Effects of Sleep Quality on the Stress of University Students

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Abstract

Purpose
To understand sleep patterns and predictors of poor sleep quality and effect on the stress among university students.

Method
One hundred thirty-nine students aged 19.97 (± 2.79) years from an urban Life University completed a cross-sectional survey about sleep habits that included the Pittsburgh Sleep Quality Index (PSQI), the Morningness–Eveningness Questionnaire (MEQ), Epworth Sleepiness Scale (ESS), Sleep Belief Scale (SBS), Perceived Stress Scale (PSS) and Kessler Psychological Distress Scale (PDS).

Results
Sleeping with the smartphone in bed and smartphone sound mode had a significant negative effect on sleep quality; sleep time, MEQ score, and awaken by smartphone. Students reported disturbed sleep; 44.6% were categorized as poor-quality sleepers by the PSQI, and sleep time, sleep latency and sleep duration were significantly related to sleep quality ($p = 0.000$, $p = 0.000$, $p = 0.000$, respectively). A significant difference was identified between sleep chronotypes based on MEQ score and sleep quality based on the PSQI score ($p = 0.037$). PSS and PDS score were significantly related to sleep quality by the PSQI score ($p = 0.001$, $p = 0.000$, respectively).

Conclusions
These results demonstrate that using smartphone is related to insufficient sleep and sleep quality. In addition, the morning type students had lower sleep quality which effects on increasing the stress and psychological distress of university students. Given the close relationships between sleep quality and smartphone habits, intervention programs to modify the habits in this population should be considered.

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Introduction

Sleep is an essential part of our lives, and we spend approximately 33% of our lives in sleep. It is well known that sleep is one of the most important factors to maintaining a well-balanced lifestyle and living a healthy life physically, mentally and emotionally. There were significantly more physical and psychological health problems for the students who have poor-quality sleep compared with good-quality sleep (Cheng et al., 2012, Lund, Reider, Whiting, & Prichard, 2010, Wiggs, 2001). According to study, the correlation was reported between inflammation and sleep quality. The patients with higher levels of CRP (C-reactive protein) slept shorter including cardiovascular and metabolic diseases (Martinez-Gomez et al., 2011). Research clearly demonstrates that adolescents who have less sleep showed higher chances of depression (Sivertsen, Harvey, Lundervold, & Hysing, 2014). Cho, Lee & Kim (2019) found that 254 (36.8%) high school students reported having a depressed mood (Hospital depression scale, HDS ≥8).

Research found that college students' mean total sleep time was 7.02 hours and that between 7.4% and 70% of the students sleep less than six hours per night (Lund et al., 2010, Taylor & Bramoweth, 2010, Kelly, Kelly, & Clanton, 2001). One of the reasons is that many college students sacrifice sleep to reinforce higher grades and academic achievement, are growing (Brown, Qin & Esmail, 2017). According to Thomas (2014), college students consistently complained their sleeping time is less than they would like to have. Moreover, sleep problems have been reported by nearly 70% of college students (Kloss, Nash, Walsh, Culnan, Horsey, and Sexton-Radek, 2015). College students, in general, experience mild daytime sleepiness and mild fatigue, but some suffered significant daytime sleepiness (14.4% to 25%) and significant fatigue (37.5% to 54.5%) (Thomas, 2014, Lund et al., 2010, Kang & Chen, 2009, Buboltz, Brown, & Soper, 2001).

Sleep complaints are frequently recognized among college students and are associated with numerous health issues. Kloss et al. (2015) and Orzech, Salafsky, & Hamilton (2011) have found that a lack of sleep negatively affected emotions, physical and mental health, cognition, depression, and anxiety. Many studies identified in young adults patterns of had poor sleep hygiene such as maintaining variable bedtimes and waketimes, consuming caffeine late in the day, smoking cigarettes and drinking alcohol before bedtime (Lund et al., 2010, Taylor & Bramoweth, 2010, Brown, Buboltz, & Soper, 2002). Other research reported college students' lower awareness of sleep hygiene compared to that of adult groups as a factor (Voinescu and Szentagotai-Tatar, 2015), and the younger generation was not aware of the correlation between poor sleep hygiene and their sleep (Thomas, 2014).

