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Relationship between Social Media Use and Sleep Quality of Undergraduate Nursing Students at a Southeastern University

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Abstract

Background

Eighty-eight percent of people aged 18-25 engage in social media use. Facebook, Instagram, Twitter, YouTube, and Snapchat are the five most popular applications. The rise of social media use raises the question of how these applications may impact sleep quality. Studies have linked high social media use, phone addiction, and media device use to poor sleep quality, yet few studies have explored how specific application use and multiuse may influence sleep.

Purpose

The purpose of this study was to examine how different social media applications affect sleep quality in undergraduate nursing students.

Methods

A personalized questionnaire was created to assess social media use and confounding variables. The Pittsburg Sleep Quality Index (PSQI) was used to assess sleep quality. The sample for this study included 133 undergraduate nursing students. Following data collection descriptive statistics, Pearson's r correlation, and ANOVA with Scheffe post hoc procedure were used to analyze data.

Findings and Implications

Using PSQI scoring, the overall sleep score of this sample showed that most participants reported poor sleep quality. Results found that individuals that used Snapchat and Twitter reported poorer sleep quality. Individuals with nighttime multiuse of applications and use of sleep aid medications also reported poorer sleep. Participants reported spending up to five hours on one application during the day. Recommendations for future research include analyzing multiuse with a larger population.

The Effects of Social Media Use on Sleep Status in Undergraduate Nursing Students

Experts from the CDC recommend that all adults should sleep at least 7 hours each night (Watson, et al., 2015). Researchers have estimated that 60% of college students report having poor sleep quality, averaging 6-6.9 hours of sleep per night (Angelika, Anja, & Merle, 2017, University Health Center, 2019).

Medic, Willie, & Hemels, (2017) conducted a meta-analysis examining the consequences of inadequate sleep, involving short-term and long-term effects on health. Short term effects included increased stress, pain, depression, and a decrease in cognitive performance. Long-term sleep insufficiency increased the likelihood of numerous chronic diseases such as: diabetes, cardiovascular disease, stroke, obesity, and depression. Rodgers (2008) reported that inadequate sleep can put both health care workers and patients at increased risk for injury due to decreased cognitive functioning of health professionals. Good quality sleep, which reduces the risk of decreased cognitive functioning, is important for nursing student's personal health, as well as the well-being of patients.

Several factors have been identified that may affect sleep quality including setting, lighting, profession, bedtime routine, medical conditions, medications, and electronic devices ("External factors that influence sleep," 2007). One plausible factor that may be affecting the high rate of reported inadequate sleep among college students is their use of social media

Social media usage rates have been reported as high as 88% in people aged 18-25 ("Pew Research Center," 2018). Among these networks the most popular social media sites for those aged 18-24-year are: YouTube, Facebook, Snapchat, Instagram, and Twitter, being used 94%, 84%, 78%, 71%, and 45% respectively (Smith & Anderson, 2018).

High usage of electronic devices and social media has been shown to have an effect on sleep quality in numerous studies. Cain and Gradisar (2010) conducted a systematic review to evaluate electronic media's effect on sleep. They concluded that increased use of media led to shorter sleep time, longer sleep onset, and more sleep disturbances. Longer social media use in the nighttime has also been associated with increased sleep disturbances (Whipps, Byra, Gerow, & Guseman, 2018). Moreover, high usage rates and overuse of specific social media outlets such as: WeChat, Viber, Tango, Line, and Instagram have an association with poor sleep quality (Mohammadbeigi et al., 2016, Xu et al., 2016). Decreased sleep quality has also been reported with increased Facebook and Twitter use (Bowler & Bourke, 2018, Garret, Liu, & Young, 2016).

There are currently no studies that examine the relationship between sleep quality and the five most popular media sites (YouTube, Facebook, Instagram, Twitter, and Snapchat) for American's aged 18-24. Additionally, no studies have identified how the multiuse of applications may affect sleep qualityor the effects on nursing students has not been examined. The purpose of this study was to examine the relationship between specific social media habits of nursing students and sleep quality.

