

Mobile Phone Use and Sleep Quality and Length in College Students

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ABSTRACT

Proper sleep length and quality are essential for physical and mental health and have found to be related to a variety of negative outcomes (Brown, Buboltz, & Soper, 2002). College is a time, a transition for individuals where they begin laying a foundation for their future and acquiring sufficient sleep is of great value. College students are recognized as one of the most sleep-deprived groups, but also, as one of the most technologically-oriented population. Due to this combination, college students' sleep habits and mobile phone use habits have begun to receive attention. The purpose of this study was to examine the relationship between sleep quality/length and mobile phone use among college students. Three hundred and fifty college students voluntarily participated by completing the Sleep Quality Index (SQI), The Sleep Habits Survey, the Mobile Phone Problem Use Scale (MPPUS), the SMS Problem Use Scale (SMS-PUDQ) and the Mini IPIP. Results indicate that various aspects of mobile phone use such as problem mobile phone use, addictive text messaging, problematic texting, and pathological texting are related to sleep quality, but not sleep length. Additionally, extraverted individuals were found to engage in greater mobile phone use and problematic text messaging. Keywords: Mobile Phone Use, Problematic Text Messaging, Sleep Quality, Sleep Durations, College Students.

Introduction

Proper sleep length and quality are essential components of one's physical and emotional well-being. This health need may be discounted by many college students in our fast paced, technologically oriented society (Buboltz, et al, 2009). Research shows that reduced sleep length and quality may negatively impact cognitive functioning, general health, and feelings of well-being (Brown, Buboltz, & Soper, 2002). College students frequently are engaged in the young adult tasks of exploring and extending the boundaries of independence and, in doing so, determining their own lifestyle rules, particularly concerning sleeping schedules (Pilcher, Ginter, & Sadowsky, 1997). Research has consistently found that college students experience a variety of sleep difficulties ranging from lack of sleep to poor sleep quality (Brown et al., 2002; Buboltz et al., 2009). Despite this research and a call to assist college students with sleep difficulties, college students may not understand or recognize that the absence of a good night's sleep can reduce their academic achievement and have other deleterious effects. As students transition from the structure of high school to the loosely organized collegiate lifestyle, sleep patterns, length and quality may undergo drastic changes.

College years are characterized as a time of minimal adult supervision and erratic schedules (Lund, Reider, Whiting, & Prichard, 2009). Many college students resort to adjusting their sleep habits in order to live up to the expectations of their new-found lifestyle (Buboltz, Soper, Brown, & Jenkins, 2002). Students are forced to make many choices as the demands of their schedules pull them in multiple, often conflicting, directions. College students typically participate in athletics, academic clubs, social activities, intramurals, and may have jobs in addition to their primary responsibility of maintaining good academic standing. While such erratic schedules may decrease one's opportunity of achieving the proper duration and quality sleep, the combination of altered schedules and lack of sleep come at a steep price. Pilcher and Walters (1997) found that functioning without sleep for at least 24 hours takes a toll on college students' cognitive performance. Participants who were deprived of sleep for 24 hours performed significantly worse on a complex cognitive task when compared to individuals who were not sleep deprived (Pilcher & Walters, 1997).

Research has demonstrated that a relationship exists between rapid eye movement (REM) stage sleep and learning (Buboltz, Brown, & Soper, 2001). The REM stage of sleep occurs during the last half of a full night's sleep, therefore if this stage of sleep is reduced, learning will also be affected (Buboltz et al., 2002). Research has demonstrated that many college students are sleep deprived, have poor sleep habits, and experience poor sleep quality. Young adults are recommended a full eight to nine hours of high quality sleep a night. Lund and colleagues (2009) conducted an online survey of student sleep habits and found that 25% of students reported attaining less than 6.5 hours of sleep a night and a mere 29.4% reported achieving the recommended 8 hours of sleep per night. One would think that a slight deviation from the suggested duration would not lead to any noticeable ramifications. However, Caldwell (2002) demonstrated otherwise, with 75% of college students complaining of fatigue after experiencing just one hour less than

the recommended 8 hours of sleep in the midst of a varying schedule. Students who received a normal night's sleep demonstrated significantly better academic performance compared to their sleep deprived peers (Caldwell, 2002). In addition to experiencing a decreased amount of sleep, research also reveals that college students experience poor sleep quality (Lund et al., 2009).

