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Exploring Sleep Knowledge and Predictors of Sleep Hygiene in College Students

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Exploring Sleep Knowledge and Predictors of Sleep Hygiene in College Students

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Exploring Sleep Knowledge and Predictors of Sleep Hygiene in College Students

Submitted in partial fulfillment
of the requirements
for the Murray State University Honors Diploma

Mirielle Erpelding

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Abstract

Sleep: something so crucial to successful daily functioning, yet also something so easily discarded in turn for something more stimulating. In college, there are late nights, early mornings, use of electronic devices, and the constant "always-on" mentality, all of which impacts student sleep hygiene. To define, the American Academy for Sleep Medicine (AASM) considers "sleep hygiene" as a pattern of healthy sleep behaviors that improve one's ability to fall asleep, stay asleep, and awake more refreshed (2020). The current study has two goals: 1) assess knowledge of recommended sleep practices in the college population, and 2) identify predictors (among sleep knowledge, habits, and/or sociocultural demands) of student sleep hygiene. Participants ($N = 205$) took part in the online survey to assess student knowledge of sleep recommendations, sleep habits, sociocultural activities, and sleep hygiene. While students exhibited moderate knowledge of sleep habits, scoring an average of 71.4% on the healthy sleep habits test, this knowledge was not correlated to sleep quality (PSQI). The only significant predictor of sleep quality (PSQI) in students was the number of all-nighters per semester. However, PSQI correlated with each of the three academic variables (GPA, academic self-satisfaction rating, and peer comparison academic rating). These results can be used to more accurately guide education and interventions to improve sleep hygiene in college students. Further explanations and implications for future research are discussed.

Keywords: sleep hygiene, sleep knowledge, habits, sociocultural demands

Exploring Sleep Knowledge and Predictors of Sleep Hygiene in College Students

Getting enough sleep is not a luxury, but a necessity (Maas et al., 1998). In fact, people typically spend one third of their lives sleeping (Mireku et al., 2019). However, the "always on" nature of college life is a constant pressure, often resulting in sleep deprivation and/or overall poor quality of sleep (Dowdell, 2019). Indeed, undergraduate students are considered the most sleep deprived group within the general population (Maas et al., 1998). However, most do not know the basics concerning sleep health and its impact on overall life quality (Maas et al., 1998).

Sleep Hygiene

The term "sleep hygiene" is commonly used in the field of sleep and is defined by the American Academy for Sleep Medicine (AASM) as a pattern of healthy sleep behaviors that improve one's ability to fall asleep, stay asleep, and awake more refreshed (2020). A main component of improving sleep hygiene is adhering to a routine to regulate sleep and wake times (Bruce et al., 2017). Measuring good sleep hygiene includes general determinants like continuity (sleeping through the night), quantity (number of hours slept), and as mentioned above, the revitalized feeling upon waking (feeling rested; Wang & Bíró, 2021). Even more specifically, healthy sleep can be assessed by adequate sleep duration (between 7-9 hours), appropriate timing, regularity, the absence of sleep disorders, and good quality from self-reported or objective sleep variables (Ramar et al., 2021).

Each of these measures highlights a new layer in how sleep can be researched across diverse platforms and populations. In practice, the Pittsburgh Sleep Quality Index (PSQI) is frequently used to capture this mult-faceted view of sleep hygiene as it combines seven components considered fundamental to overall sleep quality (Buysse et al., 1989). It measures the layers previously mentioned by questioning habits such as how often one has trouble falling

asleep, the time one goes to sleep, or even how often one wakes up in the middle of the night (Buysse et al., 1989).

Conceptually, sleep hygiene and healthy sleep recommendations encompass both habits and routines to formulate an optimal environment for improved quality of sleep. Good sleep hygiene focuses on creating a stable routine of healthy habits and a calming bedroom setup that emphasizes comfort, relaxation, and consistency (Sleep Foundation, 2022). Some commonly distributed healthy sleep facts are things like refraining from technology 30 minutes to 1 hour before bed, avoiding caffeine later in the day, maintaining a consistent sleep and wake time, and avoiding alcohol consumption before bedtime (Sleep Education, 2020). Good sleep hygiene can be found in something as simple as making sure the bedroom is cool and quiet, but can also be found in calculated decisions like exercising regularly (National Sleep Foundation, 2020). Through following a routine and the recommended habits issued by the AASM, one should be able to work towards lowering stress levels, increasing relaxation, and bettering their sleep schedule management; even minimal adjustments can aid in a stronger quality of sleep (Troy et al., 2021).

Sleep Determinants and Health Outcomes

The biopsychosocial model of sleep duration drivers is shown in Figure 1, which outlines a myriad of factors that influence sleep and health-related outcomes (Watson et al., 2015). These factors include psychological, behavioral, social, cultural, and environmental influences. Variance in these factors can either be based on intentional lifestyle choices or can originate out of an individual's realm of control. Inter-individual variability is something that should be taken into account when conducting research on how sleep needs are met (Watson et al., 2015). It is through this variability that society's diverse needs for sleep and for other life practices

originally stem from. The following section will explore these factors of influence as they specifically relate to the college student population.

Figure 1

Biopsychosocial Model of Sleep Duration Drivers
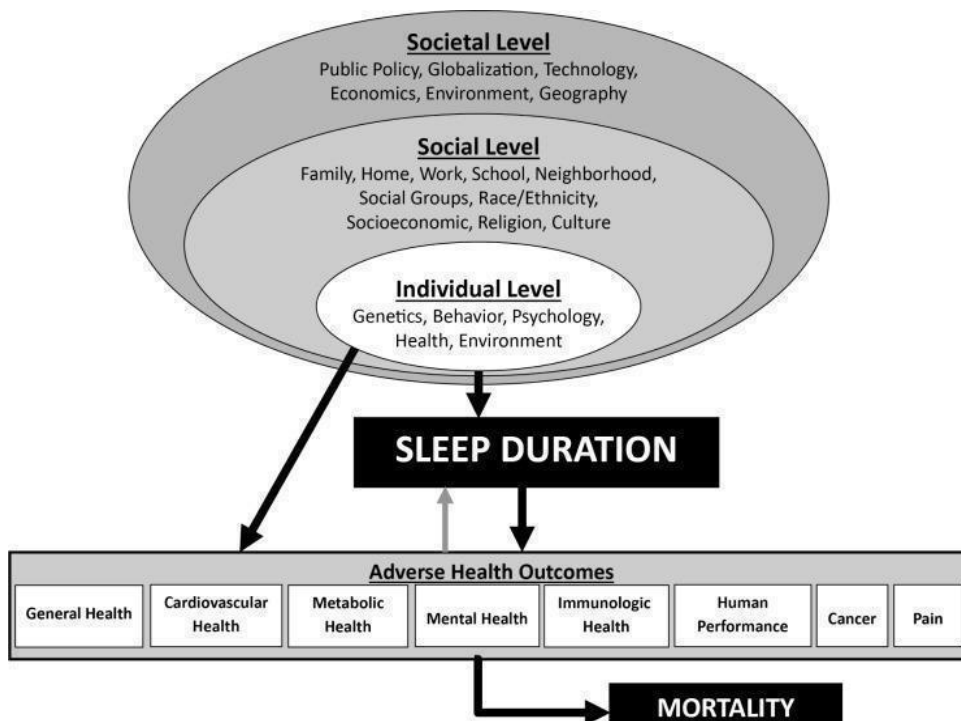
Note. This figure is a reproduction of Figure 2 from Watson et al., 2015.

As seen in Figure 1, the societal level includes drivers like technology, public policy, and geographical location (Watson et al., 2015). This level can impact sleep through a prolonged wake time due to technology usage or possibly due to a loud and disruptive surrounding environment. Specifically, the societal level can deter college students from following the healthy sleep recommendations through the constant use and influx of technology. Nearly 58% of people look at screens within an hour before bedtime (National Sleep Foundation, 2022). Use of technology competes for one's time as texting and cell phone use has become the main vehicle

for personal updates and connections for many young adults, which while convenient is not always beneficial (Dowdell, 2019).

