Effects of Sleep Quality on the Fatigue Level of Students during COVID-19 Pandemic

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Abstract

Since the coronavirus outbreak, the Philippines has been one of the many countries in the world to close its colleges and institutions, putting students at risk of being isolated from their schools and communities. This study was able to help address the issues that contribute significantly to students' sleep quality by assessing the impact of the pandemic on their fatigue levels. Based on the results of 216 students, the majority of respondents are mentally drained, have insufficient stamina for daily activities, and become sleepy very quickly. Thus, it is critical to support and monitor the well-being of college students when they reach critical developmental milestones in an unstable social environment.

Keywords
Sleep quality, fatigue, students, COVID-19.

1. Introduction
On March 8, 2020, the Philippine government announced a declaration of the public health crisis throughout the nation. In late January 2020, the first foreign patient of COVID-19 was discovered. The people's right to health is safeguarded and promoted. A total lockdown or Enhanced Community Quarantine (ECQ) was imposed on the whole Luzon cluster of islands. ECQ is the harshest category of lockdown, putting institutions, workplaces, shared spaces, and public transit on pause. Most of the remaining portion of the Philippines was quarantined shortly afterward in the same year, wreaking havoc on the healthcare, socioeconomic, cultural, and educational systems. These constraints drastically altered people's way of living and social interactions, causing uneasiness in many. There was a considerable rise in psychological discomfort and mental illness manifestations in the broader public (Aliana et al. 2021).

Students have been unable to attend classes in the Philippines due to the strict quarantine protocols. Because several Filipinos lack access to technology and dependable internet, distance learning has presented many issues for numerous students, families, and professors. Since the coronavirus epidemic emerged, the Philippines has been one of the few nations to keep colleges and universities shut, putting pupils at greater risk of opting out of educational and community isolation (Armand et al. 2021). Adverse occurrences like the COVID-19 pandemic can create emotional trauma and depressive disorders, which have been noted by 7% of female Wuhan students in the latest studies and can severely affect sleep quality.

According to considerable research, stress, anxiety, depressive illness, and sleeplessness have grown throughout the COVID-19 outbreak, particularly among college students who have changed their lifestyles. As a result, sleep difficulties or disorders wreak havoc on university students' academic performance, frequently linked to mental health conditions (Henna et al. 2028). Many young people don't acquire as much sleep to function effectively in class and on schoolwork, and excessive use of technology tends to disrupt their sleeping patterns. Because blue light from smartphones and electronics suppresses melatonin release, the most affected one is the sleep quality (Benham et al,2020).
The study mainly tackles the effect that the Covid pandemic has contributed on the respondent's quality of sleep. Other factors that could affect an individual's sleep quality besides the pandemic are not discussed. It is also essential to

consider that most of the respondents in this study are college students (Hyun et al. 2021). The study does not cover the effects of COVID-19 on students' sleep quality from Elementary to High school.

As this study focuses on identifying and evaluating the effects of sleep quality of college students during the COVID19 pandemic in terms of their fatigue level, this study considered college students from different universities but is limited to those studying in the Philippines. As for the fatigue level being used as a basis for identifying the effects of sleep quality, this study would only focus on both the physical and mental fatigue being experienced by the students.

1.1 Objectives

As the COVID19 situation in the Philippines continues to worsen due to the escalation of the COVID19 cases, psychological problems have been evident among the population, especially among university students. These problems tend to affect their condition and lifestyle, resulting in sleeping problems and disorders. With that, this study aims to assess the sleeping experiences of college students during the COVID-19 pandemic by determining the effects of their sleep quality based on their fatigue level during the pandemic.

2. Literature Review

According to studies and reports, sleeping problems among young adults continue to rise, and these problems are mainly evident in college students. This study intends to identify the determinants that affect one's sleep quality; the results are primarily based on numerous research studies. Concluding the findings from the various studies collected, multiple factors influence the college students' sleep quality, categorized as lifestyle, mental health, social factors, and physical factors (Karana et al. 2018).

