



Sleep, Physical Activity, and Wellbeing of University Students under Remote Education

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[Abstract]

The study investigated the relationship between sleep duration, physical activity, and well-being among Filipino university students under remote education due to the pandemic. A sample of 1,050 university students volunteered to participate in the study. The participants reported an average sleep duration of 6.68 hours which is below recommended levels. The study found that male students perceived better well-being than females, and those sleeping more than 7 hours had higher well-being. Engaging in regular physical activity was associated with better well-being. Regression analysis revealed that both sleep duration and physical activity significantly predicted well-being, with sleep having a stronger impact. Overall, the study emphasized the importance of adequate sleep and physical activity for students' well-being during remote education.

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Keywords: sleep duration, online education, COVID-19 pandemic, Filipino university students, physical activity participation

I . Introduction

University life has its advantages for students such as independence, social interactions, and knowledge building for future career preparation. However, university life can also be challenging and demanding for students and may lead to unfavorable changes in their lifestyle caused by various life stressors such as interpersonal stress (Alharbi and Smith 2018; Dingle, Vidas and Hong 2020), academic stress (Alharbi and Smith 2018; Barbayannis, Bandari, Zheng, Baquerizo, Pecor and Ming 2022; Dingle et al. 2020), and environmental stress (Alharbi and Smith 2018; Dingle et al. 2020). One recent environmental stressor was the emergence of COVID-19 which impacted the educational system in terms of how lessons were taught. From the traditional face to face classroom set-up, it shifted to remote education setting which led to various changes in students' behaviors (Cruz, Cando and Kim 2022; Dongol et al. 2022; Hori et al. 2023; Olfert, Wattick, Saurborn and Hagedorn 2022; Velasco et al. 2022). While face to face teaching is almost back to normal, certain schools continue to implement remote education due to ongoing pandemic circumstances. Hence, it is imperative to continue investigating topics pertaining to the impact of the (post) pandemic era, particularly in the area of online education, to gain further understanding on how this instructional approach influences diverse affective, cognitive, and behavioral aspects among students.

Several consequences transpired in students as a result of the change in teaching format caused by COVID-19. For instance, Olfert et al. (2022) found that American students' low-intensity physical activity (PA) increased, while their high-intensity PA decreased during the pandemic. Similarly, Cruz et al. (2022) observed a reduction in total PA in Filipino students during lockdown compared with pre-COVID-19 and the changes in specific types of PA between male and female students were found to differ as well. However, a different result was found by Romero-Blanco et al.

(2020). They reported an increase in total physical activity in Spanish university students during lockdown. They also revealed that female students spent more time doing PA during lockdown than male students.

The impact of the pandemic on sleep behaviors was also studied. Fowler and Kumte (2022) found that American medical students experienced worsened sleep quality during the pandemic, while sleep duration remained relatively unchanged. Gusman et al. (2021) reported that students in America attending online classes initially felt better sleep quality but it deteriorated over time. They also stated that sleep duration increased but eventually stabilized for the remaining semester. Velasco et al. (2022) found that sleep quality and daytime sleepiness of Filipino medical students became poor while attending online courses during the pandemic. Likewise, Dongol et al. (2022) showed that university students in Egypt had poor sleep quality while studying at home during COVID-19. Finally, Smit et al. (2021) demonstrated that sleep timing and duration of Canadian students were affected during remote instruction caused by social distancing. In particular, even if students' overall sleep did not differ while attending classes remotely, their sleep time increased in the morning and decreased in the evening.

Indeed, the results of the studies showed that students' behaviors have been altered resulting from the shift in the academic learning environment caused by the pandemic. The modifications in physical activity patterns and sleep behaviors underscore the broader impact of the pandemic on students' overall well-being and lifestyle. Therefore, continuous research is vital to understand and address the effects of these changes on students' health and other school-related outcomes.