Review of the Literature

Researchers have examined multiple factors associated with social media use and sleep. These have included device usage (Cain & Gradisar, 2010), amount of light (Bowler and Bourke, 2018), use of twitter (Garret, et al., 2016), use of other social media applications (Mohammadbeigi et al., 2016), night time usage of devices and media (Nose et al., 2017, Whipps et al., 2018), and the effects of insufficient sleep (Rodgers, 2008).

Cain & Gradisar (2010) performed a systematic review of 36 research studies that investigated the relationship between electronic device use and sleep quality for children

between the ages of 5-17. Researchers reported that increased use of electronic devices including television, telephones, computer, and computer games related to poorer sleep quality, more daytime sleepiness, and decreased performance in school.

Bowler and Bourke (2018) utilized a quasi-experimental design to identify how light emitting from screens disrupts sleep rhythm, social cognition involved in social media affects sleep, and the cumulative effects on sleep quality. Facebook was used to assess the social cognition and social media aspects. Different levels of filtered light were used to assess lights effect on sleep disruption. A convenient sampling plan yielded thirty undergraduate students, ages 18-23. The researchers compared combinations of a mock Facebook, use of a personal Facebook, a highly lit screen, and a blue-filtered lowly lit screen. A modified Pittsburg Sleep Quality Index (PSQI) was used to assess the effects of the interventions. The findings showed that those viewing personal Facebook reported the lowest sleep quality and a fully lit screen resulted in poorer sleep compared to those using a blue filtered light screen. The recommendation was for individuals to use a filter mode, such as Apple's night mode, as this may improve sleep quality.

Garrett, et al. (2016) conducted a longitudinal study over 10-weeks which assessing Twitter usage and its effect on the sleep quality of college students. A non-experimental design was utilized to compare weekday versus weekend use of Twitter on sleep. A convenience sampling plan was used to include 197 participants that published at least three tweets a week. The researchers measured the number of tweets each night, during the day, during the weekday, and during the weekend. Sleep quality was measured with a self-report 5-point Likert scale which included questions pertaining to the quality of sleep, stressors, stress maintenance, and emotional health. The sleep quality was compared based on the number and timing of tweets.

The researchers reported that higher twitter usage late at night on the weekdays was related to poorest sleep quality, however there was no difference in the sleep quality and tweets on the weekend. The researchers recommended a decrease in use of Twitter during the week to improve sleep quality.

Mohammadbeigi et al. (2016) utilized a non-experimental, cross-sectional design to compare the sleep quality of 380 subjects who reported cellphone and application use (Viber, WhatsApp, Tango, and Instagram). The cell phone overuse scale consisted of 17 items on a 5-point Likert scale. Based on the results participants were then separated into three groups (overuse, normal, low use). Patients sleep quality was measured using the PSQI. Only 10.7% of participants were characterized as cell phone over users, while 61.7% reported poor sleep. However, subjects with higher phone and social media usage reported the poorest quality. Researchers also examined other factors that could affect sleep quality and found that in addition to phone overuse, the subjects' sleep quality was significantly different based on living condition, with those living in dormitories reporting worse sleep quality. Other variables yielded no significant difference in sleep quality score based on gender, age groups, number of active SIM cards, educational terms and level, residency place and marital status. The authors suggested that more research needs to be conducted to assess culture and economic differences as potential factors affecting phone usage and sleep quality.

