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## The Effects of an Online Sleep Hygiene Intervention on Students' Sleep Quality

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**THE EFFECTS OF AN ONLINE SLEEP HYGIENE  
INTERVENTION ON STUDENTS'  
SLEEP QUALITY**

by

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A Dissertation Submitted to the Faculties of

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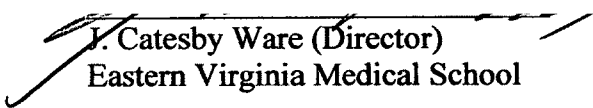
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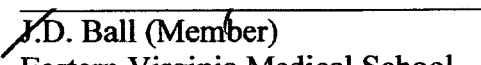
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## **ABSTRACT**

### **THE EFFECTS OF AN ONLINE SLEEPY HYGIENE INTERVENTION ON STUDENTS' SLEEP QUALITY**

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The Virginia Consortium Program in Clinical Psychology, 2012

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Students in college or in their first year of medical school undergo increased educational and social pressure. To cope, students may sacrifice sleep to meet demands. Poor sleep affects learning, performance, and health. Studies have been successful at improving sleep quality through the use of in-person recruitment or cognitive-behavioral therapy delivered over the internet (Trockel, Manber, Chang, Thurston, & Tailor, 2011). The purpose of the current study was to investigate whether an online sleep hygiene intervention could improve sleep quality. One hundred thirty-eight students from one undergraduate institution in Southeast Virginia completed this study. Students were divided into groups; one of them received information regarding good and bad sleep hygiene and the other received information about dreaming. Both groups filled out the Pittsburgh Sleep Quality Index (PSQI), The Sleep Hygiene Index (SHI), the Epworth Sleepiness Scale (ESS), the Sleep Hygiene Pretests/Post-test and the Positive and Negative Affect Schedule (PANAS). Two weeks later, participants filled out the same measures they filled out at the beginning of the study. A mixed analysis of variance was used to evaluate the two different groups. Results indicated significant differences between the two groups in sleep hygiene knowledge. Individuals who received information on this topic had higher levels of knowledge from baseline to post-intervention. No other significant findings were detected. On average, this sample of

college students had similar total hours of sleep as other researchers have identified (Lund, Reider, Whiting, & Prichard, 2010). One hundred seven students (77%) were considered “poor sleepers” by the PSQI Global scores. The SHI also identified poor sleep hygiene practices within this sample. Lastly, participants had relatively average positive mood and below average negative mood as measured by the PANAS during baseline and post-intervention. The brief online sleep hygiene intervention did not improve students’ sleep quality. It is believed the intervention did not succeed because students’ motivation to alter their sleep practices was not assessed and this may have influenced the likelihood of behavior change. Future research should focus on participants’ needs and motivation and use this information to tailor the intervention.

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## CHAPTER I

### INTRODUCTION

A common health complaint in young adults is sleep disturbances; more specifically, sleep loss, or sleep deprivation, occurs often in this population (Yang, Wu, Hsieh, Liu, & Lu, 2003). In particular, college students appear to be one of the most affected groups; approximately 49% of them report limited amounts of sleep (Tsai & Li, 2004). Medical students are also at risk for not getting enough sleep (Sheets, Gorenflo, & Forney, 1993). Research has indicated that both college students (Hicks, Lucero-Gorman, & Bautista, 1999) and medical students are not knowledgeable about sleep and behaviors that affect sleep (sleep hygiene) (Mahendran, Subramaniam, & Chan, 2004). Sleep that is not restful, or poor sleep, is related to decreased concentration, decreased academic performance (Pilcher & Walters, 1997) and job performance (Owens, 2001), and is associated with mental health problems (Breslau, Roth, Rosenthal, & Andreski, 1997).

Research suggests that some students are not aware of how sleep deprivation affects cognitive functioning. For instance, Pilcher and Walters (1997) discovered that students who stay up the night before a test rated their test performances as better than those individuals who obtained 8 hours of sleep. Not surprisingly, the students who stayed up all night performed much worse than students who slept the night before the examination. Based on this study, it seems that the effects associated with poor sleep could be avoided if students were aware of the importance of sleep hygiene. It would be beneficial to provide this information to students as early as in their first year of college, where most students are unsupervised for the first time, and during the first year of

medical school, where academic pressure intensifies and competition among classmates increases. In addition, the dissemination of this type of information should be provided in a cost-effective manner so institutions of higher learning would be more likely to adopt it. In this age, the internet is the fastest, most cost-effective way to provide information to students. It seems logical to distribute information pertaining to sleep and sleep hygiene in this manner. As with any innovative idea, it would be valuable to investigate the impact of using the internet to teach students about the importance of sleep and sleep hygiene on students' sleep quality. Results from this investigation could help lay the foundation for future interventions to reduce common difficulties associated with poor sleep.

### *Sleep During College*

College students are known for giving up hours of sleep to socialize and study during the weekdays and sleeping in on the weekends (Brown, Buboltz, & Soper, 2006). For instance, "students' sleep schedules are so variable that twice as many students as people in the general population report symptoms consistent with delayed sleep phase syndrome" (Brown, Buboltz, & Soper, 2002, p. 33). Delayed sleep phase syndrome is identified by later wake-up times on weekends, which lead to poor performance and sleepiness during the week (Brown et al., 2002). Furthermore, research in the area of sleep loss and sleep variations in college students has detected alarming effects. For instance, "among university students, poor sleep quality is related to emotional imbalance; feelings of tension, anger, depression, fatigue, and confusion...and generally lower life satisfaction" (Buboltz, Brown, & Soper, 2006, p. 231). Poor sleep has also been linked to physical, emotional, social, and academic problems (Buboltz et al., 2006).

Even students who sleep the recommended 8 hours per night but shift their sleeping schedules by 2 hours reported more depressive symptoms and attention and concentration problems than those who did not change their sleeping schedules (Buboltz et al., 2006).

### *Sleep During Medical School*

Medical students are notorious for studying long periods of time and sacrificing many aspects of their lives, including sleep, to keep up with the demands of medical training. The structure of the curriculum is likely a contributor to insufficient and poor quality sleep. Students are required to learn a large amount of detailed information and to do so, they must alter their lives to meet these expectations. Curtailing time for sleep is usually the first behavior students choose to change. For example, in a study of medical students at an American university, researchers reported that by the end of the first semester, more than half of students stayed awake at night to study, woke up early in the morning to study, took naps during the day, and slept in places other than beds (Ball & Bax, 2002). Not only do medical students choose to alter their sleeping schedules drastically to keep up with coursework, they also choose to sacrifice sleep in order to attend lectures. Furthermore, classes usually begin early in the morning and students are expected to attend. After a long night of studying, students are then expected to be alert and to absorb dense material on a few hours of sleep. A study documented the amount of hours medical students slept for over a period of two weeks. On average, these students obtained less than seven hours of sleep per night (Medeiros, Mendes, Lima, & Araujo, 2001). Other research has demonstrated other types of sleeping difficulties in this population. For example, in a survey of medical students' nighttime and daytime habits, students reported difficulties falling asleep and staying asleep in comparison to other

young, non-student adults (Veldi, Aluoja, & Vasar, 2005). Based on these observations, it is no surprise that medical students have poor sleep quality. It seems that the way students pursue a medical degree costs students more than just money; it costs them good quality sleep.

### *The Impact of Sleep Deprivation on Academic Performance*

Research demonstrates a relationship between sleepiness and academic performance. For example, sleep loss is considered the third largest obstacle to academic performance (Forquer & Johnson, 2007). Moreover, Rodrigues, Viegas, Abreu e Silva, & Tavares (2002) conducted a study with medical students where they measured students' daytime sleepiness and its effects on their academic performance throughout a semester. Results of this research indicated that students who showed an increase in daytime sleepiness at the end of the semester had worse academic performance compared to students who did not have an increase in daytime sleepiness. Another study by Brown & Buboltz (2002) with college students indicated that "Students who do not get adequate amounts of REM sleep perform significantly worse recalling newly learned information than students who had normal sleep or missed non-REM sleep stages" (Brown & Buboltz, 2002, p.411). REM sleep has been found to facilitate learning (Carlson, 2007) and furthermore, research has demonstrated that the consolidation of new information is dependent on REM sleep. For example, students who demonstrated an increase in REM sleep after intense studying performed significantly better on exams (De Koninck, Lorrain, Christ, Proulx, & Coulombe, 1989). It appears that sleep is very important to the process of learning and sleep-deprived students do not retain information as well as they

could, in turn academic performance is adversely affected (Rodrigues, Viegas, Abreu e Silva, & Tavares, 2002).

### *The Effects of Sleep Deprivation on Medical Students' Job Performance*

Most individuals recognize a difference in performance when they are well-rested compared to when they are not. In fact, tasks that depend on continuous levels of attention, tasks of longer duration, or tasks that require newly learned procedural skills all seem to be more vulnerable to the effects of short-term sleep loss (Owens, 2001). For medical students who will likely work long hours performing demanding procedures, a lack of sleep can significantly alter their performance. This certainly includes work-related tasks, such as performing surgeries, ordering medications, documenting medical histories, and monitoring anesthesia, which have all been shown to be impaired in sleep-deprived medical trainees and physicians. In turn, research has found that patients admitted after midnight have significantly higher rates of mortality (Owens, 2001). For example, a study with pediatric populations examined the mortality rates of patients admitted during the daytime and during the evening. Results indicated that patients admitted during the evening had 28% higher odds of death within 48 hours after admission compared to those admitted during the daytime hours (Arias, Taylor, & Marcin, 2004). Studies with adults also found higher mortality rates when patients were admitted at night (Morales, Peters, & Afessa, 2003). Furthermore, excessive somnolence, which is described as the failure to sustain adequate levels of wakefulness, reduces a person's ability to perform intellectually demanding or non-stimulating tasks, especially among doctors with less medical experience (Rodrigues et al., 2002). For example, well-rested residents outperformed their sleep-deprived colleagues in many cognitive tasks,

including memory, language and mathematical tests, visual attention, and short-term memory and concentration tests. Not surprising is the fact that non-sleep deprived students are able to interpret electroencephalograms, monitor anesthesia, retain information, and problem-solve better than sleep-deprived students (Rodrigues et al., 2002).

Sleep deprivation affects many aspects of a medical trainees' life, including his or her life or the lives of patients. For instance, medical residents can work up to 80 hours a week (Accreditation Council of Graduate Medical Education) and sleep deprivation can become a daily problem. Physicians in training reported incidents of falling asleep while driving after a night of on-call duty, and some of those incidents become deadly ones. In addition to being harmful to medical residents, long work hours can have undesirable effects on patient care by increasing the likelihood of accidents and errors in the delivery of care. Many trainees blame their mistakes on sleep deprivation (Halbach, Spann, & Egan, 2003). Even though first-year students are not working these long hours yet, it is still important for them to understand what more advanced students are experiencing and learn early in their training how important sleep is to their own well-being and to the well-being of their patients. To protect their sleep, it is imperative that first-year medical students understand behaviors that promote good quality sleep and behaviors that result in poor sleep. Fortunately, there are ways to improve sleep quantity and quality.

#### *Sleep Deprivation and Students' Mental Health*

In addition to subpar academic achievement and difficulty in performing intellectual or demanding tasks, sleep loss can also affect students' mental health. Even though anxiety and mood disorders are common in the general population, approximately

11.8% of college students (Moo-Estrella, Perez-Benitez, Solis-Rodriguez, & Arankowsky-Sandoval, 2005), 23.5% of undergraduate medical students, and 15.5% of first year residents reported depressive symptoms (Eller, Aluoja, Vasar, & Veldi, 2006). Currently, major depressive disorder affects 6.7% of American adults (National Institute of Mental Health, 2010) and for medical students during their initial training, the rate of depression is similar to that of the general population. However, the rate of depression can be as high as 40% in the following years of medical training (Eller, et al., 2006). In studies of sleep and mental health, researchers discovered that the risk of developing a severe mood disorder, such as major depression, was higher when an individual had a previous history of insufficient sleep (Breslau et al., 1997). Additionally, researchers have also detected that the risk of having clinical depression was greater in individuals who often slept less than 7 hours or had insomnia, compared to those individuals who had normal sleeping patterns (Chang, Ford, Mead, Cooper-Patrick, & Klag, 1997). Furthermore, in a study by Buela-Casal, Miro, Ianez, and Catena (2007), participants who slept less than 6 hours reported more somatic symptoms of depression, such as crying, loss of weight, and loss of interest in sex. Since mental health and sleep loss appear to be related, it is even more imperative that students sleep enough to help prevent mental illnesses that can interfere with their well-being, and learn the types of behaviors that promote quality sleep.

### *Sleep Hygiene*

Sleep hygiene is a set of behaviors that can lead to better sleep (Hauri, 1991). Sleep hygiene was first introduced by Dr. Peter Hauri; he presented patients suffering from insomnia with recommendations to help improve their sleep. Some of these



guidelines came from research regarding the effects of alcohol and caffeine on sleep. Others came from Dr. Hauri's own clinical observations of patients with poor sleep. These suggestions target behaviors that interfere with normal sleep and promote behaviors that improve the quality and quantity of sleep (Stepanski & Wyatt, 2003). Sleep experts commonly advise sleep hygiene methods as a treatment for patients suffering from insomnia, delayed sleep phase disorder, and insomnia related to a mood disorder (Stepanski & Wyatt, 2003). Others use sleep hygiene as part of a multi-component treatment for insomnia (Morin, Bootzin, Buysse, Edinger, Espie, & Lichstein, 2006). Patients who received sleep hygiene recommendations to improve sleep have deemed it credible (Edinger & Sampson, 2003).