Well-being is defined as a positive state based on how individuals think and feel about their life experiences (Center for Disease Control and Prevention 2018; World Health Organization 2023). That is, when individuals perceive their experiences from different aspects of their lives to be joyful, meaningful, and satisfactory, their well-being state tends to be positive. Findings from previous studies showed an association between well-being and

healthy behaviors. For instance, individuals who slept less than 7 hours rated their self-esteem and life satisfaction negatively, while those who slept 7-9 hours reported better psychological well-being (Lee and Sibley 2019). In a similar study conducted in students, results revealed that prevalence of depressive symptoms was associated with poor sleep quality and short sleep duration (Li, Yin, Cai, Cheng and Wang 2020). In terms of physical activity, studies showed that participation in physical activity has a positive association with well-being (Cruz et al. 2022; Rogowska. Pavlova, Kuśnierz, Ochnik, Bodnar and Petrytsa 2020; Shang, Xie and Yang 2021; Zhang, He and Chen 2022). For example, Zhang et al. (2022) found that engaging in physical activities with varying intensities was positively associated with happiness, life satisfaction, and positive affect but negatively associated with negative affect.

Overall, the findings from these studies indicate that students' academic environment (e.g. online education) could lead to changes in their behavior, particularly sleep and physical activity, which in turn could also potentially affect their well-being. However, given the variances in results from previous studies related to sleep and physical activity of students during remote education (Cruz et al. 2022; Romero-Blanco et al. 2020; Fowler and Kumte 2022; Smith et al. 2021) and the lack of information about the association of these important behavioral variables with well-being in students in the Philippines, further investigation is warranted about this topic. Examining the relationship between sleep and physical activity and well-being of university students during remote education could provide further understanding about important personal-related factors that could facilitate or attenuate well-being of students in an online environment. The findings can also guide the development of effective interventions to enhance well-being and academic outcomes for students.

Therefore, this study examined the relationship between sleep duration, physical activity and well-being of Filipino university students during remote education. Specifically, we aimed to determine which variable would strongly predict well-being of Filipino university students. We also compared well-being perceptions of Filipino university students based on their sleep duration level,

physical activity participation, and gender.

II . Method

2.1. Participants

A total of 1050 university students volunteered to participate in the study. There were 463 male students (44.1%), 550 female students (52.4%) and 37 LGBTQ+ students (3.5%) and their ages ranged from 18 to 22 years. The participants were students enrolled in various degree programs such as engineering, education, commerce, arts and science, and nursing. The students were recruited from a private university located in Cebu City, the Philippines' second largest metropolitan area.

2.2. Measurement Tools

To measure well-being of students, the Psychological General Well-Being Index (PGWBI) was used. The PGWBI is a 22-item questionnaire that measures an individual's intrapersonal affective states regarding one's psychological and general well-being. Each item is rated on a 6-points scale. Previous studies demonstrated the psychometric properties of this tool (Grossi and Compare 2014; Lundgren-Nilsson, Jonsdottir, Ahlborg and Tennant 2013; Uraz, Tocak, Yozgatligil, Cetiner and Bal 2013). The internal reliability score for this study is .937.

Sleep duration was assessed by asking students: "During the past month, how many hours of actual sleep did you get at night?" adapted from the Pittsburgh Sleep Quality Index (PSQI) tool (Buysse, Reynolds, Monk, Berman and Kupfer 1989).

Physical activity was measured by asking students if they actively engage in regular physical activity or exercise (2-3 times per week) for the past six months. Response choices are either yes or no.

2.3. Procedure

This quantitative cross-sectional study was part of a larger research

project related to COVID-19, remote education and students' health-related outcomes. Potential participants were recruited using a non-probabilistic convenience sampling method. Students who volunteered to take part in the study completed an online survey using Google Forms that included the purpose of the study, data to be collected, information about their rights as participants, declaration of confidentiality, and statement of informed consent. Only students who clicked the statement "I agree to take part in this study" in the informed consent section were able to proceed to the actual survey questionnaires. Data collection was conducted in 2022 in which classes in the country were still conducted via online teaching. Completion of the survey lasted approximately 15-25 minutes. Permission and approval to conduct the study were obtained from relevant school officers and ethics committees. Ethical standards of the American Psychological Association were also observed when dealing with human participants.

2.4. Data Analysis

Multiple linear regression analysis was conducted to predict university students' overall well-being based on sleep duration and physical activity. Separate one-way ANOVAs were performed to determine differences in well-being perceptions of students based on gender, physical activity, and sleep duration. Subsequent pairwise comparisons were performed when needed. The significance level was set at $p < 0.05$.