In Malaysia, the sleep quality of UiTM Perlis students was evaluated and summarized, and findings show the department with the poorest sleep quality is the Faculty of Architecture Planning and Surveying. This may be caused by added stress and other psychological problems since all their fieldwork is done through online coursework. Since the movement control order (MCO) was mandated in Malaysia, these students were required to submit more online coursework to replace their fieldwork (Wang et al. 2020). On the other hand, the department with the best sleep quality is the Faculty of Sports Science and Recreation, as they are required to do virtual exercise activities to fulfill their courses. Their active lifestyle may have led to having a good quality rest. Overall, the results of the UiTM students' level of sleep were slightly more significant in the category of poor sleep during the COVID-19 lockdown.

During the first two months of the pandemic (April to May 2020), young adults in the U.S. experienced more significant sleep problems. Depression, anxiety, PTSD, and other COVID-19-related distress and anxiety predictors were analyzed using hierarchical multiple regression analyses to assess young adults' sleep quality. Regardless of any preceding disorders, sleep quality is highly influenced by depressive and anxiety symptoms. Results show that the factors that significantly affect young adults' poor sleep are high levels of PTSD symptoms and COVID-19-related predictors. Due to the rising numbers of infections, most countries require isolation to prevent the spread of COVID; young adults must have felt alone and needed to seek help during the lockdown. A proactive support system is advised for young adults to support their mental health and sleeping patterns, as this may lead to further psychological problems (ORegan et al. 2021).

As for the lifestyle factors, determinants found in this category include the usage of caffeine, alcohol media, smartphones, and such. As for the mental health factors, determinants found in this category include mental problems such as depression, mental disorders, stress, and anxiety. As for the social factors, determinants found in this category include academic performance, personality, and behavior. As for the physical factors, determinants found in this category include pain and fatigue. Considering these determinants, physical and social factors were concluded to primarily improve the sleep quality of college students by performing correlation analyses. However, with the determinants identified from the lifestyle and mental health categories, factors were negatively correlated with sleep quality. Moreover, several factors from the last two categories were classified as worsening one's sleep quality, including food or caffeine intake and irregular sleeping and waking patterns (Ozkeskin et al. 2021).

College students typically underestimate the power of sleep in their activities, especially regarding academic performance. Most of them believe that studying more frequently than having a well-quality sleep can increase the chances of performing better in school. However, according to Allan (2015), this habit can do the exact opposite as it can poorly affect a student's academic performance. Sleep contributes to many biological attributes of the human body,

such as memory consolidation of the brain, metabolic health, diabetes, heart disease, and potential sleep disorders. These contributors are dangerous to one's health, though. The worst part, they do not even realize it. One difficult contribution that is seen more likely in students is sleep disorders. Sleep disorder is a type of condition that impairs one's sleeping quality. The most common sleep disorder for students is sleep deprivation due to multiple nights of poor sleep quality. In the long run, continuous sleep deprivation may lead to narcoleptic disorders, which are cataplexy, sleep paralysis, and hallucinations. These can be physical contributors to a person's muscle control, REM sleep, and losing sensation to move the body. There is also insomnia, where one has difficulty falling asleep, which can be linked to mental concerns such as anxiety and depression. Seeking professional help is best for college students since it results in deep-rooted medical problems if left unrecognized or untreated. It is advised that students must face the challenge of overcoming lack of sleep and potential sleep disorders. These symptoms can educate students about sleep quality and prioritize their well-being (Wang 2020).