Sleep hygiene addresses specific behaviors that deter good sleep, such as consumption of certain foods at the wrong time, and activities that arouse people before bed instead of helping them relax. One of the substances that can impair a person's ability to fall asleep is caffeine (Hauri, 1991). Caffeine consumption has been noted to interfere with neurotransmitters that help promote sleep (Stepanski & Wyatt, 2003). Alcohol is another substance that interferes with sleep (Hauri, 1991). Some people mistakenly believe that alcohol helps promote sleep. The opposite is true. Alcohol intake as far as six hours before an individual's bedtime has been detected to result in significant fragmentation of subsequent sleep (Stepanski & Wyatt, 2003). Another behavior that can severely impact a person's quality of sleep is taking naps. Individuals who do not feel refreshed after a night's rest may resort to taking naps to feel rested. For some, naps can have minimal negative impact on sleep. For others, naps can interfere with the ability to fall asleep later on. For instance, Vela-Bueno, Fernandez-Mendoza, Olavarrieta-

Bernardino, Vgontzas, Bixler, de la Cruz-Troca, Rodriguez-Muñoz, Oliván-Palacios (2008) found that college students that took naps reported significantly less night-time sleep during the weekdays compared to students who did not take naps. Other research has indicated that daytime naps can lead to a decrease depth of sleep and increase latency to sleep onset (Stepanski & Wyatt, 2003). Other behaviors that should be avoided before bed are those that are physiologically, cognitively, and emotionally arousing (LeBourgeois, Giannotti, Cortesi, Wolfson, & Harsh, 2005). Watching suspenseful or frightening movies right before bed, balancing one's checkbook, or playing an action-packed video game are types of activities that should not take place before bed. Lastly, a person should never try to sleep to the extent that it increases arousal. The more time a person spends in bed trying to sleep, the more aroused the person becomes (Hauri, 1991).

In addition to describing behaviors that interfere with sleep, sleep hygiene also describes behaviors that promote good sleep. Sleeping in a quiet, comfortable, toxin-free environment is recommended (LeBourgeois et al., 2005). Following a bedtime ritual and maintaining a stable sleep schedule is also necessary for quality sleep. Having good sleep hygiene can lead to high-quality sleep; which is described as going to bed easily at bedtime, maintaining undisturbed sleep, and easily transitioning from sleep to wakefulness in the morning (LeBourgeois et al., 2005). The aforementioned behaviors to avoid and to engage in are just a few examples of the types of recommendations sleep experts give patients who have trouble sleeping.

Research has indicated that knowledge of sleep hygiene and sleep hygiene practices are positively correlated (Hicks et al., 1999), however, good sleep hygiene practices is not commonly disseminated. In a survey assessing knowledge of sleep

hygiene, college students only answered questions correctly 50% of the time (Hicks et al., 1999). Similarly, in a study across a number of medical schools in the United States, including the University of Kentucky medical center, the Robert Wood Johnson Medical School, and the University of North Carolina-Chapel Hill, researchers tried to determine medical students' sleep hygiene and sleep medicine awareness. The results of this study concluded that knowledge in this area was low (Mahendran et al., 2004). Among those students who did have sufficient knowledge in this area, they reported that sleep medicine was important and should be included in their curriculum. Some clinicians and even patients often do not believe sleep hygiene education to be necessary for many reasons. For example, some clinicians believe that these sleep guidelines are considered common sense. Others, such as patients, may recognize sleep hygiene as useful but not applicable to them. Some individuals may have tried to follow good sleep hygiene practices for a short amount of time, expecting immediate results, and have been unsuccessful (Glovinsky, Yang, Dubrovsky, & Spielman, 2008). It is unfortunate that this information is not passed along through doctors more often because not adhering to good sleep hygiene practices is associated with poor sleep. For instance, a research study that assessed the sleep hygiene of a sample of insomniacs and controls indicated that insomniacs had more poor sleep practices compared to normal sleepers (Jefferson, Drake, Scofield, Myers, McClure, Roehrs, & Roth, 2005).

#### *Improving Sleep Hygiene in Students*

Currently, many college and medical students are unaware of how much of an impact poor sleep quality has on their lives. As a result, students are not learning as efficiently or as effectively as they could. These gaps in productivity can hurt college

students' education or can hurt medical students' future training and future patients.

Receiving information about the importance of sleep, the difficulties associated with poor sleep, and good sleep hygiene can raise awareness about positive and negative sleep habits and possibly improve behaviors that promote good sleep quality. For example, Brown, Buboltz, & Soper (2006) measured the effects of a 30-minute psychoeducational intervention geared at teaching college students good sleep hygiene practices and describing the impact of sleep difficulties on mood and academic performance.

Researchers measured sleep quality, sleep hygiene awareness, and sleep habits in two groups of college students before and after the psychoeducational intervention. Six weeks after treatment, the experimental group had significantly better changes in sleep hygiene practices and significantly better overall sleep quality than the control group. This finding was also replicated in a study with participants with ages ranging from 16 years old to 50 years and older (Gallasch & Gradisar, 2007), where a significant association was found between sleep habits and sleep quality.

A similar study promoting good sleep practices in medical students has been done in the past as well. For example, Ball & Bax (2002) examined health habits, such as sleep, and the effects of an educational intervention promoting self-care on the emotional and academic adjustments of first year medical students. Students in this study answered questionnaires about their health habits, mood, alcohol use, sleep, and overall quality of life three times during their first semester in medical school. During the second assessment, certain students received individual feedback on the questionnaires they filled out, attended a lecture on self-care habits, and participated in a group discussion of self-care issues (Ball & Bax, 2002). Students who received feedback demonstrated a

greater reduction of sleep-related problems from mid-semester to the end of the term. In addition, students who participated in the discussion group were more likely to have less trouble falling asleep and were more likely to have consistent wake times by the end of the semester, compared to students who did not attend the discussions (Ball & Bax, 2002).

Clearly, there are traditional methods of disseminating sleep-related information. However, there is a more cost-effective way of providing this information by using technology. By using the internet, students can receive this information faster and at their convenience. Creating an online sleep hygiene intervention that is easily available anywhere and at any time can help busy students receive the information they need in a way that is friendly to their hectic schedules.

#### *Internet-Based Instruction*

Internet-based instruction, or e-learning, appears to be ubiquitous in institutions of higher learning. This learning situation where instructors and learners are separated by distance, time, or both, uses network technologies to create, deliver, and facilitate learning for anyone, anytime, and anywhere (Liaw, 2008). Learning resources that are used in internet-based instruction usually contain similar or even more resources found in traditional face-to-face courses, such as books, notes, and software (Leung, 2003). Not only does e-learning provide similar information as in-class instruction, it has several advantages. For instance, the student has the freedom to choose when each online class will be viewed (Liaw, 2008). Students who have families or jobs are no longer restricted by having to attend class to receive education; they can simply choose the best time to learn. In addition, if a student is ill or has a family emergency, in a traditional classroom,

he or she would miss an important lecture; with e-learning, this negative consequence would not occur. A second advantage is the lack of dependence on time constraints of the lecturer (Liaw, 2008). Students do not need to wait on their professor to learn. Students can "attend" class whenever they wish; as opposed to only attending class on days the professor chooses to teach. A third advantage is the freedom to express thoughts, comments, and questions without limitations (Liaw, 2008). The online environment can create a better degree of communication between students and teachers. Shy students can ask any questions through e-mail and instructors can take as much time needed to answer a question without losing precious class time (Waschull, 2001). Accessibility to the courses' online material is another benefit (Liaw, 2008). The student no longer has to schedule a time to meet with a professor to gather necessary materials. He or she is only a click away from getting the information he or she needs to improve learning.

Furthermore, students also have the opportunity to access more information that would not be readily available in a traditional classroom. Using the Web, students are linked to vast collections of resources. They can access primary sources, view images and video, or visit specialized sites that contain information on a particular topic (Waschull, 2001). The student is no longer dependent on the instructor's knowledge; he or she can immediately gather more information on any class topic. Lastly, with e-learning students have the choice to take a test during the day or night. This allows students who choose to stay up the night before a test to study to have the opportunity to sleep in and take the test later in the day. As mentioned before, getting adequate sleep before a test is important for memory consolidation. With e-learning, these students can sleep in as long as they need to and wake up rested and prepared to take a test.

Internet-based instruction is not only beneficial to students; it is beneficial for professors, undergraduate, and graduate institutions as well. Instructors benefit from e-learning in the same way that students do. They do not have to be in a specific place at a specific time to teach. They do not even have to be in the same city. This frees up their time to focus on research, family, or other important endeavors (Waschull, 2001).

Internet-based instruction also helps administrators save money because the institution does not need to provide a classroom for these students, and these rooms can be used for other purposes. When students do not have to travel to the campus, there is more parking available for staff, faculty, and other students and administrators do not have to spend money to build parking lots to support the increase in student enrollment. Lastly, online classes attract more students and in turn, this leads to increase funding for the institution.

#### *Effects of internet-based instruction on student learning and perceptions*

E-learning appears to be a great way to facilitate education. It is cost-effective; no classrooms are needed and because of it, the number of students that can register is increased. E-learning allows students the ability to choose when and where they learn and provides readily available resources. Professors also benefit from e-learning; they are free to pursue other activities and are not required to be at the institution where their online class is being offered.

Everything about e-learning seems to make sense; however, do students actually learn as well as those who attend a traditional classroom? Do students' prefer this type of learning environment to being in a classroom with peers and a professor? Several studies have addressed both of these questions. In a study by Wegner, Holloway, & Garton (1999), two groups of students were taught the same course by the same instructor. One

group was taught the course through traditional means and the other was taught through an online format. During examinations, both groups were asked the same questions in the same format (multiple choice, short-answer, and essay). When the tests were scored and compared, there were no significant differences in test scores between the two groups, despite the fact that the group receiving online instruction never attended an on-campus lecture (Wegner et al., 1999). Students in this study were asked about their experience and the e-learning group had more positive feelings about their participation than the group in the traditional course. In addition, these students were also more willing to respond to surveys, they provided higher scores on class evaluations, and had more positive comments than their counterparts had. Based on this study, it seems that internet-based courses do not appear to have negative effects on student achievement or on students' perception of their learning (Wegner et al., 1999).

Leung (2003) also conducted a study to determine whether student learning would differ between those in an on-campus class and those taking an online class. The result of this study was similar to the previous one. The results showed no difference between the two groups in academic performance. Waschull (2001) also found results similar to the studies above. His students from traditional and non-traditional classes reported similar levels of educational satisfaction and had similar test performance. Furthermore, the students in the online class spent more time developing their writing skills, read both the required and suggested readings, reflected on course content, and discussed course material with peers and the instructor (Waschull, 2001).

Another study found students overwhelmingly preferred to take classes using e-learning than a traditional course. They believed e-learning was a helpful tool in their



learning (Keller & Cernerud, 2002). Researchers in this study also wanted to know if individual variables influenced these perceptions. They tested for previous experience of computers, technology acceptance, learning style, age, and gender. Contrary to what researchers expected, women had more positive attitudes than men did toward e-learning and there was no relationship to age. Students who had less experience with computers were more positive toward e-learning than students who were computer-savvy. In addition, there was no correlation between students' perception of e-learning and their learning styles (Keller & Cernerud, 2002).

#### *Internet-Based Treatments*

The widespread use and accessibility of the internet has sparked interest in determining whether treatments for sleep disorders, such as insomnia, can be delivered through the internet. For instance, Strom, Petterson, & Andersson (2004) conducted a study to determine whether nonpharmacological sleep management modalities could be disseminated using the internet. Participants were randomized to a treatment group and a wait-list control group. Both groups filled out online questionnaires pertaining to depression, anxiety, and sleep-related cognitions. Participants were also required to keep a sleep diary for 2 weeks. The treatment group also participated in the online training program, which included information about sleep hygiene, sleep restriction, cognitive restructuring, and stimulus control. It also provided information on how to change participant's sleep schedule and allowed participants to ask questions pertaining to their sleep. At the end of the program, participants reported their sleep for another 2 weeks and lastly at 9 months after post-treatment. Results of this study indicated that there was an overall improvement in the treatment group. This study demonstrated that an internet-

based, self-help intervention is a potential treatment alternative for insomnia (Strom et al., 2004).

Another study by Vincent & Lewycky (2009) used the internet to treat insomnia. In this study participants in the experimental group underwent a 5-week online treatment that included psychoeducation, sleep hygiene, stimulus control instruction, sleep restriction, relaxation training, and cognitive therapy. At the end of the study, results indicated that the experimental group had significant improvements in general fatigue, insomnia severity, and sleep quality (Vincent et al., 2009). This study also demonstrated that the internet can be a successful tool in treating specific sleep disorders.