Students who obtain poor-quality sleep not only suffer academically, but also physically and emotionally (Lund et al., 2009). As a result of research demonstrating that college students are poor sleepers, researchers have begun to direct their attention toward determining the factors contributing to sleep deprivation and decreased sleep quality in college students. By isolating the factors that interfere with the sleep of college students, researchers may gain a greater understanding of students' sleep patterns and difficulties and in turn develop interventions to combat this growing problem. College students are constantly being confronted with immense pressure to meet deadlines and fulfill other rigorous demands while maintaining a social life. Therefore, it should come as no surprise that 68% of college students reported stress as the greatest hindrance to sleep initiation (Lund et al., 2009). When asked, "If your sleep is at all compromised, to what one factor do you most strongly attribute this?" the majority of students indicated that academic (39%) or emotional (25%) stress most obstructed their sleep (Lund, et al., 2009). Ironically, not being able to sleep at night due to stress only triggers more stress. Enduring a night without sleep can lead to extreme next day tiredness, which many college students try to counteract through the use of stimulants such as caffeine. Many college students are finding themselves caught in a vicious stimulant-sedation cycle in which they ingest stimulants to ward off daytime tiredness and then consequently use depressants to offset the effects of the stimulants (Lund et al., 2009).

Potential Factors Influencing Sleep

Van den Bulck (2004) began examining the effects that television viewing, computer game playing, and surfing the internet have on sleep time and levels of tiredness among children. He found that media use was related to a reduction in sleep time in addition to greater next-day tiredness (Van denBulck, 2004). Researchers found that excessive video game players bore the physical indications of sleep deprivation such as black eye rings, muscle stiffness, and scapula pain (Tazawa& Okada, 2001). Tazawa and colleagues (1997) revealed that computer games impact sleep length and sleep quality. They found that a group of young sleep deprived patients experienced marked symptom improvement as a result of eliminating TV watching and computer game playing. Eggermont and Van den Bulck (2006) found that children and adolescents who claimed to use television, computer games, and music as a sleeping aid actually slept less and were significantly more tired than those who did not. Researchers have found that many individuals turn to television, the internet, and computer games prior to sleeping.

These particular forms of media are considered "unstructured activities" because they tend to not have predefined starting and ending times. Participating in an unstructured activity as opposed to an activity with a determined stopping point is likely

to lead to time disruptions, such as bedtime (Van den Bulck, 2006). While television watching, internet use, and computer game playing are popular unstructured activities, each activity differs in its level of appeal depending on the individual and may be dependent on availability or accessibility. With the furthering of technology, mobile phones have become a mainstay of the college student and allow access to a variety of media at any time and in any environment. For example, text messaging and other mobile phone features (internet browsing, instant messaging, and gaming) have become popular unstructured activities in today's society and successfully appeal to a large majority of young persons (Bianchi & Phillips, 2005).

Mobile Phone Use

While research has been conducted in terms of mobile phone use and driving, the relationship between mobile phone use and sleep remains virtually untouched. This relationship is worth investigating for two specific reasons: 1) college students have emerged as one of the most sleep deprived groups in the United States (Forquer, Camden, Gabriau, & Johnson, 2008) 2) college students, developing in a technologically-oriented society, are more inclined to embrace and use new technology. Specifically, young people are more likely to use the text messaging feature on their phones (Bianchi & Phillips, 2005). Researchers are beginning to find that the use of technology in a variety of areas from communication (socializing) to learning about the world (news) is disproportionate in younger adults (Massimini & Peterson, 2009). Massimini and Peterson (2009) found that 62.9% of the sampled college students prefer to communicate with friends via text messaging over other forms of communication. Mobile phone use is not only a preferred mode of communication among college students, but it has also become an obstruction in their lives (Massimini & Peterson, 2009). Students recounted that talking on a cell phone, using e-mail, using Instant Messaging (IM) services, using Social Network services (SNS), browsing the Internet, and misplacing cell phones accounts for a significant amount of class tardiness and sleep deprivation (Massimini & Peterson, 2009).

The majority of students indicated that they had lost sleep at least one time within the previous seven days due to interference of mobile phone use (Massimini & Peterson, 2009). Over two thirds of the sample also reported texting between the late evening hours of 10 p.m. and 1:59 a.m. (Massimini & Peterson, 2009). Massimini and Peterson (2009) also found a significant relationship between sleep length and addictive mobile phone behavior. When without their mobile phone, those who attained less sleep during the week, perceived themselves as more stressed and helpless than those who acquired more sleep (Massimini & Peterson). According to Bianchi & Phillips (2005), extraverts spend more time using their mobile phone overall, throughout the week, and for addictive use. In particular, young extraverts are likely to be frequent mobile phone users whereas addicted/dependent users tended to be young, extraverted, and have lower self-esteem. Ehrenberg, Dip, White, and Walsh (2008) found that extraverts, as well as individuals high on neuroticism, reported frequent use of text messaging.

