The Effects of a Sleep Intervention Program on College Students’ Sleep Quality

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May 2, 2014
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Abstract

This study focuses on sleep quality and quantity in college students and assessed the level of effectiveness that an educational intervention along with reflection has on improving students’ sleep habits by helping students to understand what they can do to improve their sleep and seeing if they then make the suggested changes. It is crucial to develop more effective ways to improve sleep as the negative effects can be very extreme on college students. This study will also look at technology use and attitudes toward sleep and how these factors impact the students’ sleep quality and quantity. These factors were chosen because technology use is ubiquitous on college campuses. The current study focuses on the effects of technology use in the hour before a student goes to bed. There has been little research on how a person’s attitudes toward sleep can affect their sleep quality and quantity and this study will look to further the literature. It is expected that the intervention, which will include an educational presentation on sleep followed by reflection on how a given students’ sleep can be improved, will significantly improve their sleep quality and quantity. It is also assumed that attitudes toward sleep will have a main effect on sleep quality and quantity, that reflection on sleep will have a significant effect on sleep quality and quantity, and that technology use in the hour before sleep will be negatively associated with sleep quality. The study used an educational intervention as well as extensive baseline measures of technology use, attitudes toward sleep, and reflection before sleep to measure the possible effective of the intervention on students’ sleep habits. The results showed that the intervention and reflections had no significant effect on the sleep quality of students, but did find a correlation between technology use in the hour before sleep and sleep quality, as well as a correlation between students’ attitudes toward sleep and sleep quality.
Introduction

Sleep is an extremely important part of life, yet many people get far less sleep than what is necessary to have a healthy and productive lifestyle (Buboltz et al., 2001). Many problems arise from having too little sleep including health problems (e.g., Partinen et al., 1982) as well as problems with everyday performance in that not enough sleep causes less next day effort than one would normally have (Engle-Friedman et al., 2003). The issue of having too little sleep is something that is rampant in the college population (Lund et al., 2010). College students make many lifestyle changes upon arriving at school and one of the most extreme changes that they make is in their sleep schedule (Buboltz et al., 2001). A number of things may cause them to make this change, including an increased workload from what they previously had in high school, less parental supervision, and a desire to go out to party or hang out with friends on any given day of the week. Although there are times when this lack of sleep is seemingly unavoidable (e.g., heavy workload), it is typically the case that with better time management and sleep hygiene one can find a way to get the sleep that one needs. Restricted sleep and erratic sleep schedules are extremely prevalent in college students who think that they have no choice but to stay up all night doing work so that they are able to turn in an assignment on time (Lund et al., 2010). However, with better time management these students likely could have avoided having poor sleep and having being forced to do such things as “pulling an all nighter”. Students often lack the knowledge about what causes a person to have worse sleep quality and quantity so they do not make the necessary changes. What little things in life can students change to ensure better sleep quality and quantity?
This study aims to look at some contributors to poor sleep by looking at sleep hygiene in college students, which is the practice of habits that are conducive to positive sleep quality, including technology use in the hour before sleep and attitudes toward sleep and how these factors can have a negative impact on one’s sleep. This study will use an educational intervention to determine the extent to which education on sleep can improve one’s sleep. It will also look at whether or not reflection shortly before sleep improves students’ sleep quality.

Prevalence of Sleep Problems

A poll was taken by the National Sleep Foundation (2011) which asked participants approximately how much sleep they got on weekdays and weeknights, how often they felt that they got a good night of sleep, and how sleepy they were. They separated the participants into four groups: generation Z’ers (age 13-18 years), generation Y’ers (19-29), generation X’ers (30-45), and baby boomers (46-64). The college population, which is the focus of this study, is found to be a mix between generations Z and Y. Generation Z was found to have 25 minutes more of sleep per night than generation Y which was found to have about 12 minutes more than both of the older generations. It was also found that 51% of participants in generation Y reported that they rarely or never got enough sleep on weekdays. The next highest in this category was generation Z at 46% while the Baby Boomers were at 38%. Therefore, the college-age generations Z and Y showed that about 50% of participants had poor sleep. While it is clear that college age participants have the most need of some sort of sleep intervention, all of the other age groups discussed could stand to have improved sleep habits as well. It was interesting that generations Z and Y had more sleep per night than did the older generations, but this can be explained by the idea that as one ages, less sleep is expected (Redline et al., 2004).
According to some reports, the average person gets approximately 7.5 hours of sleep per night (Basner et al., 2007). However, it has been reported that college students average much less sleep than this per night. In a study by Buboltz, Brown and Soper (2001) it was found that 73% of college students experience at least occasional sleep problems. Most of the students experiencing sleep problems were having difficulty falling asleep more than three times a week, were waking up too early, had morning tiredness, and took longer than 30 minutes to fall asleep. These factors all contribute to very poor sleep. The study showed that college students have very decreased sleep quality in comparison to the greater adult population (Buboltz et al., 2001).

Another study on university students (Lack, 1986) showed that 18% of students had frequent trouble falling asleep; 50% of the participants stated that they needed approximately a half hour more sleep to feel that they got enough sleep. Furthermore, the study looked at how delayed sleep phase syndrome (DSPS), which is a circadian rhythm sleep disorder that affects the timing of sleep in that people with the disorder do not become sleepy until early morning hours and wake up in the afternoon as a result, affects students. It found that academic performance in people with this syndrome was significantly worse than those who were not afflicted by DSPS, showing that poor sleep patterns among college students can have a negative effect on academic performance.

Poor sleep quantity is something that is very prevalent in college students. However, simply not getting enough sleep is not all that is important if one wants to have a healthy night of sleep. Having a consistent sleep schedule is very important as well. While a consistent sleep schedule is important, few people, particularly those in college, abide by a healthy sleep schedule. A study on Canadian college students showed that if a student socializes one night, they get a lot of sleep that night. However, if they use alcohol one night, they do not get a lot of
sleep. If they are stressed, they do not get a lot of sleep. Essentially, the point here is that so many things predict what type of sleep we will get every night and the typical student does not know this so they fall into the trap of having an unhealthy sleep schedule. They go to bed when they can every night, which is usually not the same time each night and they wake up when they need to. Consistency is non-existent in the college students’ sleep schedule. These problems were shown in first year college students as sleep quantity ranged from 7 hours on weeknights to 8.5 hours on weekends. This inconsistency and lack of sleep can make for a very unhealthy lifestyle as inconsistent sleep patterns led to students having a worse mood and less energy. It also led to increased stress. (Galambos et al., 2009). Galambos, Howard, and Maggs (2013) found that women slept longer each year in college and men slept less. For example, when women arrived at school in 2005, they slept for 6.6 hours a night. When they left in 2009 they were sleeping just over 7 hours a night. Men, however, slept just over 7 hours in 2005 and slept just 6.7 hours in 2009. When the students lived away from home, they had worse sleep quality as there were more sleep disturbances. All of these sleep quantities are significantly less than the average of 7.5 hours of sleep stated previously (Basner et al., 2007).

The problem of poor sleep quality and quantity has been increasing drastically over time. In 1978, in a given sample, 76% of students reported being satisfied with their sleep. Ten years later, in 1988, approximately 50% of students reported being satisfied with their sleep. Twelve years after that, in 2000, just 29% of students reported being satisfied with their sleep (Hicks et al., 2001). These figures show an incredible drop off in sleep satisfaction. Poor sleep quality has gone from infrequent to extremely prevalent in just 22 years. This prevalence of sleep problems among college students suggests that effective sleep interventions could have a marked impact on sleep quality in this population.
Problems Associated With Poor Sleep

There are numerous issues associated with poor sleep including academic and health problems. A large number of studies have looked at these problems that arise from poor sleep.

Academic performance is one thing that is negatively affected by poor sleep. This is a very significant problem in students of all ages and can be seen beginning with adolescents. A self-reported shortening of total sleep time, an erratic sleep-wake schedule, late bed and rise times and poor sleep quality all harm the academic performance of adolescents (Wolfson & Carskadon, 2004).

Poor academic performance as a result of poor sleep is seen not only in adolescents. Poor sleep quality in both undergraduate and graduate college students also has been found to have significant effects on academic performance (Ahrberg et al., 2012). Studies have been done on medical students, as they are frequently forced to go without sleep for significant amounts of time. These studies have revealed that low sleep quality is associated with poor academic performance prior to exams. However, these same students did not have poor quality on the exams themselves. The students who generally had poor sleep did not perform poorly on the exams, but those who had good sleep quality and prior to the exam had a change in their sleep schedule and had poor sleep did tend to perform poorly. The prevalence of poor sleep quality in these students should, according to Ahrberg (2012) result in the use of interventions to try to get them to have better sleep. Furthermore, poor sleep quantity, as well as quality as discussed above, can have detrimental effects on ones’ academic performance. Irregularity in the sleep-wake cycle and sleep deprivation have very negative influences on students’ ability to learn (Medeiros et al., 2001). Sleep deprivation clearly has a very negative effect on the academic performance of medical students as people who are highly susceptible to poor sleep schedules
based on the fact that when students had low sleep quality prior to an exam, they also had poor quality on said exam (Aherberg et al., 2012).