#### *Gaps in the literature*

Sleep is a daily behavior, but its importance is sometimes overlooked, especially during an exciting, yet stressful time, such as the start of college or medical school. Post-secondary institutions therefore have a responsibility not only to enrich their students' intellectual curiosity but also to ensure that students know how to effectively take care of their biological needs, starting with a good night's rest. Promoting good sleep hygiene is a great first step in that direction.

Some academic institutions have taken steps to promote good sleep hygiene. For instance, research has indicated that in-class sleep interventions for college students and medical students has been successful in decreasing sleep problems (Ball & Bax, 2002 ) and improving sleep habits and sleep quality in students (Brown et al., 2006). Other types of comprehensive interventions using new modalities, such as the internet, have also been deemed effective at improving sleep disorders, like insomnia, (Strom et al., 2004, Vincent et al., 2009). A study by Trockel et al., (2011) also used the internet to promote

sleep and health in college students. These researchers recruited college students in dorms and emailed cognitive behavioral sleep improvement programs for 8 weeks. Students with poor sleep quality at baseline reported improvements in sleep quality at post-intervention.

Even though these past studies have targeted college students and used the internet to disseminate information, there is still a paucity in the literature indicating whether a brief internet intervention that teaches students good sleep hygiene would have similar results as interventions performed in the classroom. In particular, it is uncertain whether teaching good sleep hygiene practices to a non-clinical population, such as students, over the internet would result in improved sleep quality and changes in sleep practices.

### *Hypothesis*

The purpose of the proposed study is to evaluate the impact of an internet-based intervention on student's sleep hygiene and sleep quality. It is hypothesized that students receiving this intervention will report significantly greater improvement in sleep quality. Second, it is hypothesized that students receiving the intervention will improve their sleep hygiene practices. Third, it is expected that students who receive the intervention will decrease their daytime sleepiness significantly more than students who do not receive the intervention. Fourth, it is hypothesized that students' mood in the control group and the experimental group will not differ significantly. Lastly, it is predicted that students exposed to the intervention will increase their knowledge of sleep and sleep hygiene practices.

In addition to understanding whether an online sleep hygiene intervention will be effective, the student investigator is also interested in possible reasons participants use to complete online studies. Knowing why participants choose to complete internet-based studies can help future researchers design studies that appeal to such individuals and hopefully decrease participant attrition. As the internet becomes a more widely-used tool in the area of psychological research, it is important to understand the many reasons as to why some participants complete online studies and others do not.

## CHAPTER II

### METHOD

#### *Participants*

Participants who were at least 18 years old and were enrolled at Old Dominion University (ODU) and Norfolk State University (NSU), as well as first year medical students from Eastern Virginia Medical School (EVMS), were invited to participate. Recruitment began in June 2011 and ended in December 2011. Participants at EVMS were recruited through flyers around commonly visited areas, such as libraries and student centers. Students at NSU were recruited by in-class announcements by NSU faculty. At ODU, the study was posted on the Sona Research Participation System. For some ODU psychology students, they were either required to participate in an online study through the Sona system or could gain extra credit for their respective class by participating in research. No such requirements were put in place for the NSU or EVMS students and no extra credit was available to these students either. However, as an incentive to participate, students from all institutions had the opportunity to enter a raffle to win one of four \$25 Visa Gift Cards if they completed both parts of the study. Students with any current diagnosis of sleeping disorders and/or individuals receiving treatments (i.e. medications) for sleeping disorders were excluded. Students with a diagnosis of mood or anxiety disorders and/or receiving treatments (i.e. medications) for anxiety or mood disorders were also excluded. Individuals of all ethnic backgrounds were invited to participate. Ethical guidelines of all of the Institutional Review Boards were adhered to.

## *Materials*

A study information letter was presented to participants before any information was collected. This form described the benefits and drawbacks of participation, the nature of the study, and provided contact information for the student and principal investigator (see Appendix G). Information gathered during the study included a demographics questionnaire, the Pittsburgh Sleep Quality Index (PSQI), the Epworth Sleepiness Scale (ESS), the Sleep Hygiene Index (SHI), the Positive Affect Negative Affect Schedule (PANAS) the Sleep Hygiene Pretest/Post-Test, and the Participant Feedback Form. Participants also read information in the Sleep Hygiene Placebo Intervention or the Sleep Hygiene Intervention.

### *Pittsburgh Sleep Quality Index (PSQI)*

Buysse, Reynolds, Monk, and Kupfer's (1989) Pittsburgh Sleep Quality Index (PSQI) was used to assess sleep quality in students (see Appendix A). The PSQI is a nineteen-item, self-rated questionnaire utilized to measure sleep quality during the previous month. The items are grouped into seven components, each weighted equally on a 0 to 3 scale. The seven components consists of : subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction over the last month. These component scores were added together to produce a "global PSQI score", which has a range of 0 to 21; with higher scores indicating worse sleep quality. A global score of 5 or below is considered good sleep quality. Scores above 8 are considered to be indicative of poor sleep quality. The PSQI also contains questions that request the evaluation of the participant's bedmate or

roommate, because these are not scored; they were not used in this study. The entire scale can be completed in 10 minutes. A sample question from this measure follows:

“During the past month, how often have you had trouble staying awake while driving, eating meals, or engaging in social activity?

- Not during the past month
- Less than once a week
- Once or twice a week
- Three or more times a week”

The PSQI has been shown to have a high degree of internal reliability in a sample of healthy control subjects, patients with sleep disorders, and depressed patients; Cronbach's alpha was 0.83 for the global scores (Buysse, Reynolds, Monk, Berman, & Kupfer, 1988). Test-retest reliability with patients and controls was 0.85 for the global score and 0.65 to 0.84 for component scales. In terms of validity, depressed patients and patients with sleep disorders obtained a significantly higher score than healthy controls. Group differences were corroborated by differences in polysomnographic measures of sleep latency, sleep duration, sleep efficiency, and number of arousals (Buysse et al., 1988).

#### *Epworth Sleepiness Scale (ESS)*

Johns' (1991) Epworth Sleepiness Scale was used to detect students' general level of daytime sleepiness (See Appendix B). The Epworth Sleepiness Scale is an eight-item, self-rated questionnaire utilized to measure daytime sleepiness in adults. Each of the items describes a situation in which sleep-deprived individuals may doze off. Participants are asked to indicate on a scale of 0-3 (0 = would never doze; 3 = high chance of dozing) the likelihood of dozing off or falling asleep in each of the eight situations, “based on their usual way of life in recent times” (Johns, 1991 p. 541). If the participant has not

been in some of the situations described, he or she is asked to estimate how each might affect him or her. Participants are also asked to differentiate dozing behaviors from feelings of tiredness (Johns, 1992). The sum of the ESS items can range from 0 to 24, with higher scores indicating higher level of daytime sleepiness. The entire scale can be completed in 5 minutes. A sample situation from the ESS follows:

“As a passenger in a car for an hour without a break

- 0 = would never doze
- 1 = slight chance of dozing
- 2 = moderate chance of dozing
- 3 = high chance of dozing”

The ESS has been shown to have a high degree of internal reliability in a sample of healthy control participants (medical students) and patients with various sleep disorders; Cronbach's alpha was 0.88 for patients and 0.73 for controls (Johns, 1992). The ESS has high test-retest reliability and can significantly differentiate between controls and groups of patients with various sleep disorders. Epworth Sleepiness Scale scores have been significantly correlated with sleep latency measured with the Multiple Sleep Latency Test (MSLT) during the day and at night with polysomnography (Johns, 1991).

### *Sleep Hygiene Index*

Mastin, Bryson, and Corwyn's (2006) Sleep Hygiene Index is utilized to determine the practice of sleep hygiene behaviors (See Appendix C). The Sleep Hygiene Index is a 13-item self-administered questionnaire that evaluates the presence of sleep hygiene practices. Participants are asked to specify on a scale of 0-4 (0 = never; 4 = always) the frequency in which they engage in specific behaviors thought to comprise sleep hygiene (Mastin, et al., 2006). The items on this questionnaire were taken from the



diagnostic criteria for inadequate sleep hygiene, found in the International Classification of Sleep Disorders (Mastin et al., 2006). The scores on the items are summed, yielding a global assessment of an individual's sleep hygiene. Item scores can range from 0 to 52, with higher scores indicating maladaptive sleep hygiene practices. The entire scale can be completed in 5 minutes. A sample question from the Sleep Hygiene Index follows:

"I take daytime naps lasting two or more hours.

- 0 = Never
- 1 = Rarely
- 2 = Sometimes
- 3 = Frequently
- 4 = Always"

To date, the Sleep Hygiene Index has superior internal consistency with a non-clinical sample compared to previously published sleep hygiene instruments indicated by a Cronbach's alpha of 0.66 (Mastin et al., 2006). The Sleep Hygiene Index has good test-retest reliability and has been positively correlated with features of poor sleep hygiene. The Sleep Hygiene Index has also been positively correlated with the Epworth Sleepiness Scale and the Pittsburgh Sleep Quality Index component scores (Mastin et al., 2006).

#### *Positive and Negative Affect Schedule (PANAS)*

Watson, Clark, and Tellegen's (1988) Positive and Negative Affect Schedule was used to detect students' mood (see Appendix D). The PANAS is a 20-item, self-report, mood scale that was developed to measure positive and negative affect. Twenty words are grouped into two columns describing positive affect and negative affect. The participant is asked to indicate, on a 5- point scale, where 1 is "very slightly or not at all" and 5 is "extremely", the extent he or she generally experiences each mood state during a specific time frame. The time frames range from this "moment" to in "general". Each

response is scored from 1 to 5 on a scale of frequency of occurrence. Scores range from 10 to 50 on each scale, with higher scores indicating more positive or negative affect (Watson et al., 1988). Low positive affect and high negative affect has been suggested as distinguishing features of depression and anxiety (Tellegen, 1985). The PANAS can be completed in approximately 5 minutes.

Normative data for the Negative Affect scale revealed that this scale is not normally distributed and the Positive Affect scale also had a positive skew. To correct these issues, researchers created a table of percentiles to convert raw scores. These percentiles are used instead of the raw scores when interpreting an individual's score.

The PANAS has been shown to have a high internal reliability with alpha coefficients ranging from 0.86 to .90 for the Positive Affect scale (PA) and 0.84 to 0.87 for the Negative Affect scale (NA) in a non-clinical sample. Test and retest reliability was high for all of the different time frames; scores ranged from 0.86 to 0.90 on the PA scale, and between 0.84 to 0.87 on the NA scale (Watson et al., 1988). Convergent and discriminant validity were both excellent; convergent correlations ranged from 0.89 to 0.95, and discriminant correlations were low, ranging from -0.02 to -0.18 (Watson et al., 1988). A sample item question from the PANAS follows:

"Indicate to what extent you generally feel this way. Use the following scale to record your answers.

\_\_\_Interested                      \_\_\_Irritable

- 1-Very slightly or not at all
- 2-A little
- 3-Moderately
- 4-Quite a bit
- 5-Extremely"

### *Demographics Questionnaire*

A brief demographics questionnaire (See Appendix E) was created to gather socio-demographical information about each student, including gender, age, and ethnicity. This questionnaire can be completed in 2 to 5 minutes.

### *Sleep Hygiene Pretest and Post-test*

A 9-item pretest and post-test was created from the information presented during the Sleep Hygiene Intervention. This instrument was used exclusively for this study to test students' baseline knowledge of sleep-related topics and sleep hygiene (See Appendix F) before and after students view their respected interventions. The pretest and post-test are comprised of the same questions. To determine the Sleep Hygiene Pretest and Post-test's internal reliability, a small internet study was conducted with college and graduate students. The study was posted for approximately one week and the final sample consisted of 49 students. The results of the Cronbach's alpha analysis demonstrated that the Sleep Hygiene Pretest had an alpha of 0.23 and the Post-test had an internal reliability of 0.55. Although considered low, other sleep hygiene measures have also been found to have only fair internal reliability. For instance, the Sleep Hygiene Awareness and Practices Scale (Lacks & Rotert, 1986) and the Sleep Hygiene Self-Test (Blake & Gomez, 1998) have been found to have an internal consistency as measured by Cronbach's alpha of 0.47 and 0.54. The only other sleep hygiene measure to have higher internal reliability is the Sleep Hygiene Index, which has a Cronbach's alpha of 0.66 (Mastin et al., 2006). This test takes approximately 5 to 10 minutes to complete. A sample item question from the Sleep Hygiene Pretest and Post-test follows:

"Sleep is divided into two different types. During which type of sleep do most vivid dreams occur?"

a. NREM sleep b. REM sleep c. DREM sleep”

### *Sleep Hygiene Placebo Intervention*

A placebo intervention was constructed exclusively for students in the control group (see Appendix I). This intervention was created to keep both the control group and experimental group as equal as possible and to help reduce social interaction threats to internal validity (compensatory rivalry, resentful demoralization, etc.). The content of this intervention is made up of information pertaining to dreams and the perception of dreams. The topic of dreams and dream perception was selected because it is related to sleep in that dreaming usually occurs during sleep. The information in this presentation was collected from articles gathered from *Dreaming* (Bulkeley K., 2009; Kai-Ching Yu C., 2009; Nielsen T., 2003) a peer-reviewed, multidisciplinary journal. This intervention takes approximately 10 to 15 minutes to complete.