Previous research suggests low physical activity and high screen time can increase mental health problems and reduce sleep quality (Wu, et al., 2015). Figure 1 directly depicts how each level contributes to the adverse health outcomes experienced, which only emphasizes why media and technology use at night is frequently noted as being the reason for this reduced quality of life (Wang & Bíró, 2021). Night-time use of the most commonly used devices i.e. mobile phones and televisions was even associated with inconsistent wake times (Mireku et al., 2019). All of this is consistent with data focused on college students; 57% leave their phone ringer on during sleep, with only 33% turning it to silent or vibrate modes (Hershner & Chervin, 2014). In contrast to what is commonly practiced, a current recommendation to improve sleep quality is to turn off technology at least 30 minutes before sleep (Sleep Education, 2020). This recommendation seems simple, yet the research mentioned above highlights the difficulty college students experience to put their many devices down each day.

Earlier this year, the author conducted a study to examine the relationship between sleep and technology. Poor sleep quality, which was analyzed by having a high PSQI score, was found to not correlate with total time on electronic devices ($r = .097$). Furthermore, there was no significant difference in PSQI scores for those who used their phones within an hour before bed compared to those who did not [$t(78) = -0.207$, $p = 0.411$]. These findings contradict the majority of research in the field (e.g., Wang & Bíró, 2021; Wu et al., 2015), which is why the current study will re-examine time spent on electronic devices along with other factors to see which best predict student sleep hygiene.

Next, the social level found in Figure 1 includes influences such as family, home, work, and school (Watson et al., 2015). From a developmental standpoint, college students are at a time in their lives where social influences dominate. Sleep can be impacted socially through the schedules of people coexisting with the individual, the amount of homework or office work one has, and even the level of comfort one's home emits. There are also many social demands within the developmental drive to specifically focus on social connections (Agarwal et al., 2018). These demands are ingrained in social environments with peers, close friends, and those they reside with. This network facilitates important peer interactions and provides opportunities for friends to model behaviors (Agarwal et al., 2018). Thus, it could be the balance of wants versus needs. Students may need sleep, but given the college culture of not prioritizing sleep, peer modeling may perpetuate the sleep deprivation cycle.

Indeed, sleep behaviors are affected by a variety of external factors like a full course load, part-time jobs, and the many social responsibilities that are hallmarks of college (Paprocki, 2021). In addition, it was found that students involved in extracurricular activities for more than 10 hours a week experience significant alteration in their sleep through experiences of non-restorative sleep, sleeping less than 6 hours per night and excessive daytime sleepiness, which can then disrupt their day-to-day functioning (American Academy of Sleep Medicine, 2008).

Moreover, the culture and behavior of alcohol and caffeine consumption do not benefit sleep; typically higher motives for drinking alcohol are related to poor sleep quality and higher caffeine consumption is related to sleep disturbances like insomnia (Wang & Bíró, 2021). Smoking also negatively impacts sleep, because nicotine is a stimulant that raises heart rate and increases alertness (Diaz, 2020). Lastly, an all-nighter, which is defined as going a whole night

without sleep, directly impacts cognitive function and has impairments that are similar to being drunk (Suni & Rehman, 2022).

Although sleep has to continually compete for one's attention and priority against the seemingly endless distractions, it is nevertheless crucial to successful daily functioning. Unsurprisingly, more than a third of adults report insufficient sleep and do not achieve the 7 or more hours recommended (Center for Disease Control, 2016). College students have a variety of demands like performing well in school and being involved in an array of activities that overpower the time allotted for sleep. A recent survey of colleges across the US found that only 4.3% of students averaged 7-9 hours of sleep over a 2-week period, and only 3.8% of college students reported feeling rested upon awakening in each of the 7 days prior to the survey (American College Health Association, 2022). These numbers are extremely low for any population, but especially a vulnerable one that is experiencing a foundational time of personal and professional growth.

With this in mind, proper sleep hygiene likely impacts academic performance within the demanding college environment. The American College Health Association established reducing "the proportion of students who report that their academic performance was adversely affected by sleep difficulties in the past 12 months" as one of their main objectives for improving the health of college students (Ramar et al., 2021). Indeed, 80% of students feel overwhelmed by academic responsibilities (Paprocki, 2021), and previous research finds that daytime sleepiness and related behaviors are "negatively associated with college students' attentiveness and academic performance" (Stock et al., 2020).

This negative association with sleep deprivation has a detrimental impact on academic performance. It affects cognitive and motor processes as well as emotional stability, which is

important for typical day-to-day functioning and decision making (Lowry et al., 2010). This connection should lead to a change of priorities in those that are concerned with academics. The mentioned study found that the average amount of sleep per night was significantly correlated with academic performance as defined by GPA. Specifically, those who slept longer tended towards higher grades (Lowry et al., 2010).

Disturbances in a student's sleep have a relationship with academic problems, but startlingly three-fourths of college students reported never receiving information about sleep from their university (Ramar et al., 2021). For this reason, the current study will collect data on academic success to explore its potential relationship with sleep behaviors and knowledge. This branch of research can be defined numerically through GPA and nominally through subjective ratings of their own academic performance and its comparison to those of peers. Having both forms of data collection will allow a deeper understanding of how students perceive academics and how their school priorities impact sleep duration and quality.

Lastly, the individual level in Figure 1 is found in variables of psychology, health, behavior, and genetics (Watson et al., 2015). These variables are less flexible in terms of personal control, such as developmental processes, maturation, biological predispositions, and genetics. It can instead be viewed as a starting point from which an individual must work within to influence sleep continuity, quantity, and more (Watson et al., 2015). For instance, developmentally, the young adult / typical undergraduate college student age group in general have a biological delay that disrupts sleep onset, which results in staying awake later and an overall shortened sleep duration. The biological delay is derived from two processes that are found in sleep regulation: intrinsic circadian timing system and the homeostatic sleep-wake system (Bruce et al., 2017). The intrinsic period of the circadian clock can also be called the

"internal day length" and is lengthened during adolescence (Crowley et al., 2007). The internal day length influences when one's body thinks it is night time (or time for bed), so when it is lengthened the body's natural bedtime becomes later.

Moreover, the homeostatic sleep-wake system, which is thought to be independent of circadian timing, documents the sleep process through sleep pressure measurements that increase when one is awake and decrease when asleep (Crowley et al., 2007). Essentially, the sleep-wake system regulates the body's internal environment and keeps things such as body temperature stable and ready for the situation it is placed in (such as being in bed). Not even considering the external factors of academics and other obligations, these processes show how sleep is internally and biologically altered during this life stage, which exacerbates the crucial need to follow healthy sleep recommendations.

The levels from Figure 1 in connection with sleep duration list other health outcomes like cardiovascular health, metabolic health, and mental health (Watson et al., 2015). In order to be alert, productive, and psychologically and physically healthy, sleep must be prioritized in a college student's life. Without that increased time spent asleep, students will experience detrimental deprivation that will impact various health implications (Maas et al., 1998). For example, healthy sleep is important for "cognitive functioning, mood, mental health, and cardiovascular, and metabolic health" (Ramar et al., 2021). For cardiovascular health, an elevated risk for disease and specifically hypertension was found to be associated with sleeping less than 6 hours each night (Watson et. al, 2015). There are mixed results regarding the direct link between sleep and metabolic health, however, lack of sleep can be found in cases of obesity, diabetes, and other metabolic diseases due to the irregular functioning (Watson et al., 2015).

To further elaborate on the internal and individual level, the impacts of sleep on cognitive functioning and mental health are well documented. The less sleep obtained, the quicker cognitive deficits and mood dysregulation is evident (Watson et al, 2015). Sleep deprivation is commonly related to making poor choices, which may stem from an inability to adequately assess the consequence of these behaviors (Bruce et al., 2017). The inability to properly process and react to one's surroundings due to exhaustion is an occurrence that can be found often in the college environment. However, something being a common practice does not mean it is a praised practice. Furthermore, lack of sleep impacts testing skills like memory recall and concentration (Paprocki, 2021). Each of these adverse health outcomes not only affects the time spent in bed, but bleeds over into academic performance, social choices, physical and mental health, and more.

These health outcomes highlight the vast importance that sleep has on one's functioning at any age, but especially for the undergraduate population. Figure 1 depicts many external and internal factors that impact sleep quality and sleep duration. Interestingly, these drivers appear at various levels of human existence to further emphasize how difficult it is to provide a single set of recommendations that apply to the entire population and still take note of the many individual differences. However, this difficulty does not deter those within the field from researching and attempting to expand the knowledge of healthy sleep behaviors.

