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Anxiety and Sleep Disorder Comorbidity: Affecting the College Students' Performances

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ANXIETY AND SLEEP DISORDER COMORBIDITY: AFFECTING THE COLLEGE STUDENTS' PERFORMANCES

ANXIETY AND SLEEP DISORDER COMORBIDITY: AFFECTING THE COLLEGE

STUDENTS' PERFORMANCES

A dissertation submitted in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy in Health Science

By

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May 2012
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Abstract

The purpose of this study is to determine the effects that anxiety disorders and sleep disorders have on students' academic performance. The prevalence of both disorders is rising in the college student population. This study examines those who have been physician diagnosed with the one or both of the disorders and how the students' grade point average (GPA) is affected.

The National College Health Assessment was used for data collection; this survey assesses college students' health habits, behaviors, and perceptions. The sample was comprised of 57 institutions representing every region in the U.S. totaling 34,208 participants. Data was acquired through questions asking if the student had been physician diagnosed with anxiety, physician diagnosed with a sleep disorder, and a question inquiring about the student's GPA.

An ordinal logistic regression was used to analyze the data. It was found that the comorbid condition of anxiety and sleep disorders, nor anxiety disorders were significant predictors of GPA. Sleep disorders were the only significant predictor for GPA, $p < 0.0001$, odds ratio of 1.28. Therefore a student with a sleeping disorder is 1.28 times more likely to receive a lower GPA than student who does not have a sleep disorder.

This dissertation is approved for recommendation
to the Graduate Council.

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Chapter I: Introduction

College students represent a unique population; these students are emerging into adulthood and embarking on unique distinctive stresses that play a significant role in every facet of their life. These unique stresses, when chronic can induce increased morbidity rates of anxiety and sleep disorders, among many others (Chrousos, 2009). Research suggests, discussed below, that these effects of stress may have an affect on the students' well being resulting in reduced academic performance.

Sleep has received considerable research for years; however, research continually overlooks the college student population until recently. Perhaps this oversight is due to the misconception that a college student's lack of sleep is due to their chosen lifestyles of partying and procrastination. However, recent findings have displayed a different story to the contrary. As many as 73% of students report sleep disturbances, symptoms range from mild and sporadic to chronic and constant (Buboltz, Brown, & Soper, 2001).

Sleep quality extends much further than the commonly prescribed 8 hours of sleep every night. Attempting to sleep for 8 hours and having quality sleep progressing through the desired REM (Rapid Eye Movement) cycles are very different; the lack of this REM sleep can have devastating effects on a person both physically and psychologically, anxiety included. As discussed in the review by Lee, and Douglass (2010), REM sleep may affect psychiatric disorders in two different channels. It has been found that REM sleep may have a significant impact on memory, cognitive function, and diminishing the emotional valence of memories and in turn affect a number of psychiatric disorders (Lee & Douglass, 2010). It was also noted that sleep and psychiatric disorders share an influence of similar neurochemistry (Lee & Douglass,

2010).   Beyond sleep duration, sleep latency, and number of sleep awakenings are also factors contributing to sleep quality.

Anxiety is an umbrella term to house a variety of types of anxiety. Regardless of the manifestation, each disorder centers around excessive irrational fear and dread (NIH, 2009a) and may result in sleep disturbances (Ohayon & Roth, 2001) and a decrease in academic performance (Spielberger, 1962). Forms of anxiety affecting college students include test anxiety (Driscoll, Evans, Ramsey, & Wheeler, 2009), separation anxiety (American Psychiatric Association, 2000), and social anxiety (Purdon, Antony, Monteiro, & Swinson, 1999), among other forms.

A relationship has been established between anxiety and sleep disorders; insomnia is highly prevalent among individuals suffering from anxiety (Roth, 2009); however, little research has been conducted to examine the effects of this comorbidity on college students. Additionally the majority of research conducted regarding anxiety only examines clinical levels, while self-reported levels may still have a significant impact on the inhabitant. Because the impacts of sleep deprivation are linked to poor daily function and in turn inhibiting a student's academic performance (Taras & Datema, 2005), it deems necessary for the relationship to be examined amongst anxiety, sleep habits, and academic performance.