Sleep problems are related to the circadian timing system, which is influenced by factors of physiological function and plays a role in psychiatric disorder. In particular, college students are exposed to various medical risks including school and work schedules (Rasekhi, Ashouri, & Pirouzan, 2016). Sleep is a challenge for students and poor sleep can be linked to mental health issues and a person's academic performance (Herrmann, Palmer, Sechrist & Abraham 2018). According to a research, employed students had poor sleep time due to the stress from multiple responsibilities from studying and working (Knowlden and Sharman, 2014).

There have been several studies on sleep quality and behavior among college students, especially in developed countries, but to the best of my knowledge there have been no such studies in Cambodia. The purpose of this study is to provide information about overall sleep quality and habits among the students in a university in Cambodia, and to understand sleep habits and patterns that affect sleep quality, the factors that increase the risk of sleep deprivation and their correlation with stress and depression among the students.

Methods

The design of this study was based on cross-sectional survey research. This entailed

conducting surveys throughout Year 2, 3 and 4 students at Life University, Cambodia, in October of 2019, and the survey was given to the classroom lecturers, who handed it out to students. The student survey was developed in English originally and translated into Khmer by a professor with an excellent command of the English language.

General Information

The main research questions were divided into three sub-questions and were addressed. Sub-question 1 was for demographic information and smartphone behaviors to consider the associations between factors of sleep behaviors including sex, age, grade, Body Mass Index (BMI), fast food eating habits, screen (TV, computer and smartphone) exposure time, and smartphone handling and behaviors. BMI (kg/m^2) was calculated by dividing weight (in kg) over height^2 (in m^2). For this study, time spent was measured by how often the participant used each device of television, computer and smartphone, and screen time was calculated by the total time of all electronic devices used the hour before bedtime.

PSQI (Pittsburgh Sleep Quality Index) & MEQ (Morningness-Eveningness Questionnaire)

The diagnostic measures included the Pittsburgh Sleep Quality Index (PSQI) and Morningness-Eveningness Questionnaire (MEQ), used for sub-question 2 and 3 to understand sleep behaviors and assess chronotype.

To measure sleep quality and behavior, the PSQI was used. It consists of 19 self-rated questions and is grouped into seven component scores to measure sleep quantity and quality including, sleep latency, sleep duration, habitual sleep efficiency, the frequency, and severity of specific sleep-related problems, sleep medication, daytime dysfunction, and sleep quality over the last 4 weeks (Lai & Say, 2013). The seven component scores are summed to calculate a global PSQI score and the sum score of "5" or greater indicates poor sleep quality while less than "5" indicates good sleep quality. A sum score of greater than "10", which indicates severe sleep problem or sleep disorder. The PSQI sum score was reported with a good specificity and sensitivity between 0.82 and 0.89 (Schlarb, Claßen, Grünwald, & Vögele, 2017).

To assess the chronotype or the sleeping habit, the MEQ was used. Candidates were required to answer a total of 19 questions about preferred time for getting up, going to bed, physical exercise or working in day time or evening time, and their feelings during the day time. A sum score was calculated to differentiate the student as morning types (people with morningness) or evening types (people with eveningness) in five levels: Definitely morning type (70-86); moderately morning type (59-69); neither type (42-58); moderately evening type (31-41) and definitely evening type (16-30) (Schlarb et al., 2017).

Epworth Sleepiness Scale (ESS)

The Epworth Sleepiness Scale (ESS) was used a questionnaire to evaluate daytime sleepiness. There are eight items assessing the probability to fall asleep in eight everyday situations with response from 0 (would never fall asleep) to 3 (high chance to fall asleep). The sum score of the ESS is from 0 to 24. The sum scores ≥ 10 were considered to have significant levels of daytime sleepiness (Lai and Say, 2013).