With the substantial evidence stated above in mind, the current study plans to examine seven predictors of sleep quality: number of college credits, total hours involved in working, alcohol consumption, caffeine consumption, smoking behaviors, the frequency of all-nighters, and daily time on technology.

Sleep Education

This leads one to question, would improving and expanding sleep knowledge impact sleep hygiene? Sleep-related fields recognize the need to promote sleep-related education (Zozula et al., 2001). One study assessed medical students' knowledge about sleep and sleep disorders in a 30-question survey, in which they averaged 56.3% correct. Unfortunately, in this study, sleep education improved knowledge but did not seem to improve the actual quality of sleep. For the baseline data, students had poor sleep quality with a mean PSQI score of 5.9 and no improvement was seen after the educational intervention (Mazar et al., 2021). However, this study assessed knowledge of sleep disorders - not healthy sleep habits and practices. The current study will focus on assessing knowledge of sleep hygiene recommendations from the American Academy of Sleep Medicine (Troy et al., 2021), providing a unique addition to the literature on knowledge of sleep hygiene practices in student populations. Through assessing knowledge of habits needed for better sleep quality, the study aims to explore whether this knowledge is associated with implementation of healthy behaviors (as reflected by a lower PSQI score) in the college students analyzed.

Current Study and Hypotheses

The theoretical framework of the current study is embodied by the following research questions and hypotheses:

1) **What is a college student's average knowledge of recommended sleep habits, and is this related to sleep quality?** Given the lack of research on student knowledge of recommended sleep habits, the current study quantified sleep knowledge and examined whether sleep knowledge is related to sleep quality.

2) **Which college-related factors are most predictive of sleep hygiene?** Using a single regression, seven predictors (number of college credits, total hours involved in working, alcohol consumption, caffeine consumption, smoking behaviors, the frequency of all-nighters, and total technology time) were entered to determine significant predictors of PSQI.

3) **What relationship does sleep quality have with academic performance?** It was hypothesized that there is a positive relationship between sleep quality and academic performance (grade point average).

The expected outcome of the proposed study was to better understand sleep knowledge and factors that influence sleep quality in college students. Such knowledge can be used to target education and interventions aimed to improve sleep hygiene in students, thus improving their quality of life.

Method

Participants

The target sample included all Murray State University undergraduate students enrolled in psychology courses given access to SONA, Murray State University Honors College students, and members of Alpha Sigma Alpha ($N = 205$). This final sample was primarily female ($n = 162$) and Caucasian ($n = 188$). The highest participation came from those of freshman status ($n = 101$). Interestingly, only 30.2% ($n = 62$) of participants were involved with Greek life. In addition, 36.1% ($n = 74$) were members of the Honors College. Those that participated through SONA services received psychology study credits to fulfill a study requirement for their class. This study was approved by the Murray State University IRB (see Appendix D). Informed consent was obtained prior to participation in the current study.

Table 1

Sample Demographics

	Total	
	N	%
Biological Sex		
Female	162	79.0%
Male	42	20.5%
Prefer not to say	1	0.5%
Class Level		
Freshman	101	49.3%
Sophomore	51	24.9%
Junior	30	14.6%
Senior	23	11.2%
Ethnicity/Race		
Caucasian	188	91.7%
Bi-racial	6	2.9%
African American	4	1.9%
Asian/Pacific Islander	2	1.0%
Hispanic	2	1.0%
Native American	1	0.5%
Other	2	1.0%
Diagnosed Sleep Disorder		
Yes	6	2.9%
No	198	97.1%
Greek Life Members		
Yes	62	30.4%
No	142	69.6%
Honors College Members		
Yes	74	36.1%
No	131	63.9%

Note. The table reflects the demographics of the participants found at Murray State University.

Measures

  Demographic data was collected concerning biological sex assigned at birth, class level (freshman, sophomore, junior, senior), ethnicity/race, sleep disorder diagnoses, greek like membership, honors college membership, and if participants were completing the survey for SONA credit or not. In addition, participants were asked to report if their bedtime differs from the week to the weekend.

  Sleep hygiene knowledge. To measure knowledge of recommended sleep habits, the 14 AASM healthy sleep habits (Troy et al., 2020) was modified into a multiple choice test (see Appendix C). It was scored by the number of correct answers (0 - 100%). The Kudar-Richardson 20 revealed poor internal consistency ($a = .44$).

  Sleep hygiene. The Pittsburgh Sleep Quality Index was used to assess sleep hygiene (Buysse et al., 1989). It is a 19-item self-rated questionnaire, which is weighted equally 0-3, for evaluating subjective sleep quality over the previous month. The 19 questions are turned into 7 component scores and are added to obtain a global score ranging from 0–21. In the current study, one question (#8 "During the past month, how much of a problem has it been for you to keep up enthusiasm to get things done?") was accidentally omitted. The PSQI was subsequently analyzed using the standard scoring procedures (Buysse et al., 1989), so that the actual range in the current study ranged from 0 - 20, with higher scores indicating worse sleep quality. Although this affects the generalizability of raw scores to other publications, the overall PSQI scores are consistent within the current study and still are informative as to general sleep quality. The PSQI internal consistency was acceptable (Cronbach's alpha; $\alpha = .74$).

  Self-reported factors. Academic performance was operationally defined and quantified as self-reported GPA. The survey requested the participant's current college GPA and asked those

that did not have one yet (e.g. some freshman) to leave blank. The survey also included two 7-point Likert scales to identify students' satisfaction with their own academic performance and how they academically self-rated in comparison to peers. For personal academic satisfaction Likert, participants indicated their level of satisfaction from "Extremely dissatisfied (1)" to "Extremely satisfied (7)." For the peer comparison Likert scale, participants indicated their standing from "Significantly worse (1)" to "Significantly better (7)."

Participants reported the number of college credits for the current semester and average number of hours worked per week. Participants self-reported use of alcohol, caffeine, and smoking in the past month using the scale provided by Wang and Bíró (2021), and have also reported the number of all-nighters pulled in the last month.

Technology habits. Technology habits were quantified through total time spent on devices and most common use of technology before bed using questions from a previous publication (Mireku et al., 2019). The technology variable was narrowed from technology habits to total technology time for analysis purposes, because 100% of participants reported using technology before bed. Therefore, it was quantified into total technology time during the day across phones, laptop/tablet, and gaming/tv/other.

Extracurricular obligations. Similar to previous research (American Academy of Sleep Medicine, 2008), participants were asked to report how many hours they are involved in work and other common obligations during a typical week in the academic term. Total hours of involvement were calculated, because previous research showed students who reported more than 10 hours total in these areas reported poorer sleep quality (American Academy of Sleep Medicine, 2008).

Procedure

  Psychology student participants located the survey through the SONA system and were provided an informed consent form before continuing. This specific study is not required, but instead was an option of many that the students could choose from in order to fulfill their research exposure requirement. Once the study was available through SONA systeming, all students had the opportunity to participate from September 30th, 2022 to October 12th, 2022. For members of the Honors College, the survey details were sent through email and students were encouraged, but not required to participate. For girls in Alpha Sigma Alpha, the survey details were presented at a chapter meeting and the link was shared through the sorority's GroupMe. Girls in the chapter were not required to participate and received no compensation.

Analysis

  Four participants (#37, 64, 65, and 152) were removed due to insufficient data needed for scoring the PSQI, resulting in a total sample of 205 participants used for analyses.

  The first research question is twofold: *What is a college student's average knowledge of recommended sleep habits, and is this related to sleep hygiene?* First, average knowledge of sleep habits was quantified (percentage correct on the 14 question test), as no previous research has been found characterizing sleep knowledge in the average college student population. Percent correct on the sleep habit test was compared to PSQI scores using a Pearson's *r* correlation.

  The second research question is: *Which college-related factors are most predictive of sleep hygiene?* Using a single analysis regression, seven predictors (number of college credits, total hours involved in working, alcohol consumption, caffeine consumption, smoking behaviors,

the frequency of all-nighters, and total daily time on technology) were entered to determine which are significant predictors of PSQI.