Nose et al. (2017) conducted a quasi-experimental study to explore the relationship between evening smartphone use and its effect on cardiac autonomic nervous activity after awakening. A convenient sample resulted in 36 high school students, ages 15-18. All participants were to adhere to the same living conditions and regulations, in an attempt to minimize the effects of confounding variables. The participants were divided into those that used cell phones

for long periods (>120 min) and those with short usage (<60 min). The researchers hypothesized that increased blue light exposure and longer cell-phone use would be associate with poorer sleep quality. A self-report questionnaire was used to assess smartphone use and daily lifestyle. Physiologic parameters, ECG, and intra-aural temperature measurements were used to assess participants biological characteristics and cardiac ANS activity (ANS). The researchers reported that those in the longer usage group had diminished ANS activity upon waking, later bedtimes, and delayed wake-times. They concluded that individuals with increased use of smartphones had poorer sleep quality compared to the short usage group.

Whipps, et al. (2018) utilized a non-experimental design to evaluate nighttime media use and how it affects sleep patterns and health of first semester college students. The researchers hypothesized that sub-optimal sleep would correlate with both an increase nighttime use of media, as well as weight gain over the semester. A convenient sampling method yielded 128 participants ages 18-24. Nighttime media use was assessed using a self-report survey, the PSQI was used to assess sleep quality. BMI and weight were used to assess the amount of weight gain. They reported a significant correlation between the greater nighttime media use playing games in bed lead and higher BMI scores. A moderate correlation was found between social media use, playing games, and sleep quality and quantity. The researchers acknowledged that nighttime media use may have also been used to improve mental health of participants, but the increased use increases the likelihood of sleep deprivation and poor sleep quality.

Rodgers (2008) conducted a meta-analysis of 211 research studies to determine the relationship between fatigue and sleepiness to nurse performance and patient safety. Discussed were issues related to insufficient sleep, the effects of insufficient sleep, extended work hours, consecutive shifts, and how these affect the quality of care for patients. Rodgers then analyzed

specific measures on how to combat fatigue, insufficient sleep, and recommended safety practices that could decrease fatigue and sleepiness. Specific practices to combat fatigue were short naps, stimulant use (caffeine and Modafinil), and increase in exercise frequency. The implication for this study found that no positive effects of insufficient sleep were found in the 211 reviewed articles; therefore, it was used to support the hypothesis that insufficient sleep has an adverse effect on cognition, performance, and mood. Lastly, Rodgers states how these research implications relate to clinical practice with his two recommendations. Rodgers recommends that nurses obtain 7-8 hours of sleep per night in order to provide safe care to patients and that younger nurses be vigilant about sleep quality as mood and work performance can be impacted by insufficient sleep.

Conclusion

In conclusion, increased electronic media use has been shown to correlate with poor sleep quality. However, none of the studies examined the effects of the most popular North American applications (YouTube, Facebook, Snapchat, Instagram, and Twitter) or the multiuse of these applications on sleep quality of nursing students.

The purpose of this study was to examine the relationship of social media habits of nursing students and sleep quality. The two hypotheses were:

I) increased use of social media networks during the day and before bed will be associated with decreased sleep quality.

II) multiuse of social media networks during the day and before bed will be associated with decreased sleep quality.

Methods

A non-experimental correlational design was used to determine the relationship between specific application use of various social media sites and sleep quality. The study was approved by the University of Tennessee Knoxville Institutional Review Board.

Sampling

The target population was nursing students who were enrolled in a Bachelor of Science Nursing program. The accessible population was nursing students at a Southeastern University. Inclusion criteria included enrollment in an accredited nursing program and access to at least one of the following: YouTube, Facebook, Instagram, Snapchat, and/or Twitter.

A convenience sampling plan was used to identify eligible and willing students. Power analysis was conducted with a confidence interval of 95%, total width of confidence interval of 5, and a standard deviation of the variable as 5 (Hulley, Cummings, Browner, Grady, & Newman, 2013) and resulted in a recommended sample size of 61 participants. Students were recruited at the end of either pharmacology class (juniors) or medical-surgical class (seniors). The study was explained, and participation was voluntary. An informed consent was obtained prior to participation.