Sleep Belief Scale

For assessing sleep hygiene awareness, the sleep belief scale (SBS) was used in which a 20-item. Scale evaluates a candidate's awareness regarding the knowledge of behaviors related to the influence on sleep, including drug consumption (alcohol, caffeine, nicotine, sleep medication), daytime behaviors (physical exercise and naps), and activities and thoughts previous to sleep (eating, studying, relaxing, worries). The correct answer is a negative effect for all the questions except numbers 5, 9, 15, and 19 (which have a positive effect). The points were calculated as one point per question for the correct answer, and the total range from 0 to 20. The totals are classified as a poor awareness (0~5), an intermediate (6~13), and an excellent awareness (14~20) (Alshahrani, & Al Turki, 2019).

Perceived Stress Scale (PSS) & Kessler Psychological Distress Scale (PDS) (K10)

The Perceived Stress Scale (PSS) was used for measuring psychological stress. It was designed to measure the degree of frequency of individuals' feelings and thoughts related to specific events and situations which occurred in the last month. There are 10 items in which the numbers 1, 2, 3, 6, 9 and 10 are negative and the 4, 5, 7 and 8 are positive. Each item is rated on a 5-point Likert scale (1 = never to 5 = very often) and total scores range from 0 to 40 (Lee, 2012).
The Kessler Psychological Distress Scale (K10) was used to assess levels of psychological distress. The K10 scale includes 10 questions about emotional states each with a 5-point Likert scale (1 = never to 5 = very often) and total scores range from 0 to 40. Scores are classified as a good condition (10~19), a mild (20~24), a moderate (25~29), and a severe disorder (30~50) (Anderson, Sunderland, Andrews, Titov, Dear, & Sachdev, 2013).

This project has been followed by the Research Committee of Life University, Cambodia. While conducting this research study, all individuals and the parent/guardian participating in this study signed informed consent forms and answers given by all respondents were anonymously and confidentially processed.
Statistical analysis was done using SPSS version 16.0 (SPSS Inc. USA). For comparisons, group differences were analyzed using Chi-square test or Student's t Test or ANOVA. Furthermore, Spearman's correlations were carried between the sleep patterns, behavior and sleep-related variables. In all analyses, $P<0.05$ (2-tailed) was considered statistical significant.

Results

General characteristics
The sleep survey was distributed to a total of 269 students, and 236 responded and attempted the questionnaire, yielding an initial response rate of 87.7%. Out of the 236 responses, 97 (41.1%) were excluded because they were incomplete, had a lack of consent of the participants, or had a chronic disease. With final respondents 139 students consisted of 94 (67.6%) females and 45 (32.4%) males, ranging between 18 to 30 years old with a mean age of 19.97 (±2.79 years) (Table 1).

Table 1. Demographics

Variable		n	(%)
Sex	Male	45	(32.4)
	Female	94	(67.6)
Grade	Year 2	118	(39.9)
	Year 3	94	(31.8)
	Year 4	84	(28.4)
Major	Art, Humanities & Languages	32	(23.0%)
	Business Management	40	(28.8%
	Science & Engineering	25	(18.0%)
	Hospitality Management	14	(10.1%)
	Nursing & Midwifery	28	(20.1%)
Sleep with Smartphone in Bed	Yes	84	(60.4%)
	No	55	(39.6%)
Phone Mode	Off	46	(33.1%)
	Vibration	41	(29.5%)
	On	52	(37.4%)
Awaken by Smartphone	Yes	50	(36.0%)
	No	89	(64.0%)
Variable		M(±SD)	
Age		19.97 (±2.79)	years old
BMI		20.18 (±3.07)	
Fast food		2.71(±2.27)	times/week
Screen Time	Total	259.99(±212.36)	
	TV	14.09(±26.74)	
	Computer	68.17(±110.89)	
	Smart phone	177.73(±168.25)	
Awaken Rate by Smartphone		0.88(±1.74)	
MEQ Score		54.57(±7.01)	
PSQI Score		6.10(±2.45)	
Sleep Time		11.10(±1.22)	pm
Sleep Latency		20.79(±16.21)	
Rise Time		6.54(±0.51)	am
Sleep Duration		6.93(±1.39)	hours