The final research question is: *What relationship does sleep quality have with academic performance?* It was hypothesized that there is a positive relationship between sleep quality and academic performance (grade point average). Sleep quality is first defined as the PSQI score, and academic performance is the self reported GPA. Secondly, not all participants (i.e. freshman) had a college GPA to report, so subjective measures were also included. The two subjective measures assessed personal satisfaction with their academic standing and how the participant thought of their academics compared to their peers. The research question was analyzed using a Pearson's *r* correlation.

Results

Hypothesis 1: Sleep Hygiene and Knowledge

Participants scored an average of 71.4% ($SD = 13.09$) correct on the sleep knowledge test. A Pearson's *r* correlation was used to assess the potential relationship between sleep hygiene (PSQI) and sleep knowledge (% correct). No significant relationship was found ($r = -0.094$, $p = .181$; see Figure 2).

Figure 2

Scatterplot of Sleep Hygiene (PSQI) and Sleep Knowledge (% Correct)
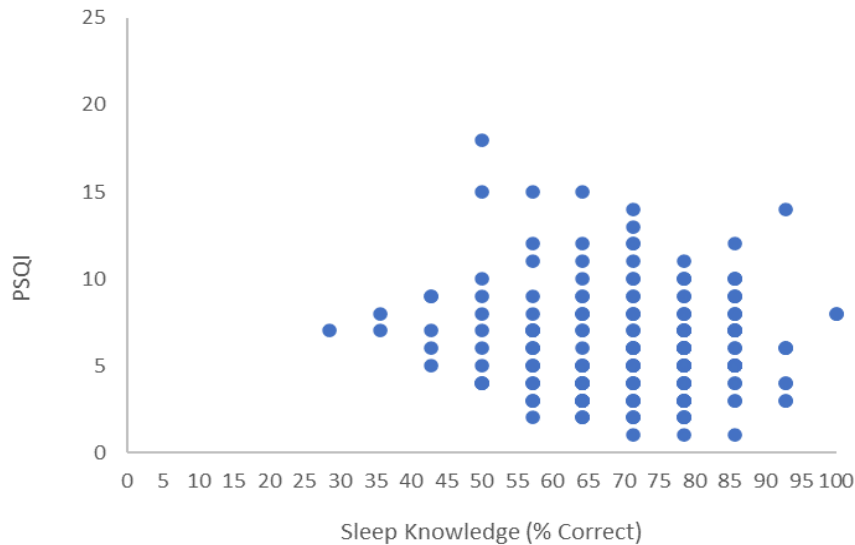
Hypothesis 2: Predictors of Sleep Hygiene

To examine if college related factors were predictive of sleep hygiene, a multiple regression was conducted. The overall regression was statistically significant ($R^2 = .163$, $F(7, 196) = 5.43$, $p < .001$). Contrary to expectations, the only positively significant predictor of the PSQI was the average number of all-nighters per semester ($\beta = 0.25$, $p < .001$; see Figure 3). All other predictors did not significantly contribute to the regression model for sleep hygiene (see Table 2).

Table 2

Multiple Regression Predictor Variables

Variable	*B*	*SE*	t	*p*
Number of college credits	0.06	0.14	0.85	.40
Hours worked for pay	0.10	0.02	1.52	.13
Alcoholic drink intake weekly	0.11	0.04	1.56	.12
Smoking behaviors weekly	0.11	0.01	1.41	.16
Caffeine intake weekly	0.03	0.03	0.51	.61
All-nighters per semester	0.25	0.07	3.60	<.001**
Hours of daily technology time	0.11	0.04	1.71	.09

Note. The table reflects the seven variables that were assessed alongside sleep quality (PSQI).

Figure 3

Number of All-Nighters Predicts Sleep Hygiene
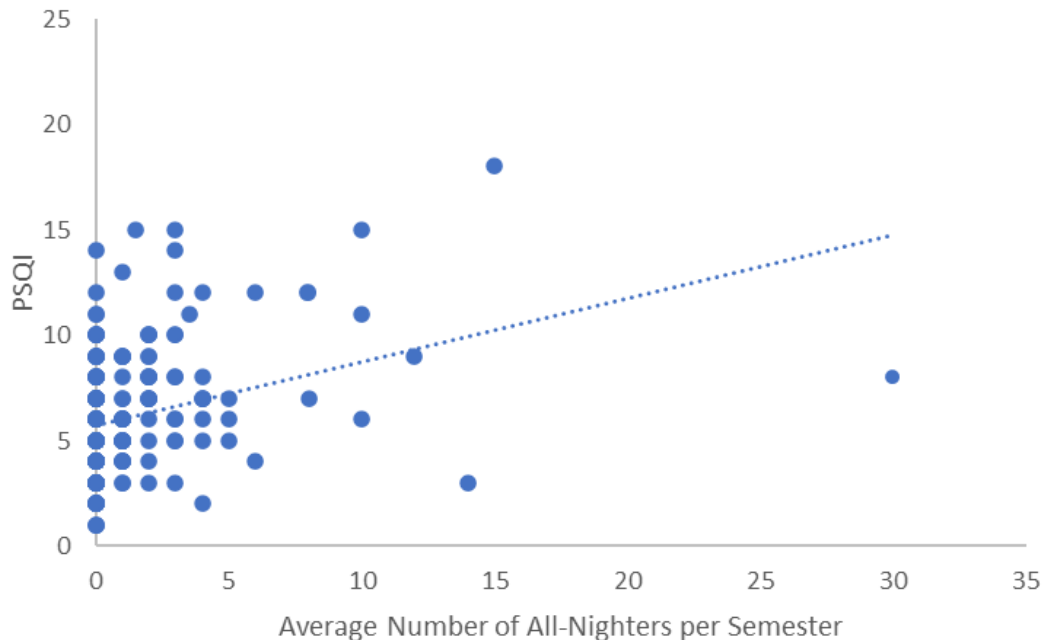
Hypothesis 3: Academic Performance and Sleep Hygiene

Academic performance was assessed using three separate measures. College GPA (M = 3.59; SD = 0.48) was self-reported by 143 of the 205 participant data used in this study. This is most likely due to first semester freshmen not having college GPAs. In anticipation of this, academic performance was also assessed by measuring personal academic satisfaction [M = 5.1 (5 meaning "slightly satisfied"; SD = 1.57] and academic satisfaction in comparison to peers [M = 4.7 (4 meaning "average"); SD = 1.28]. Higher academic performance on all three indices was associated with better sleep hygiene (lower PSQI scores). Specifically, pearson's r correlations revealed significant negative relationships between GPA and sleep quality (PSQI) (r = -0.37, p < .001; see Figure 4), academic satisfaction ratings and sleep quality (PSQI) (r = -0.32, p < .001; see Figure 5), and peer academic comparison ratings and sleep quality (PSQI) (r = -.19, p =.003;

see Figure 6). These findings suggest that sleep quality is closely tied to academic standing and perceptions of that standing.

Figure 4

Grade Point Average Predicts Sleep Hygiene
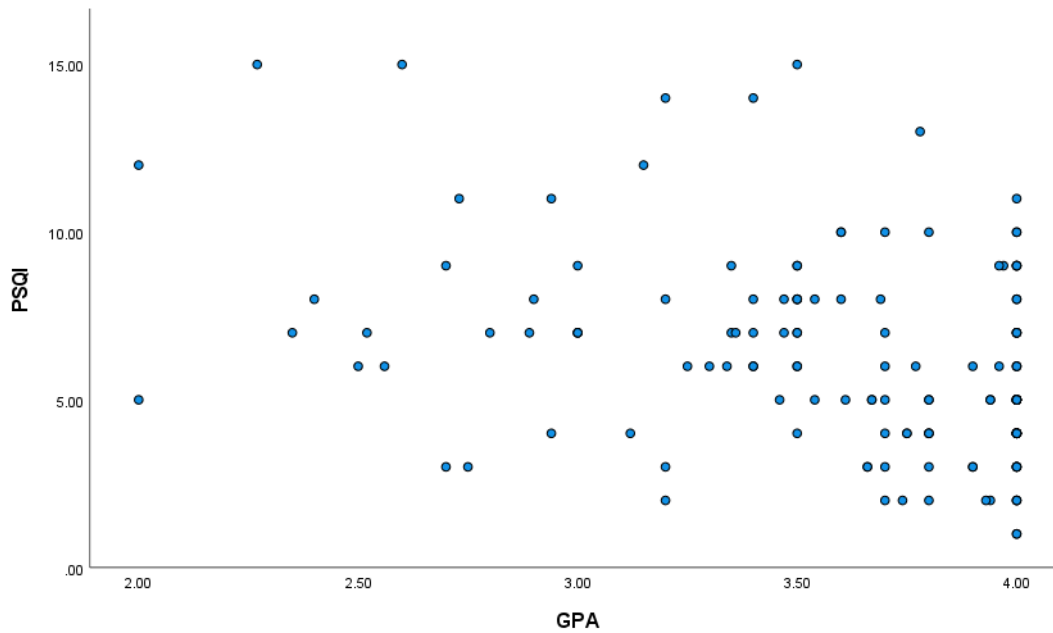
Figure 5