The Present Study

One of the goals of the present study is to examine the relationship between mobile phone use and sleep quality and length among college students. To date little research has examined the influence that mobile phone use may have on college students' sleep habits and its potential impact on sleep length and quality. Investigation in this area is imperative as mobile phone use has infiltrated almost every aspect of young adults' lives and the impact of its effect on individuals is just beginning to emerge. To explore and understand the relationship between mobile phone use and sleep quality and length the following hypotheses were examined.

Hypotheses

H₁: Mobile phone use will be negatively related to reported sleep length. Individuals with higher mobile phone use will report sleeping for a shorter duration of time compared to individuals lower in mobile phone use.

H₂: Mobile phone use will be negatively related to reported sleep quality. Individuals with higher mobile phone use will report poorer sleep quality than individuals with lower mobile phone use during the week and on the weekends.

H₃: Addictive text messaging (a combination of pathological texting and problem texting) will be negatively related to sleep quality and length. Individuals who are addicted to text messaging will report less sleep and report poorer quality sleep than individuals who are not addicted to text messaging.

H₄: Individuals who are engaging in pathological text messaging will report decreased sleep length and poorer sleep quality than individuals who are not engaging in pathological text messaging.

H₅: A negative relationship will be found between problem text messaging and reported sleep quality and length. Individuals who are engaging in problem text messaging will report less sleep and decreased sleep quality than individuals who are not engaging in problem texting.

H₆: Problem mobile phone use will negatively relate to sleep length and quality. Individuals who are problem mobile phone users will report less sleep and poorer quality of sleep than individuals who are not problem mobile phone users.

H₇: Addictive text messaging and problem mobile phone use will both be unique predictors of reported sleep quality and length.

H₈: Extraversion will be positively related to mobile phone use and addictive text messaging. Individuals who are higher in extraversion will spend more time using their mobile phone and score higher on the addictive text messaging scale.

Method

Participants

Three hundred and fifty introductory psychology students voluntarily participated in this study. Of the 350 students 45.1% were male and 53.7% were female, four participants did not indicate their gender. Participants' average age was approximately 20

years old ($M = 20.08$; $SD = 3.34$). The ethnic composition of the sample was as follows, 18.6% African American, 0.6% Asian American, 76% Caucasian, 0.9% Hispanic/Latino, 0.3% Native American, and 2.9% identified with an ethnic group that was not listed, and 0.9% did not specify ethnic identity. The academic rank was as follows: 44.9% were freshmen, 25.1% sophomores, 14.6% juniors, 14.3% seniors, 0.6% other, and two participants did not identify their current year in school.

Instrumentation

The demographics questionnaire consisting of nine general questions about the participant's academic rank, relationship status, age, gender, ethnicity, major, grade point average (GPA), housing and living situations. Sleep Quality Index (SQI; Urponen, Partinen, Vuori, & Hasan, 1991) is an 8-item inventory that measures the extent to which the participant may or may not be experiencing sleep problems. Each response is weighted as 0, 1, or 2, with 2 representing severe sleep problems. All of the items are added together in order to derive a total sleep quality score. Scores of 0 or 1 signify good sleep quality, scores from 2 to 8 denote occasional sleep difficulties, and scores extending from 9 to 16 designate poor sleep quality.

Previous research demonstrated that the scale has acceptable reliability ($\alpha = .71$) (Buboltz et al., 2009). Urponen et al., (1991) supported the validity of the SQI by reporting a significant relationship between quality of sleep and subjective health. The current sample had an alpha of .76. SMS Problem Use Scale (SMS-PUDQ; Rutland, Sheets, & Young, 2007) was developed as an adaptation of the Internet Addiction Questionnaire. This scale consists of 8- items that measure participant's level of addiction to text messaging. Participants rate how accurately each of the items describes their current selves using the following rating scale: Very Inaccurate (VI), Moderately Inaccurate (MI), Neither Inaccurate nor Accurate (N), Moderately Accurate (MA), or Very Accurate (VA).