Among these 139 students, 55 (39.5%) were Year 2 students, 41 (29.5%) were Year 3 students and 43 (30.9%) were Year 4 students, and the largest group consisted of Business Management majors, numbering 40 students

Table 2. Comparison of the incidence of frequency of sleep disturbance

Reason for having trouble sleeping	Not during the past month n (%)	Less than a week n (%)	Once or Twice a week n (%)	3 or more times a week n (%)
cannot get to sleep within 30 minutes	36 (25.9)	49 (35.3)	29 (20.9)	25 (18.0)
wake up in the middle of the night or early morning	49 (35.3)	37 (26.6)	27 (19.4)	26 (18.7)
have to get up to use the bathroom	38 (27.3)	44 (31.7)	36 (25.9)	21 (15.1)
cannot breathe comfortably	77 (55.4)	40 (28.8)	13 (9.4)	9 (6.5)
cough or snore loudly	105 (75.5)	27 (19.4)	4 (2.9)	3 (2.2)
feel too cold	57 (41.0)	46 (33.1)	28 (20.1)	8 (5.8)
feel too hot	56 (40.3)	54 (38.8)	25 (18.0)	4 (2.9)
have bad dreams	65 (46.8)	43 (30.9)	20 (14.4)	11 (7.9)
have pain	94 (67.6)	24 (17.3)	17 (12.2)	4 (2.9)

(28.8%). Average BMI was 20.18 (±3.07) and the frequency of having fast food or fried food was 2.71 (±2.28) times a week. There was no statistically significant difference between sex and age regarding rate of having fast food.

The average time for watching TV was 14.09 (±26.75) minutes a day. However, 82 (59%) students did not watch TV at all. Average time on a computer/laptop was 68.17 (±110.89) minutes daily, involving 85 (61.2%) students. Most of the students, 136 (97.8%), spent time on a smartphone at an average of 177.73 (±168.25) minutes. Moreover, 225 (76%) students slept putting their smartphone on their bed, with those putting it in "Off" mode numbering 46 (33.1%), "Vibration" at 41 (29.5%), and "On" mode at 52 (37.4%). Fifty (36%) students were awake due to the smartphone, and the average was 0.88 (±1.75) rate a week. The results showed that time spent on a computer/laptop and smartphone was significant correlated with total screen time (r=0.623, p=0.000; r=0.858, p=0.000, respectively). A statistically significant difference was noticed between sleeping with the smartphone in bed and total screen time (F=5.646, p=0.017).

Sleep patterns and behaviors

The average bedtime of the students was 11.10 p.m. (±1.22 hours) and rise time was at 6.54 a.m. (±0.51 hours). In the whole sample, 9.3% reported sleep latency of more than 30 min and they had an average of 6.93 (±1.39) hours of daily sleep duration (Table 1). The results showed that time spent with a smartphone was not significant correlated with sleep time and rise time. There was no statistical difference between gender and sleep duration. Statistically, a significant difference was observed in that males spent more time than females on computers or laptops (t=3.10, p=0.002) and total amount of screen time (t=2.54, p=0.012).

Sleep quality

As measured by PSQI, 11 (7.9%) students reported that their overall sleep was very good, 106 (76.3%) - fairly good, and 22 (15.8%) - fairly bad. The total score of PSQI was above the cutoff for good sleepers suggesting that sleep quality was impaired. More specifically, the average was 6.10 (±2.45), and the majority of the students 97 (48.2%) were good sleepers, 62 (44.6%) students had impaired sleep quality with a total PSQI score above 5, and 10 (7.2%) students had severe sleep problems according to the PSQI (>cut-off 10). A statistically significant correlation was shown between PSQI score regarding sleep time, sleep latency and sleep duration (r=0.354, p=0.000; r=0.329, p=0.000; r=-0.659, p=0.000, respectively) (Table 3). Genders and grades did not differ concerning the proportion of bad sleep quality and severe sleep problems. Results indicated students' genders and grades showed no differences in overall sleep quality, however the number of female students who had good sleep quality (n=49; 52.1%) was higher than males (n=18; 40.0%). Moreover, there was significantly difference