III. Results

Overall results showed that university students engaged in remote education reported an average sleep duration of 6.68 hours, with nearly half of them (48%) sleeping less than 7 hours per night. Meanwhile, Additionally, a significant portion (56.4%) of students reported having no regular physical activity during their time in online education. Finally, university students' average well-being score was 58.63, and more than half of the participants (53.4%) scored below this average, indicating a prevalence of severe distress

among the sample.

3.1. Influence of Gender, Sleep Duration, and Physical Activity on Well-Being

<Table 1> Well-Being of University Students based on Students' Personal Characteristics

Variable	mean	SD	<i>p</i> value	eta ²	<i>Post hoc</i>
Gender					
Male	61.41	16.60	0.001*	0.021	f
Female	56.53	17.55			
LGBTQ+	55.11	18.30			
Sleep duration					
more than 7 hours	65.67	16.33	0.001*	0.144	a,b,c
6-7 hours	58.78	15.95			a,d,e
5-6 hours	50.50	16.64			a,d
4 hours and below	45.23	14.48			a,e
Physical activity					
No regular PA	54.63	16.44	0.001*	0.069	
Regular PA	63.81	17.08			

Note: a=more than 7 hours > 6-7; b=more than 7 hours > 5-6 hours; c=more than 7 hours > 4 hours or below; d=6-7 hours > 5-6 hours; e=6-7 hours > 4 hours below; f=male > female

Table 1 shows the results for the well-being of students based on gender, sleep duration, and physical activity. One-way ANOVA results showed a statistically significant effect of gender ($F(2,1047) = 10.96$, $p < .001$), sleep ($F(3,1046) = 58.67$, $p < .001$), and physical activity level ($F(1, 1048) = 77.89$, $p < .001$) on well-being.

Multiple comparisons between genders showed that only male students' well-being mean score was significantly greater than female students' well-being score. However, there were no statistically significant differences in well-being mean scores between male and LGBTQ students or between female and LGBTQ students.

Results of the multiple comparisons for sleep duration revealed that the well-being mean score for sleep duration of more than 7 hours was significantly higher compared with well-being mean

scores for all other remaining sleep duration groups (6-7, 5-6, and 4 hours and below). Likewise, the well-being mean score for 6-7-hour sleep duration was significantly higher than the well-being mean scores for 5-6 hours and 4 hours and below sleep duration. However, no significant difference was found between the well-being mean scores for 6-7 hours and more than 7 hours sleep duration. Meanwhile no difference in well-being mean scores were found between 5-6 hours and 4 hours and below sleep duration.

Regarding physical activity, the well-being mean score for regular PA was significantly higher than well-being mean score for no regular PA.

<Table 2> Regression Analysis among Sleep, Physical Activity, and Well-Being of Students

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	27.92	2.33		11.97	0.001
Sleep duration	4.09	0.34	0.37	11.93	0.001
Physical activity	7.84	0.99	0.22	7.95	0.001

Table 2 shows the results for the regression analysis with well-being regressed on sleep duration and physical activity. The overall regression was significant: $F(2,1044) = 114.903$, $p<.001$. The model explains about 18% of the variance in well-being. Both sleep duration and physical activity were significant predictors with a positive relationship to well-being. We also performed stepwise regression to further determine how much variance each predictor has in explaining well-being. Results showed that 13.1% of the variance in well-being was contributed by sleep duration whereas only 5.0% was explained by physical activity.

IV. Discussion

The purpose of the study was to examine the relationship between sleep duration and physical activity of university students during

remote education. Specifically, we examined which variable would strongly predict well-being of Filipino university students. We also compared well-being perceptions of Filipino university students based on their sleep duration level, physical activity participation, and gender.

Overall, the findings revealed that students' average sleep duration during remote education was 6.68 hours which indicates that students in this study were sleeping below the recommended sleep duration for young adults of 7-9 hours (Hirshkowitz et al. 2015). This finding supports (Capinding 2021) but also contradicts (Fowler and Kumte 2022; Gusman et al. 2021; Smit et al. 2021) previous results. Differences in study findings may be attributed to a sample population with varied sleeping durations within participants. Moreover, the present study also showed that the average well-being score of students was 58.63 points, suggesting feelings of severe distress from a significant portion of the student sample.