*Predictors of Poor Sleep in Undergraduate College Students*

However, poor sleep is certainly not limited to medical students. Undergraduates experience many of the same problems with poor sleep habits and rigorous academic demands. Studies have very frequently been done on sleep deprivation and academic performance in undergraduate college students. Some things that cause this poor sleep to occur in college students are alcohol consumption and the general college environment as this been shown to have a negative effect on the sleep schedules of students, which in turn brings about a negative effect on the GPA of the students (Singleton et al., 2009). Furthermore, Gomes et al. (2011) also looked at how sleep patterns affect academic performance. In order to examine this affect, Gomes used potential predictors including class attendance, time spent studying, and substance use as these are factors that could potentially have a significant effect on academic performance. The results of this study showed that self-reported sleep quality and self-reported frequency of sufficient sleep were among the main predictors of academic performance (Gomes et al., 2011). So sleep quality does seem to have an effect on academic performance but it may only be a factor if one looks at a student’s full course load. In one study, when looking solely at the academic results of one introductory psychology course, sleep patterns were not a significant predictor of academic performance. However, when looking at a full course load those who reported poor sleep quality performed more poorly than those who reported better sleep quality (Howell et al., 2004). In 2010, Gaultney looked at sleep disorders in college students and how they may affect grade point average (GPA). She found that 27% of students are at risk for at least
one sleep disorder and that these students were very highly represented among students with GPA problems who were at risk for academic failure (Gaultney, 2010).

The above studies talk about how too little sleep harms academic performance, but does extending the amount of time asleep improve a student’s academic performance? Hasler (2008) found that participants who were able to extend their sleep showed decreased difficulty in waking up in the morning, improved sleep efficiency, and increased cognitive performance. Based on the aforementioned studies, it is clear that poor sleep quality does have a significant negative effect on academic performance.

Sleep problems have also been frequently associated with health problems. Pilcher et al. (1996) looked at both sleep quantity and quality to see how they related to health, well-being, and sleepiness. Looking not only at sleep quantity, but also at sleep quality allowed Pilcher et al. to go into more in depth factors such as general satisfaction with sleep, how well rested one feels upon waking up, and depth of sleep. Pilcher did two studies, one in which they distributed surveys to the participants during final exam week and one in which surveys were distributed during the first third of the semester; their assumption was that the students would have better sleep in study two than in study one. In the first study, participants slept an average of 6 hours 41 minutes per night and in the second they slept 7 hours 4 minutes. The participants rated their sleep quality and found that in the first study, sleep quality was significantly worse than it was in the second study. So interestingly but not surprisingly, more time asleep was associated with a higher sleep quality rating. In both of the study groups, poor sleep quality was found to be correlated with more physical health complaints and feelings of anxiety, depression, anger, fatigue, and confusion. Therefore, not only does poor sleep quality negatively impact physical health, but it may hurt one’s social life as well. If one experiences all of the above feelings,
friendships as well as everyday social interactions are bound to be affected. Sleep quality was found to have a greater effect on health and emotions than sleep quantity did. Finally, poor sleepers in both of the studies reported increased levels of sleepiness.

Sleep quality and quantity have greater effects than simply making you more susceptible to sickness. A study done by Partinen et al. (1982) showed that sleep disorders relate to coronary heart disease, as the men that slept less than 6 hours showed greater symptomatic heart disease. The relationship between sleep and cardiovascular disease held strong after accounting for other potential factors, including smoking, alcohol use and neuroticism, among others. Subsequent studies have shown that people with chronic insomnia reported to have more heart disease, high blood pressure, neurologic disease, breathing problems, urinary problems, chronic pain, and gastrointestinal problems (Taylor et al., 2007). Also, people with heart disease, cancer, high blood pressure, neurologic disease, breathing problems, urinary problems, chronic pain, and gastrointestinal problems all reported having more insomnia than those without these medical problems. The correlation between insomnia and an increase in said health problems leads one to believe that poor sleep quality and quantity may play a part in increasing risk for these issues, although it is also possible that these health problems simply interrupt sleep. Further research on the causality between sleep problems and health problems would help make this information more clear.

In addition to having negative effects on the overall health of a person, sleep loss has been shown to have a negative effect on short term recognition memory. In a study by Elkin and Murray the 20 participants that were deprived of sleep made significantly more errors on the memory recognition task than did the 20 non-deprived participants (Elkin & Murray, 1974). It has been found that following sleep restriction or deprivation, there are significant decreases in
verbal creativity, attention, and psychomotor performance (Wolfson & Carskadon, 2004). These findings show that poor sleep quality and quantity can have a negative effect on the brain and simply add more evidence that poor sleep has substantial effects on one’s overall well-being.

There are other problems that arise from sleep loss that may seem much less significant but are still very negative. For example, sleep loss causes one to try less hard on a given task the next day. One study used the Math Effort Task to test the effort that students put into their given tasks, and although the students did not realize that they were putting less effort into their work, they chose less difficult problems so that their accuracy would remain high (Engle-Friedman et al., 2003). The idea that students put less effort into their work when they are sleep deprived has negative implications, as if they are constantly tired they may continuously put less effort into their work and as a result learn less than they might if they were not sleep deprived.

Other work has been done to look at the problems of sleep loss in groups that do not include college students and yet are relevant to this population. For example, suicidal behavior has been linked to sleep loss among adolescents; sleeping less than 8 hours per night and having frequent nightmares significantly increased suicide attempts and thoughts of suicide (Liu, 2004). Thus interventions that improve sleep quality quite literally might save lives.

Based on the demonstrated association between sleep and academic performance, physical health, and things such as effort, it is clear that poor sleep has a very negative impact on many aspects of a person’s life, including that of a college student. Therefore, it is very important for further research to be done to see how interventions might be able to help students improve their sleep and, in turn, their general quality of life.

Problems with Technology Use Before Sleep
Many people, especially those that are of the college age (18-21 years), use some sort of technology in the hour before they try to go to sleep. How does this use of technology affect sleep quality?

Christina Calamaro has done a significant amount of research on how technology affects adolescents’ sleep duration and ability to function during the next day. Her findings suggest that technology use can cause an increase in the consumption of caffeine and thus result in insufficient sleep duration. Calamaro examined 12-18 year olds, so the upper end of her participant pool overlaps with the lower end of the college age participant pool of this study. Calamaro et al. (2009) found that many of the adolescents used multiple types of technology late into the night and while they were doing this, consumed caffeinated beverages which caused them to stay up even later than they would have otherwise. As a result of this later bedtime, they then have greater difficulty staying alert and functioning throughout the next day. This study only measured hours of television use though, while realistically there are many more types of electronics that the participants could have been using during the study.

Calamaro did another study in 2012 that corrected for this limitation. It once again looked at technology use and caffeine, but this time it took different technologies into account in order to encompass many aspects of technology use. This study was an analysis of data from 6-10 year olds from the National Sleep Foundation’s Sleep in America Poll (2004). The study found that 30% of children had caffeine every day and 42% had a television in their bedroom. It also found that children who had three different technology items in their bedroom had 45 minutes less sleep than children who had no technologies in their bedroom. 45 minutes is a significant amount of time and can have a negative effect on a person in areas such as health and academic performance as was shown previously (Calamaro, 2012). Therefore, Calamaro’s study does give
a clear picture of the negative effects that technology use can have on a person’s sleep quantity.

However, Calamaro’s study does not look at a reverse view of the results - that people who sleep less could be more inclined to have technology in their rooms. This study will improve upon Calamaro’s research by not just looking at what technology students have in their rooms, but how much they actually use the technology before they go to sleep.

A review of relevant material by Cain and Gradisar (2010) shows that the use of electronic media in adolescents has a negative impact on their sleep. The use of media causes a delayed bedtime and less total time asleep. This makes sense, as if there are electronics present to distract someone from going to sleep, it is likely that a person would stay up longer than they would if they had nothing to do.