Table 3. Correlation of sleep patterns based on PSQI Score

	Sleep Time		Sleep Latency		Rise Time		Sleep Duration	
	r	p*	r	p*	r	p*	r	p*
PSQI Score	0.354	0.000	0.329	0.000	0.037	0.665	-0.695	0.000

*p-value Pearson Correlation test
PSQI: Pittsburgh Sleep Quality Index Scale

between overall sleep quality and PSQI score (F=4.793, p=0.010).

The result showed that the self-reported incidence of frequency of sleep disturbance based on the PSQI survey (Table 2). More specifically, female students had experienced more often than male sleeping trouble resulting in their inability to get to sleep within 30 minutes and it was observed statistically significant differences (χ^2=10.09, p=0.018). However, for feeling too cold, male showed significant highly chances than female (χ^2=8.78, p=0.032).

The students who had awake experiences by smartphone significantly reported higher trouble staying awake in social activity compared with they didn't (χ^2=15.77, p=0.001). Although many students were reported as significantly facing sleep disturbance, only 20 students admitted to taking medicine to help them sleep. 28 (20.1%) students of them had no problems at all in having enough energy in getting things done, 72 (51.8%) students had only a very slight problems, 38 (27.3%) students had somewhat of a problem and only 1 (0.7%) student had a very big problem. Statistically, no significant difference was observed between genders and the problem with having enough energy in getting things done.

Most of the students (M=31, F=10) had no bed partner/roommate. Among the 41 students who had sleep partners/roommate, 9 (M=2, F=7) students reported that they slept in the same bed. More specifically, 1 student who slept in the same bed with partners/roommates reported long pauses between breaths while asleep once or twice a week and 2 students are less than once a week. For episodes of legs twitching while sleep, 4 students experienced less than once a week, and each 1 student reported disorientation and loud snoring during sleep less than once a week. The students sleeping with partner/roommate showed significantly higher opportunities facing sleep disturbance for cough or snore loudly (F=5.750, p=0.001) compared with no sleeping partner/roommate, however, no statistically difference PSQI score.

Chronotype

Concerning chronotype based on MEQ score, in the whole sample, 32.3% were morning types, 64.7% were neutral types and 2.9% declared to be evening types, and the average was 54.57 (±7.02). In this study, 101 of the students were categorized into moderately (n=43), definitely morning (n=2), moderately evening type (n=4). A significant difference was identified between sleep chronotypes based on MEQ score and major (F=3.530, p=0.009). Post Hoc Tests recognized that the students who are in Nursing & Midwifery highly showed significant difference than Business Management and Hospitality Management (p=0.003; p=0.001, respectively).

MEQ score was significantly correlated with time spending watching TV indicating that there was a positive relationship (r=0.191, p=0.024) between morningness-eveningness and sleep quality of the students in this study. Statistically, significant relationship was observed between MEQ score concerning PSQI score, sleep time, rise time and sleep duration (r=0.177, p=0.037; r=-0.387, p=0.000; r=-0.182, p=0.032; r=0.204, p=0.016, respectively) (Table 6). In addition, there was significant difference between MEQ score and smartphone mode during sleep (F=4.171, p=0.017). Post Hoc Tests recognized that MEQ score was significant difference at the "Off" mode compared with "On" and "Vibration" mode (p=0.010; p=0.020, respectively). No

Table 4. Correlation of Sleep Quality & Patterns between SBS, PSS & PDS Score

	PSQI Score		Sleep Time		Sleep Latency		Rise Time		Sleep Duration	
	r	p*	r	p*	r	p*	r	p*	r	p*
SBS Score	0.078	0.360	0.234	0.005	0.110	0.199	0.004	0.964	-0.092	0.280
PSS Score	0.268	0.001	0.224	0.008	0.015	0.864	-0.192	0.024	-0.156	0.066
PDS Score	0.412	0.000	0.215	0.011	0.200	0.018	-0.023	0.789	-0.240	0.004