This instrument was designed to assesses two factors. The first factor called pathological texting, consists of items concerning relapse, withdrawal, mood modification, and interpersonal conflict (Rutland et al., 2007). The second factor which is referred to as problem texting, measures one's preoccupation with texting as well as compulsivity and tolerance associated with texting (Rutland et al., 2007). Previously reported alpha estimates are .84 for pathological texting and .87 for problem texting (Rutland et al., 2007). The current sample hadan alpha of .76 for overall addictive texting, .71 for pathological texting and .66 for problematic texting. Mobile Phone Problem Use Scale(MPPUS; Bianchi & Phillips, 2005) consists of 27 items that measure excessive and problematic mobile phone use. All the items are answered using a Likert-type scale ranging from 1 (not true at all) to 10 (extremely true). Bianchi & Phillips consider the MPPUS to be a one-factor scale measuring problematic mobile phone use. Previously reported reliability estimates were .93 (Bianchi & Phillips, 2005). The current study had an alpha of .90 for problem mobile phone use.

These results indicate that pathological (withdrawal, mood, interpersonal conflict) texting is related to sleep quality, but not sleep length which provides partial support for hypothesis four. Hypothesis five stated that individuals who are engaging in problem texting will report decreased sleep and poorer sleep quality than individuals who are not engaging in problem texting. No significant relationship was found between sleep quality and problem texting ($r = .09$, ns) and between sleep length and problem texting ($r = -.05$, ns). These results indicate that problem (compulsivity and tolerance) texting is not associated with sleep length or quality and this does not provide any support for hypothesis five. Hypothesis six stated that problem mobile phone use will be negatively related to reported sleep length and quality. Results showed that problem mobile phone use was not significantly related to sleep length ($r = -.02$, ns), but problem mobile phone use was significantly related to sleep quality ($r = .17$, $p = .00$). These results indicate that problem mobile phone use is related to sleep quality, but not sleep length which provides partial support for hypothesis six.

Hypothesis seven stated that the components of addictive text messaging (problem texting and pathological texting) and problem mobile phone use would be significant and unique predictors of sleep quality and sleep length. Two regressions were run to examine which of the three variables were significant predictors of sleep length and then which of the three were significant predictors of sleep quality. See Table 3 for summary of the results. The regression for sleep length was not significant ($R^2 = .00$, $F(2, 308) = .35$, ns) indicating that none of the three variables were significant predictors of sleep length. The regression for sleep quality was significant ($R^2 = .03$, $F(2, 300) = 4.79$, $p = .01$), with pathological texting being the only significant predictor ($\beta = .18$, $p = .01$). Results indicate that none of the three variables were significant predictors of sleep length and that only pathological texting was a significant predictor of sleep quality, providing mixed support for hypothesis seven.

Hypothesis eight states that extraversion will be positively related to overall mobile phone use, problem mobile phone use, problem texting and pathological texting. Results revealed significant relationships between extraversion and overall mobile phone use ($r = .21$, $p = .00$), problem mobile phone use ($r = .13$, $p = .02$) and problem texting ($r = .13$, $p = .02$). However, extraversion was not significantly related to pathological texting ($r = .11$, ns). These results show that extraversion is related to most aspect of mobile phone use, with the exception of pathological texting and provide some support for hypothesis eight.

Discussion

The majority of previous research on college students has examined the impact that lack of sleep or poor sleep quality has on one's academic performance, adjustment as well as emotional and physical health. However, little research has examined factors which may be contributing to the poor sleep quality and decreased sleep length in college students. To address this issue this study examined the relationship between mobile phone use and sleep quality and length. In general the results showed that mobile phone

use was related to reported sleep quality, but not sleep length. Specifically, sleep quality was found to be related to problem mobile phone use, pathological texting, and problem texting. The implications of these findings are of interest considering that our culture is often times described as both sleep deprived and technologically over stimulated. Considering that mobile phone use has gained widespread popularity among college students and with the proliferation of smart phones the results of this study are of great significance.

Perhaps individuals who engage in habitual mobile phone use are so attuned with their mobile phone that they actually experience difficulties “shutting off” this behavior when it is time to power down their phone and go to sleep. One possible explanation for the lack of quality sleep is that such individuals have developed a hyper vigilant attitude toward their mobile phone, even in the late night hours. This phenomenon may be comparable to that of a mother who is able to sleep through the sound of the local train or music from across the street, but immediately awakens at the sound of her baby’s cry. Just as a mother develops an “ear” for her baby, perhaps college students have developed an “ear” for their cell phone. Considering the aforementioned phenomenon, one does not have wonder whether individuals who develop an “ear” for certain stimuli really experience quality sleep, the answer is no. This possible phenomenon may also be akin to having sleep apnea where as an individual’s oxygen levels drop due to not breathing the brain stimulates the person to start breathing by rousing to a lighter stage of sleep. This stimulation by the brain moves the individual into lighter stages of sleep until adequate breathing has resumed and oxygen levels return to normal levels.