Data Collection Process

Participants were recruited in two sessions. Prior to both sessions an email and canvas announcement were send out to junior and senior nursing students regarding this project. Verbal explanation about this project was provided in Pharmacology and Medical Surgical class, for juniors and seniors respectively. An IRB pre-approved script was used to explain the nature and goals of this study. Survey links were mailed out to potential participants by teachers for each

class. Students were given the opportunity to complete the voluntary survey at their convenience. The survey link that was distributed remained open for one month, from December to January.

Measures

A QuestionPro survey was developed to measure demographic characteristics, social media usage, confounding variables, and sleep quality. The demographic characteristics assessed were age, race, ethnicity, gender, marital status, and college enrollment. The use of social media application both during the day and two hours prior to bed was measured with four items and students were asked if they used the "night mode" to decrease blue enriched light exposure. Potential confounding variables that affect sleep quality include residency, profession, bedtime routine, medical conditions, medications, and electronic devices used were also measured. (Cain & Gradisar, 2010, "External factors that influence sleep," 2007). Due to the numerous extraneous variables that may affect sleep quality, incidental findings were examined as well. The survey also included five items that assessed sleep hygiene practices, sleep disorders, and medication use.

Sleep quality was measured using the Pittsburg Sleep Quality Index (PSQI) Developed by Buyesse, Reynolds III, Monk, Berman, & Kupfer (1989). The PSQI is a self-administered questionnaire, which includes four open-ended questions and fourteen Likert response items to be answered based on event frequency, over the past month. These nineteen questions comprise seven components that summed to calculate the sleep quality score. Components were measured as either very good (0), fairly good (1), fairly bad (2), or very bad (3). A PSQI score greater than 5 is indicative of poor sleep quality (Smyth, 2012). The PSQI is widely used, with established reliability, and validity for both clinical and non-clinical sleep studies (Mollayeva et al., 2015).

The internal consistency was reported with a Cronbach's alpha coefficient) of 0.83 for its seven components (Smyth, 2012).

Data Analysis

Descriptive statistics and Pearson's r correlation were used to analyze each variable and test the hypotheses. A p-value of ≤ 0.05 was selected to indicate statistical significance for each variable. ANOVA with Scheffe post hoc tests were also used.

Sample Characteristics

This sample consisted of 129 participants that ranged in age from 19-38 ($\bar{x}$ = 21, SD = 1.7) with all but one subject between 19-22. The majority of participants were Caucasian (n = 122, 95%) and from Tennessee (n = 126, 98%). Most subjects were also female (n = 116, 90%) and were single or unmarried (n = 125, 97%). Most participants reported being a full-time student (n=113, 88%).

Application Use

Descriptive information about the use of each application is presented in Table 1. Reported are the number of students with an account, whether the application was used at night, and the number of minutes used during the day and at night.

Table 1

Participants reports of having a social media account, use at bedtime, and minutes used during day and night.

Application	Active Account (n, %)	Use Bedtime (n, %)	Minutes/Day (range, mean, SD)	Minutes/Bedtime (range, mean, SD)
Snapchat	118, 92	93, 72	0-330, 56, 58	0-100, 18, 19
Twitter	81, 63	50, 39	0-300, 10, 14	0-75, 10, 14
Instagram	125, 97	117, 91	0-240, 51, 21	0-60, 19, 14
Facebook	120, 93	78, 61	0-120, 31, 31	0-6, 12, 14
YouTube	91, 70	48, 37	0-240, 28, 38	0-90, 16, 21

Snapchat

Snapchat accounts were reported by a majority of subjects (n = 118, 92%) and was the most used application during the day. The number of minutes ranged from 0 – 330 minutes (x = 56, SD = 58) and the second most used application at night (range = 0-100, $\bar{x}$ = 18, SD = 13).

Twitter

Twitter use was the least used application (n = 81, 63%). Twitter was used sparingly during the day (range in minutes = 0-300, $\bar{x}$ = 25, SD = 43) Twitter use before bed was not as common as other applications (range = 0-75, $\bar{x}$ = 10, SD = 14)

Instagram

The most popular social media application was Instagram (n = 125, 97%). It was the second most used application during the day in relation to minutes (range = 0-240, x = 51, SD = 39) and the most popular application to use at night (range = 0-60, $\bar{x}$ = 19, SD = 13).