*p-value Pearson Correlation test
PSQI: Pittsburgh Sleep Quality Index Scale; SBS: Sleep Belief Scale; PSS: Perceived Stress Scale;
PDS: Psychological Distress Scale

significant difference was measured in the MEQ scores concerning genders, grades, awaken rate due to smartphone and PSQI score.

BMI, food craving of high-calorie foods and sleep quality

The results showed that BMI was not correlated with fast food craving, PSQI score, MEQ score and sleep amount.

Smartphone and sleep quality

There was a significant difference between sleep with the smartphone in bed regarding MEQ score, sleep time and total screen time (t=2.407, p=0.017; t=-2.071, p=0.040; t=-2.409 p=0.017, respectively) (Table 5). A significant difference was noticed between smartphone sound mode and MEQ Score (F=4.171, p=0.017) (Table 5). Additionally, a statistically significant difference was measured between awaken by smartphone and PSQI score (F=0.770, p=0.001) (Table 5). No difference was observed between sleep with the smartphone in bed regarding PSQI score and awaken by smartphone. There was no statically difference between smartphone sound mode regarding sleep time, PSQI score and awaken by smartphone.

Epworth Sleepiness Scale (ESS)

The total score of ESS was 8.22 (±3.44) and most students marked would never doze for "Sitting and talking to someone" with 112 (80.6%) and "In a car, while stopped for a few minutes in the traffic" with 107 (77.0%). There was no significant difference in the ESS scores concerning genders, major, sleep quality based on PSQI score and MEQ score.

Sleep Belief Scale (SBS)

For the SBS, the total score was 8.59 (±3.38). 103 (74%) students had the correct answer for the question "Smoking before falling asleep", however, 128 (92.1%) students answered wrong for "Doing intense physical exercise before going to bed". A statically relation was identified between SBS score and Sleep Time (r=0.234, p=0.005) (Table 4). There was no significant difference in the SBS scores concerning genders, major, PSQI score and MEQ score.

Perceived Stress Scale (PSS) & Psychological Distress Scale (PDS)

The average score was 18.27 (±6.75) for the PSS. The highest stress for the students was "feeling confident to handle their personal problems" and lowest was "being upset about something that happened unexpectedly". PSS score was significantly correlated with PSQI score (r=0.268, p=0.001). A positive (r=0.224, p=0.008) between PSS score and sleep time, and negative (r=-0.192, p=0.024) relation between PSS score and rise time were identified (Table 4). There was no significant difference in the PSS scores concerning genders and majors, however, females mentioned a significantly highly rate for the question "frequency of feeling nervous and stressed" than males (F=0.037, p=0.002). No difference was identified between the PSS score regarding MEQ score and sleep amount. A significant difference was identified between the major and "frequency of feeling unable to control the important things" (F=2,454, p=0.049) and Post Hoc Tests recognised that the students who are in Nursing & Midwifery highly showed a more significant difference than those in Arts, Humanities & Languages, Science and Engineering (p=0.013; p=0.024, respectively).

Table 5. Comparison of Sleep Behaviour of Smartphone between PSQI, MEQ, PSS and PDS Score

	PSQI Score		MEQ Score		PSS Score		PDS Score	
	t	p*	t	p*	t	p*	t	p*
Sleep with Smartphone in Bed	-1.384	0.168	2.407	0.017	-1.883	0.062	-2.467	0.015
Awaken by Smartphone	-3.353	0.001	-0.089	0.929	-0.828	0.409	0.768	0.444

	PSQI Score		MEQ Score		PSS Score		PDS Score	
	F	p**	F	p**	F	p**	F	p**
Smartphone Sound Mode	0.010	0.990	4.171	0.017	1.215	0.300	0.089	0.915