The effects of technology use on teenagers’ sleep as it relates to school start times were looked at by Borlase (2013) by comparing the sleep patterns of high school students in 1999 and in 2008. In the 2008 participant pool, the twelfth graders went to school at delayed start times, 1.5 hours later than the ninth and eleventh graders arrived at school. Borlase looked at technology use in the bedroom in his study. From 1999 to 2008 the percentage of students who had technology in their bedroom rose from 80.7 to 96.4 percent; thus almost all students in 2008 had technology in their bedrooms. It was found that in 2008, ninth graders reported higher levels of daytime sleepiness if they had more types technology in their room. Along with this, having more technologies was associated with sleeping less on school nights. The sleep habits of year twelve students were improved, but only because they had delayed start times for school. The increased presence of technologies for year nine students, however, leads to later sleep times and daytime sleepiness for these students.
Studies have been done not only on adolescents, but also on college students. Goddard (2012) looks at college students and how technology use affects them. Goddard is concerned with depression, as it presents a risk for suicide, academic failure, and other major psychosocial problems. She decided to look into technology use because the literature shows that the prevalence of depression has risen in the college student population during the last two decades (Goddard, 2012). In this same time period, sleep quality has decreased while technology use has increased. Therefore, Goddard looked into whether or not that technology use has played a part in the increase in prevalence of depression. Recent studies show that maladaptive use of technology by college students is related to depressive symptoms, but at this time there is little research looking at this relationship between technology, sleep problems, and depression in college students. Goddard looks at a state of stress that is induced by technology, called “technostress”. Technostress refers to a number of symptoms, including physiological arousal, headaches, irritability, and depressed mood brought on by the use of technology, including computers, the internet, social networking, email, phones, and texting. In this study, it was found that technostress predicted 1.1 percent of the variance in depression while controlling for sleep quality and a misuse of technology predicted an additional 4.9 percent. Regression analyses were used to see if technostress or a misuse of technology mediated the relationship between sleep quality and depression, but this hypothesis was not supported. However, this does not take away from the fact that sleep quality has decreased while depression and technology use have increased over the last couple of decades which should worry us as it is possible that technology use and as a result, depression, may continue to increase with the passage of time so further research should be done to follow a possible continuing trend.
Finally, using electronic media has been found to alter how you perceive your sleep to have been. So, even if one has a good night of sleep, the use of electronic media can make one believe that they did not which can lead to negative consequences. A study by Suganuma et al. (2007) looks into this idea of technology use negatively impacting perception of their sleep quality. They first distributed a survey for the participants to fill out, which revealed that 48% of participants said they had insufficient sleep as a result of electronic media use. They then found that light media users perceived themselves to sleep an average of 6.38 hours, intermediate media users perceived themselves sleeping 6.20 hours, and heavy media users perceived themselves to be sleeping 6.22 hours. Therefore, there was a significant difference between light users and intermediate and heavy users. 53% of heavy media users perceived themselves having too little sleep while just 29% percent of light media users perceived that they had insufficient sleep. There was only a difference of 0.16 hours slept between the heavy and light media users, so this cannot account for the fact that approximately two times more of the heavy media users reported perceived bad sleep than did light media users. Therefore, technology use may play a part in determining perceived sleep quality.

Based on the literature reviewed here, it is clear that technology use can have a negative effect on sleep quality and quantity, but there is room for much more research on this topic. Studies have not looked at technology use in college students in the hour before bed and tried to reduce this technology use, so this is a potential direction for future studies to go in.

Prevalence of Technology Use Before Sleep

There are a number of lifestyle choices that factor into having a poor night of sleep and technology use may be one of these factors. This study will look at the prevalence of technology
use in the hour before sleep as seen in college students and if getting rid of this pre-sleep technology use can improve the overall sleep quality and quantity of students.

The National Sleep Foundations poll on how “connected” Americans are was discussed previously; however, the new and most important part of this poll for this study was the part that discussed technology use in the hour before trying to go to sleep. In generation Y, which is the generation that is most important for this study as it consists of college-age participants, 67% of participants reported using a cell phone, 60% used a laptop, 59% watched television, 43% used an electronic music device, and 18% used a video game console in the hour before bedtime (National Sleep Foundation, 2011). This information is very troubling as it shows that at least two-thirds of people that are in this age group use some sort of electronic device in the hour before going to bed. As discussed previously, electronic devices have been found to have a very detrimental effect on sleep when used shortly before going to bed, so it is crucial to try to reduce this pre-bedtime technology use in everyone’s routine, and more specifically, in the routines of college students.

*Attitudes Toward Sleep*

While research has been done on poor sleep quality and its relation to technology use before bedtime, there has been very little research done on how our attitudes about sleep affect our sleep. For example, if we view sleep as important, do we get better sleep? If we view sleep as useless and just something that we do because we have to, do we get poor sleep? No research has examined the precise nature of any relation between attitudes toward sleep and sleep, so this study will look into that relationship in the hopes to find a significant correlation between attitudes and sleep quality.

*Reflection and Sleep*
Reflection is a tool that has been looked at as something that can help to improve sleep quality and quantity. Does reflecting on your sleep hygiene practices improve your sleep by possibly causing us to listen to our reflections and make the necessary changes? There has been some previous work done on reflection, but little that relates directly to the idea that this study aims to explore.

One study that looked to promote reflection before sleep was done by Mooney et al. (2009) and looked at how writing about your thoughts, worries and emotions can have effects on health in people with insomnia. The study used the Pennebaker writing task to look at these factors of emotional processing. This writing task has been proven to improve a number of areas in health and in this study, the writing tasks ability to improve pre-sleep cognitive arousal and sleep onset latency was tested. However, the study showed that the writing task did significantly decrease self-rated cognitive arousal among poor sleepers but there was not significant reduction of sleep onset latency. These results showed that there were essentially no real significant sleep effects from the Pennebaker writing task (Mooney et al., 2009). However, the expected results of a reflection in this study will not be altered as a result of the lack of significant results in the Mooney study. Reflection on sleep hygiene should still cause one to reconsider their actions and implement changes that will have an effect of improving sleep quality and quantity.

Previous Interventions Done to Improve Sleep Habits

Are the beliefs of college students’ on sleep in line with what one would learn in sleep education? If not, interventions are needed to help students’ understanding of sleep hygiene. Nancy Digdon (2010) looks into college students’ beliefs about sleep education. This study investigated whether students’ beliefs about sleep were compatible with the actual facts one would find when learning about sleep hygiene. Digdon’s study also looked at whether evening or
morning personality types were more incompatible with the sleep education. However, contrary to the belief of Digdon, the evening types did not differ from the morning types. It was found that most students’ beliefs about sleep scheduling, caffeine consumption, sleep environment, and bedtime arousal and their effects were compatible with what one would learn in sleep education. However, their thoughts about exercising, doing important work close to bedtime, and using their beds for studying or television were not compatible with sleep education. Because they only understand some of the facts behind sleep education, it is important that sleep education interventions look at what students do not already know and educate them on those things rather than re-educate them on what they already know (Digdon, 2010).

Due to such reasons as Digdon discussed, in that students simply do not understand what proper sleep hygiene is, there is a plethora of literature on interventions to improve sleep habits and these have typically used educational interventions. A number of these studies have been done on adolescents and college students and these interventions have shown interesting results.

Why are interventions used so frequently to try to improve the sleep habits of both adolescents and college students? Brown et al. (2002) found that knowledge of sleep hygiene is related to sleep practices and, in turn, overall sleep quality. They also found that having inconsistent sleep schedules, going to bed thirsty, going to bed in a noisy environment, and worrying, or ruminating while falling asleep all contribute to poor sleep quality. These findings suggest that increasing knowledge about sleep hygiene would lead to significantly better sleep practices. Evidence that sleep hygiene education can help with sleep practices and, in turn, quality has led to efforts to refine the sleep hygiene interventions.

How can interventions be implemented to improve the overall sleep hygiene of adolescents and college students? First, there have been a number of studies done on adolescents.
Wallace (2011) did a study on the sleep habits of high school students and used an intervention intended to make their sleep habits better. There were two parts to this study. Wallace first took survey information on sleep duration, sleep quality, grade point average, physical and mental health, and attendance to examine the relationships among those factors. He then examined the effect of a 30 minute psychoeducational presentation on sleep. The surveys found that students did not sleep enough and had poor sleep quality. Negative consequences arose as a result of these poor sleep habits. Wallace found that just a 30-minute presentation was not enough to change the sleep habits of students (Wallace, 2011). It suggests that something more is needed in an intervention to truly have an effect on adolescents. Another study done on high school students also looked at the effects of an educational sleep program. In this study, the students filled out sleep questionnaires, filled out sleep diaries, and had five, 50-minute classes on sleep. Sousa et al. (2013) found that this particular sleep education program can have a positive effect on the sleep-wake cycle of students, but it does not change their levels of daytime sleepiness.