### *Sleep Hygiene Intervention*

This sleep hygiene intervention was created for students in the experimental group. It provided information about the nature of sleep, the importance of sleep, good sleep hygiene practices, and sleep restriction (see Appendix J). The information in this intervention was gathered from a published book on insomnia (Hauri, 1991), published articles on non-pharmacological treatments of sleep disorders (Morin, 1993; Glovinsky, 2008), and reputable websites [see references]. Recommendations from published articles on sleep education were also utilized to create this intervention (Brown & Buboltz, 2002). In addition, short questions and answers related to the information provided in this intervention were included in an attempt to make this intervention more interactive. This intervention takes approximately 10 to 15 minutes to complete.

### *Participant Feedback Form*

This form was created to understand the reasons participants used to complete this internet study (See Appendix K). Students had the option to choose a reason or to type in their own for completing this internet-based study. Since the proposed study was a relatively new concept in the area of sleep hygiene, it is important to determine the factors that affect the completion of an online study. This form also provided an opportunity for participants to enter a raffle by providing an e-mail address. This form takes approximately 1 to minute to complete.

### *Procedure*

The collection of surveys and interventions were created through the *Inquisite Survey Software*, a computer program that allows individuals to create, post, and manage surveys on the web. This survey software does not track IP addresses. The online study included the study information letter, the PSQI, the PANAS, the ESS, the Sleep Hygiene Index, the Demographics Questionnaire, the Sleep Hygiene Pretest and Post-test Questionnaire, the Sleep Hygiene Intervention and the Sleep Hygiene Placebo Intervention, and the Participant Feedback Form. The data collection began on June 2011 and ended in December 2011.

Participants were contacted at least twice throughout this study. During the first contact, all volunteers viewed the study information letter depicting the nature of the study and those who were not ODU students were prompted to provide an e-mail address. It was recommended that participants provided an e-mail address that did not contain any possible sensitive information, such as a last name. Originally, to further protect participants' confidentiality, a third party that had no connection was going to create

index values that linked to participants' e-mail addresses and responses to the surveys. After each participant had been assigned a specific value (i.e. a number) the third party would have de-identified the data and emailed it to the student investigator for analysis. At that time, the third party would have destroyed the list containing the e-mail addresses and their corresponding participant number. Only students from ODU signed up for the study so a third party was not needed. ODU's Sona system allows for researchers and participants to communicate anonymously. Each participant is assigned a Sona ID and that was the only identifying information the researcher had access to.

Participants were selected to either the control group or the experimental group (Group A or Group B). The students' year of birth was used to sort them. If the last digit of a participant's year of birth was odd, they were placed in the control group. If the digit was even, they were placed in the experimental group. Once sorted, all participants were asked to fill out the demographics questionnaire, the Sleep Hygiene Pretest, the PSQI, the PANAS, the ESS, and the Sleep Hygiene Index. Students in the control group (Group A) viewed the Sleep Hygiene Placebo Intervention and those in the experimental group (Group B) viewed the Sleep Hygiene Intervention. Both groups completed the Sleep Hygiene Posttest immediately after they completed their respective interventions. Each participant had at least one week to complete all of the aforementioned materials.

Two weeks after the initial contact, students were asked to fill out the PSQI, ESS, Sleep Hygiene Index, the PANAS, the Participant Feedback Form, and were asked to provide an e-mail address if they wished to participate in the Visa gift card raffle. Participants also had at least one week to complete these questionnaires. Some participants had to be prompted more than once to complete the study. The Sona system

is equipped to send reminders to participants without any party viewing each other's email addresses. This system was used until the majority of participants completed the study. After December 1, 2011, participants who had not completed the second part of the study were dropped.

## CHAPTER III

### RESULTS

All statistical analyses were performed with the Statistical Package for the Social Sciences (SPSS) Version 14.0 for Windows.

A total of 200 college students from ODU signed up for the first part of study and 138 (69%) completed both parts. The ages of participants ranged from 18 to 40 years. No students from NSU or EVMS signed up to participate. Sixty ODU students were in the control group and 78 ODU students were in the experimental group. Overall the sample was largely reflective of female (78.3%), Caucasian (45.6%), single (50.7%), non-smoking (88.4%), college students (100%), who live with a roommate (61.6%). Table 1 depicts demographic characteristics of the total sample, control group only and experimental group only.

Table 1  
*Demographics of the sample*

Characteristic	Control (n = 60)	Experimental (n = 78)	All Participants (n = 138)
Age, mean (SD)	20.97 (4.48)	19.35 (2.88)	20.05 (3.73)
Sex			
Female	41	67	108
Male	19	11	30
Ethnicity			
Caucasian	29	42	71
African American	25	28	53
Hispanic/Latino	6	7	13
Asian	2	3	5
Ame. Indian	1	3	4
Other	2	3	5
Preferred not to answer	0	2	2
Status			



Table 1 Continued

Characteristic	Control	Experimental	All Participants
Single	27	43	70
Married	5	2	7
In Relationship	28	33	61
Live			
Alone	4	2	6
Roommate	31	54	85
Spouse/Partner	10	2	12
Parents/Stepparents	13	20	33
Children	2	0	2
Smoker			
Yes	7	9	16
No	53	69	122
# of Cigarettes, mean			
Weekdays	5.14	3.78	4.38
Weekends	6.78	5.50	6.44
Smoke before going to bed on weekdays			
Yes	3	1	4
No	49	51	100
Sometimes	0	2	2
Smoke before going to bed on weekends			
Yes	3	2	5
No	48	49	97
Sometimes	0	3	3

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\*\* Missing data in smoking questions

### *Data Management and Preliminary Analyses*

Prior to conducting hypothesis testing, the data were scrutinized for missing values. No missing values were found. This sample size met the minimum of 138

participants that was needed to achieve adequate power, as determined by a power analysis conducted a priori, with power set at .80 and the alpha level set at .05.

The data were also screened for potential outliers, using the cutoff of three standard deviations above or below the mean to identify an outlier (Tabachnick & Fidell, 2007). Through the method of Winsorizing, all outliers were appropriately dealt with by transforming them to a number one unit larger or smaller than the next most extreme score in the distribution. This method reduced the impact of the outliers on the shape of the distribution while still allowing the observed values to remain deviant. Across all scales, a total of 10 scores were transformed via this method.

Data were also tested for normality, screening for any significant skewness and kurtosis. The level of skewness for all variables fell within the acceptable range to justify normality (Tabachnick & Fidell, 2007). Thus, all scales were found to be normally distributed. Descriptive statistics (i.e., means, standard deviations, skewness and kurtosis statistics) for dependent variables are reported in Table 2.

Table 2  
*Descriptive Statistics for All Dependent Variables*

Variable	<i>M</i>	<i>SD</i>	Skewness	Kurtosis	Range	Clinical Scores
PSQI Global Index Score Baseline	8.09	3.01	.050	-.336	0-21	≥ 5
PSQI Global Index Score Post-Intervention	6.12	2.86	.651	.158		
Sleep Hygiene Pretest	5.88	1.40	-.658	.448	0-9	NA

Table 2 Continued

Variable	<i>M</i>	<i>SD</i>	Skewness	Kurtosis	Range	Clinical Scores
Sleep Hygiene Posttest	6.40	1.30	.054	-.065		
Epworth Sleepiness Scale Baseline	7.75	3.63	.096	-.607	0-24	> 10
Epworth Sleepiness Scale Post-Intervention	7.83	4.11	.345	-.435		
Sleep Hygiene Index Baseline	36.25	5.82	-.233	-.473	0-52	34.66
Sleep Hygiene Index Post-Intervention	36.96	6.32	.066	-.359		
PANAS Positive Affect Baseline	33.67	6.53	.100	-.573	10-50	< 26 or low %
PANAS Positive Affect Post-Intervention	32.80	7.44	.033	-.412		
PANAS Negative Affect Baseline	20.04	6.75	.619	-.491	10-50	>23 or high %
PANAS Negative Affect Post-Intervention	19.22	7.24	.850	-.182		

Note. *N* = 138.

### *Group Differences in Sleep-Related Factors*

Analyses were performed to detect group differences in sleep quality, sleepiness, sleep hygiene practices, sleep and sleep hygiene knowledge, negative affect, and positive mood during baseline and after the interventions. Also, the reasons participants decided

to complete this study were also analyzed. Results indicated that there was a significant difference between the groups based on Negative Affect. Based on this information, the groups were not considered equal and each hypothesis was analyzed with and without NA as a covariate. Since using a covariate did not change whether a hypothesis was significant or not, only the results of the analyses without a covariate are presented below.

### *Sleep Quality*

To determine whether sleep quality, as measured by PSQI Global scores, differed between groups after the intervention, a mixed design analysis of variance (ANOVA) was performed with time (baseline, post-intervention), as the within-subjects variable, and type of group (control, experimental) as between-subjects variable. All necessary assumptions were met in order to justify running this analysis, including normality of sampling distributions of means and homogeneity of variance (Aron & Aron, 2003). Results of the analysis indicated that no significant difference was found,  $F(1, 136) = 0.63, p = .43$ , partial  $\eta^2 = .005$ . Sleep quality does not depend on the combination of type of group and time. On average, the control group ( $M = 7.58, SD = 3.06$ ) reported similar levels of sleep quality compared to those in the experimental group ( $M = 6.75, SD = 2.79$ ) after the intervention. Cronbach's alpha for the 16 items on the PSQI was .741. PSQI Global Index scores at or higher than 5 are considered in the clinical range.

In an effort to further examine the groups and to determine their sleep quality, a comparison of scores was conducted. At baseline, 77% (107) participants were considered "poor sleepers", or had a PSQI Global scores above 5, indicating poor sleep. At post-intervention, 51% (71) participants were qualified as poor sleepers. For those in

the control group, 35% (49) of them were categorized as "poor sleepers" at baseline and at post-intervention 26% (37) of them were considered "poor sleepers." In the experimental group, 42% (58) were "poor sleepers" at baseline and only 24% (34) were categorized as "poor sleepers."

### *Sleepiness*

To determine whether sleepiness, as measured by the ESS scores, differed between groups after the intervention, a mixed design analysis of variance (ANOVA) was performed with time (baseline, post-intervention), as the within-subjects variable, and type of group (control, experimental) as between-subjects variable. All necessary assumptions were met in order to justify running this analysis, including normality of sampling distributions of means and homogeneity of variance (Aron & Aron, 2003). Results of the analysis indicated that no significant difference was found,  $F(1, 136) = 0.42$ ,  $p = .84$ , partial  $\eta^2 = .001$ . Sleepiness does not depend on the combination of type of group and time. On average, the control group ( $M = 8.1$ ,  $SD = 3.81$ ) reported similar levels of sleepiness compared to those in the experimental group ( $M = 7.55$ ,  $SD = 3.93$ ) after the intervention. Cronbach's alpha for the 8 items on the ESS was .724. ESS scores at or higher than 10 are considered in the clinical range.

### *Sleep Hygiene Practices*

To determine whether sleep hygiene practices, as measured by SHI total scores, differed between groups after the intervention, a mixed design analysis of variance (ANOVA) was performed with time (baseline, post-intervention), as the within-subjects variable, and type of group (control, experimental) as between-subjects variable. All necessary assumptions were met in order to justify running this analysis, including

normality of sampling distributions of means and homogeneity of variance (Aron & Aron, 2003). Results of the analysis indicated that no significant difference was found,  $F(1, 136) = 3.83, p = .052$ , partial  $\eta^2 = .002$ . Sleep hygiene practices does not depend on the combination of type of group and time. On average, the control group ( $M = 36.43, SD = 6.65$ ) reported similar sleep hygiene practices compared to those in the experimental group ( $M = 36.75, SD = 5.60$ ) after the intervention. Cronbach's alpha for the 13 items on the SHI was .685. SHI scores at or higher than 34.66 are considered in the clinical range. The mean scores for this sample during baseline and post-intervention were almost similar to those found by Mastin et. al, 2006. In their study, the mean score was 34.66 and the standard deviation was 6.6.

#### *Sleep/Sleep Hygiene Knowledge*

To determine whether sleep hygiene and sleep knowledge, as measured by Sleep Hygiene Pretest and Posttest, differed between groups after the intervention, a mixed design analysis of variance (ANOVA) was performed with time (baseline, post-intervention), as the within-subjects variable, and type of group (control, experimental) as between-subjects variable. All necessary assumptions were met in order to justify running this analysis, including normality of sampling distributions of means and homogeneity of variance (Aron & Aron, 2003). A significant difference was detected,  $F(1, 136) = 4.97, p < .05$ , partial  $\eta^2 = .035$ . On average, the control group ( $M = 5.83, SD = 1.22$ ) reported less sleep and sleep hygiene knowledge compared to those in the experimental group ( $M = 6.83, SD = 1.19$ ) after the intervention. Cronbach's alpha for the 9 items on the Sleep Hygiene Pretest/Posttest was .331.