4.1. Well-Being Perception of Students based on Gender, Sleep Duration, and Physical Activity

Differences in perceptions of well-being of students were also found based on the three independent variables. For gender, male students reported better perception of their well-being than their female counterparts and in line with previous research that female students exhibited higher state of distress during school lockdown (De la Rosa et al. 2022; Eleftheriou, Rokou, Arvaniti, Nena and Steiropoulos 2021). Interestingly, no significant differences were obtained between LGBTQ students and male and female students despite having the lowest well-being score. The number of participants in this category could have affected the non significant finding. It is therefore noteworthy to further explore the well-being of students during remote education and if differences or similarities exist among other gender identities in order to understand how gender identities influence well-being.

As expected, differences in well-being of students were found based on sleep duration and physical activity. Students who slept

more than 7 hours reported higher well-being compared to those students who slept fewer than 7 hours. Similarly, students who engaged in regular PA stated better well-being than those with no regular PA. The present results confirm previous studies that also found significant effects of sleep duration and physical activity on students' well-being (Cao, Teng, Shao and Wu 2023; Lee and Sibley 2019).

4.2. PA and Sleep Duration as Predictors of Well-Being

Similar to other previous findings (Cao et al. 2023; Cruz et al. 2022; Alshammari et al. 2022), both sleep duration and physical activity, were found to be positively associated with well-being of university students during remote education. That is, students' perceived well-being is likely to become poor when they are deprived of sleep and when they do not engage in regular physical activity and vice versa. The present study also showed that sleep duration (17.9% variance) is a greater contributor in predicting well-being.

The change in learning setup in education during the pandemic has caused additional stress (Lim et al. 2022; Nuryana, Xu, Kurniawan, Sutanti, Anisa Makruf and Nurcahyati 2023) to the myriad of stressors being experienced by students (Alharbi and Smith 2018; Barbayannis et al. 2022; Dingle et al. 2020) and subsequently affected various aspects of their lives. In the present study, since students had to attend remote education in either asynchronous or synchronous format outside of school premises or at home, it is plausible that their daily schedule could have been replaced with or allotted to other activities leading to students not having enough time for PA and sleep. For instance, Abad Santos et al. found that Filipino university students spend a daily average of 10.3 hours using the internet during the pandemic while Custodio et al. (2021) reported that university students mostly devote their time to online classes and other school-related tasks as well as spend their time on various social media. In this case, the long hours expended online on academic work and social media could have disrupted students' time to acquire sufficient sleep and participate in PA and subsequently resulted in a decrease in their well-being state. Nonetheless, the current findings highlight the

importance of not only participating in regular PA but more so getting sufficient sleep in maintaining or enhancing students' positive well-being during remote education.

4.3. Limitation

This study has its limitations. First, it used a cross sectional research approach and thereby cannot state causal relationships among variables. Future study examining these variables using a longitudinal approach is recommended. Second, other personal and environmental variables that may affect well-being of students during remote education such as personality traits, study location, and teacher teaching behaviors were not examined. Examining these factors could provide additional insights about their association with well-being of students during remote education. Finally, only well-being was investigated as an outcome measure in students. Hence, it would be noteworthy to consider if other student-related outcomes such as academic performance could be affected by PA and sleep.

4.4. Conclusion

The results of the current study demonstrate that the majority of Filipino university students in this sample population are sleep-deprived, while more than half do not engage in regular physical activity and are experiencing severe distress. Furthermore, the findings show positive associations between physical activity and sleep duration and well-being of university students during remote education caused by the pandemic. It is therefore suggested that appropriate interventions and support programs be implemented to address the sleep deprivation, lack of physical activity, and psychological distress among Filipino university students, particularly during periods of remote education.

Disclosure Statement

The authors have no conflicts of interest to disclose.

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Received: April 11, 2024; Reviewed: December 30, 2024; Accepted: January 3, 2025