In a final adolescent sleep intervention study, Tan (2012) looked into how a sleep hygiene intervention would affect sleep hygiene, quality and daytime sleepiness. The participants filled out questionnaires and completed a sleep hygiene program. This study found that an education program can be effective in improving children’s sleep. However, it was a before and after pilot study and therefore had limitations so the findings in this study cannot be accepted without caution until it is replicated with a randomized controlled trial and a larger sample size. Based on the interventions done on adolescents, it is clear that interventions have the potential to correct sleep habits but there have been limitations and unanswered questions in these studies; no intervention has proven to work well in every area. For this reason, the interventions must be improved upon.
Many interventions have also been done with college students, which are more relevant to the present study. When interventions are done to attempt to improve the sleep of the participants, those who create the interventions always target sleep hygiene education. Suen looks at sleep hygiene and its relation to sleep quality in college students in Hong Kong. She looks at whether or not sleep hygiene factors are associated with sleep quality. She does this by using the Pittsburgh Sleep Quality Index (PSQI) and by getting their sleep hygiene knowledge and practice, which were then found to be significantly associated with one another (Suen et al., 2010). Because sleep hygiene and sleep quality are significantly associated, studies should be done to examine whether or not an improvement in sleep hygiene would bring about an improvement in sleep quality.

Educational interventions have shown mixed results when working with college students. Brown et al. (2006) looks at the creation of the Sleep Treatment and Education Program for Students (STEPS) and evaluates it. STEPS included a thirty-minute oral presentation as well as handouts with guidelines for sleep hygiene and information about substances that had caffeine in them. The presentation also talks about the impact of sleep difficulties. Participants in the experimental group had significantly improved sleep quality and sleep hygiene behaviors. Brown’s study shows that a simple presentation can be beneficial for the sleep habits of college students.

Another intervention that attempted to improve the sleep habits of college students through education was done by Tsai and Li (2004). Their intervention extended throughout an entire semester as part of an academic course called “Sleep Management.” The course consisted of 100 minutes per week of class and the sleep patterns of the students were evaluated over the course of the semester. The students kept seven day sleep logs three times during the semester.
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and sleep logs were also taken from 65 students who were not in the class. Tsai and Li found that sleep quality was progressively better for the in-course group than it was for the control group. Overall, the course had a very limited effect. So this is another study in which there was a positive effect, but there was substantial room for improvement.

The final two pieces of literature were the most intriguing to look at as one took place in an environment very similar to that of this study, and the other had the most overall similarities to the study. The first, done by Lamberti (2012) was interesting because of the sample it used. It took place in a small, private, liberal arts college in Southern New England. Although the school used in this study is not in Southern New England, it is near Southern New England and is also a small, private, liberal arts college so it will be very interesting to see how the results of the two studies compare. In this intervention, participants filled out baseline surveys about sleep quality and sleep hygiene practices. Afterward they participated in discussion sessions after this in which the control group talked about general health issues and the experimental group talked about sleep issues. Finally, both groups received two emails a week for the rest of the semester which elaborated on what they had talked about in their discussion sessions. However, the results showed that there was no significant difference between the groups.

The second intervention that is of particular interest for this study is Clark’s 2010 intervention with college students. Clark used a thirty minute psychoeducational sleep presentation as well as self-reports of sleep quality, physical and mental health. As a result of the intervention, sleep quality significantly improved for poor sleepers and those students in the intervention group had greater improvements in sleep quality than did those students in the control group. Along with this, students who had the greatest decrease in sleep quality had lower mental health scores which is just another of the many negative impacts that poor sleep habits
can have. This study shows that a sleep intervention presentation is a good way to improve sleep in college students.

A number of interventions have been done to try to change the sleep habits of adolescents and college students but none have had a positive enough effect to be implemented in schools. Students need to gain knowledge on sleep hygiene and then be persuaded to reflect on what they learned so that they do not listen to the information and then forget it immediately after. This is where improvements can be made on past interventions and is how this study hopes to make a significant impact.

*The Present Study*

This study had a number of goals that are based directly on the literature reviewed above. It used the ideas from previous interventions and expanded on them in the attempt to make a more successful intervention. First, it examined whether or not specific aspects of an educational intervention can have a positive impact on the sleep habits of college students. Ideally, students would have learned about what it takes to have truly good nights of sleep and in turn implement their new sleep hygiene knowledge in their lives. Second, the study looked at how reflection can have a positive impact on sleep quality and quantity. If a student was asked to write about the measures they are taking to improve their sleep based on what they learned in the presentation, they would be more motivated to implement these strategies. Third, it looked at the effects of technology use on college students’ sleep quality. Technology use is rampant in the college environment and is something that we hoped could be cut down on by most students in the hour before they go to sleep. If the students listen to the suggestions given in the presentation, their sleep quality would hopefully improve. Finally, the study examined the problems behind having careless attitudes about sleep. If a student looks at sleep as non-essential or as something that is
not a priority it is hypothesized that they would have worse sleep than those who believe they need to get a good amount of sleep every night to stay healthy. If all of these goals come to fruition this study would be a success and the intervention could then be used to improve the sleep of college students everywhere.

Hypotheses

The following results are expected based on the previous literature on each subject.

H1: A presentation-based sleep intervention will significantly improve the sleep quality and quantity in college students.

H2: There will be a positive main effect of attitudes towards sleep on improvements in sleep.

H3: There will be a significant effect of sleep reflection on sleep quality.

H4: Technology use in the hour before sleep will be negatively associated with sleep quality.

Methods

Participants

The participants in this study were recruited from three introductory psychology courses at a small, liberal arts college in the Northeast United States. 84 students were initially recruited from the introductory psychology courses. Of these 84, there were a total of 52 students obtained as participants from the three introductory psychology courses. The other 32 originally recruited did not complete all of the required aspects of the study. 47 of the participants attended the liberal arts school at which the study was conducted while the remaining 5 participants attended a neighboring college. Of these 52 students, 33 were in the experimental group while 19 were in the control group.
Table 1: Demographics: Gender and Age

<table>
<thead>
<tr>
<th></th>
<th>Experimental Group(# of participants)</th>
<th>Control Group(# of participants)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>22</td>
<td>10</td>
</tr>
<tr>
<td>Female</td>
<td>11</td>
<td>8</td>
</tr>
<tr>
<td>18 years old</td>
<td>13</td>
<td>9</td>
</tr>
<tr>
<td>19 years old</td>
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<td>7</td>
</tr>
<tr>
<td>20 years old</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>21 years old</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

Of the 33 students in the experimental group, 22 were female and 11 were male. Of the 19 students in the control group 10 were male, 8 female, while one chose not to say. The students ranged from 18 to 21 years old. All but 9 of the participants were 18 or 19 years old while 48 of the 52 participants were either freshman or sophomores in college. Furthermore, 41 of the participants were white, 5 were Chinese, 2 were Hispanic, 2 were African American 1 was
Japanese and 1 was Vietnamese. One participant did not specify their race. Every participant in the study except for one had a GPA of 3.0 or better at the time at which this study was conducted. Finally, the participants described their current living situation. In the experimental groups, 23 participants had their own room while 10 students lived with one roommate. In the control group, 10 students had their own room, 8 students had one roommate, and 1 student had a roommate but lived off campus.

Measures

A number of measures will be used to look at the aspects that are necessary for this study.

- **Sleep Quality**

  The Pittsburgh Sleep Quality Index (PSQI) was used to assess sleep quality. The PSQI is a nineteen item self-rated index that looks at sleep quality and disturbances over a 1-month period. The PSQI has been found to have a high test-retest reliability and good validity by Backhaus et al. (2002).

- **Sleep Hygiene**

  The Sleep Hygiene Index (Mastin et al., 2006) will be used to look at the participants’ current sleep hygiene. The Sleep Hygiene Index is a thirteen-item self-administered index that looks at the presence of behaviors in the participant that comprise sleep hygiene. It has also been found to be reliable (Mastin et al., 2006).

- **Sleepiness**

  The Epworth Sleepiness Scale (ESS) is an eight item questionnaire that simply looks at your likelihood of falling asleep in certain tasks. It differentiates between people who are and are not sleep deprived (Johns, 1991). Johns (1992) later tested the scale and found it to have high reliability.
• **Attitudes toward sleep**

   This scale was created for this study and assessed the attitudes of the participants toward sleep by asking them to state whether they agree or disagree with statements about sleep among college students. They rated statements such as, “Sleeping is a luxury”, “Adequate sleep is not normal”, and “The importance of sleep varies during the school year”. The entire measure is highlighted in Appendix F.