Facebook

Facebook was also quite popular with the majority of participants having an account (n = 120, 93%). However, it was not used as frequently as other application during the day (range in minutes = 0-120, $\bar{x}$ = 31, SD = 31) or during the night (range = 0-60, $\bar{x}$ = 12, SD = 14).

YouTube

YouTube was used by a majority of participants (n = 91, 70%). YouTube was one of the least used application both during the day (range in minutes = 0-240, $\bar{x}$ = 28, SD = 38) and during the night (range = 0-90, $\bar{x}$ = 16, SD = 21).

Use of Multiple Applications

During the day, most students used all five apps (range of app use = 1-5, $\bar{x}$ = 4.19, SD = .936). The multiuse of applications reportedly used at bedtime was slightly less prevalent (range = 1-5, $\bar{x}$ = 3.06, SD= 1.05).

Confounding Variables

The confounding variables measured in this study were bedtime routine, the use of night mode, sleeping in one's own bed, presence of a sleep disorder, and the use of medications (see descriptive statistics in Table 2). The majority of participants reported having a bedtime routine, (n = 93, 77%) using night mode, (n = 75, 62%) and sleeping in their own bed most of the time (n = 127, 99%). However, reports on presence of a sleep disorder, (n = 1, 1%) and medication use (n = 16, 13%) were much less prevalent.

Table 2

Confounding variables showing the number of people who reported yes/no to each variable.

Variable	Yes (n, %)	PSQI Mean, SD	No (n, %)	PSQI Mean, SD2	t-test Results
Bedtime Routine	93, 77	6.6, 3.3	28, 23	7.1, 3.3	t = -.707, df = 119, p = .481
Night Mode	75, 62	6.5, 3.2	45, 38	6.9, 3.5	t = -.571, df = 118, p = .569
Sleep Disorder	1, 1	9, n/a	97, 99	6.9, 3.5	t = -.590, df = 96, p = .557
Medication Use	16, 13	9.2, 3.4	106, 97	6.3, 3.1	t = -.3.45, df = 120, p = .001

Sleep Quality

PSQI scores were broken down into seven components which resulted in an overall sleep quality score. Participants are asked to complete items based on the previous month. PSQI scores ranged from 1-17, with 1 indicating the best reported sleep, 17 the worst (range of scores = 1-17, $\bar{x}$ = 6.7, SD = 3.3). Participant reports showed that 58% (n = 71) of people reported a PSQI score of greater than 5, which is the threshold for poor sleep. The seven components, in order, were subjective sleep quality, sleep latency (time to sleep), sleep duration, sleep efficiency, sleep disturbances, use of meds, and daytime dysfunction (Table 2). Component questions were converted to a 0-3 Likert scale in which 0 indicated very good, 1 is fairly good, 2 is fairly bad, and 3 is very bad.

Table 3

PSQI component score results using Likert scale. PSQI component mean scores show distribution of how the PSQI total score (overall sleep quality) was assessed.

Component	Very Good (0) (n, %)	Fairly Good (1) (n, %)	Fairly Bad (2) (n, %)	Very Bad (3) (n, %)	PSQI Component Mean
Subjective Sleep Quality	10, 8	90, 70	22, 17	4, 3	1.2
Time to Sleep	25, 20	47, 37	37, 29	13, 10	1.3
Sleep Duration	72, 56	34, 27	15, 12	6, 5	0.6
Sleep Efficiency	64, 67	31, 25	8, 6	3, 2	0.4
Sleep Disturbance	8, 6	82, 65	30, 24	5, 4	1.3
Use of Medications	97, 77	14, 11	9, 7	6, 5	0.4
Daytime Dysfunction	15, 12	54, 44	44, 35	12, 9	1.4
PSQI Total					6.7

Subjective Sleep Quality

Overall, the majority of participants rated their subjective sleep quality fairly or very good (n=100, 78%). Only four subjects (3%) reported very bad sleep quality.