### *Negative Affect*

To determine whether negative mood, as measured by the Negative Affect total percentile on the PANAS, differed between groups after the intervention, a mixed design analysis of variance (ANOVA) was performed with time (baseline, post-intervention), as the within-subjects variable, and type of group (control, experimental) as between-subjects variable. All necessary assumptions were met in order to justify running this analysis, including normality of sampling distributions of means and homogeneity of variance (Aron & Aron, 2003). Results of the analysis indicated a significant difference between the groups during baseline,  $F(1, 136) = 6.65, p < .05$ , partial  $\eta^2 = .047$  and after the intervention,  $F(1, 136) = 9.15, p < .01$ , partial  $\eta^2 = .063$ . On average, the control group ( $M = 21.7, SD = 7.11$ ) reported higher negative affect compared to those in the experimental group ( $M = 18.77, SD = 6.21$ ) at baseline. Similarly, on average, the control group ( $M = 21.28, SD = 7.99$ ) reported higher negative affect compared to those in the experimental group ( $M = 17.63, SD = 6.20$ ) after the intervention. Cronbach's alpha for the 10 items on NA was .863. NA scores with a high percentile (Raw scores > 23) are considered in the clinical range.

### *Positive Affect*

To determine whether positive affect, as measured by the Positive Affect total percentile on the PANAS, differed between groups after the intervention, a mixed design analysis of variance (ANOVA) was performed with time (baseline, post-intervention), as the within-subjects variable, and type of group (control, experimental) as between-subjects variable. All necessary assumptions were met in order to justify running this analysis, including normality of sampling distributions of means and homogeneity of

variance (Aron & Aron, 2003). Results of the analysis indicated that no significant difference was found,  $F(1, 136) = .004, p = .948$ , partial  $\eta^2 = .000$ . Positive Affect does not depend on the combination of type of group and time. On average, the control group ( $M = 32.77, SD = 7.34$ ) reported similar positive affect compared to those in the experimental group ( $M = 32.83, SD = 7.57$ ) after the intervention. Cronbach's alpha for the 10 items on the PA was .867. PA scores with a low percentile (Raw scores < 26) are considered in the clinical range. Table 3 depicts the means and standard deviation of all of the dependent variables by type of group and time.

Table 3  
*Means (Standard Deviations) of Dependent Variables by Groups and Time*

Variables	Control (N=60)	Experimental (N=78)
PSQI Baseline	8.68 (3.23)	7.64 (2.76)
PSQI Post-Intervention	6.47 (2.89)	5.86 (2.82)
Sleep Hygiene Pretest	5.67 (1.48)	6.05 (1.33)
Sleep Hygiene Posttest	5.83 (1.22)	6.83 (1.19)
Epworth Sleepiness Scale Baseline	8.03 (3.61)	7.52 (3.66)
Epworth Sleepiness Scale Post-Intervention	8.17 (4.01)	7.56 (4.19)
Sleep Hygiene Index Baseline	35.58 (6.34)	36.77 (5.36)
Sleep Hygiene Index Post-Intervention	37.27 (6.95)	36.72 (5.83)
PANAS PA Baseline	33.95 (6.51)	33.45 (6.58)



Table 3 Continued

Variable	Control	Experimental
PANAS PA Post-Intervention	32.77 (7.34)	32.83 (7.57)
PANAS NA Baseline	21.70 (7.11)	18.77 (6.21)
PANAS NA Post-Intervention	21.28 (8.00)	17.63 (6.20)

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*Note.*  $N=138$

### *Reasons for Participating*

Of the 138 students who completed both parts of the study, 102 (73.9%) decided not to provide a reason for participating. For those who did provide a reason, 15 (10.9%) reported that they chose to partake in this study because they were required to participate in research, 9 (6.5%) of them stated that they wanted extra credit, 3(2.2%) of them completed the study because they were only interested in sleep, 4 (2.9%) students reported they were both interested in the topic of sleep and in the Visa gift card, another 4 (2.9%) stated other reasons for completing the study (i.e. the study was offsite), and 1 (.7%) person was interested in sleep, wanted extra credit, and was interested in the Visa gift card. A closer examination at the participants who were interested in sleep compared to those who were not yielded interesting results. First of all, the researcher looked at the change in Global PSQI scores from baseline to post-intervention by subtracting baseline scores from post-intervention scores. A negative number indicated that the Global PSQI score was lower at post-intervention than baseline, indicating improved sleep quality after the intervention. Secondly, only students who provided a reason for participating and

were in the experimental condition were used ( $N=15$ ). Thirdly, the group was further divided into those who were interested in sleep (3) versus those who were not interested (12). An independent t- test was run, with change in PSQI scores as the dependent variable and interested in sleep (yes, no) as the independent variable. Results indicated a significant difference in change PSQI scores in participants who were interested in sleep,  $t(13) = 2.54, p < .05$ . Those interested in sleep ( $M = -6, SD = 1.73$ ) had significantly higher changes in PSQI scores than those who were not interested in sleep ( $M = -2.5, SD = 2.19$ ) after the intervention. The use of change scores has been used in research with college students to determine differences in quality of sleep as measured by the PSQI (Trockel et al., 2011)

#### *Amount of Sleep*

Based on a recent research study conducted with college students and sleep (Buboltz, Jenkins, Soper, Woller, Johnson, & Faes, 2009), it was expected that this sample of students obtained approximately 7 hours of sleep per night. Results were consistent with this previous finding. For instance, the average number of hours slept by participants during baseline ( $M = 7.81, SD = 1.50$ ) and post-intervention were similar ( $M = 7.69, SD = 1.43$ ). This sample slept, on average, about 7.5 hours each night.

#### *Other Analyses*

An independent t-test was run to determine if there were gender differences within the dependent variables. Results of this analysis did not yield any significant findings. Another analysis focused on splitting the PSQI Global scores by using the median and seeing if there was a difference in response to the intervention. Similar to the previous analysis, there were no significant findings. A Pearson product- moment

correlation was conducted on age and the sleep variables (PSQI, ESS, SHI, and Sleep Knowledge). Significant relationships were found. Age was significantly positively associated with the Sleep Hygiene Index scores at baseline and at post-intervention: SHI baseline ( $r = .173, p < .05$ ), SHI post-intervention ( $r = .252, p < .01$ ). Results appear to suggest that age is related to sleep hygiene practices. Other analyses included using change scores and only using "clinical" scores for each of the dependent variables to determine whether differences existed between the groups. Results indicated no significant findings.

Another set of analyses focused on demographic variables and sleep quality, as measured by the PSQI Global score. An independent t-test was run to determine if there were differences between sex, living situation, and smoking status in sleep quality at baseline and post-intervention. No significant findings were found between sex, living situation, and sleep quality. However, there was a significant difference in smoking status and sleep quality,  $t(136) = 2.66, p < .05$ . Smokers ( $M = 9.94, SD = 3.94$ ) had higher PSQI Global scores than non-smokers ( $M = 7.85, SD = 2.80$ ) at baseline. To determine differences between ethnicity and relationship status with sleep quality, an ANOVA was run. Results did not yield significant findings. Lastly, a Pearson product-moment correlation was conducted on age and sleep quality. No significant relationships were found.

Other analyses focused on demographic variables and total sleep time as provided by the PSQI. An independent t-test was run to determine if there were differences between relationships status, living situation, and ethnicity in total sleep time. No significant findings were found between relationship status, living situation, most

ethnicities, and total sleep time. However, there was a significant difference between African Americans and Caucasians in total sleep time,  $t(106) = 2.54, p < .05$ . African Americans ( $M = 2.27, SD = .809$ ) slept less than Caucasians ( $M = 1.90, SD = .665$ ) at baseline. The mean scores above are based on specific total sleep time groupings. Participants who slept less than 5 hours had a score of 3, those who slept between 5-6 hours had a score of 2, and participants who slept for 6-7 hours had a score of 1

## CHAPTER IV

### DISCUSSION

The overall purpose of the current study was to investigate the impact of an internet-based intervention on student's sleep quality. Although interventions presented in the classroom have been used to increase sleep quality in college students and internet interventions for insomnia (Ritterband, Bailey, Thorndike, Lord, Farrell-Camahan & Baum, 2011; Thorndike, Ritterband, Saylor, Magee, Gonder-Frederick, & Morin, 2011) have also been examined, few studies (Trockel et al., 2011) have evaluated the impact of an intervention delivered solely through the internet with a non-clinical sample of college students. This research study sought to help close that research gap by exploring whether an internet-based intervention could improve students' sleep quality. In measuring sleep in students, many factors were observed, including sleepiness, sleep hygiene practices, knowledge of sleep and sleep hygiene, sleep quality, and affect. Overall, a significant finding in this study at post-intervention was that college students who received the sleep hygiene intervention increased their knowledge of sleep and sleep hygiene behaviors compared to students who received the placebo intervention.

#### *Hypothesis 1*

It was hypothesized that students in the experimental group would report significantly greater improvement in sleep quality. The current study found no significant differences between the groups in their sleep quality at post-intervention. That is, both the control group and experimental group did not show any differences in their sleep quality, as measured by the PSQI at post-intervention.

Other studies have used the PSQI with college samples to determine sleep quality. For example, a study by Lund et al., 2010 indicated that 34.1% of their sample (N=1,125) had PSQI scores at or below 5. However, another study that used the PSQI with college students (Carney, Edinger, Meyer, Lindman, & Istre, 2006 ) had a higher rate of good sleepers (57%). Compared to both studies, this sample had, at baseline, 22.4% (N=138) of participants with PSQI scores at 5 or below, and at post-intervention, the number increased to 48.6%. It appeared that the distribution of good sleepers in this particular study, post-intervention, was between the percentages attained by the aforementioned studies.

The PSQI has been validated in several studies (Buysse, 1988; Beck, 2004; Magee, 2008) with different populations and with the “gold standard” of sleep measurement, polysomnography. Polysomnography provides measures of specific sleep stages and precisely monitors physiological events (respiratory, cardiac, neuromuscular, etc.) through the use of electroencephalogram (EEG), electrooculogram (EOG), electrocardiogram (ECG), and electromyogram (EMG) (Beck, Schwartz, Towsley, Dudley, & Barsevick, 2004). Polysomnography is usually used in a sleep laboratory and can be uncomfortable, inconvenient, and expensive for a study participant. Although it can provide an accurate measurement of how much an individual sleeps, it cannot determine the quality of it. This is up to the participant. This is partly the reason that researchers prefer to use a self-report measure, such as the PSQI. In this particular study, the use of polysomnography would have provided more accurate readings of time the participant fell asleep, when they awoke, and how many times they entered into REM sleep. However, with regards to sleep quality, perception is everything. Sleep is

subjective and people need different amounts of sleep. Only an individual, not a machine, can determine if their sleep is restful and restorative.

It is important to note that even though the PSQI has been validated multiples times with clinical populations, the use of this instrument has not been validated with young adults in college settings (Digdon, 2008). It is possible that the PSQI may not capture all of the subtleties associated with the irregular sleeping schedule of college students. Future research should focus on validating the PSQI with this population.

### *Hypothesis 2*

The second hypothesis predicted that the experimental group would improve their sleep hygiene practices. Similar to the previous hypothesis, this one was not supported by the results of the study. Students in both groups did not show significant differences in their sleep hygiene practices, as measured by the Sleep Hygiene Index, after they received the intervention. However, a trend was observed in the experimental group's mean score. Compared to the control group, the experimental group's score did not increase at post-intervention.

It is unclear why students in the experimental group did not change their sleep hygiene practices after learning about good sleep hygiene. It is posited that some of the sleep hygiene practices measured by the Sleep Hygiene Index were outside of students' control and therefore difficult to change. For instance, this measure asks about sleeping on a comfortable bed. For students who live in dorms, the mattress issued may be old and uncomfortable, and students may not be allowed or may not know to request a new one. Another practice the SHI asks about is only using a bed for sleep and sex. Again, for

those students living in dorms, their room is used for multiple purposes (i.e. studying, socializing, etc.)

Sleeping in an uncomfortable room is yet another sleep hygiene practice that college students may not have control over. For instance, when living in a dorm, students may not have control over the noise level in the hallway or even in their room if they share it with another student. One roommate may stay up all night watching television or talking with friends while the other one may be trying to sleep. Another possible reason for a room to be uncomfortable is the temperature. If each roommate has different preferences for room temperature, this can make it difficult to sleep. Lastly, the SHI asks about getting out of bed at different times throughout the week. For college students, not all classes may be available at the same time every day; students have to create their schedules based on their availability. This may explain why students were unable to report a difference in the SHI during the post-intervention; they had no control over their class schedule. Perhaps future studies can be more aware of sleep hygiene practices that can be changed while students are residing in dorms. If this is not possible, may be it would be helpful for researchers to focus only on students who live in apartments, where they have more control over their sleeping environment.

### *Hypothesis 3*

The third hypothesis predicted that students in the experimental group would decrease their daytime sleepiness significantly more than students in the control group. This hypothesis was not supported by the current data. Students did not show any significant change from baseline to post-intervention. A possible reason for the lack of change could be that students did not experience high levels of sleepiness at the onset of



the study; therefore, they may have not seen a purpose or had the motivation to change their behavior. Students' scores at baseline were relatively low ( $M = 7.75$ ) compared to the clinical populations that were used in the validation study of this measure. Those individuals had scores greater than 10. The scores gathered in this study were consistent with findings by Lund (2010) and lower than findings by Digdon (2008). In particular, Lund (2010) found that first year college students had mean ESS scores of 7.3 ( $SD = 3.6$ ) and Digdon's sample of college students had a mean ESS scores of 9.19 ( $SD = 4.04$ ). Another possible reason this hypothesis was not supported could be the amount of time allotted for behavior change. For instance, participants were only given two weeks to change their behavior. It is possible that this amount of time was too short. As ESS scores are based on a behavior (i.e. likelihood of falling asleep) that is impacted by a change of sleep practices, if there was not enough time for change to occur, these scores would, therefore, remained the same. This is what the results of the data analysis from baseline to intervention for both groups illustrate. If only more time was needed for participants to alter their sleeping practices, perhaps a difference in scores from baseline to post-intervention would have been detected through the ESS scores.