• **Barriers to better sleep**

   This scale was created for this study and looked at what barriers there were that stopped the participants from implementing the changes that were suggested to them in the sleep hygiene intervention presentation.

• **Technology use before bedtime**

   This scale was created for this study and looks at the technology that each participant uses in the hour before bedtime and how much the participants used that technology.

**Materials**

The surveys used in this study were created and conducted via Qualtrics. IBM SPSS Statistics, Version 21 was then used to analyze the data.

**Procedure**

All students that agreed to participate in this study received a baseline questionnaire with the above mentioned scales as well as informed consent, demographics and nutrition, exercise, rumination, mindfulness, and technology questionnaires. However, the technology questionnaire is the only measure that is of relevance for this study. A professor at the given liberal arts school went to two of the three introductory psychology classes. He went to one class as a guest speaker and gave the other presentation to his own class. The professor gave both classes a thirty minute
presentation. One of these classes became the control group and did not receive a presentation. The distribution of the participants can be seen in Appendix A. The other two classes received a presentation that educated them on sleep hygiene and the importance of getting enough sleep. Half of each intervention group was assigned to a sleep focused reflection group while the other half was assigned to a non-sleep focused reflection group. Immediately after the intervention, a follow-up email asked how the participants in the reflection groups could apply the information they received to their own lives. These students then wrote down these reflections. The non-sleep focused reflection group reflected on how they were going to manage their time, so this was unrelated to sleep. All groups, including the control group received another questionnaire at this point which reassessed each participants’ PSQI, ESS, attitudes toward sleep, technology use, and their barriers to better sleep. Four weeks after the initial presentation, the same follow-up email was sent to the participants in the experimental group with a reflection question and a questionnaire which included the same elements as the first follow-up. The control group got the same questionnaire, but the intervention groups had an extra section on barriers that they experienced against improving their sleep. What stopped the participants from implementing the changes suggested in the educational presentation?

Table 3: Study Design
**R=Reflection, NR=No reflection

Design

The design of this study will be a repeated subjects ANOVA with a between subjects factor. This between subjects factor will be group: control or one of the two intervention groups (educational presentation with or without reflection). Time will be the repeated measure as information will be taken at three different points in time (initial intervention, two weeks post intervention, four weeks post intervention).

Data Analysis

A repeated subjects ANOVA with a between subjects factor was run to test for possible improvements in sleep quality, thus testing the main hypothesis, that a presentation-based sleep intervention would improve the sleep quality (PSQI) of the participants. Another repeated
subjects ANOVA was run to test the effect of reflection on sleep quality from baseline to the second follow up.

Correlations were done to examine the association between the degree of technology use and the sleep quality and quantity of the participant. These correlation were expected to support hypothesis 4, which stated that technology use in the hour before sleep would be correlated with negative sleep quality. Correlations were also used to examine the association between attitudes toward sleep and sleep quality and quantity. This final analysis is expected to prove hypothesis 2, which stated that there would be a positive main effect of attitudes toward sleep on sleep quality.

Results

Main Hypothesis: Effect of Sleep Intervention on Sleep Quality

For the data analysis of the main hypothesis in this study, a Repeated Measures ANOVA with a between subjects factor of group assignment was used. This ANOVA told us whether or not our intervention had a significant effect on the sleep quality of the participants. According to the ANOVA, there was no significance of our intervention on the sleep quality of the participants. This is shown in figure 1, as the experimental group’s PSQI scores rose at follow-up 1 and decreased in the same trend as the control group at follow-up 2.

Figure 1: Effect of Intervention on Sleep Quality
Hypothesis 2: Correlation Between Sleep Quality and Attitudes Toward Sleep

My second hypothesis looked at participants’ attitudes toward sleep and whether or not participants with more positive attitudes toward the importance of sleep had better sleep quality than participants with negative attitudes toward the importance of sleep. There was not a significant correlation between the participants’ attitudes toward sleep and their PSQI scores at baseline and follow up 2, signifying that attitudes did not significantly affect sleep quality. However, the correlation showed that attitudes t(45)=.02, p<.05. Therefore, it seems that with a greater sample size significance between attitudes and sleep quality may be found more frequently. The significant correlation at follow-up 1 can be seen in Table 2.
Table 4: Attitudes toward Sleep and Sleep Quality

<table>
<thead>
<tr>
<th>Correlation Between Attitudes and Sleep</th>
<th>β</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>0.149</td>
</tr>
<tr>
<td>Follow-up 1</td>
<td>0.022**</td>
</tr>
<tr>
<td>Follow-up 2</td>
<td>0.439</td>
</tr>
</tbody>
</table>

** highlights significant correlation (p<.05)

Hypothesis 3: Effect of Sleep Reflection on Sleep Quality

The third hypothesis looked at the effect of the sleep reflection on sleep quality. The Repeated Measures ANOVA showed that there was no significant difference between the experimental groups that were assigned to sleep reflection and the experimental groups that were not assigned to time management reflection.

Figure 2: Effect of Reflection on Sleep Quality
Hypothesis 4: Correlation Between Technology Use and Sleep Quality

The final hypothesis looked at the effects of technology use in the hour before bed on sleep quality. This area of the study showed the most significance. There was a significant correlation between sleep quality and technology use at baseline; t(45)=.380, p<.05, with a significance level of .02. There was also a significant correlation between sleep quality and technology use at follow-up 2; t(45)=.329, p<.05, with a significance level of .02 again. This supported past studies that said that technology use in the hour before sleep hurts ones sleep quality. However, there were no significant effects of our intervention on technology use and sleep quality, showing that sleep quality is harmed by technology use in the hour before bed but our intervention was unable to change this in the participants. The significance levels found for the effects of technology use in the hour before bed on sleep quality can be seen in table 3.

Table 5: Technology Use and Sleep

<table>
<thead>
<tr>
<th>Correlation Between Technology Use and Sleep Quality</th>
<th>β</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>0.010*</td>
</tr>
<tr>
<td>Follow-up 1</td>
<td>0.140</td>
</tr>
<tr>
<td>Follow-up 2</td>
<td>0.019*</td>
</tr>
</tbody>
</table>

** highlights significant correlations (p<.05)

Discussion

This study found that a sleep intervention presentation does not have a significant effect on the sleep quality of college students. Therefore, hypothesis 1 was not supported. Hypothesis 2
was supported in that there was a significant correlation between the participants’ attitudes toward sleep and sleep quality at the first follow-up. The third hypothesis was unsupported as there was not a significant difference between the sleep reflection and time management groups reported sleep quality. The final hypothesis saw the most success, as it was found that there was a significant correlation between technology use in the hour before sleep at baseline and at follow-up two. Follow-up 1 was likely accounted for as it fell during the week of mid-term examinations, thus skewing the results.

There has been a significant amount of research done to see what different factors affect a person’s sleep and what one can do to improve their sleep. A lot of this research has found consistencies with what different things affect sleep and cause sleep deprivation. While there have been a number of interventions done on college students in an attempt to find a way to improve their sleep, not a lot of these interventions have been effective. For example, Lamberti’s study (2012) was done on a similar population to the one that was used for this study as Lamberti’s study was done on a small, private, liberal arts college in New England. However, Lamberti’s study showed no significant differences between the experimental and control groups, showing that the intervention did not have a significant effect. The same can be said for many of the interventions that have been done to attempt to improve the sleep quality and quantity of students. Some people, such as Elizabeth Clark (2010), have found intriguing results in their interventions. For example, Clark found that her intervention significantly improved the sleep of poor sleepers. This study sought to expand upon what people such as Clark and Lamberti have done and develop an intervention that is successful enough to implement in schools so that students can receive the help that they need in getting the sleep that they need.
However, this study like many of the other interventions that have been done, did not find the results that we had hoped for.