Time to Sleep (Sleep Latency)

Sleep latency was measured with two questions: how often participants reported not being able to sleep within 30 minutes in a week and the normal number of minutes it takes for one to fall asleep once they are in bed. Results showed the majority of participants fell asleep fairly good (n = 47, 37%) followed by fairly bad, (n = 37, 29%) very good, (n = 25, 20%) and very bad (n = 13, 10%).

Sleep Duration

Sleep duration was assessed by asking how many hours of actual sleep patients got each night. There was a wide range (4 to 10 hours; $\bar{x}$ = 7.5, SD = 1.3). The component was calculated

and indicated the majority of participants reported very good to fairly good sleep duration (n = 106, 93%) with only six (5%) reporting very bad sleep duration.

Sleep Efficiency

This component was derived from answers on three questions: time gone to bed, time one woke up in the morning, and actually hours slept. Very good sleep quality, scores >85%, were reported by the majority of participants, (n = 64, 67%) followed by fairly good sleep quality (n = 31, 25%). Only eight subjects (6%) reported poor sleep efficiency.

Sleep Disturbance

Nine total components were included in potential sleep disturbances. Participants were asked to assess how often each component affected sleep during the past month (none, less than once a week, once or twice a week, three or more times a week). The nine variables assessed were: waking during night, nighttime bathroom use, cannot breathe comfortably, cough or snore loudly, feeling too cold, feeling too hot, having bad dreams, and having pain. The ninth variable was "other" which included answers such as: work (n = 2), anxiety/stress (n = 26), roommates (n = 1), family (n = 1), allergies (n = 2), studying, (n = 3) pain, (n = 1) and ETOH use (n = 1).

Sleep disturbance were fairly common. Waking at least once in the middle of the night was reported by the most students, (n = 99, 79%) as was nighttime bathroom use (n = 67, 53%). Most people breathed comfortably, (n = 108, 86%) did not snore, (n = 106, 82%) did not feel too cold, (n = 69, 54%) and did not have pain (n = 97, 75%). A majority did report feeling hot (n = 79, 61%) and bad dreams (n = 71, 56%).

Use of Medications

Medication use was measured both in the PSQI and as a confounding variable Most participants reported they did not use a sleep aid medication within the past month (n = 98,

76%). Most of those who did report medication use, used the medication less than once a week, (n = 14, 11%) followed by twice a week, (n = 9, 7%) and three or more times a week (n = 6, 5%).

Daytime Dysfunction

Daytime dysfunction was the variable that most students reported that impacted PSQI scores. Two questions were used to assess this component: whether participants had trouble staying awake during the day and whether they lacked enthusiasm to complete tasks during the day. In total, 54% (n = 60) of participants reported trouble staying awake at least once a month and 88% (n = 111) reported they lacked enthusiasm throughout the day. Only 15 participants, (12%) did not report daytime dysfunction compared to 60 participants (44%) reporting many incidences of daytime dysfunction.

PSQI Total

PSQI total measured the overall sleep quality of participants. PSQI total was measured by adding all component PSQI scores. Responses varied greatly (range of scores = 1-17, $\bar{x}$ = 6.66, SD = 3.28). Experts report that an overall PSQI score of greater than five, indicates poor sleep (Smyth, 2012).

Hypothesis Testing

Hypothesis 1: Increased use of social media networks during the day and before bed will be associated with decreased sleep quality.

A weak positive correlation was found between PSQI scores and daytime Snapchat use (r = .209, p = .025) and a moderate correlation with bedtime use (r = .342, p = .001) indicating that increased use was related to poorer sleep quality. There was also a weak positive correlation between daytime Twitter use and PSQI scores (r = .216, p = .025). However, there was not a

significant correlation between night twitter use and sleep quality. No significant correlations were found between the use of Instagram, Facebook or YouTube and sleep quality.