Students suffer from a sleep disorder and sleep deprivation if they are often faced with difficulties in school activities. Nowadays, schools are more demanding in terms of student workloads and activities that keep students awake in the middle of the night. Furthermore, schools often start their classes early in the morning, making sleep-deprived students tired and drowsy during the day. This makes students unable to focus on lessons and difficulty retaining lessons in their minds. The focus of this study is to determine the sleep quality of students and the factors that increase the risk of sleep deprivation. Students were asked the same questions and were observed based on different documentation. Mostly, students are less likely to have better sleeping quality during school days and catch up with their sleeping patterns during weekends. Depending on their daily habits and situations, participants' sleeping schedules are out of step and irregular. Irregular sleeping patterns can disrupt and make a person tired during the day. Every so often, napping can be a solution to this issue. However, this brief ease can be risky as it disrupts sleep at night. To further analyze this study, early hours of school, stress, and stress contribute to the increase of sleep deprivation among students. In the end, sleeping is a hard case to crack as it is a complicated procedure as factors can contribute to whether one will have a good or bad sleep quality (Yilmaz 2020).

3. Methods

As shown in the conceptual framework (see Figure 1), this study focused on how the two aspects of fatigue, mental and physical fatigue, affect students' sleep quality by assessing their subjective sleep quality. These factors namely: sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction, are feasibly the factors that influence one's sleep.
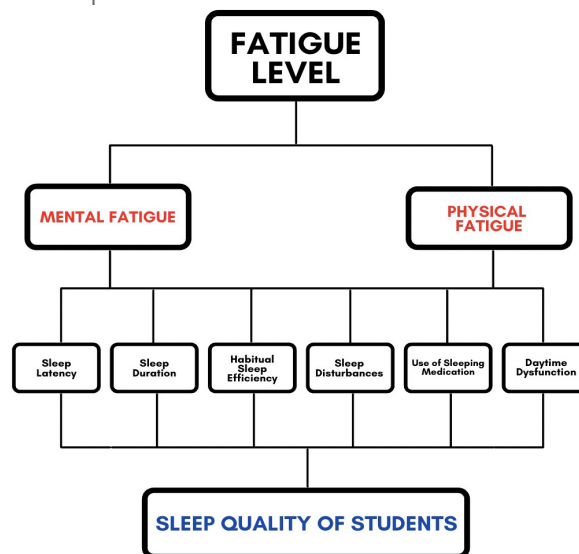

Figure 1. Conceptual Framework

3.1. Survey Tools

The researchers developed an online questionnaire through Google Forms with three (3) sections that include: (1) asking for the respondents' consent by answering the online survey voluntarily, (2) socio-demographic profiling, which asks about their name, age range, gender, area of residence, school, year level, program, and college program, and (3) the sleep quality and fatigue assessment scale. One (1) survey tool was used in the third section of the online survey; the Pittsburgh Sleep Quality Index (PSQI) is a 19-item questionnaire used to assess factors and disturbances that affect the sleep quality of a specific clinical population (Zhong et al., 2015). Ten (10) items from PSQI encompass the same content from the Fatigue Assessment Scale, which will only be expounded on in the next chapter.

3.2. Statistical Treatment of Data

Data obtained from the survey questionnaire given to the respondents was organized using Descriptive Statistics and analyzed using three (3) statistical analyses. Primarily, assessment using the One-Way ANOVA was utilized to determine the difference between factors. Following this analysis, the relation between sleep quality and fatigue, physical or mental, among students was determined using Pearson Correlation Analysis. To further analyze the data and conclude the analysis of results, Regression Analysis was utilized to determine the effect of sleep quality on the students' psychological state.

4. Results and Discussion

4.1. Respondent's Profile

Out of the 216 respondents, 32.41% are male, and 67.59% are female. Most of the respondents are 20-year-olds which is 40.74% of the respondents, followed by age 21, 39.81%, 10.19% are 22, and above, 8.33% are 19-year-olds, and 0.93% are 18 below. Moreover, 66.67% of the students live in NCR, and 33.33% live in the province. 48.15% of the respondents are from Mapua University, 10.19% are from De La Salle-College of Saint Benilde, followed by Centro Escolar University of, 9.26%, 7.41% from the University of Santo Tomas, and 25% came from other individual schools. In addition, 3.70% are first-year students, 25.93% are in their second year, 63.89% are in their 3rd year, 5.56% are fourth-year students, and 0.93% are in year five or above. Lastly, since researchers did not focus on a particular department, 50% of the participants came from the College of Engineering, 12.96% from the College of Sciences, 12.04% from the College of Accountancy and Business, 10.19% from the College of Medicine, and 14.81% are enrolled in other individual college departments.