#### *Hypothesis 4*

The fourth hypothesis suggested that students' mood in the control group and the experimental group would not differ significantly. This hypothesis was not supported. Students in the control group had higher NA scores compared to those in the experimental group. High NA scores are associated with anxiety and depression. These differences in scores were also seen at post-intervention. The student researcher included this measure to ensure that, if significant changes were detected between the control and

experimental group, the differences in scores were due to the intervention and not to mood. As research has indicated, there is an association between mood and sleep.

#### *Hypothesis 5*

Lastly, it was predicted that the experimental group would increase their knowledge of sleep and sleep hygiene practices. This hypothesis was the only one that was supported by the data. However, this finding was expected since the questions from the Sleep Hygiene Pretest and Post-Test came directly from the Sleep Hygiene Intervention. The student researcher wanted to ensure that participants in the experimental group actually read through information and recognized the information two weeks later. The analysis indicated that those in the experimental group had similar mean scores during the pretest and post-test.

#### *Reasons for Participation*

The information gathered through the Participant Feedback Form was useful. It shed light on the reasons this sample decided to partake in the study. Thirty-six students filled out this form and more than half of students reported school requirement or extra credit as the main reason for participating. For the few that were interested in sleep and were in the experimental group, results indicated that they had significant changes in their sleep quality scores from baseline to post-intervention compared to those not interested in sleep. One can argue that perhaps those individuals who were interested in sleep were motivated to improve their sleep and used the information they learned from the intervention to change their behavior. However, there is no data to support this. To know for sure, it would have been useful to ask the experimental group if they had utilized any

of the information they learned throughout the study and if they noticed a change in their sleep quality.

Another interesting observation on reasons for participating was the ease of recruitment for this sample. All volunteers in this study used the Sona system to participate in this research. The Sona system let the researcher provide a summary of the study, the length of the study, and the amount of credit provided if the study was completed. This system also allowed for the exchange of anonymous information between parties. Lastly, it gave greater recruitment opportunities to the researcher because the study was available to anyone with a Sona ID at ODU. The other students that were recruited in a traditional fashion (i.e. flyers, teacher announcement) did not participate in the study. Based on the aforementioned observation, it appeared that internet recruitment, through the Sona system, was more effective than traditional methods in reaching students and giving them the opportunity to participate in this study.

### *Limitations*

There are several limitations to this study that warrant mention. The first one is that all students that were targeted did not have the same incentives for participating. No NSU or EVMS students had the opportunity to gain extra credit from completing this study. Only ODU students were given that option. This limited the sample size and prevented the researcher from collecting important information from medical students and from a predominantly African American college sample. In addition, the extra credit at ODU may have attracted certain kinds of students and introduced a selection bias; this incentive may have attracted students who are self-motivated and wanted to ensure a good grade in a class. Or perhaps the extra credit attracted individuals who were

struggling to pass a class. The researcher did attempt to answer this question through the Participant Feedback Form. Unfortunately, the majority of the participants did not provide an answer. Since it was difficult to distinguish between the two types of participants, it is difficult to determine if the findings in this study are generalizable to a college population.

The absence of participants from the medical school was also a drawback, as they were a large target population for this study. Recruitment in the medical school consisted of posting flyers in high volume areas, such as the library. It appeared that a more active recruitment process was needed to enroll this particular group of students. Due to the lack of participation within this group, the findings in this study only apply to a sample of college students.

The literature is limited when it comes to evaluating the sleep of American undergraduate medical students. Most of the research has been conducted with American residents or International undergraduate medical students (Abdulghani, Alrowais, Bin-Saad, Al-Subaie, Haji, & Alhaqwi, 2012; Medeiros et al., 2002; Eller et al., 2006). The few studies that have focused on this population have indicated that sleep medicine knowledge among this group is low (Mahendran et. al., 2004) and sleep disturbances and their academic achievements are related (Abdulghani et al., 2012). This is an important area of research that, regrettably, this study was unable to further advance.

Motivation to change is another factor that needed closer examination. Students did not have an external incentive to change their behavior; the incentive given was only to complete the study. If this sample of students did not perceive their sleeping behaviors as problematic, then there was no motivation to alter their behavior based on the

information given through the intervention. Since the researcher did not count on motivation as being such an influential factor in this study, and therefore, did not assess for it, it is unknown whether the intervention did not help students improve sleep quality because students were not motivated to change or because the intervention itself was ineffective.

Another limitation to this study was that the questionnaires required the participants to summarize their sleep habits over several weeks. Accurate results of their sleep behaviors may not have been obtained because of memory difficulties. In addition, not all participants completed the second part of the study in two weeks, as the researcher had expected. Some participants took longer than two weeks to complete the study. This delay may have affected their responses if significant events, such as midterms or finals, were taking place before or after this two week period.

A shortcoming in this study was that the sample, based on their scores on the sleep-related questionnaires at baseline, did not appear to have significant sleep problems across all variables. For instance, on the ESS, the mean score for all participants ( $M = 7.75$ ) was below what is considered mild sleepiness (Digdon, 2008) and on the SHI, the mean score ( $M = 36.25$ ) was similar to what Mastin (2006) observed on his validation study of the SHI. This is perhaps one of the biggest limitations to the study. If only the students who had significant sleep problems were allowed to participate, then the researchers would have a much better sense of the impact the Sleep Hygiene Intervention would have had on these participants. Furthermore, the researcher did not directly ask the participants if they were satisfied with their sleep quality or with the number of hours

they slept during baseline. If this question was included, then it would have been easier to decipher which individuals to focus on during the analysis.

It is unclear whether students in the experimental group benefited at all from participating in this study. Unlike other internet studies, this intervention only used psychoeducation; other studies have utilized cognitive-behavioral therapy strategies as part of their intervention (Trockel et al., 2011). Perhaps knowledge of the importance of sleep and sleep hygiene practices may prevent future problems from developing or perhaps it will have no impact at all. In addition, students' study habits may have changed based on the information this group was given or perhaps the students did not make any changes at all. Researchers truly do not know if any components of the Sleep Hygiene Intervention had an impact on students.

Although there are limitations to this study, there are also strengths. First of all, the information regarding the number of hours slept by this particular college sample is higher than what some research studies have reported in the past. Studies by Singleton, Wolfson, & Royce (2009) and Pilcher, Ginter, & Sadowsky (1997) reported hours of sleep in some college samples to be less than 8 hours. The majority (51.4%) of participants in this study slept at least 8 hours. Granted that the study began in June, during the summer break when there is less academic demand on students, the majority of the participants completed the study throughout the fall semester. This seemingly well-rested sample of college students may be unique or perhaps there has been a slow moving trend in sleep becoming more important to college students.

Another strength is that the entire study was conducted online. Past studies in this area have used in-person contact and the internet to disseminate information (Trockel et

al., 2011). Because participants were able to complete the entire study online without in-person contact, it suggested that human contact is not absolutely necessary for the completion of research studies focusing on sleep in college populations. Online studies also have greater recruitment opportunities and improved user convenience (Thorndike et al., 2011). This study also provided more support for the use of the internet in conducting research.

### *Future Directions for Research*

Future research should focus on only targeting college students with self-proclaimed unsatisfactory sleep. As mentioned before, good quality sleep can be subjective; even though we have objective measures of sleep, unless an individual is unhappy with their sleep, the objective measures provide futile information. An experiment that delivers an intervention that fit students' needs determined by baseline assessment would yield more informative data. Future studies should also focus on grouping individuals with poor sleep satisfaction based on their level of motivation. Knowing this from the beginning, would help researchers know which techniques are more effective for each group. Perhaps individuals with high motivation only need information and recommendations, whereas those with low motivation need guidance and more follow-up.

Another focus of future research is asking participants exactly what aspects of an intervention was most useful and why. If researchers know what aspect was most helpful to students, then the interventions can be more tailored in the long run. In addition, research has indicated that stress can sometimes impact a person's sleep. For instance, in a study by Lund et al., 2010, 20.1% of students reported that stress interfered with their

sleep at least once a week. In this particular study, the level of stress perceived by students was not measured. It would be beneficial for researchers to consider stress as a possible barrier to obtaining adequate amount of sleep and include stress management techniques in the intervention. Lastly, as the internet becomes a more prevalent tool in conducting research, future studies should focus on ways to decrease attrition and consider methods to enhance participation retention in internet studies.

### *Recommendations*

Overall, past research has indicated that adequate sleep quantity and good sleep hygiene are important for students (Buboltz, Jenkins, Soper, Woller, Johnson, & Faes, 2009). To promote good sleep practices in students, it is recommended that counseling center staff, on-campus health care providers, and for those students living on campus, residential assistants (RAs), should consider making sleep education a priority (Buboltz et al., 2009). Learning about sleep hygiene practices now may benefit students later when they are older as sleep may become more fragile. For medical students, it would be especially helpful to witness health care providers take an interest in evaluating sleep habits during routine check-ups, not only to promote good sleep behaviors, but also to model to how important it is to ask about sleep practices. Lastly, for college students, to ensure good sleep hygiene practices are followed, counselors and RAs should help students incorporate this new information into their routines and help them resolve possible barriers to changes in their sleep habits (Buboltz et al., 2009).



## CHAPTER V

### CONCLUSION

The importance of sleep in college students can take a backseat to all of the new and exciting opportunities the college experience offers. However, lack of sleep can hinder academic performance and possibly disrupt mental health in some students. Knowledge of ways to cope with sleepiness in this population is limited. In a study by Digdon (2008), college students infrequently identified getting more sleep as a way to prevent sleepiness, instead, the majority stated that keeping busy or distracting oneself was effective in relieving sleepiness. It appears that the dissemination of why sleep is important is still lacking. Internet-based interventions may be one avenue that students with self-proclaimed poor sleep can use to help improve their sleep.

Future research is still needed to determine what components of an online sleep intervention are most useful to students. More research is needed to determine why some students have good sleep habits. In particular, it would be helpful to discover their beliefs about the importance of sleep, their motivation for getting adequate amount of sleep, their level of sleep knowledge, and lastly, their sense of mastery over sleep practices. With this information in hand, it would be prudent to utilize it when creating sleep interventions for this population. Lastly, instead of relying on self-report, it would be beneficial for future researchers to figure out ways to utilize more objective measures, such as polysomnography, to accurately measure sleep time that is friendly to a university setting. Perhaps using the internet with this device is the next step to conducting sleep research with college students. As technology moves forward, the way research is conducted needs to adapt to it.

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## APPENDIX A

## PITTSBURGH SLEEP QUALITY INDEX (PSQI)

## Instructions:

The following questions 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.

1. During the past month, when have you usually gone to bed at night?  
Usual bed time \_\_\_\_\_
2. During the past month, how long (in minutes) has it usually take you to fall asleep each night?  
Number of minutes \_\_\_\_\_
3. During the past month, when have you usually gotten up in the morning?  
Usual getting up time \_\_\_\_\_
4. During the past month, how many hours of actual sleep did you get at night? (This may be different than the number of hours you spend in bed.)  
Hours of sleep per night \_\_\_\_\_

For each of the remaining questions, check the one best response. Please answer all questions.

5. During the past month, how often have you had trouble sleeping because you...
  - (a) Cannot get to sleep within 30 minutes
    - ☐ Not during the past month
    - ☐ Less than once a week
    - ☐ Once or twice a week
    - ☐ Three or more times a week
  - (b) Wake up in the middle of the night or early morning
    - ☐ Not during the past month
    - ☐ Less than once a week
    - ☐ Once or twice a week
    - ☐ Three or more times a week
  - (c) Have to get up to use the bathroom
    - ☐ Not during the past month
    - ☐ Less than once a week
    - ☐ Once or twice a week
    - ☐ Three or more times a week
  - (d) Cannot breathe comfortably
    - ☐ Not during the past month
    - ☐ Less than once a week
    - ☐ Once or twice a week



- ☐ Three or more times a week
  - (e) Cough or snore loudly
    - ☐ Not during the past month
    - ☐ Less than once a week
    - ☐ Once or twice a week
    - ☐ Three or more times a week
  - (f) Feel too cold
    - ☐ Not during the past month
    - ☐ Less than once a week
    - ☐ Once or twice a week
    - ☐ Three or more times a week
  - (g) Feel too hot
    - ☐ Not during the past month
    - ☐ Less than once a week
    - ☐ Once or twice a week
    - ☐ Three or more times a week
  - (h) Had bad dreams
    - ☐ Not during the past month
    - ☐ Less than once a week
    - ☐ Once or twice a week
    - ☐ Three or more times a week
  - (i) Have pain
    - ☐ Not during the past month
    - ☐ Less than once a week
    - ☐ Once or twice a week
    - ☐ Three or more times a week
  - (j) Other reason(s), please describe \_\_\_\_\_
6. During the past month, how would you rate your sleep quality overall?
- ☐ Very good
  - ☐ Fairly good
  - ☐ Fairly bad
  - ☐ Very bad
7. During the past month, how often have you taken medicine (prescribed or "over the counter" to help you sleep?
- ☐ Not during the past month
  - ☐ Less than once a week
  - ☐ Once or twice a week
  - ☐ Three or more times a week

8. During the past month, how often have you had trouble staying awake while driving, eating meals, or engaging in social activity?
- ☐ Not during the past month
  - ☐ Less than once a week
  - ☐ Once or twice a week
  - ☐ Three or more times a week
9. During the past month, how much of a problem has it been for you to keep up enough enthusiasm to get things done?
- ☐ No problem at all
  - ☐ Only a very slight problem
  - ☐ Somewhat of a problem
  - ☐ A very big problem
10. Do you have a bed partner or roommate?
- ☐ No bed partner or roommate
  - ☐ Partner/roommate in other room
  - ☐ Partner in same room, but not same bed
  - ☐ Partner in same bed

## APPENDIX B

### EPWORTH SLEEPINESS SCALE

How likely are you to doze off or fall asleep in the following situations, in contrast to feeling just tired? This refers to your usual way of life in recent times. Even if you haven't done some of these things recently try to work out how they would have affected you.