Hypothesis 2: Multiuse of social media networks during the day and before bed will be associated with decreased sleep quality.

Using one-way ANOVA, there was not a statistically significant in difference in the PSQI scores and number of apps used during the day. There was a statistically significant difference between nighttime multi-use and sleep quality; ($F = 3.11$, $df = 4$, $p = .018$) however, there were not significant differences between the number of applications used at bedtime with the Scheffe post hoc test procedure. This may be due to the unequal group sizes (Tables 4 and 5). The group that had the best sleep quality scores were those that reported using two applications ($n = 33$, $\bar{x} = 5.42$, $SD = 2.69$) and those with the poorest sleep quality were those that only used one application ($n = 7$, $\bar{x} = 8.29$, $sd = 4.61$), followed by use of four apps ($n = 35$, $\bar{x} = 7.77$, $SD = 3.61$), and five apps ($n = 9$, $\bar{x} = 7.56$, $SD = 3.91$). This information is shown in Table 4 and 5.

Table 4

Descriptive statistics showing nighttime multiuse: number of applications used, (multiuse) number of participants, mean, and standard deviation for each nighttime multiuse response.

#Apps Used	Participants (n)	PSQI Mean	PSQI SD
1	7	8.29	4.61
2	33	5.42	2.69
3	37	6.24	2.63
4	35	7.77	3.61
5	9	7.56	3.91

Table 5

ANOVA t-test results of the nighttime multiuse.

ANOVA	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	125.7	4	31.4	3.1	0.018
Within Groups	1172.7	116	10.1		
Total	1298.4	120			

The number of apps used was recoded into three groups: 1-2 apps, 3 apps, and 4-5 apps. The was a statistically significant difference in the sleep quality between the three groups (F=3.8, df=2, 118, p=.025). Overall the more apps that were used the poorer the sleep quality. Post hoc testing indicated that the significant difference was between those that used 1-2 apps compared to 4-5 apps (Mean difference = 1.802, p = .041). Those using 1-2 apps reported the best sleep, (n = 40, $\bar{x}$ = 5.93, SD = 3.23) followed by 3 apps, (n = 37, $\bar{x}$ = 6.24, SD = 2.63) and 4-5 applications (n = 44, $\bar{x}$ = 7.73, SD = 3.62). These results were consistent with the hypothesis that as nighttime multiuse increased, sleep quality would decrease.

Table 6

Recoded application multiuse for nighttime showing PSQI mean and standard deviation for participants in each group.

#Apps Used	Participants (n)	PSQI Mean	PSQI SD
1,2	40	5.93	3.23
3	37	6.24	2.63
4,5	44	7.73	3.62

Table 7

ANOVA t-test results for the recoded nighttime application use

ANOVA	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	78.2	2	39.1	3.8	0.026
Within Groups	1220.3	118	10.3		
Total	1298.4	120			

Analysis of Other Variables Affecting Sleep Quality

The descriptive and inferential statistics were computed for each of the variables measured that could affect sleep quality (Table 5). There was no statistical difference in sleep quality for subjects with or without a bedtime routine, used night mode versus no night mode, or did or did not have a reported sleep disorder.

Sixteen (%) subjects reported using the drug Melatonin. The was a significant difference in the sleep quality between those that used a sleep aid medication compared to those that did not ($t = -3.45$, $df = 120$, $p = .001$). Those that reported using a melatonin reported poorer sleep quality (mean = 9.2, sd= 3.4) than those that did not (mean = 6.3, sd = 3.1).

Table 5

Confounding variables showing participation, mean PSQI and standard deviation for each variable. T-test results also shown to show whether any confounding variables had a statistically significant effect on sleep quality.