4.2. Fatigue Assessment Result

The Fatigue Assessment Scale is a 10-item questionnaire to assess the clinical symptoms of chronic fatigue (Michielsen et al., 2003). Due to the nature of the question, items 3 and 9 were recorded in reverse upon quantifying the overall FAS score.

As shown in Table 1, the mean and standard deviation was used to compute the minimum and maximum range for each factor; since most of the aspects have a range of 1-5, this has been the basis of a 2.5 threshold, except for the ones that range from 2-5, the threshold for this is 3.5. Since all of the given factors exceeded the thresholds 2.5 and 3.5, all factors mentioned above are considered significant. Based on the highest thresholds, most respondents feel mentally exhausted, followed by insufficient energy for everyday life, and quickly get tired.

Table 1. Result of Fatigue Assessment

Items	Mean	Std. Dev.	Range	Agreement
Bothered by fatigue.	3.27	1.14	1-5	Agree
Get tired very quickly.	3.31	1.18	1-5	Agree
Don't do much during the day.	3.01	1.22	1-5	Agree
Don't have enough energy for everyday life.	3.34	0.88	1-5	Agree
Physically exhausted.	3.30	1.11	2-5	Agree
Have problems starting things.	3.28	1.26	1-5	Agree
Have problems thinking clearly.	3.06	1.21	1-5	Agree

Feel no desire to do anything.	3.04	1.21	1-5	Agree
Mentally exhausted.	3.81	1.23	2-5	Agree
Cannot concentrate well	3.10	1.00	1-5	Agree

4.3. Sleep Quality Assessment Result

The Pittsburgh Sleep Quality Index (PSQI) is a 19-item questionnaire that measures disturbances that affect the sleep quality for one 1-month (Zhong et al., 2015). Table 2 exhibits the summarized data of sleep quality measurement where the computation of the minimum and maximum range came from the mean and standard deviation. The standard threshold is 1.5 since the range of all factors is 0-3; only four (4) factors exceed the 1.5 threshold and are considered significant. From the highest thresholds, most respondents cannot get to sleep within 30 minutes, lack enthusiasm, wake up in the middle of the night, and generally have poor sleep quality. Other factors are considered insignificant since their thresholds are too small, and most respondents do not experience these factors.

Table 2. Result of Sleep Quality Assessment

Items	Mean	Std. Dev.	Range	Agreement
Cannot get to sleep within 30 mins	2.44	0.88	0-3	Agree
Waking up in the middle of the night	1.64	1.12	0-3	Agree
Getting up to use bathroom	1.12	1.04	0-3	Disagree
Cannot breathe comfortably	0.53	0.90	0-3	Disagree
Cough or snore loudly	0.53	0.93	0-3	Disagree
Feeling too cold	0.90	1.03	0-3	Disagree
Feeling too hot	0.97	1.00	0-3	Disagree
Having bad dreams	0.99	0.99	0-3	Disagree
Feeling pain	0.98	1.08	0-3	Disagree
Taking sleeping medications	0.44	0.90	0-3	Disagree
Trouble staying awake	1.16	1.11	0-3	Disagree
Lack of enthusiasm	2.13	0.98	0-3	Agree
Poor sleep quality	1.60	0.85	0-3	Agree

4.4. Pearson correlation analysis

The study conducted a Pearson correlation analysis to determine if the values are associated with one another. Based on the result shown in Table 3, mental and physical fatigue is associated with a moderate to strong correlation with sleep quality. However, the factor that accumulated the highest correlation value was the relationship between Physical Fatigue and Mental Fatigue. A correlation score of 0.628 indicates that students who are prone to feel physical fatigue would also tend to experience mental fatigue. While the following relationship between mental fatigue and sleep quality only obtained 0.454, the relationship between the physical Fatigue and Sleep quality accumulated a correlation value of 0.425. This indicates that if people experience either mental or physical fatigue, they tend to affect their respective sleep quality.