For the individual with sleep apnea this pattern may happen several hundred times a night and this constant stimulation by the brain interrupts sleep patterns and the quality of sleep despite the individual reporting sleeping all night. Thus, when the person awakes the next day they do not feel rested and report feeling tired and lackluster during the day. It may be that’s one college students are so obsessed with their mobile phones and not wanting to miss anything, that they have become so vigilant that they do not enter deep sleep. This is an important hypothesis to examine as many college students may be sacrificing their academic standing, emotional well-being, physical health and other aspects of life in order to ensure that they do not miss a call, text, or social networking post. In addition to revealing a relationship between mobile phone use and sleep quality, findings also revealed significant relationships between personality and specific types of mobile phone use. Specifically, extraverts engage in greater mobile phone use than their introverted peers.

Intuitively this makes sense, in that outwardly focused individuals expectantly would be more interested in conversing with others than individuals who have an inward focus. Not only do extraverts use their mobile phones more frequently than introverts, but they also use their mobile phones in more excessive and problematic ways than their counterparts. However, a distinction was found in the manner with which extraverts engaged in text messaging. The findings of this study revealed that extraverts are more likely to find themselves engaging in problem texting, but not pathological texting. Thus

extraverts are more likely to experience preoccupation, compulsivity, and tolerance rather than interpersonal conflict, relapse, withdrawal, and modified mood as a result of texting. Such findings highlight the importance of designing specific mobile phone interventions based on one's personality. As texting continues to gain global popularity, such interventions are likely to be needed. In conjunction with aforementioned explanations, the findings from this study also suggest that not adhering to sleep hygiene recommendations (such as reserving your bed for sleeping only, avoiding naps throughout the day, and engaging in sleep rituals) could be a precursor for poor quality sleep. Clearly, engaging in mobile phone use such as pathological texting during the late night hours would be discordant to following sleep hygiene recommendations.

Limitations

While this study acts as a catalyst for the advancement of sleep research, there are clearly some associated limitations. One limitation is that the data is based on self-reports, for this reason we cannot determine whether reported behaviors reflect actual behaviors. Although the present study included various self-reports regarding sleep quality and length of sleep as well as mobile phone use behaviors, the issue of sleep hygiene was relatively neglected. Examining whether individuals follow sleep hygiene recommendations such as reserving their bed only for sleeping, engaging in sleep rituals, and avoiding taking naps throughout the course of the day could provide valuable information related to sleep quality.

Future Research

The results of this study give emphasis to an ever important need for future researchers to concentrate not just on length of sleep, but to also give further attention to quality of sleep. Specifically, future research would benefit from directly measuring mobile phone use and sleep quality. One possible direction for future research would be to directly measure one's mobile phone use and sleep quality. This could be achieved by having participants partake in a sleep study component in addition to monitoring mobile phone use via a tracking device. Researchers may wish to develop more objective sleep-related and mobile phone use measures in order to more accurately assess the relationship that clearly exists between communication technology and sleep.

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Table 1: Descriptive Statistics and Reliabilities

Variable	M	SD	α
Mobile Phone Use	333.73	326.70	-
Sleep Length	7.71	5.69	-
Sleep Quality	5.00	3.28	.76
Problem Texting	7.77	4.06	.66
Pathological Texting	8.57	4.04	.71
Problem Mobile Phone Use	97.67	37.96	.90
Extraversion	13.17	3.41	.72

Note: Internal Consistency Reliability (α) reported

Table 2: Correlations

Variable	1	2	3	4	5	6	7
1.Mobile Phone Use	-						
2.Sleep Length	-.01	-					
3.Sleep Quality	.01	.02	-				
4.Problem Texting	.36**	-.05	.09	-			
5.Pathological Texting	.31**	-.03	.18**	.48**	-		
6.Problem Mobile Phone Use	.39**	-.02	.17**	.54**	.60**	-	
7.Extraversion	.21**	.03	.03	.13	.11	.13*	-

Variable 1 2 3 4 5 6 7

Table 3: Regression of Sleep Length and Sleep Quality

	Sleep Length					Sleep Quality				
	B	F	df	R	R ²	B	F	df	R	R ²
		.34	3	.06	.00		4.26	3	.20	.03*
Problem Texting	-.07					-.07				
Pathological Texting	-.01					.13				
MPPUS	.03					.13				

*p<.05, **p<.01

For Sleep Length, N=310; For Sleep Quality, N=302.