*p-value Pearson Correlation test; **p-value ANOVA test
PSQI: Pittsburgh Sleep Quality Index Scale; MEQ: Morningness Eveningness Questionnaire; PSS: Perceived Stress Scale; PDS: Psychological Distress Scale

An average score for PDS was 9.82 (±6.66), and "feeling everything was an effort" was the most frequent, and "using medication for anxiety, depression, tension" was the least psychological issues. PDS score was significantly correlated with PSQI score (r=0.412, p=0.000). A statistically significant difference was identified between PDS score and PSQI score (F=9.959, p=0.000). A positive (r=0.215, p=0.011; r=0.200, p=0.018, respectively) between PDS score regarding sleep time and sleep latency, and negative (r=-0.240, p=0.004) relation between PDS score and sleep duration were identified (Table 4). There was no significant difference in the PDS score concerning genders, majors and MEQ score, however, for the question of "feel hopeless", there was significant difference between PDS score and major (F=3.416, p=0.011). Post Hoc Tests measured that the students who are in Nursing & Midwifery showed a more significant difference than those in Arts, Humanities & Languages (p=0.002).

Discussion

This study aimed to assess sleep habits and patterns that affect sleep quality and the factors that increase the risk of sleep deprivation and the correlation with stress and depression among Cambodian university students. In this cross-sectional study, a sample of 139 students was investigated using a self-administered questionnaire. The study found that the mean reported sleep duration was 6.93 hours, bedtime was 11.10 p.m., and rise time was 6.54 a.m. Of these, 15.8% were categorized as poor-quality sleepers by the PSQI score and 89.9% did not have the appropriate amount of sleep (<8 hours). Furthermore, 12.9% of the students have slept less than 6 hours per night. This finding is consistent with other surveys on college students who reported mean total sleep time of 7.02 hours (Lund et al., 2010). Other studies have found that college students (7.4% to 70%) have slept less than six hours per night (Kelly, Kelly, & Clanton, 2001; Lund et al., 2010; Taylor & Bramoweth, 2010). However, results in this study indicated that only 15.8% of students reported that their overall sleep was fairly bad compared with 7.9 % who reported that theirs was very good and 76.3% was fairly good as the PSQI subclass question. Similarly, 74.11% of students presented their sleep quality as good compared with 25.88% who had a poor quality of sleep (Badicu, 2018). However, a study identified 56.5% of medical student had a poor sleep quality (Alshahrani and Al Turki, 2019). The average score PSQI was 6.10 (±2.45) which was similar with a study as about 7.6 points (Ji1 and Wang 2018).

Another interesting finding was that between sleep chronotypes based on MEQ score and sleep quality based on the PSQI score. There was a mild negative correlation between the MEQ score and PSQI score. Research showed that the students with higher MEQ scores were likely to have lower PSQI scores (Cho et al., 2019). More specifically, in this study a significant negative correlation was shown

between MEQ score regarding sleep time, rise time and sleep duration. However, a Malaysia study reported that there was no significant correlation between MEQ and PSQI score (Lai & Say, 2013). It might be that all of the students in their study reported as categorized into neither, definitely morning, and moderately morning types.

Findings revealed a significant difference between sleeping with the smartphone in bed had regarding total screen time and sleep quality such as MEQ score and sleep time. In addition, smartphone sound mode had a significant effect on the correlation between and MEQ score. Almost (97.8%) students had time using smartphone with an average of 177.73 minutes. In addition, 76% students fell asleep with their smartphone in the bed with while only a third of students were setting the mode "Off". The students (36%) reported disturbance in their sleep due to the smartphone and the average was 0.88 rate a week. This finding is consistent with other surveys. Using electronics is one of factors for sleep diminishing activities of the poorer quality of sleep (Owens, 2014). An increasing mobile phone addiction level was correlated with decreasing sleep quality (Sahin et al., 2013). Using a smartphone longer resulted in a later bedtime, however, there was no relation with sleep disturbance (Lemola et al., 2015). A study found that internet usage plays a major effect on poor sleep quality and sleep problems including mental health problems (Cheng et al., 2012).