Table 3. Result of Correlation Analysis

Relationship	N	Correlation	95% CI for P	P-value	Remarks	Level of Correlation
Mental fatigue and sleep quality	216	0.425	(0.256, 0.568)	<0.0001	Significant	Moderate Association
Physical fatigue and sleep quality	216	0.454	(0.256, 0.568)	<0.0001	Significant	Moderate Association

Physical fatigue and mental fatigue	216	0.628	(0.498, 0.730)	<0.0001	Significant	Strong Association

4.5. Result of Regression Analysis

After conducting a Pearson correlation analysis, the researchers conducted a regression analysis wherein the dependent variable is the sleep quality index of the respondents, and the independent variable is the respondents' mental and physical fatigue scores. Based on the result as shown in Table 4, the factors of mental and physical fatigue accumulated a P-value of less than 0.05. This indicates that mental fatigue and physical fatigue have a significant contribution to students' sleep quality.

Table 4. Result of Regression Analysis

Term	Coefficient	SE Coefficient	T-Value	P-Value	VIF
Constant	0.046	0.213	0.22	0.083	
Mental Fatigue	0.0238	0.0113	2.11	0.0038	1.65
Physical Fatigue	0.0464	0.0164	0.0164	0.006	1.65
Regression Equation					
Sleep Quality =0.046 -0.028 Mental Fatigue +0.0464 Physical Fatigue					
Model Summary					
S	**R-squared**	**R-squared (adjusted)**		**R-squared (predicted)**	
0.437119	43.85%	42.40%		39.29%	

Furthermore, the data were checked using the normal probability plot and residual scatter plot, as shown in Figures 2 and 3, to see if the data met the conditions of linearity, homoscedasticity, and independence conditions. As shown in Figure 3, the residual plots were almost as close to the normal straight diagonal line as the normal probability plot, indicating that the residuals were of approximate normal distribution. Furthermore, the scatter plot revealed that most of the plots clustered in an almost rectangular form along the zero line, with approximately equal dispersion around zero and no strong tendency to be larger or less than zero, indicating that the residuals were linear homoscedastic. As a result, there was no cause to be concerned about the regression assumptions being violated.
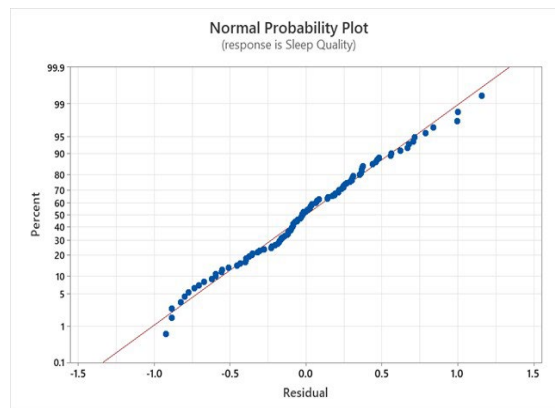