The first hypothesis that was made was that the intervention would significantly improve sleep quality and quantity in college students. We did not achieve the results that we hoped for as the intervention did not have a significant effect on the sleep quality or quantity in college students. While we had hoped that the intervention would have a significant effect on the sleep habits of our participants, it is not entirely surprising that we did not obtain the results that we had hoped for. As stated previously, Lamberti’s intervention found no significant results in the participants. Clark’s was much more successful than Lamberti’s as she improved the sleep of poor sleepers. This study was more similar to Clark’s intervention, as it used the same presentation as Clark but simply added factors. Moving beyond interventions done only on college students, Wallace (2011) attempted an intervention on adolescents in an attempt to improve their sleep habits. Wallace, like Lamberti, found that a presentation would not be successful in changing the sleep habits of children. While Wallace did find that the high school students had poor sleep habits, he was not able to make any sort of change. Therefore, while an improvement in the sleep quality and quantity of the college students in this study was certainly hoped for, it is understandable that significant results were not found in this area of the study. To change the sleep habits of college students, it would seem that one would need to have a group of participants that is willing to be educated and make the necessary changes in their sleep hygiene to improve their sleep habits. The selection of college students used in this study may not have been willing to make the necessary changes, or it is possible that they simply were unable to do so due to college demands.
The second hypothesis that was made was that one’s attitudes toward sleep would have a main effect on sleep quality. So, it was expected that a person who has positive attitudes towards sleep, in that they think it is important and do not treat it as the first thing that they can cut back on, would have better sleep quality than someone who has negative attitudes towards sleep. This study did show some significance when looking at attitudes and their relationship with positive sleep quality. Although the study did not show any significance at baseline and at the second follow up, there was a significant correlation between attitudes toward sleep and sleep quality at the first follow up. So, although there was not a correlation between the two throughout the study, the fact that there was a significant correlation at the first follow up shows that a persons’ attitude toward the importance of sleep shows tells us that the two may be related. Therefore, this study shows that if the attitudes of college students toward sleep can be improved in that they view sleep as something that is very important for them to get the necessary amount of and not something that they can simply do away with whenever they feel the need to, there is potential to improve the sleep quality of said students. As there has been very little research done on this in the past it stands to reason that more research done on greater sample sizes would show a significant relationship between attitudes toward sleep and sleep quality. In turn, putting a greater emphasis on the importance of a positive outlook on sleep in the interventions that are given to college students in the future may help to improve the results of these educational sleep interventions. However, it was unfortunate that this educational intervention did not improve the attitudes of the students toward sleep at all. It appeared as if it would when the correlation improved from .149 at baseline to .022 at the first follow-up, but at the second follow-up it was no longer significant and was much further from significance than was the correlation at baseline. This makes it even clearer that a better intervention with a greater influence on attitudes
could be very beneficial in actually improving the sleep quality of college students. However, a correlation does not prove causation, so in the future it would be interesting to look specifically at attitudes toward sleep and whether or not attitudes are a causing factor of positive or negative sleep quality.

The third hypothesis that was looked at in this study had to do with sleep reflections and their effect on sleep quality. Within the experimental group, participants were placed into either the sleep reflection condition or the time management reflection condition. In the sleep reflection condition, the participants were asked to write about ways that they have learned to improve their sleep. They also were asked to write about how better sleep habits might improve their life. In the time management reflection condition, participants were simply asked to write about how they plan to manage their time during the semester and how better time management would affect their lives. It was hypothesized that the students that wrote about sleep and the importance of sleep in their lives would improve their sleep quality significantly more than the students that reflected on their time management skills before going to sleep. However, this was not the case as there was no significant difference between those who reflected on their sleep habits and those who reflected on time management. This was interesting because it seems logical that if one were to reflect on their sleep and how to make it better, they might consciously, or even subconsciously, make small changes to their habits to improve their sleep. This was not the case because, as stated previously, there was no significant difference between the two different types of reflection.

The final hypothesis that was looked at in this study was that there would be a significant correlation between technology use in the hour before going to sleep and sleep quality. I felt that it was important to look at this correlation because as the National Sleep Foundation (2011)
showed in a poll they ran, a startling amount of people use technology in the hour before going to bed. Therefore, if there actually is a significant correlation between using these electronic devices in the hour before one goes to sleep, the statistics found by the National Sleep Foundation are extremely problematic for the sleep quality of students so it is important that as much evidence as is possible to be found about this possible correlation is found. Calamaro (2009) found that the correlation between technology use and poor sleep in her study had to do with an increase in the consumption of caffeinated beverages which in turn caused the participants to stay up later. However, this study did not aim to look at how using technology late into the night can keep you up by increasing your caffeine consumption, but it looked at whether or not the technology itself was keeping the participants up and making their sleep quality worse. Goddard (2012) emphasized what this study sought to find by showing the trends that can be seen in technology use and sleep quality. Goddard found that depression rates in college communities have been rising over the last decade so she looked at a possible association between technology use and sleep quality. Goddard found that over the last two decades technology use before going to sleep has risen drastically, as expected based on the fact that there is far more available technology now than there was two decades ago. Goddard also found that sleep quality has decreased in this same time frame.

This study found that there was a significant correlation between participants’ use of technology in the hour before bed and their sleep quality. At both baseline and follow-up two there was a significant correlation found between technology use and sleep quality while the first follow-up was not far off from reaching significance. Therefore, this study confirmed that technology use in the hour before bed does have a negative effect on sleep quality. So, if it is
Effects of Educational Intervention on Sleep

possible to get people to cut back on their technology use in the hour before they go to bed, sleep quality has the potential to increase for college students.

Limitations

There were a couple of clear limitations in this study which, if this study were to be done again, would need to be accounted for. The first of these limitations was that the sample size was not large enough. If all 84 of the potential recruits in the Introductory Psychology courses had participated in the study and contributed to our results it would have been much better but the fact that 32 of the participants dropped out of the study, leaving us with just 52 was a problem. It is possible that this lack of a large participant pool held the study back and had there been a larger sample of participants we may have found more significant results.

Another limitation of this study that I believe held it back the most had to do with what we were asking the participants to do. The fact that the participants were all college students was a major limitation. For example, this study looked at attitudes toward sleep as well as technology use and its effects on sleep and tried to change the student’s attitudes and technology use by using an intervention. However, college students, especially in this time period are constantly using technology. The fact that the study was done partly during mid-term examinations was an issue here, as it would have been very difficult to make positive changes in sleep during such a stressful time. If there had been more time to complete the study, it could have been done on different dates so that it did not fall during mid-term examinations. The same issue lies in attitudes toward sleep. College students often have carefree attitudes toward sleep. For many students, sleep is the first thing that can be put off when they do not have a lot of time on their hands. If you have to write a long paper, you cut back on your sleep in order to finish it. If you have an exam to study for, you cut back on your sleep in order to study enough for it. If college
students want to hang out with their friends on the weekend, they cut back on their sleep. When mid-term examinations are taking place, sleep is often the first thing to go, leading to generally negative attitudes toward sleep. So, this leads to negative attitudes toward the importance of sleep and these are attitudes that are very difficult to change if the students are not in the right position to make that change.

A final limitation that existed in this study is that we did not have any way of observing the sleep habits of the participants and controlling for different factors. If we had been able to use a sleep lab, for example, we could have set up a situation in which some participants used technology in the hour before they went to bed and some people did not. If that had been possible we would have been able to see more definitively the effects of technology use on sleep.

Future Research

As far as future research goes, there are a couple of changes things that could be done to find some potentially very interesting results in college students. First of all, as discussed in the limitations section, it would be interesting to get a large enough group of college students who were willing to make the necessary changes to their sleep hygiene because they truly wanted to make a change and get better sleep. If a study like this were done instead of one which took a random group of college students who only did the study to satisfy requirements for their introductory psychology class, it would potentially show more significant results. Another interesting direction to take would be to test for the effects of attitudes and technology use individually in separate studies. In the attitudes study, it would be interesting to find a large group of participants who absolutely had positive attitudes about the importance of sleep and then a large group of participants who absolutely had negative attitudes about the importance of sleep. Then the intervention could be given and the same procedure that was used for this study
could be used to see if the people with positive attitudes had better sleep quality in comparison to
the people with negative attitudes. This would likely be much more effective in testing for the
effect of attitudes on sleep quality than the present study was. Another study could be done
solely on the effects of technology use in the hour before sleep on sleep quality. If a study was
able to use a sleep lab, as was discussed in the limitations section, and control for the
participants’ use of technology in the hour before bed the results would be very reliable. If
controlled, half the participants would be given technology and be told to use this technology
before a designated “bedtime”. The other half of the participants would have their technology
use in the hour before bed completely restricted. Their sleep quality would then be tested for and
if there were a significant difference between the participants who used technology and the
participants that had it restricted from them, the results would be absolute.

This study did find significant results, as it found that there were significant correlations
between both attitudes toward sleep and sleep quality and technology use in the hour before
sleep and sleep quality. However, there was no significant effect of the intervention on sleep
quality which was the main goal of the study. If the discussed changes were made to the study,
however, the results could show a much greater level of significance.
References


*Dissertation Abstracts International: Section B: The Sciences and Engineering.* 73.