Use the following scale to choose the **most appropriate number** for each situation:

- 0 = would **never** doze
- 1 = **slight chance** of dozing
- 2 = **moderate chance** of dozing
- 3 = **high chance** of dozing

*It is important that you answer each question as best you can.*

#### **Situation**

1. Sitting and reading
2. Watching TV
3. Sitting, inactive in a public place (e.g. a theater or a meeting)
4. As a passenger in a car for an hour without a break
5. Lying down to rest in the afternoon when circumstances permit
6. Sitting and talking to someone
7. Sitting quietly after a lunch without alcohol
8. In a car, while stopped for a few minutes in the traffic

## APPENDIX C

### THE SLEEP HYGIENE INDEX

Please rate the following statements using the scale below:

5 = Always, 4 = Frequently, 3 = Sometimes, 2 = Rarely, 1 = Never

1. I take daytime naps lasting two or more hours.
2. I go to bed at different times from day to day.
3. I get out of bed at different times from day to day.
4. I exercise to the point of sweating within 1 hour of going to bed.
5. I stay in bed longer than I should two or three times a week.
6. I use alcohol, tobacco, or caffeine within 4 hours of going to bed or after going to bed.
7. I do something that may wake me up before bedtime (for example: play video games, use the internet, or clean).
8. I go to bed feeling stressed, angry, upset, or nervous.
9. I use my bed for things other than sleeping or sex (for example: watch television, read, eat, or study).
10. I sleep on an uncomfortable bed (for example: poor mattress or pillow, too much or not enough blankets).
11. I sleep in an uncomfortable bedroom (for example: too bright, too stuffy, too hot, too cold, or too noisy).
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.

## APPENDIX D

## POSITIVE AND NEGATIVE AFFECT SCHEDULE (PANAS)

This scale consists of a number of words that describe different feelings and emotions. Read each item and then mark the appropriate answer in the space next to that word. Indicate to what extent you generally feel this way, that is, how you feel on average. Use the following scale to record your answers

1	2	3	4	5
Very slightly	A little	Moderately	Quite a bit	Extremely
Or not at all				

☐ Interested  
☐ Distressed  
☐ Excited  
☐ Upset  
☐ Strong  
☐ Guilty  
☐ Scared  
☐ Hostile  
☐ Enthusiastic  
☐ Proud

☐ Irritable  
☐ Alert  
☐ Ashamed  
☐ Inspired  
☐ Nervous  
☐ Determined  
☐ Attentive  
☐ Jittery  
☐ Active  
☐ Afraid

**APPENDIX E****DEMOGRAPHICS QUESTIONNAIRE**

Please answer the following questions as accurately as you can. The answers you provide are completely anonymous.

**1. Student Status:**

- ☐ College student
- ☐ Medical student
- ☐ Other

**2. Gender:**

- ☐ Female
- ☐ Male

**3. Age: \_\_\_\_****4. Ethnicity:**

{Choose all that apply}

- ☐ African-American/Black
- ☐ Asian
- ☐ Caucasian
- ☐ Hispanic/Latino
- ☐ American Indian
- ☐ Other
- ☐ Prefer not to answer

**5. Current Relationship Status:**

- ☐ Married
- ☐ Divorced
- ☐ Separated
- ☐ Single (Not in a relationship)
- ☐ In a Relationship

**6. Living situation:**

- ☐ Live alone
- ☐ Live with a roommate(s)
- ☐ Live with spouse/partner
- ☐ Live with parents/step-parents
- ☐ Live with children

**7. Do you smoke?**

- ☐ Yes
- ☐ No

8. Number of cigarettes per day on weekday\_\_ on weekend\_\_

9. Do you smoke before going to bed on weekdays?

- ☐ Yes
- ☐ No
- ☐ Sometimes

10. Do you smoke before going to bed on weekends?

- ☐ Yes
- ☐ No
- ☐ Sometimes

**APPENDIX F****SLEEP HYGIENE PRETEST AND POST-TEST**

The following questions pertain to sleep. Please answer them as best you can.

1. Sleep is divided into two different types. During which type of sleep do most vivid dreams occur?
  - a. NREM sleep
  - b. REM sleep
  - c. DREM sleep
2. Your body has three systems that regulate sleep, the homeostatic system, the circadian system, and the:
  - a. Endocrine system
  - b. Arousal system
  - c. Circulatory System
3. The circadian system is based on your internal clock; it produces a rhythm of sleep and wakefulness that lasts about:
  - a. 12 hours
  - b. 24 hours
  - c. 32 hours
4. Different activities during the day/night can interfere with sleep. Which of the following does not:
  - a. Drinking coffee
  - b. Drinking alcohol
  - c. Taking a warm bath
5. A good snack before bed is a:
  - a. Chocolate cookie
  - b. Spicy taco
  - c. Banana
6. Insufficient sleep can affect your ability to
  - a. Drive
  - b. React quickly
  - c. Both a + b
7. Which of the following things can affect your sleep:
  - a. Uncomfortable bed
  - b. Room temperature
  - c. Both a + b
8. REM sleep helps:
  - a. Recall new information
  - b. Create neurons
  - c. Increase energy



9. When you don't get enough sleep, you may experience:

a. Irritability

b. Ecstasy

c. Both a + b

## APPENDIX G

### STUDY INFORMATION LETTER

Dear Student:

The purpose of this study is to evaluate whether an online sleep hygiene intervention for students will improve students' sleep quality. Although limited research has been conducted to evaluate the effectiveness of in-class sleep education programs on students, it is unknown to the student investigator at this time whether delivering sleep hygiene education through the internet is effective. The student researcher is interested in learning whether this new method of delivery is as successful or more successful as in-class education.

You must be at least 18 years old and enrolled in your first year of college at Old Dominion University, Norfolk State University, or enrolled in your first year at Eastern Virginia Medical School in order to participate. In addition, only students who DO NOT have a current diagnosis of a sleep disorder/anxiety disorder/mood disorder or are being treated for a sleep disorder/anxiety disorder/mood disorder can participate.

If you choose to participate you will be randomized into one of two study groups. This means that you will be assigned into a group by chance. All students will have an equal chance of being placed in either Group A or Group B. Once sorted, you will complete questionnaires during two different time points. The questionnaires pertain to demographic information, sleep-related topics and behaviors, and symptoms of positive and negative moods. In addition, information related to sleep will be presented. During the first contact, the study will take approximately 40-50 minutes to complete. You will have one week to complete the first part of this study. During the second contact, the study will take approximately 30-40 minutes to complete. You will also have one week to complete the second part of this study. You will be contacted via e-mail to complete all of the parts described above. To protect the validity of this study, it is very important that you do not discuss the information presented to you during the study with anyone once the study has begun until the study has ended three weeks later.

Your participation is very important and completely voluntary. There is no compensation for your participation; however, you will have the opportunity to enter a raffle after you complete all parts of the study. Four randomly selected students will win a \$25 Visa gift card. Winners will be selected and notified upon completion of the study.

If you do not feel comfortable participating, you are free to withdraw from this study at any point, without penalty, by simply closing your browser window. The nature of this study requires your e-mail address and information will be sent to you through the internet. Because of this, there is a minimal risk that your responses could be traced back to your e-mail address if you do not close your browser window; however, no other identifying or sensitive information will be collected. As a precaution, it is recommended that you provide an e-mail address that has no identifying information, (i.e. last name).

By proceeding to the next page you are consenting that you are at least 18 years old, are enrolled in your first year of school at ODU, NSU, or EVMS, and have no current diagnosis of a sleep disorder/anxiety disorder/mood disorder and are not being treated (i.e. receiving medications) for a sleep disorder/anxiety disorder/mood disorder.

The student investigator of this study is Giuliana Farias, M.A., who is working under the supervision of Dr. J. Catesby Ware, Division of Sleep Medicine at Eastern Virginia Medical School. This study has been reviewed by the IRB (#10-10-WC-0222). If you have any questions or concerns about the study, please forward them to [Gfarias1082@hotmail.com](mailto:Gfarias1082@hotmail.com) or [warejc@evms.edu](mailto:warejc@evms.edu).

Thank you for your participation.

Giuliana Farias, M.A.  
Student Investigator  
[Gfarias1082@hotmail.com](mailto:Gfarias1082@hotmail.com)

J. Catesby Ware, Ph. D.  
Principal Investigator  
[warejc@evms.edu](mailto:warejc@evms.edu)  
(757) 388-3322

## APPENDIX H

### RECRUITMENT FLYER

Eastern Virginia Medical School

COLLEGE FRESHMAN and FIRST YEAR EVMS STUDENTS

Wanted for a research study investigating sleep quality

The purpose of this research study is to evaluate students' sleep and mood during their first year in college or medical school. Eligible participants must be:

- At least 18 years old
- Be in their first year of college or medical school
- Not currently being treated for a sleeping disorder (i.e. taking sleeping pills or seeing a sleep specialist), anxiety disorder, or mood disorder (depression, bipolar disorder, etc.)

All participants who complete the study will be eligible to enter a raffle and four students will win a \$25 Visa Gift Card.

To participate in this study please send an e-mail to: [studentsleepstudy@gmail.com](mailto:studentsleepstudy@gmail.com). In the heading please write: "first year student sleep study"

This research is conducted under the direction of Dr. J. Catesby Ware, EVMS Division of Sleep Medicine Director, (757) 388-3322 or [WareJC@EVMS.edu](mailto:WareJC@EVMS.edu)

"Advertising approved by EVMS IRB # 10-10-WC-0222"

## APPENDIX I

### SLEEP HYGIENE PLACEBO INTERVENTION (SLIDES)

#### SLIDE 1

Most people have dreams every night. Some individuals remember these dreams and others do not. We are interested in the content of students' dreams, students' perceptions of dreams, and how dreams impact students' behaviors. We are also interested in how dreams impact an individual's quality of sleep. Please answer all of the questions as best as you can and thank you for your participation.

#### SLIDE 2

There are four main theories on why humans dream. One theory states that dreams contain emotions buried in our unconscious; ultimately, dreaming helps uncover these feelings. A second theory states that dreams help pick apart information and determine what is useful; in turn, providing insight into solving problems. A third theory indicates that dreaming helps the brain sort out information gathered throughout the day and gets rid of unnecessary information that can confuse the brain. Lastly, a fourth theory states that dreams are the brain's attempt to make sense of random neuron firings occurring within the brain.

#### SLIDE 3

1. Which dream theory do you agree with the most?
  - a. Dreams contain hidden emotions
  - b. Dreams sort out information and helps solve problems
  - c. Dreams help throw out unnecessary information
  - d. Dreams are the brain's attempt to make sense of random neuron firings

## SLIDE 4

Some people have experienced religiously significant dreams, or mystical dreams. These mystical dreams usually contain atypical or nonhuman beings, friendly exchanges, positive emotions, and good fortunes. Mystical dreams are described as powerful, realistic, and unforgettable.

2. Have you ever had a "mystical dream"?

☐ Yes

☐ No

☐ Unsure

## SLIDE 5

Mystical dreams can have reoccurring themes. Some themes are:

- a. Death ( being visited by a deceased loved one offering comfort)
- b. Christianity (being visited by God, Jesus, saints, or angels,)
- c. Light (seeing a light that is positive and "beautiful")
- d. Precognition (foreseeing the death of a loved one or seeing events before they occur)
- e. Nightmare (negative situations involving fighting, chasing, struggling, etc.)
- f. Impact (experiencing a powerful dream but not being able to recall the details, only the sensations felt afterwards)

## SLIDE 6

3. Have you ever had mystical dreams involving (check all that apply):

☐ Death

☐ Christianity

- ☐ Light
- ☐ Precognition
- ☐ Nightmare
- ☐ Impact
- ☐ Never had a mystical dream

#### SLIDE 7

Some people experience dreams that are associated with psychotic delusions. Delusions are strong false beliefs, including: believing one is Jesus or a famous person, believing the FBI is spying on him/her, believing one is superior to everyone else, etc.

