs	0	1	3	4	1	9
	2-4 hrs	2	2	5	3	0	12
	more than 4 hrs	1	1	6	1	0	9

One participant, who reported to have spent 8+ hours on streaming services and another 8+ hours on social media per day, had only 4 hours of sleep at night with a very low sleep quality of 1. However, this student performs well in school with an accumulated grade average of 3.3 where 4.0 is the highest average.

Other respondents who reported to have 4+ hours on both gaming and streaming services showed an average of 2.9, showing that healthy sleep patterns do help with maintaining a higher grade average.

Meanwhile, another participant, reported spending 0-2 hours on both gaming and streaming services. The student spend on an average of 6-7 hours of sleep and an overall sleep quality of 4. The grade average also reported to be high (3.8). As a matter of fact, respondents who answered 0-2 hours on both gaming and streaming services, had an average of 3.18 which is on the higher end of the group in terms of academic performance.

4.3 Sleep Quality and Social Media Use

Table 3 show that 70 % of the respondents or 21 out of 30, use social media ranging for more than 6 hours on the average per day. Of these respondents, 6 (28.6%) had poor sleep quality i.e. 1-2, 11 (52.4%) had sleep quality of 3 and only 4 (19%) had good sleep quality i.e. 4-5.

There is a negative correlation of -0.44 between the number of hours used of social media and the quality of sleep.

Table 3. Frequency of respondents based on sleep quality and hours of social media use

		Sleep Quality (1-worst, 5 -best)					
		1	2	3	4	5	Total
Average number of hours for social media use per day	0-2 hrs	0	0	1	2	0	3
	2-4 hrs	0	1	2	3	0	6
	4-6 hrs	1	0	5	3	1	10
	more than 6 hrs	3	3	11	3	1	21

4.4 Effect on Academic Performance and Coping Mechanism

The responses from the survey revealed that twenty-one (21) or 70% of the respondents believe that IT services are beneficial for their academic performance, as they provide access to online tools and digital resources. Such services are found to be helpful in finding information, improving task efficiency, and aiding in academic requirements, as well as serving as a source of motivation and stress relief. On the other hand, nine (9) respondents disagreed, stating that IT services had little positive impact on their academic performance. This group believe that IT services distracting, leading to a loss of focus on academic tasks and procrastination, ultimately hindering their performance.

The responses regarding the impact of IT services on sleep quality were diverse, with eight (8) or 26.67% of the respondents find them beneficial in aiding sleep, nineteen (19) or 63.3% stating negative effects due to addiction and staying awake, and three (3) or 10% expressing a neutral view. Some respondents acknowledged the positive aspects, noting

that technology helps them relax before bedtime and occasionally aids in falling asleep, improving sleep quality. However, many respondents raised concerns about the negative impact, citing addictive behaviors and exposure to disturbing content on social media as factors that disrupt their sleep. Despite recognizing the drawbacks, some found it difficult to reduce their reliance on IT services due to habit and accessibility. Conversely, a few respondents reported no significant impact on sleep quality, suggesting that technology played a relatively neutral role in their sleep patterns.

Based on the responses, 73.33% (22 of 30) of respondents view IT services and gadgets as a coping mechanism when facing sleep difficulty, using browsing, streaming services, and social media to relieve stress.

While technology can help some individuals relax and fall asleep, it can also exacerbate sleeping difficulties for others, leading to increased screen time and stimulation. Factors contributing to sleeping difficulties include academic stress, unbalanced sleep schedules, and anxieties related to schoolwork and deadlines. Further analysis reveals interesting patterns in students' perceptions of technology as a coping mechanism for sleep difficulties in relation to the timing of their responses.

During the PH period, 54.55% (5 of 11) responses do not consider technology as a coping mechanism likely due to the heavy workload and pressure. In contrast, during the PL period, 81.82% (9 of 11) responses considered technology as a coping mechanism maybe due \lighter workload and reduced stress. Although the percentage during midterms week in PMH period is higher, with 87.5% (7 of 8) responses indicating technology as a coping mechanism. The data suggests that students' perception of technology as a coping mechanism for sleep difficulties varies depending on the period being more beneficial during less intense periods and non-beneficial during stressful times.

5. Conclusions and Future Work

Information technology services are beneficial to students not only on their academic requirements but also in their general mental well-being. However, excessive usage of technology may negatively affect their academic performance, sleep quality and mental health. This could mean that technology may not always be safe to use by the learners especially when they cause distraction to sleep and technology addiction. This study aims to investigate how high usage rate of IT services such as social media, video games, and streaming services, can negatively affect the academic performance and sleep quality of high school students. Thirty (30) STEM high school students participated in this study over 3 different periods of academic workload. 63.3% believe that IT services are beneficial to their academic performance. 73% find such services as their coping mechanism during stress and heavy academic workload. Students' perception of technology as a coping mechanism for sleep difficulties varies depending on the period being more beneficial during less intense periods and non-beneficial during stressful times. 70% believe that IT services have negative impact on the quality of their sleep. However, there is small correlation between the number of hours used of social media and the quality of sleep, between the number of hours used of video streaming and the quality of sleep. There is no correlation at all with between sleep quality and number of hours of gaming per day. The results of this study show that IT services have no negative impact on the academic performance of the respondents and even beneficial since they are used as coping mechanism when faced with stress and heavy workload. However, most believe that they have negative impact on their quality of sleep. Future work may involve more respondents and more qualitative questions.

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