Appendix A: Distribution of Participants

- **Invited Students**: 84 Students
  - **Did not complete study**: 32 Students
  - **Total Study Completions**: 52 Participants
    - **Saw Presentation (Experimental)**: 34 Participants
      - **Sleep Reflection**: 17 Participants
      - **Did not see Presentation (Control)**: 18 Participants
Appendix B: Informed Consent Form

Study Title: Health and Wellness Among College Students
Faculty Advisor: Seth J. Gillihan, PhD
Students: Noemi Agagianian, Tami Mau, Gabe Olsen, Kylie O’Neill-Mullin

Purpose and Procedure: The purpose of this research study is to examine how various factors affect health and wellness in a sample of college students. The study will take approximately 30 [15-20 for follow-ups] minutes to complete. We expect that about 90 people will participate in this study.

Compensation: You will receive 0.5 credits toward experiment participation [$5 for second follow-up] as compensation for your time in completing this research study. Participants who complete all study components (including two follow-ups) will be eligible for a $50 lottery.

Confidentiality/Anonymity: The data collected in this study will be confidential. You will be assigned a code at the beginning of the study; your name will not be directly associated with any of your responses. Additionally, only the principal investigator and student researchers will have access to your data, which will be stored in a locked lab on password-protected computers and will only be viewed in the laboratory, for the stated purposes of the research study. The researchers are interested in patterns of results at the aggregated, group level of analysis rather than the responses of any single individual.

Voluntary Nature of Participation: Your participation in this research study is voluntary; refusal to participate will involve no penalty or loss of benefits to which you are otherwise entitled. In addition, you can decide not to answer any question you do not want to answer, or discontinue your participation, at any time with no penalty or loss of benefits to which you are otherwise entitled.

Contact Information: If you have any questions about this research study or your rights as a research participant, please contact Professor Seth J. Gillihan by email at sgilliha@haverford.edu. You may also address concerns to Professor Richard Ball (rball@haverford.edu), Chair of the Haverford college IRB (a committee that oversees human subjects research).

Please click “Agree” below to acknowledge that you have been informed about this study’s purpose, procedures, and possible benefits and risks. In addition, by clicking below you indicate that you voluntarily agree to participate in this study. By stating that you agree to these terms, you are not waiving any of your legal rights.

PLEASE PRINT A COPY OF THIS PAGE FOR YOUR RECORDS

Agree
Appendix C: Sleep Handout

Even if you do NOT have any sleep problems, hold on to this handout. Many students develop poor sleep habits over their first year of college and have long lasting sleep problems.

Why is sleep so important?
- Muscles and brain cells grow during sleep.
- Your immune system recharges during sleep.
- Odd sleep patterns or lack of sleep can lead to:
  Lower: Grades, Attention, Memory
  More: Mood Swings, Anger, Depression

Healthy Sleep Habits:
1. Relax 30 minutes before bedtime
2. Go to bed and awake around the same time each day.
3. Limit naps to 50 minutes in the early afternoon.
4. Exercise on a daily basis.
5. Do not drink caffeine within 4 hours of bedtime.
6. A light carbohydrate snack with milk before bedtime may help you sleep.
7. A walk outside in the morning will help you wake up.

What should I do if I have trouble falling asleep?
- Start relaxing an hour before bedtime.
- DO NOT go to bed until tired.
- Stop drinking beverages with caffeine within 4 hours of bedtime.
- Go to bed and awake within the same 2 hours each day.
- Do not take naps.
- Exercise on a regular basis.

What should I do if I think too much and can't sleep?
- Keep paper or a journal next to your bed and write out all the things you are thinking about.

What should I do if my roommate or dorm is too noisy?
- You can use soft, disposable earplugs which will reduce the noise.
- You can also buy sleep masks to cover your eyes if your roommate leaves the light on.

What should I do if I wake up and cannot fall asleep?
- If you cannot fall back to sleep within 20 minutes, get out of bed and do something else until you feel sleepy again.
- Wake up around the same time each day.
- Do not drink alcohol within 2 hours of bedtime.

What if I like to stay up late on the weekend?
- Take classes that start later.
- Try and pick Friday to be your late night out, which will give you more time to resume your sleep schedule for Monday.
- Get outside and exercise Monday morning before class, as sunshine and exercise can reset the biological sleep clock.

Do TV or Video Games Impact Sleep?
- Exciting TV and video games can make you more alert and less likely to sleep.
Myths about Sleep

If I can't sleep, I'll just go to the doctor and take sleep medicine.

- In study after study, changing sleep habits was more effective than taking sleeping pills.
- Once you start taking pills, it is hard to sleep without them.
- Also, there can be serious side effects when taking sleep medications.
- When you see an advertisement in a magazine, read all the fine print about possible side effects.

It’s okay if I stay up all night, I can sleep more the next day, right?

- WRONG! You CANNOT make up for lost sleep, it just hurts your sleep schedule!

If I can't sleep, I can just take naps the next day right?

- WRONG! If you take naps you will NOT feel sleepy at your bedtime and the sleep problems will continue.

All this talk about sleep bothers me, I can stay up all night and do fine on a test the next day!

- Actually, researchers compared the test performance of students who stayed up all night with those who had 8 hours of sleep.
- The people who slept did MUCH better on the test even though the people who did not sleep THOUGHT they did better on the test.

It doesn't matter when I sleep, as long as I get 8 hours of sleep, right?

- WRONG! Changing your sleep schedule is as bad as not getting enough sleep.

If I can't fall asleep, should I stay in bed longer?

- NO! This will just make you become frustrated and it is more difficult to sleep.

Doesn't alcohol help me sleep better?

- You fall asleep faster, but it makes your sleep lighter and you will not feel rested.
Sleep Hygiene Guidelines

1. Do not go to bed until you are drowsy.

2. Wake up within an hour of your normal wake-up time every day, including weekends.

3. Do not take naps. If you do take a nap, limit it to less than an hour early in the afternoon.

4. Expose yourself to sunlight or other bright lights in the morning.

5. Do not drink alcohol later than 2 hours before bedtime.

6. Do not consume caffeine after about 4 p.m. or within 6 hours prior to bedtime.

7. Do not smoke within several hours before bedtime.

8. Exercise regularly, but not within 2 hours of bedtime

9. Make your bedroom easier to sleep in and have a bedtime ritual. Turn down the lights before bedtime, make sure your bed is comfortable, and minimize noise. Use earplugs if your neighbors are noisy.

10. If you usually snack before bedtime, have a light carbohydrate snack with a small amount of fluid, such as milk.

Stimulus Control Instructions

1. Do not use your bed or bedroom for any activity other than sleep or sex.

2. Lie down intending to sleep only when sleepy. If unable to fall asleep after about 15 minutes, get up and go into another room. If in a dormitory, get out of bed and do something non-sleep related, but that is relaxing. Return to bed only after you feel sleepy. If once in bed, or you re-awake at a later time and cannot fall asleep within 15 minutes, get out of bed once more and repeat the procedure.

3. Establish a set of regular pre-sleep routines that get you read for bed. Each night do the same routine in the same order.

4. If you awake in the middle of the night and cannot fall asleep within 15 minutes, get out of bed and do something else that is relaxing until you feel sleep again. Once you feel sleepy return to bed. If once again you cannot fall asleep, get out of bed until you feel sleepy again.
Substances with Caffeine

Coffee
Instant Coffee: 60-100 mg
Percolated Coffee: 100-350 mg
Decaffeinated Coffee: 2-4 mg

Tea
Black Tea: 30-120 mg
Green Tea: 10-20 mg

Sodas
Coca-Cola & Diet Coke: 46 mg
Dr. Pepper: 40 mg
Pepsi: 37 mg
Diet Pepsi: 35 mg
Generic colsas: 30-60 mg
Jolt: 71 mg
Mountain Dew: 55 mg

Food
Chocolate: 8 mg per ounce

Non-Prescription Medicines
Some medicines such as weight loss pills (Dexatrim) and certain pain relievers (Midol) contain caffeine. If you take medicine at night you may want to check the ingredients for caffeine.
Appendix D: Debriefing Statement

1. **What is the general aim of this research?**
   The general purpose of our study is to develop better ways to enhance the sleep of college students. We are interested in whether having students reflect on their sleep habits and ways they might improve them will be more effective than simply giving students information about sleep. We will also examine the association between sleep and a number of variables, including exercise, nutrition, technology use close to bedtime, rumination, and mindfulness. Finally, we will be examining the kinds of barriers that tend to get in the way of better sleep, with the hope that identifying these barriers will lead to ways to remove them.