Self-reporting of Academic Satisfaction is Related to Sleep Hygiene
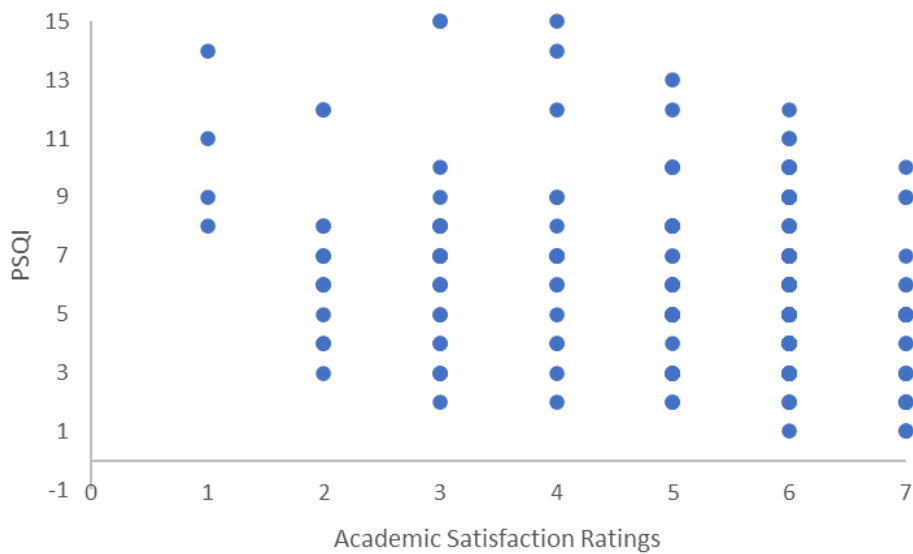
Figure 6

Self-reporting of Peer Academic Comparison is Related to Sleep Hygiene
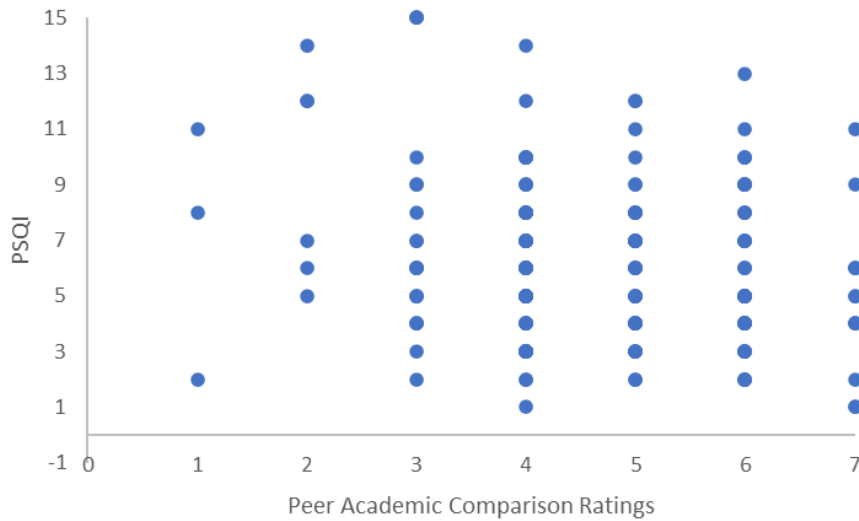
Post Hoc Analyses

In addition, other variables were analyzed for relationships to help determine which variables are the most significant predictors of one's sleep quality and sleep knowledge. It was also found that there is a negatively significant relationship between the average number of all-nighters and academic performance defined by GPA ($r = -0.42$, $p < .001$), suggesting that staying up all night was not beneficial to students. There was also a positively significant correlation between sleep knowledge scores and academic performance as defined by GPA ($r = 0.19$, $p = .02$), suggesting that academic and sleep knowledge are weakly related.

Discussion

As previously mentioned, the "always on" nature of college life is a constant pressure, often resulting in sleep deprivation and/or overall poor quality of sleep (Dowdell, 2019). The current study suggests poor sleep quality is associated with pulling more all-nighters and lower perceived and actual academic performance.

The first research question failed to reveal a relationship between sleep quality and sleep knowledge. As previous research found, sleep education improved knowledge but did not seem to improve the actual quality of sleep (Mazar et al., 2021). Unfortunately, both of these outcomes mean that knowledge and awareness of best sleep practices is not related to implementation of such behaviors in college students. The inability to detect a connection is unknown, but could stem from a lack of concern from undergraduate students regarding their sleep. This domain could be something that is not highly regarded until later in life based on their current developmental phase, and could be a basis for future research. The low internal validity of the sleep knowledge test used in the current study could also potentially explain the results shown here. As no other publications were found assessing sleep knowledge, this is an area of research to further refine.

The second research question revealed that of seven factors considered, the number of all-nighters per semester was the strongest indicator of a student's sleep hygiene. This logical connection demonstrates the adverse outcomes that are apparent when a student forgoes sleep for the entire night. Although the overall model predicted sleep quality, the rest of the predictors did not significantly predict sleep hygiene individually, contradicting previous research. As shown in Figure 1, there could be a variety of other individual, social, and/or societal influences driving sleep (Watson et al., 2015). While general sleep recommendations can be issued, each sample is unique and can exhibit different findings in things such as hours worked, alcohol intake due to personal preferences, or common lifestyle choices to a culture. The current study suggests college students may have very unique predictors from that of the general population.

The final research question provided converging lines of evidence for a relationship between sleep quality and academic performance. Academic performance as measured by GPA,

satisfaction of current academic performance, and comparison of academic performance to peers were all significantly related to sleep quality. These lines of evidence add to the already extensive literature suggesting good sleep practices are beneficial not only to one's health (Watson et al., 2015), and general cognitive improvements (Lowry et al., 2010) but also having real-world relationships with academic performance and perceptions of academic performance. However, a previous study found that the average amount slept each night was tied to the students GPA, but not overall sleep quality (Lowry et al., 2010). Thus, future studies should continue to explore the bidirectional relationship between sleep hygiene and academic performance and other contributing factors. Further, experimental designs can explore whether there is temporal precedence for sleep quality and its potential impact on academic performance. Indeed, if improving sleep quality can improve academic performance, interventions can be planned to help students improve their academic performance in college.

Limitations and Future Directions

Several limitations were outlined previously. Most notably, the lack of internal validity on sleep knowledge. Future studies should explore psychometric properties and develop a useful assessment for sleep knowledge in the general college population. Additionally, it would be beneficial to collect data from a wider and less traditional range of participants. For predictors and environments specific to college students, it may be prudent to consider students' housing (on-campus or off-campus) and how or if that impacts their decisions and academics. Studies can also be expanded to provide a fuller picture of developmental priorities and the variation in habits in non-traditional students or even in comparison to similar aged persons not in college.

Looking towards the academic improvements, it would be interesting to investigate the relationship between class times and sleep quality. Previous literature indicated that self-reported

shortened total sleep time, erratic sleep/wake schedules, late bed and rise times, and poor sleep quality are negatively associated with academic performance for adolescents from middle school through the college years (Wolfson & Carskadon, 2003).