4. Have you ever had any of the following dreams (choose any that apply):

- ☐ Someone tracking you or spying you
- ☐ An alien taking over a loved one's body and using it to spy on you
- ☐ Technology (TV, computer, cameras, etc.) being used to spy on you
- ☐ Never had any of the types of dreams described above

#### SLIDE 8 Continued from previous slide...

Have you ever had any of the following dreams (choose any that apply):

- ☐ Becoming a celebrity/someone influential (Oprah, Brad Pitt, Hulk Hogan, the president of your country, etc.)
- ☐ Becoming a certain form of god or an influential religious figure (God, Allah, Jesus, the Virgin Mary, etc.)
- ☐ Becoming a superhero (Spiderman, Superman, Wonder Woman, Batman, etc.)
- ☐ Never had any of the types of dreams described above

## SLIDE 9

Research shows that individuals believe that dreams offer significant insight into themselves and the world they live in. In fact, people treat the content of their dreams as more significant than the content of some thoughts. It appears that dreams are more meaningful than thoughts because dreams do not have an obvious external cause; dreams appear to be generated from nowhere.

5. Do you believe the content of certain dreams carry more significance than the content of certain thoughts?

☐ Yes

☐ No

☐ Unsure

## SLIDE 10

Research demonstrates that the content of a dream influences some people's behavior while awake. Below are some behaviors that may be influenced by the content of dreams. Please determine if any of the dream contents below would/has influenced your behavior:

6. If you dreamt of a plane crash the night before you took a flight somewhere, would you still take that flight?

☐ Yes

☐ No

☐ Unsure

7. A week before a final exam, you dreamt that you failed the exam. Would this dream influence you to study harder?

☐ Yes



☐ No

☐ Unsure

8. If you dreamt that your teeth fell out, would you make an appointment with a dentist?

☐ Yes

☐ No

☐ Unsure

SLIDE 11 Continued..

9. If you dreamt that one of your family members was hurt, would you call them to see if he or she is alright?

☐ Yes

☐ No

☐ Unsure

10. If you dreamt that your significant other (boyfriend/girlfriend, wife/husband, fiancé) was being unfaithful, would you confront them?

☐ Yes

☐ No

☐ Unsure

SLIDE 12

Research has demonstrated that when people have dreams about a positive interaction with a friend(s), the dream was perceived as more meaningful.

11. Do you agree with this research conclusion?

☐ Yes

☐ No

☐ Unsure

SLIDE 13

Research has also demonstrated that when a dream portrays a friend in a negative light (he or she is saying bad things about you, he or she is doing something mean to you, etc.), people are more likely to find the dream as insignificant and dismiss it.

12. Do you agree with this research finding?

☐ Yes

☐ No

☐ Unsure

SLIDE 14

We are interested in determining the different types of dreams students have. Please check all that apply:

13. Have you ever dreamed of:

☐ Being chased/attacked by someone or something

☐ Trying to do something more than once

☐ Eating tasty meals

☐ Finding money

☐ Being naked

☐ Falling/flying

☐ Being hurt/killed

☐ Being awake but paralyzed

☐ Seeing an angel, saint, God, or any religious figure

☐ Having a sexual experience

☐ Seeing a UFO or a mythical creature (unicorn, leprechauns, genies, etc.)

SLIDE 15

14. In the past year, have your dreams affected your quality of sleep?

☐ Yes or most of the time

☐ No or rarely

☐ Unsure

15. In the past month, have you woken up during the night or early in the morning because of an unpleasant dream (nightmare)?

☐ Yes

☐ No

☐ Don't remember

16. In the past month, have you had unpleasant dreams (nightmares)?

☐ 1-2 times a week

☐ More than 2 times a week

☐ 1-2 times a month

☐ More than 2 times a month

☐ Have not had any unpleasant dreams/nightmares in the past month

SLIDE 16

Thank you for your participation! You will be contacted one more time by e-mail to fill-out some questionnaires. Once you complete these surveys, you will have the option to enter a raffle for a \$25 Visa gift card!

## **APPENDIX J**

### **SLEEP HYGIENE INTERVENTION (SLIDES)**

#### **SLIDE 1**

You will be presented with general information about sleep; more specifically, what kinds of activities interfere with sleep, and ways to achieve good quality sleep every night. Some slides in this presentation will only provide information and others will test your knowledge of sleep habits. Thank you for participating in this study!

#### **SLIDE 2**

Sleep is divided into two types: non-rapid-eye movement (NREM) sleep and rapid-eye movement (REM) sleep; both types of sleep are experienced throughout the night. During NREM sleep, most cognitive and physiological functions slow down, and the restoration of physical energy occurs. During REM sleep the brain is active and physical movements are visible, specifically on the eyes as the name suggests, but the majority of the body is paralyzed. REM sleep is the type of sleep where most people have vivid dreams and is associated with cognitive functions, including consolidating memories.

Sleep decreases as you age; an infant sleeps approximately 16-18 hours per day, a child sleeps 10-11 hours a day, and adolescents to young adults sleep for about 7-9 hours per day.

#### **SLIDE 3**

Sleep is very sensitive and is affected by many things, including highly emotional experiences. For example, a big fight with a loved one, shocking news, or even physical events, such as a car accident can affect sleep. Sleep is also affected by tasks that are difficult to manage or problems that are tough to figure out. Sleep may also be

jeopardized in the face of a real or perceived threat, such as when soldiers at war need to stay awake to protect themselves.

#### SLIDE 4

There are a number of other things that can interfere with sleep. Answer the following question to see if you know what affects sleep:

1. True or False: Not participating in any activities during the day and lying down to rest helps you fall asleep faster at night.

☐ True      ☐ False

#### SLIDE 5

False- Being inactive during the day or even laying down to rest in the daytime CAN impact your sleep.

Your body has three systems that regulate sleep. One of them is called the homeostatic system. This system manages how much sleep you need. The more time you spend awake and alert, the more sleep you will need at night. If you are inactive during the day or sleep during the day, the homeostatic system tells the body that you do not need much sleep at night. This can be a problem in the evening when you are trying to fall asleep.

#### SLIDE 6

Here are some other activities that can cause problems for the homeostatic system:

- Napping during the day or evening
- Spending too much time in bed
- Sleeping more than usual on the weekends.

## SLIDE 7

Naps are a good way to get some rest, but if taken at the wrong time or for too long, they can cause problems at night. For instance, 2 hour naps in the late afternoon or evening can negatively affect your sleep quality. If it is necessary for you to take a nap, you should take it after lunch, before 2 or 3 o'clock in the afternoon. These naps should also last for less than 1 hour.

## SLIDE 8

The circadian system also regulates your sleep. This system is based on your internal clock, which is also called the circadian cycle; it produces a rhythm of sleep and wakefulness that lasts about 24 hours. This system does not take into account your prior sleep history.

## SLIDE 9

2. True or False: Too little or too much light in the morning can affect your circadian cycle.

☐ True      ☐ False

## SLIDE 10

True-Little exposure to light during the day can cause you to "sleep in" because your body does not know it's daytime. Too much light early in the morning causes you to wake up earlier than usual. Having an irregular pattern, such as waking up later than usual (due to not enough light) or waking up too early (due to more light than is normal for you) can confuse your circadian rhythm and cause problems at night when you are trying to fall asleep. To prevent this, wake up and go to bed around the same time

everyday, even on the weekends. If this is not possible, try to get the same amount of sleep each day.

#### SLIDE 11

Other activities during the day can interfere with sleep. Drinking too much coffee, or other liquids with caffeine (ice tea, hot chocolate, soda, cold/allergy medicine) too late in the day (approximately within 4-5 hours of your planned bedtime), or even exercising in the late evening can interfere with sleep. These activities stimulate the arousal system (the 3<sup>rd</sup> system responsible for sleep). This system promotes wakefulness and counteracts the homeostatic system. The arousal system prevents you from falling asleep.

#### SLIDE 12

There are other activities that can activate the arousal system. These include:

- Smoking
- Eating a late evening meal
- Getting home late and not having enough time to wind down
- Having a distressing conversation before bed

#### SLIDE 13

Eating certain foods around bedtime can affect sleep. If hungry, you should avoid eating heavy, sugary, or spicy foods. A snack that is rich in the amino acid tryptophan, such as milk or bananas can help decrease hunger and help you sleep.

#### SLIDE 14

For some people it is very difficult to sleep the recommended 7-8 hours per night; some sleep for approximately 6 hours. Sleeping for only 6 hours a night can affect your academic performance. Research suggests that REM sleep, which occurs approximately

every 90 minutes, is needed to help you remember newly learned information. When you do not get enough hours of sleep, it is difficult for your brain to recall information you learned the day before. This is why cramming for a test is not an effective method of studying. Your brain needs enough sleep to be able to process new information. Try to get 7-8 hours of sleep every night, especially the day before a big test!

#### SLIDE 15

3. Answer the following question: Insufficient sleep affects a person's ability to:

1. Focus
2. React quickly
3. Drive
4. All of the above

#### SLIDE 16

4. All of the above- Not sleeping enough can lead to many problems including all of the ones mentioned in the previous slide. In addition to increased mistakes, problems communicating, and mood changes, insufficient sleep can also make individuals more susceptible to illnesses and can increase the risk of experiencing anxiety and depression

#### SLIDE 17

How do you know if you are not getting enough sleep? Here are some common symptoms related to sleep loss:

1. Feeling sleepy in class
2. Not able to focus and concentrate on school-related work (reading, writing, etc.)
3. Feeling sad, irritable, or anxious
4. Not performing as well in sports and being susceptible to injuries or illness



## SLIDE 18

There is another activity that can affect your academic performance; drinking alcohol. Alcohol has negative effects on sleep. Alcohol actually fragments sleep, so after one night of drinking, you may have trouble recalling information the next day. If you are going to drink alcohol, make sure you drink it 4-6 hours before your scheduled bedtime.

## SLIDE 19

Exercising regularly during the day is not only beneficial for your health; it can also help you sleep better at night. Individuals who exercise report less sleep problems and fall asleep faster than individuals who do not exercise. If you are having trouble sleeping, try exercising during the day to see if this helps you sleep better at night.

## SLIDE 20

You already know that certain daily and nighttime activities can affect your sleep. There are other physical things in your bedroom that can impact the quality of your sleep.

4. Which of the things below do you think affect your sleep? (Check all that apply)

- A. Bed
- B. Room temperature
- C. Amount of noise and light
- D. Television
- E. All of the above

## SLIDE 21

All the items listed above can determine whether you get a good night's sleep. For example, an uncomfortable bed can cause you to toss and turn during the night and interfere with your sleep. It is important to evaluate whether your mattress or bedding

needs to be replaced. The temperature in your room is also important. The room should be cool and well-ventilated. Rooms that do not have adequate air flow or are too hot or too cold can keep you awake at night. The noise level and amount of light in your room can affect your sleep as well. Too much noise or too much light can keep you from falling asleep. A sleep mask to cover your eyes can be used if you share a room or if too much light comes from your window. Ear plugs or a white noise maker can drown out loud noises and help you fall asleep. These sleep aids can be found at your local pharmacy. Watching television or playing video games before your bedtime is a bad idea. Both activities are arousing and can keep you awake.

#### SLIDE 22

##### Bedtime Rituals:

It is important to establish bedtime rituals to provide your body cues that it is time to sleep. Here are a number of things you can do before bed:

1. Eat a light snack (remember to eat snacks rich in tryptophan!)
2. Practice relaxation activities such as yoga or deep breathing to help relieve anxiety
3. Take a warm bath/shower, this will raise your body temperature, but the drop in temperature after the bath/shower will make you feel sleepy.
4. Do some light reading

#### SLIDE 23

It is also very important to remember that you should only go to bed when you are sleepy. If you are in bed and unable to fall asleep after 15 minutes, get out of bed and do something relaxing and avoid stimulating thoughts or activities.

**SLIDE 24**

Follow the suggestions above and remember that you have the power to control your sleeping environment! A good night's sleep is in your hands.

Thank you for your participation! You will be contacted one more time by e-mail to fill-out some questionnaires. Once you complete these surveys, you will have the option to enter a raffle for a \$25 Visa gift card!

**APPENDIX K**  
**PARTICIPANT FEEDBACK FORM**

Thank you for participating! We are interested to know why you chose to complete this study. Please choose your reason from the following options:

- A) I was interested in the topic of sleep
- B) I wanted to win the Visa Gift Card
- C) Other \_\_\_\_\_

If you would like to participate in the raffle to win a \$25 Visa gift card, please enter your e-mail address here: \_\_\_\_\_

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**EDUCATION**

- 2006 – 2012      **Psy.D. in Clinical Psychology, Virginia Consortium  
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- 2008      **M.A. in Community/Clinical Psychology, Norfolk State  
University, Norfolk, VA**
- 2004      **B.S. in Psychology, University of Florida, *With Honors*,  
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**CLINICAL TRAINING IN PSYCHOTHERAPY**

- July 2011 – June 2012      Clinical Intern  
Baylor College of Medicine (APA-Accredited), Houston, TX
- AUG 2007 – Dec 2007      Graduate Student Counselor  
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- Aug 2006 – Dec 2006      Graduate Student Intake Interviewer  
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- July 2009 –April 2010      Graduate Student Assessment Clinician  
Hampton-Newport News Community Services Board  
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