2. **Where can I learn more about this kind of research?** The following articles may be of interest if you would like to learn more about what motivated this study and what related studies have found:

3. **Who is the faculty member supervising this research and how can I contact him?** The supervising faculty member for this research study is Seth J. Gillihan in the psychology department. If you have any questions about this research or concerns about this study, you may reach him by email at sgilliha@haverford.edu. You may also address concerns to Dr. Richard Ball (rball@haverford.edu), Chair of Haverford College’s Institutional Review Board (a committee with oversight on human subjects research).
Appendix E: Recruitment Form

First Contact, pre-presentation
We are conducting a research study on college student health and invite you to participate! The study involves completing some questionnaires online, which will take about 30 minutes. You will receive ½ of a research credit for participating.

If you choose to participate now there will be additional opportunities to participate later in the semester (in about 3 weeks). If you complete all the components of this study you will also be entered into a lottery to win $50.

If you’re interested, please click on the link below to find out more about the study and how to participate.

[LINK]

This study is being conducted by Seth J. Gillihan, PhD, and senior psychology students Noemi Agagianian, Tami Mau, Kylie O’Neill-Mullin, and Gabe Olsen. If you have any questions, please contact Dr. Gillihan (sgilliha@haverford.edu).

Second Contact, post-presentation
We are conducting a research study on college student health and invite you to participate in a brief follow-up. It will take about 5 minutes of your time. If you complete this brief follow-up and another follow-up in a couple of weeks (which takes 15-20 minutes), you will receive ½ research credit for participating.

To remind you, you will also be eligible for a $50 lottery if you complete all components of the study.

If you’re interested, please click on the link below to find out more about the study and how to participate.

[LINK]

This study is being conducted by Seth J. Gillihan, PhD, and senior psychology students Noemi Agagianian, Tami Mau, Kylie O’Neill-Mullin, and Gabe Olsen. If you have any questions, please contact Dr. Gillihan (sgilliha@haverford.edu).

Third Contact: 2-week follow-up
As you may recall, we are conducting a research study on college student health and invite you to participate in a brief follow-up. It will take about 15-20 minutes of your time and you will receive ½ a credit of experiment participation.

To remind you, you will also be eligible for a $50 lottery if you complete all components of the study.
If you’re interested, please click on the link below to find out more about the study and how to participate.

[LINK]

This study is being conducted by Seth J. Gillihan, PhD, and senior psychology students Noemi Agagianian, Tami Mau, Kylie O’Neill-Mullin, and Gabe Olsen. If you have any questions, please contact Dr. Gillihan (sgilliha@haverford.edu).

**Fourth Contact: 4-week follow-up**

As you may recall, we are conducting a research study on college student health and invite you to participate in a brief follow-up. It will take about 15-20 minutes of your time and you will receive $5 compensation.

To remind you, you will also be eligible for a $50 lottery if you complete all components of the study.

If you’re interested, please click on the link below to find out more about the study and how to participate.

[LINK]

This study is being conducted by Seth J. Gillihan, PhD, and senior psychology students Noemi Agagianian, Tami Mau, Kylie O’Neill-Mullin, and Gabe Olsen. If you have any questions, please contact Dr. Gillihan (sgilliha@haverford.edu).
Appendix F: Measures

Sleep Hygiene Index:

<table>
<thead>
<tr>
<th></th>
<th>Always</th>
<th>Frequently</th>
<th>Sometimes</th>
<th>Rarely</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>I take daytime naps lasting two or more hours.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>I go to bed at different times from day to day.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>I get out of bed at different times from day to day.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>I exercise to the point of sweating within 1 hr of going to bed.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>I stay in bed longer than I should two or three times a week.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>I use alcohol, tobacco, or caffeine within 4 hr of going to bed or after going to bed.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>I do something that may wake me up before bedtime (for example: play video games, use the internet, or clean).</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>I go to bed feeling stressed, angry, upset, or nervous.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td>I use my bed for things other than sleeping or sex (for example: watch television, read, eat, or study).</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td>I sleep on an uncomfortable bed (for example: poor mattress or pillow, too much or not enough blankets).</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td>I sleep in an uncomfortable bedroom (for example: too bright, too stuffy, too hot, too cold, or too noisy).</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
12. I do important work before bedtime (for example: pay bills, schedule, or study).

13. I think, plan, or worry when I am in bed.

**Technology Use Questionnaire:**

When in the evening do you stop using the following technologies?

<table>
<thead>
<tr>
<th>Technology Type</th>
<th>2+ hr before bedtime</th>
<th>1 hr before bedtime</th>
<th>30 min before bedtime</th>
<th>15 min before bedtime</th>
<th>5 min or less before bedtime</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laptop/computer/tablet</td>
<td>1.</td>
<td>2.</td>
<td>3.</td>
<td>4.</td>
<td>5.</td>
</tr>
<tr>
<td>Cell phone</td>
<td>1.</td>
<td>2.</td>
<td>3.</td>
<td>4.</td>
<td>5.</td>
</tr>
<tr>
<td>Television</td>
<td>1.</td>
<td>2.</td>
<td>3.</td>
<td>4.</td>
<td>5.</td>
</tr>
<tr>
<td>Video game console</td>
<td>1.</td>
<td>2.</td>
<td>3.</td>
<td>4.</td>
<td>5.</td>
</tr>
<tr>
<td>Electronic music device (e.g., iPod)</td>
<td>1.</td>
<td>2.</td>
<td>3.</td>
<td>4.</td>
<td>5.</td>
</tr>
</tbody>
</table>

How often do you use [technology type] within 1 hour of going to bed?

Daily 5-6 times/week 3-4 times/week 1-2 times/week Rarely Never

**College Student Sleep Attitudes Scale:**

Please indicate the extent to which you agree with the following statements about sleep among college students using the scale below.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Disagree Very Much</th>
<th>Disagree Somewhat</th>
<th>Neither Agree Nor Disagree</th>
<th>Agree Somewhat</th>
<th>Agree Very Much</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Sleeping is a luxury.</td>
<td>1.</td>
<td>2.</td>
<td>3.</td>
<td>4.</td>
<td>5.</td>
</tr>
<tr>
<td>2. Adequate sleep is not normal.</td>
<td>1.</td>
<td>2.</td>
<td>3.</td>
<td>4.</td>
<td>5.</td>
</tr>
<tr>
<td>3. The importance of sleep varies during the school year.</td>
<td>1.</td>
<td>2.</td>
<td>3.</td>
<td>4.</td>
<td>5.</td>
</tr>
<tr>
<td>4. I can always sleep in later to make up for sleep deprivation.</td>
<td>1.</td>
<td>2.</td>
<td>3.</td>
<td>4.</td>
<td>5.</td>
</tr>
<tr>
<td>5. People who get enough sleep probably aren’t working hard enough.</td>
<td>1.</td>
<td>2.</td>
<td>3.</td>
<td>4.</td>
<td>5.</td>
</tr>
</tbody>
</table>

7. Sleep is the first thing I give up when I’m especially busy.

8. Being sleep deprived is the norm.

9. Being productive requires not getting enough sleep.

10. Going without sleep shows mental and physical toughness.

11. It’s more important to have a rich social life than to get enough sleep.

12. People who are determined to succeed must be willing to sacrifice their sleep.

---

**Barriers to Better Sleep Questionnaire**

In the presentation on sleep you learned about several ways to improve your sleep. Please read the list below and rate the extent to which you followed the guideline, using the scale provided. For guidelines that you did not follow, please indicate what prevented you from following them.

<table>
<thead>
<tr>
<th></th>
<th>1 Almost Never</th>
<th>2 Rarely</th>
<th>3 Sometimes</th>
<th>4 Often</th>
<th>5 Almost Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Keeping a regular sleep schedule even on weekends</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Avoiding naps longer than 30 minutes</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Exposing yourself to bright light in the morning</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Avoiding caffeine within 6 hours of bedtime</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Avoiding alcohol within 2 hours of bedtime</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Avoiding smoking within 2 hours of bedtime</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Having a relaxing bedtime ritual</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Having a light snack before bedtime</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Using bed only for sleeping (and sex)</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Going to bed only when sleepy</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
11) Getting out of bed if awake for >15 minutes

For each item that is rated <4, participants will be asked: What prevented you from following this guideline?

Reflection Questionnaire

Reflection condition:
1. In the presentation by Dr. Gillihan in your Psych 100 class you learned about ways that college students can improve sleep. Please take a moment to write down ways that you can apply what you learned to improve your own sleep.

2. How would better sleep habits affect your life? Please be as specific as possible.

Non-reflection condition:
1. How do you plan to effectively manage your time this semester?

2. How would better time management affect your life? Be as specific as possible.