Another study found that class start times have a significant relationship with the sleep habits of college students. Specifically, later start times were found to be related to increased alcohol intake in addition to later bedtimes (Onyper et al., 2011). The alteration of habits based on when students have class could also impact the grades reported. If students are more likely to engage in alcohol consumption and other alternative behaviors, the impact on grades and academic perception could be altered through a decrease in functioning and cognition based on decreased sleep quality.

In addition, academics could be further tied by not only general sleep quality but specifically the amount of sleep. Previous research strongly concluded that shortened sleep time and a more erratic sleep/wake schedule are negatively associated with academic performance (Wolfson & Carskadon, 2003). It would be interesting to break down each component of sleep (like number of hours, bed time, sleep disorder prevalence, etc.) and more specifically analyze them against academic measures.

In conclusion, the current study illustrates the importance of sleep on academic performance in college students, however it also reveals that sleep may not be valued, as their knowledge of best sleep practices was not related to their personal sleep hygiene. The current study has provided insights that can be useful to drive further research on predictors of sleep quality in college students, and the potential benefits that can be produced for not only students, but society as a whole. The nuances in the current study and the variances within the literature promote the importance of sleep research within the parameters of the undergraduate

environment. Future studies could review the lack of connection between sleep knowledge and sleep quality to determine why knowledge does not lead to action within this population.

References

American College Health Association. (2022). S22 Undergrad data report. *American College*

    Health Association. Retrieved August 31, 2022, from

    https://www.acha.org/documents/ncha/NCHA-

    III_SPRING_2022_UNDERGRAD_REFERENCE_GROUP_DATA_REPORT.pdf

Agarwal, D., Loukas, A., & Perry, C. L. (2018). Examining college students' social environment,

    normative beliefs, and attitudes in subsequent initiation of electronic nicotine delivery

    Systems. *Health education & behavior : the official publication of the Society for Public*

    Health Education, *45*(4), 532–539. https://doi.org/10.1177/1090198117739672

American Academy of Sleep Medicine. (2008). College students involved in extracurricular

    activities are more likely to have sleep deprivation. *American Academy of Sleep*

    Medicine. Retrieved September 8, 2022, from https://aasm.org/college-students-involved-

    in-extracurricular-activities-are-more-likely-to-have-sleep-deprivation/

Bruce, E. S., Lunt, L., & McDonagh, J. E. (2017). Sleep in adolescents and young adults.

    Clinical Medicine, 17(5), 424-428. Retrieved September 1, 2022 from

    http://waterfield.murraystate.edu.ezproxy.waterfield.murraystate.edu/login?url=https://se

    arch.ebscohost.com/login.aspx?direct=true&db=a9h&AN=125747863&site=ehost-

    live&scope=site

Buysse, D. J., Reynolds III, C. F., Monk, T. H., Berman, S. R., & Kupfer, D. J. (1989). The

    Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice and research.

    Psychiatry Research, 28(2), 193–213.

Centers for Disease Control and Prevention. (2016). 1 in 3 adults don't get enough sleep. *Centers for Disease Control and Prevention.* Retrieved August 28, 2022, from https://www.cdc.gov/media/releases/2016/p0215-enough-sleep.html

Crowley, S., Acebo, C., & Carskadon, M. A . (2007). Sleep, circadian rhythms, and delayed phase in adolescence. *Sleep Medicine, 8*, 602-612. Retrieved on October 15, 2022. doi:10.1016/j.sleep.2006.12.002

Diaz, K. (2020). Smoking and sleep. *American Sleep Association*. Retrieved September 8, 2022, from https://www.sleepassociation.org/blog-post/smoking-and-sleep/

Dowdell, E. B., & Clayton, B. Q. (2019). Interrupted sleep: College students sleeping with technology. *Journal of American College Health, 67*(7), 640–646. Retrieved on February 9, 2022 from https://doi.org/10.1080/07448481.2018.1499655

Gardner, B., Lally, P., & Wardle, J. (2012). Making health habitual: the psychology of 'habit-formation' and general practice. *The British Journal of General Practice: the Journal of the Royal College of General Practitioners, 62*(605), 664–666. https://doi.org/10.3399/bjgp12X659466

Hershner, S., & Chervin, R. (2014). Causes and consequences of sleepiness among college students. *Nature and Science of Sleep, 6*, 73-84. https://doi.org/10.2147/NSS.S62907

Lowry, M., Dean, K., & Manders, K.R. (2010). The link between sleep quantity and academic performance for the college student. *Regents of the University of Minnesota, 3*, 16-19. https://www.semanticscholar.org/paper/The-Link-Between-Sleep-Quantity-and-Academic-for-Lowry-Dean/694319a89199a3cf766a6bf6b4140e3d75a7a891

Maas, J. B., Axelrod, D. J., Blumin, J. A., Hogan, B. R., & Wherry, M. L. (1998). *Power Sleep: The Revolutionary Program That Prepares Your Mind for Peak Performance.* Harper Collins.

Mazar, D., Gileles-Hillel, A., & Reiter, J. (2021). Sleep education improves knowledge but not sleep quality among medical students. *Journal of Clinical Sleep Medicine: Official Publication of the American Academy of Sleep Medicine, 17*(6), 1211–1215. https://doi.org/10.5664/jcsm.9170

Mireku, M.O., Barker, M. M., Mutz, M., Dumontheil, I., Thomas, M. S. C., Röösli, M., Elliott, P., & Toledano, M. B. (2019). Night-time screen-based media device use and adolescents' sleep and health-related quality of life. *Environment International, 124*, 66-78. Retrieved on February 9, 2022 from https://doi.org/10.1016/j.envint.2018.11.069.

National Sleep Foundation. (2022). *Screen Use Disrupts Precious Sleep Time*. National Sleep Foundation. Retrieved August 31, 2022, from https://www.thensf.org/screen-use-disrupts-precious-sleep-time

National Sleep Foundation (2020). *10 Tips for a Better Night's Sleep*. National Sleep Foundation. Retrieved September 3, 2022, from https://www.thensf.org/10-sleep-tips-sleep-quality/

Onyper, S., Thacer, P., Gilbert, J., & Gradess, S. (2011). Class start times, sleep, and academic performance in college: a path analysis. *Chronobiology International, 29*(3), 318-335. Retrieved November 15, 2022 from https://doi.org/10.3109/07420528.2012.655868

Paprocki, J. (2021). *College students aren't getting nearly enough sleep*. Sleep Education. Retrieved September 2, 2022, from https://sleepeducation.org/college-students-arent-getting-nearly-enough-sleep/

Ramar, K., Malhotra, R. K., Carden, K. A., Martin, J. L., Abbasi-Feinberg, F., Aurora, R. N., Kapur, V. K., Olson, E. J., Rosen, C. L., Rowley, J. A., Shelgikar, A. V., & Trotti, L. M. (2021). Sleep is essential to health: an American Academy of Sleep Medicine position statement. *Journal of Clinical Sleep Medicine: Official Publication of the American Academy of Sleep Medicine, 17*(10), 2115–2119. https://doi.org/10.5664/jcsm.9476

Stock, A., Lee, S., Nahmod, N., & Chang, A.M. (2020). Effects of sleep extension on sleep duration, sleepiness, and blood pressure in college students. *Sleep Health, 6*(1), 32-39, https://doi.org/10.1016/j.sleh.2019.10.003.