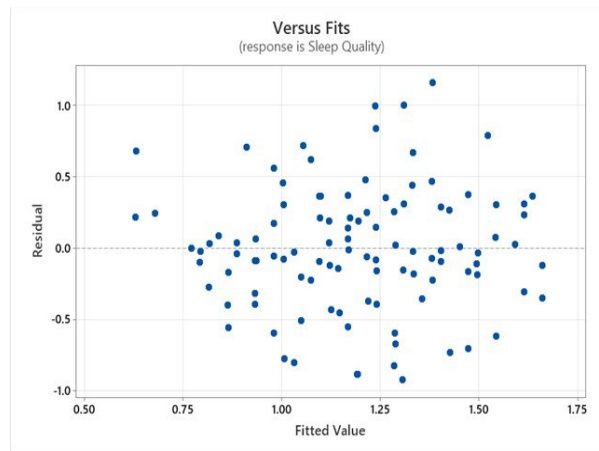Figure 2. Normal Probability Plots

Figure 3. Regression Fitted Model

5. Conclusion

Since implementing the enhanced community quarantine (ECQ) in the Philippines in 2020 due to the COVID-19 pandemic, schools and universities have shifted to online education to prevent the virus spread among students and teachers. Since the pandemic, universities, and schools are closed, contributing to the probability of students feeling that they are opting out of school or community isolation. Furthermore, through the shift in online learning, the difference between home-study life can be challenging to separate. Stressors such as excessive workload, anxiety, depressive disorders, and sleep deprivation presumably affect the students' physical, emotional, and mental health. Being in a situation of uncertainty, it is essential to prioritize health, especially among students. One of the most critical factors that affect one's health is sleep, as it is considered a basic necessity in one's life. Most students feel that studying excessively and finishing the workload of activities compared to having a good quality sleep can increase their academics. Yet, this type of habit can be dangerous to one's health. For further analysis, this study aims to evaluate the sleeping quality of college students during the COVID-19 pandemic by determining the effects of sleep quality on their fatigue level. This can be beneficial to students and universities to assess the factors that contribute to a student's fatigue level. Results in this study were gathered from college students using a survey questionnaire aiming to determine. Through the collected data, the assessment of students' fatigue is feeling exhausted throughout the day. This can be correlated to students' sleep quality since sleep deprivation makes students feel drowsy and tired during the day (Henna, 2018). To understand the factors that disturbs students' sleep quality, Pittsburgh Sleep Quality Index (PSQI) was utilized. Hence, by assessing these factors, it was determined that difficulty in sleeping attained the highest rate, followed by lack of enthusiasm. Night routines such as using gadgets before sleeping and academic performance can be causes that can affect these situations.

In closing, mental fatigue and physical fatigue have affected one another. Students experiencing either one of these fatigue levels causes them to experience the other. Their relationship with one another suggests that excessive workload from school or home and stressors regarding their mental health can be indicators of fatigue that students can experience within their bodies.

6. Recommendation

This study provided an accurate and deep understanding of how mental and physical fatigue correlates to the sleep quality of college students. Results show that 92.6% of the respondents experience substantial fatigue, and all factors from the fatigue assessment scale are significant. Moreover, there is only a moderate correlation between sleep quality and physical fatigue, which proves that the students' only four (4) from the PSQI were significant and highly felt. Given these numbers, it is still advisable for students to achieve a good sleep quality as it is the primary source of vitality, motivation, and physical and mental well-being.

In an unstable social situation, it is crucial to show support and monitor the well-being of college students as they achieve major developmental milestones, as sleep deprivation highly influences university students' academic success. Institutions are advised to provide ample time for students to recover from academic workloads, provide counseling

to students, and raise physical and mental health awareness to help students enhance their study skills and adjust to their working environment.

This study was limited to the information on the students' academic workload and their daily activities. However, it was evident that the sleep quality of the respondents is slightly greater on poor sleep. This could be attributed to bad sleeping habits, including irregular sleep cycles, medical conditions, psychological issues, taking vices, or too much screen time. For future researchers, it is recommended to look at the students' sleep quality before, during, and after the COVID-19 lockdown. It is also advisable to consider other age groups as respondents (Elementary, Junior and Senior High School, Master's Degree, and Post-Graduate) and look upon their pre-existing psychological issues and daily activities.

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