Variable	Yes (n, %)	PSQI Mean, SD	No (n, %)	PSQI Mean, SD	t-test Results
Bedtime Routine	93, 77	6.6, 3.3	28, 23	7.1, 3.3	t = -.707, df = 119, p = .481
Night Mode	75, 62	6.5, 3.2	45, 38	6.9, 3.5	t = -.571, df = 118, p = .569
Sleep Disorder	1, 1	9, n/a	97, 99	6.9, 3.5	t = -.590, df = 96, p = .557
Medication Use	16, 13	9.2, 3.4	106, 97	6.3, 3.1	t = -.3.45, df = 120, p = .001

Discussion

Previous studies have reported significant impacts on sleep from both electronic device and social media use. Often simply owning a smartphone could decrease sleep quality (Cain & Gradisar, 2010, Lemola, Perkinson-Gloor, Brand, Dewald-Kaufmann, & Grobb, 2014). Moreover, in other countries, popular apps and overuse of applications were associated with poorer sleep quality (Mohammadbeigi et al., 2016). However, the results of this study did not find similar results.

Although there was some evidence that specific applications, increased use of Twitter and Snapchat, were associated with poorer sleep quality there were no other significant correlations.

The results of multiuse at night did not trend in a linear fashion as one would expect. The worst sleep quality was reported among those who used only one application. One explanation for this is unequal group sizes. When groups were equalized, there was significantly porter sleep with the use of multiple apps as hypothesized. Although previous studies did not study multiuse of applications, findings from previous indicated that the overall increase in time used did associate with poorer sleep (Cain & Gradisar, 2010). Past studies had also found that increased device use may have association with depression in some adolescents (Lemola, et al., 2014). The relationship between multiuse, depression, mental health, and sleep quality could be potential focuses for future studies.

The only significant cofounding variable that was found to affect sleep quality was medication use. Those who reported using Melatonin, a sleep aid drug, reported significantly poorer sleep quality than students that did not use Melatonin. The National Sleep Foundation suggests that research on Melatonin use is conflicting, with some studies reporting it can increase sleep quality, while others claim it has no affect ("Melatonin and Sleep," 2020). One explanation is that students who report and predict poor sleep may be more inclined to utilize sleep aid medications, but the reasons for students taking Melatonin was not measured in this study.

The overall sleep quality for this sample of nursing students was poor. It is important to note that overall, studies have shown that nursing students may experience more stress through college than those of different majors (Olvera Alvarez et al., 2019). This increased and prolonged stress may be one factor in students reporting poor sleep.

One important finding was the overall time spent using social media. Mohammadbeigi et al. (2016) found that phone addiction and overuse of social media did negatively impact sleep quality. Although the data only yielded associations of Snapchat and Twitter with poor sleep, it could be possible the excess use of these applications was a contributing factor to poor sleep.

The most significant component affecting poor sleep reported was daytime dysfunction. Daytime dysfunction was measured by asking participants if they had trouble staying awake during the day or if they lacked enthusiasm to get work done during the day. Only 6% of the sample reported having no dysfunction within the past month. This increased use of applications throughout the day and right before bed may be contributing to student's dysfunction.

This reported dysfunction is quite important as this may impact student's ability to perform in the classroom or clinical setting. As stated previously, inadequate sleep may impact a nurse's ability to critically think and provide safe patient care (Rodgers, 2008). The reported dysfunction, excess use of media in minutes, and associations outlined could impact these students' ability to provide patient care in the future.

The major limitations for this study was the small convenience sample. Future studies may find that these popular applications have a greater impact on sleep quality than found in this study. Few studies have analyzed the five most popular North American application used here; therefore, it is recommended that the relationship between these applications and sleep quality / day to day function be assessed. Additionally, no previous studies had assessed the multiuse of applications. The results found night multiuse to be significant, therefore this specific area of social media use may be a promising future research endeavor.

In conclusion, this study did find that nursing students reported poor sleep quality, and Snapchat/Twitter were the only applications with association to poor sleep. Increasing night

multiuse did have a negative relationship with sleep quality, and individuals that used melatonin reported poorer sleep quality.

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