Suni, E., Vyas, N. (2022). *What Is Sleep Hygiene?* Sleep Foundation. Retrieved August 28, 2022, from https://www.sleepfoundation.org/sleep-hygiene

Suni, E., & Rehman, A. (2022). *All-Nighters: Helpful or Harmful?* Sleep Foundation. Retrieved September 8, 2022, from https://www.sleepfoundation.org/sleep-hygiene/why-are-all-nighters-harmful

Troy, D., Hershner, S., & Shaikh, I. (2021). *Healthy Sleep Habits.* American Academy of Sleep Medicine: Sleep Education. Retrieved August 26, 2022, from https://sleepeducation.org/healthy-sleep/healthy-sleep-habits/

Wang, F., Bíró, E. (2021). Determinants of sleep quality in college students: A literature review. *EXPLORE, 17*(2), 170-177. Retrieved on January 25, 2022 from https://doi.org/10.1016/j.explore.2020.11.003

Watson, N.F., Badr, M.S., Belenky, G., Bliwise, D.L., Buxton, O.M., Buysse, D., Dinges, D.F., Gangwisch, J., Grandner, M.A., Kushida, C., Malhotra, R.K., Martin, J.L., Patel, S.R., Quan, S.F., & Tasali, E. (2015). Joint consensus statement of the American Academy of Sleep Medicine and Sleep Research Society on the recommended amount of sleep for a

healthy adult: methodology and discussion. *Journal of Clinical Sleep Medicine, 11*(8), 931–952. https://doi.org/10.5664/jcsm.4950

Wolfson, A. & Carskadon, M. (2003). Understanding adolescents' sleep patterns and school performance: a critical appraisal. *Sleep Medicine Reviews 7*(6), 491-506. Retrieved on November 15, 2022 from https://doi.org/10.1016/s1087-0792(03)90003-7

Wu, X., Tao, S., Zhang, Y., Zhang, S., & Tao, F. (2015). Low physical activity and high screen time can increase the risks of mental health problems and poor sleep quality among Chinese college students. *PloS one, 10*(3). https://doi.org/10.1371/journal.pone.0119607

Appendices

Appendix A - Informed Consent Form
Appendix B - Self-Report Survey
Appendix C - Healthy Sleep Habits Survey
Appendix D - IRB Approval Letter

Appendix A

SONA Study Description

MSU TITLE: The Prevalence of Sleep Hygiene Knowledge and Impacts of Sociocultural Factors

SHORT DESCRIPTION: This study asks participants to complete a survey to self-report daily habits and sleep knowledge.

LONG DESCRIPTION: This study asks participants to sign up for an online survey on Google Forms linked from the SONA page. Upon clicking the link to begin the study, participants will be asked to complete a short survey assessing sleep quality in addition to a variety of other factors (e.g., academic success, technology usage, and awareness of proper sleep hygiene). Participation in this study should take no more than 30 minutes. Participants will receive 15 credits for completing this study.

INFORMED CONSENT

Project Title: Sleeping on Sleep: The Prevalence of Sleep Hygiene Knowledge and Impacts of Sociocultural Factors
Primary Investigator: Mirielle Erpelding, Dr. Megan St. Peters, Murray State University, Murray, KY 42071

You are being invited to participate in a research study. You must be at least 18 years of age to participate. Below is an explanation of the purpose of the project, the procedures to be used, and the potential benefits and possible risks of participation.

Nature and Purpose of the Project: The purpose of this study is to gain information regarding factors related to sleep quality and knowledge of sleep recommendations.

Explanation of Procedures: Your participation in this study will require you to respond honestly to a few short surveys regarding sleep quality, knowledge of sleep recommendations, academic data, technology habits, and some demographic information. Your total participation should take no longer than 30 minutes.

Discomforts and Risks: There are no anticipated risks to you as a participant. Regardless, please know that you can quit participating at any time without penalty.

Benefits: There are no direct individual benefits to you beyond the opportunity to learn first-hand what it is like to participate in a research study and to learn about some of the methods involved in psychological research. A general benefit is that you will add to our knowledge of the research subject.

Confidentiality: Your responses on all the tasks will be completely confidential; they will only be numerically coded and not recorded in any way that can be identified with you. All information related to this study will be retained for at least three years after completion of this study, after which all such documents will be destroyed.

Required Statement on Internet Research: All survey responses that the researcher receives will be treated confidentially and stored on a secure server or hard drive. However, given that the surveys can be completed from any computer (e.g., personal, work, school), we are unable to guarantee the security of the computer on which you

choose to enter your responses. As a participant in this study, the researcher wants you to be aware that certain "keylogging" software programs exist that can be used to track or capture data that you enter and/or websites that you visit.

Refusal/Withdrawal: Your participation in this study should be completely voluntary. Your refusal to participate will involve no penalty. In addition, you have the right to withdraw at any time during the study without penalty or prejudice from the researchers.

By clicking on the button below, I have read this consent form, I am at least 18 years old, and I voluntarily consent to participate in this research.

THIS PROJECT HAS BEEN REVIEWED AND APPROVED BY THE MURRAY STATE UNIVERSITY INSTITUTIONAL REVIEW BOARD (IRB) FOR THE PROTECTION OF HUMAN SUBJECTS. ANY QUESTIONS PERTAINING TO YOUR RIGHTS AS A PARTICIPANT OR ACTIVITY-RELATED INJURY SHOULD BE BROUGHT TO THE ATTENTION OF THE IRB COORDINATOR AT +1(270) 809-2916. ANY QUESTIONS ABOUT THE CONDUCT OF THIS RESEARCH PROJECT SHOULD BE BROUGHT TO THE ATTENTION OF THE RESEARCHERS AT mstpeters@murraystate.edu.

Appendix B

[information in brackets was not visible to participants]

The following questions are about your sleep quality, technology habits, and your knowledge of sleep health. THERE ARE NO RIGHT OR WRONG ANSWERS TO THIS SURVEY.

Questions in this first section relate to your usual sleep habits during the past month only. Your answers should indicate the most accurate reply for the majority of days and nights in the past month. Please answer all questions.

During the past month,
1. When have you usually gone to bed (e.g. 9:00 pm)?
2. How long (in minutes) has it taken you to fall asleep each night (e.g. 30 minutes)?
3. What time have you usually gotten up in the morning (e.g. 8:00 am)?
4. A. On average, how many hours of sleep did you get at night (e.g. 8 hours)?
   B. How many hours were you in bed (e.g. 10 hours)?

5. During the past month, how often have you had trouble sleeping because you	Not during the past month (0)	Less than once a week (1)	Once or twice a week (2)	Three or more times a week (3)
A. Cannot get to sleep within 30 minutes				
B. Wake up in the middle of the night or early morning				
C. Have to get up to use the bathroom				
D. Cannot breathe comfortably				
E. Cough or snore loudly				
F. Feel too cold				
G. Feel too hot				
H. Have bad dreams				
I. Have pain				
J. Other reason (s), please describe, including how often				

you had trouble sleeping, because of this reason (s):				
6. During the past month, how often have you taken medicine (prescribed or "over the counter") to help you sleep?				
7. During the past month, how often have you had trouble staying awake while driving, eating meals, or engaging in social activity?				
8. During the past month, how much of a problem has it been for you to keep up enthusiasm to get things done?				
9. During the past month, how would you rate your sleep quality overall?	Very good (0)	Fairly good (1)	Fairly bad (2)	Very bad (3)

10. On an average day, indicate the amount of time you use each of the following devices in minutes	Total time in minutes	Time in minutes solely for academic purposes
Phone		
Laptop / Tablet		
Gaming / TV / Other		

11. Please select the most common use of each technology within the last hour before bed.	Check which one applies…
Phone	
Laptop / Tablet	
Gaming / TV / Other	

[demographic questions]

[Questions M. and N. - (Thatcher, 2008)]
[Questions #1-3 - (Collins et al., 1985)]

[Collins, R. L., Parks, G. A., & Marlatt, G. A. (1985). Social determinants of alcohol consumption: The effects of social interaction and model status on the self-administration of alcohol. *Journal of Consulting and Clinical Psychology, 53*(2), 189–200. https://doi.org/10.1037/0022-006X.53.2.189

Thatcher, P. (2008). *University Students and the "All Nighter": Correlates and Patterns of Students' Engagement in a Single Night of Total Sleep Deprivation.* Behavioral Sleep Medicine, 6(1), 16-31. http://waterfield.murraystate.edu.ezproxy.waterfield.murraystate.edu/login?url=https://search.ebscohost.com/login.aspx?direct=true&db=pbh&AN=43471773&site=ehost-live&scope=site]

A. Biological sex assigned at birth: Male   Female
B. Class level (circle one)   Freshman   Sophomore   Junior   Senior
C. Ethnicity/Race:
   Caucasian   African American   Native American   Asian/Pacific Islander
   Hispanic   Bi-racial   Other (please specify):_____
D. Have you been diagnosed with a sleep disorder? Yes   No
E. Does your bedtime differ from the week to the weekend? Yes   No
F. Are you in the Honors College? Yes   No
G. Are you in Greek Life? Yes   No
H. Are you doing this for SONA credit?
   If yes, please enter your SONA ID: _____
I. How many college level credit hours are you currently enrolled in for this semester?
J. What is your current <u>college</u> GPA (leave blank if you do not have a college GPA)?
K. How satisfied are you with your academic performance?