In this study, no significant finding was the correlation between BMI and PSQI scores. This result supports the conclusion that researchers have discovered that BMI was not correlated with PSQI, MEQ scores, and sleep duration (Lai & Say, 2013). On the contrary, the relationship between BMI and sleep quality was identified (Herrmann et al., 2018, Rasekhi et al., 2016, Moore et al., 2011). Many researches found that college students (25~50%) complained about significant levels of daytime sleepiness (Orzech et al., 2011) and lack of sleep leads to daytime napping (Ye, Johnson, Keane, Manasia, & Gregas, 2015). Students with poorer nighttime sleep quality result in poorer functioning and lower life satisfaction (Ye et al., 2015, Goldstein & Walker, 2014). Good sleep hygiene plays important role for the college students to reinforce their sleep quality including a regular sleep-wake schedule, quiet sleep environment, and avoidance of caffeine after lunch, and stimulating activities before bed (Hershner and Chervin, 2014). However, there was no statistically significant difference between ESS score and SBS score. Furthermore, sleep quality based on the PSQI score was not correlated with ESS score and SBS score. These results might be consistent with a study that found that college students don't much appreciate good and poor sleep hygiene practices and how these behaviors result in their sleep (Thomas, 2014). This data identified a need to investigate the college students' sleeping habits and perceptions to identify if further intervention is needed.

Sleep complaints due to lack of sleep are prevalent among college students and cause negative effects on their physical and mental health such as feeling more tense, irritable, depressed, and anxious (Herrmann, et al., 2018, Orzech et al., 2011). According to research, it is caused by circadian timing system which is correlated with numerous factors including physiological function, school and work schedules, and various medical conditions of the body including genetic differences (Rasekhi, Ashouri, & Pirouzan, 2016). Another study found that decreasing sleep quality declines drive and motivation, emotional coping and stress-managing capacities (Knowlden and Sharman, 2014). The result in this study showed statistically significant difference between PSQI score regarding PSS score and PDS score. Additionally, some significant data was identified for some questions at PSS and PDS score among students who are studying between Nursing & Midwifery and others. Much research has found a correlation between poorer sleep quality and lower academic achievement (Cho et al., 2019, Brown, Qin & Esmail, 2017, Dewald et al., 2010, Howell, Jahrig, & Powell, 2004). Employed students were highly stressed from multiple responsibilities and which restricted the amount of sleep at night (Knowlden and Sharman, 2014). For further study, our data are recommended to evaluate the college students' sleeping habits, factors that increase the risk of

sleep deprivation and the correlation with stress and depression among them.

One problem with the study is that the analyses are based on self-reported data on sleep quality. Any other objective measures of sleep were not used to quantify the data. However, although additional standardized measures were considered to support the quality of the survey of perceived sleep quality, the survey will be used for further studies to reduce participant load and increase survey completion rates. It may be another limitation to generalize the findings to all college students in Cambodia or to other racial or ethnic groups while the participants represent a single university-based sample of sleep quality in Cambodia. Another limitation of this study is that no information was taken from the participants on sleep disorders and other comorbidities. Although some chronic health problems were excluded, sleep disorders other than insomnia could not be excluded. Even though the prevalence is very low in young-adult, consequently, the possibility was not ruled out that some of the sleep complaints are associated with these disorders. Further, the details of hypnotics (e.g. type, dosage, and duration of exposure) were not collected.
Further studies in larger groups conducted in a broader set up in a multi-centric way are recommended in view of the potentially significant impact of sleep deprivation in this age group.

Conclusions

These results demonstrate that using smartphone is related to insufficient sleep and sleep quality. In addition, the morning type students had lower sleep quality which effects on increasing the stress and psychological distress of university students. Students who are studying Nursing & Midwifery are influenced highly at some sections of the stress. Given the close relationships between sleep quality and smartphone habits, intervention programs to modify the habits in this population should be considered.

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