Extremely dissatisfied	Moderately dissatisfied	Slightly dissatisfied	Neutral	Slightly satisfied	Moderately satisfied	Extremely satisfied
1	2	3	4	5	6	7

L. Compared to peers, how do you rate your academic performance?

Significantly worse	Moderately worse	Slightly worse	Average	Slightly better	Moderately better	Significantly better
1	2	3	4	5	6	7

M. Have you ever pulled an all-nighter (e.g. a single night of total sleep deprivation)?Yes No
   [For those who select YES:]
   On average, how many all-nighters do you pull per semester? _____

1. **For this question, one drink equals**:

   ⁻ 12oz.beer (10oz. Microbrew; 8oz Malt Liquor, Canadian beer or Ice beer; 6
   oz. of ice malt liquor)
   ⁻ 5 oz. of wine
   ⁻ 10oz. wine cooler
   ⁻ 1 Cocktail with 1 oz. of 100 proof liquor or 1 ½ oz. (single jigger) of 80 proof liquor.

FOR EXAMPLE:

- If on Thursdays you typically drank 3, 12 oz. regular beers, you would type in 3 drinks.
- If on Fridays you typically drank 1 mixed drink that contained 3, 1 oz. shots of 100-proof liquor, you would type in 3 drinks.

Consider a typical week during the past month...	How much alcohol, on average, (measured in number of drinks), do you drink on each day of a typical week?
On a typical **Monday**:	____drink(s)
On a typical **Tuesday**:	____drink(s)
On a typical **Wednesday**:	____drink(s)
On a typical **Thursday**:	____drink(s)
On a typical **Friday**:	____drink(s)
On a typical **Saturday**:	____drink(s)
On a typical **Sunday**:	____drink(s)

2. **For this question, one time use of nicotine equals**:

- a single cigarette / e-cigarette / vape
- chewing tobacco / snuff
- per cigar / pipe / water pipe (hookah)
- nicotine patch / other nicotine wearable

Consider a typical week during the past month...	How many times have you used nicotine, on average, (measured in number of uses as defined above), do you use on each day of a typical week?
On a typical **Monday**:	____use(s)
On a typical **Tuesday**:	____use(s)
On a typical **Wednesday**:	____use(s)
On a typical **Thursday**:	____use(s)
On a typical **Friday**:	____use(s)
On a typical **Saturday**:	____use(s)
On a typical **Sunday**:	____use(s)

Caffeine:

3. **For this question, one use of caffeine equals**:

- a single cup of coffee (or equivalent - e.g., caffeine gum)
- one shot of espresso (e.g., most small / medium coffee drinks have one shot; large coffee drinks have two)
- single energy drinks

Consider a typical week during the past month...	How much caffeine, on average, (measured in number of drinks), do you drink on each day of a typical week?
On a typical **Monday**:	_____ use(s)
On a typical **Tuesday**:	_____use(s)
On a typical **Wednesday**:	_____use(s)
On a typical **Thursday**:	_____use(s)
On a typical **Friday**:	_____use(s)
On a typical **Saturday**:	_____use(s)
On a typical **Sunday**:	_____use(s)

4. During a **typical week** in the academic term, how many **hours** are you involved in for each of the following:	
Work (for pay)	
Voluntary work	
Inter-collegial sports teams	
Greek life	
Other organized college-affiliated activities	

Appendix C

Healthy Sleep Habits Survey

[Correct answers in bold]

[Troy, D., Hershner, S., & Shaikh, I. (2021). *Healthy Sleep Habits.* American Academy of Sleep Medicine: Sleep Education. Retrieved August 26, 2022, from https://sleepeducation.org/healthy-sleep/healthy-sleep-habits/]

1.What type of sleep schedule is most recommended?

   a. As long as you get enough sleep each night, having a schedule is not necessary.
   b. Go to bed and wake up at similar times every day of the week.
   c. Have two consistent schedules - one for weekdays, one for weekends.
   d. Sleep schedules are not necessary.

2. How many hours of sleep per night is recommended for college students?

   a. 5-6 hours
   b. 7-8 hours
   c. 9-10 hours

3. When should you go to bed?

   a. When you are not sleepy, but it is getting late
   b. When you are sleepy, no matter the time
   c. When you are not sleepy, but you have to get up early

4. If you don't fall asleep after _____ minutes, get out of bed.

   a. 30 minutes
   b. 20 minutes
   c. 45 minutes
   d. Stay in bed indefinitely

5. What words should describe an ideal bedtime routine?

   a. Relaxing and quiet
   b. Inconsistent and up to change
   c. Busy and complex

6. Which of the following is recommended to NOT use your bed for? (select all that apply)

   a. Homework
   b. Watching TV
   c. Checking your phone
   d. Reading
   e. Sex
   f. Sleep

7. What temperature should your bedroom be before sleep?

    a. Cool/comfortable
    b. Cold/chilly
    c. Warm/toasty
    d. Warm/hot

8. Should you limit bright lights before bed?

    a. Yes, all bright light should be limited.
    b. No, it does not impact sleep behaviors.
    c. Yes, but only light from electronic devices.

9. What is the minimum time recommended to turn off electronic devices before bedtime?

    a. 5 minutes before going to bed
    b. 15 minutes before going to bed
    c. 30 minutes before going to bed
    d. 5 hours before going to bed
    e. You can use them until you fall asleep (0 minutes)

10. You can eat dinner right before bedtime with no effect on your sleep.

    a. True; meal times do not impact sleep
    b. False; meal times do impact sleep

11. Do regular exercise and a healthy diet affect sleep?

    a. Yes, they contribute to better sleep quality
    b. No, they are beneficial for you, but do not impact sleep

12. When should you avoid consuming caffeine in order to get good sleep?

    a. In the morning
    b. In the afternoon
    c. In the evening
    d. Both a. and b. are correct
    e. Both b. and c. are correct
    f. Both a. and c. are correct

13. Does consuming alcohol before bedtime promote more restful sleep?

    a. Yes
    b. Yes but only if ingested right before bed
    c. No

14. Does liquid intake influence sleep?

    a. Yes
    b. No
    c. Only if it has caffeine

Appendix D

IRB Approval Letter

MURRAY STATE UNIVERSITY

Institutional Review Board

328 Wells Hall
Murray, KY 42071-3318
270-809-2916● msu.irb@murraystate.edu

TO:	Megan St Peters, Psychology
FROM:	Jonathan Baskin, IRB Coordinator
DATE:	9/23/2022
RE:	Human Subjects Protocol I.D. – IRB # 23-019

The IRB has completed its review of your student's Level 1 protocol entitled *Sleep Knowledge, Habits, and Sociocultural Predictors of Sleep Hygiene in College Students*. After review and consideration, the IRB has determined that the research, as described in the protocol form, will be conducted in compliance with Murray State University guidelines for the protection of human participants.

The forms and materials that have been approved for use in this research study are attached to the email containing this letter. These are the forms and materials that must be presented to the subjects. Use of any process or forms other than those approved by the IRB will be considered misconduct in research as stated in the MSU IRB Procedures and Guidelines section 20.3.

Your stated data collection period is from 9/23/2022 to 5/22/2023.

If data collection extends beyond this period, please submit an Amendment to an Approved Protocol form detailing the new data collection period and the reason for the change.

This Level 1 approval is valid until 9/22/2023.

If data collection and analysis extends beyond this date, the research project must be reviewed as a continuation project by the IRB prior to the end of the approval period, 9/22/2023. You must reapply for IRB approval by submitting a Project Update and Closure form (available at murraystate.edu/irb). You must allow ample time for IRB processing and decision prior to your expiration date, or your research must stop until such time that IRB approval is received. If the research project is completed by the end of the approval period, then a Project Update and Closure form must be submitted for IRB review so that your protocol may be closed. It is your responsibility to submit the appropriate paperwork in a timely manner.

The protocol is approved. You may begin data collection now.

Opportunity afforded

murraystate.edu

Equal education and employment opportunities M/F/D, AA employer. Murray State University supports a clean and healthy campus. Please refrain from personal tobacco use.