Many professors and students alike can contend to the importance of class attendance to a successful academic career, but despite this apparent common knowledge college classrooms are plagued with low attendance rates (Friedman, Rodriuez, & McComb, 2001). While some cases of absenteeism are avoidable, many cases are due to unavoidable reasons. Specific reasons pertaining to this study may include extreme exhaustion or illness from sleep deprivation.

Because college students appear to have an onset of multiple and unique stressors, and it is found that sleep is easily effected by stress and anxiety (Roth, 2009), it deems necessary to examine how these two phenomenons are effecting the academic performance of college students.

Purpose of the Study

The purpose of this study is to examine the comorbidity of anxiety and sleep disorders among college students and the effects on the college students' academic performances.

Hypotheses

1. Students who have been physician diagnosed with anxiety will have a lower GPA than those students who have not been physician diagnosed with anxiety.

2. Students who have been physician diagnosed with a sleep disorder will have a lower GPA than those students who have not been physician diagnosed with a sleep disorder.

3. Students who have been physician diagnosed with comorbid anxiety and a sleep disorder will have a lower GPA than those students who have not been physician diagnosed with the comorbid conditions of anxiety and a sleep disorder.

4. Students who have been physician diagnosed with the comorbid condition of anxiety and a sleep disorder will have a lower GPA than those students who have only been physician diagnosed with one of the disorders, anxiety or a sleep disorder.

Significance of the Study

College students are the next generation entering the work force and making an impact on our current society and economy. It is important that college students not only have a successful

academic career to successfully contribute to society, but also learn coping mechanisms to deal with life's many stressors that are lurking at every stage in life.

As emerging research suggests high morbidity rates of both anxiety and sleep disorders plague the college student population, further research needs to be completed to examine the effects of these morbidities on the college student. By finding how college students are affected by sleep deprivation and anxiety, strategies can be developed and implemented to help students cope with these morbidities.

By providing students with strategies to better manage their new stressors, the students' will be healthier now and in the future. Additionally, the students will be more receptive to their academic experiences and more adept in developing social skills needed for life beyond college. College students will impact our society, therefore enhancing their overall experience, health, and wellness through their college years will only benefit the society that we all are affected by.

Delimitations

The study was delimited to participants of the fall 2009 National College Health Assessment. The fall 2009 NCHA had 57 institutions distribute the survey, compiling 34,208 individual participants (ACHA, 2009). Institutions participating in the distribution of the survey include both two-year and four-year public and private organizations (ACHA, 2009). The institutions represent a variety of geographic regions, Carnegie Foundation Classifications, and campus settings (ACHA, 2009).

Limitations

Limitations to this study include the means of data collection; the survey is self-reported and lends itself to the respondents' own interpretations and perceptions. It is possible that students respond according to social and environmental norms, however anonymity was

guaranteed in hopes to deter most false responses. An additional concern regards the selection of the participants. Participating universities are self-selecting, however the universities do represent all regions within the U.S. and only universities who distributed the survey to students in a random fashion were included in the dataset.

The GPA variable is also limiting to the research. Because no definition of scale was provided to determine GPA, it may not be consistently reported the same by all participants. Additionally, it may have been beneficial to have the GPA as a continuous variable rather than a categorical (ordered) variable.

Definition of Terms

Sleep disorder. A Sleep disorder is a broad term characterized by a long-term, chronic sleep problem encompassing more than 70 different disorders (Patient Education Institute, 2008)

Anxiety disorders. An anxiety is characterized by the feeling of fearfulness and uncertainty; it becomes a disorder when it lasts for six months or more (National Institute of Mental Health, 2010).

National College Health Assessment. The National College Health Assessment (NCHA) was developed by the American College Health Association (ACHA) to facilitate health service providers, faculty, researchers, and student affairs professionals to better understand the health status of the diverse college student population (ACHA, 2005). The survey assesses college students' health habits, behaviors, and perceptions; specific topics covered by the NCHA includes alcohol, tobacco, and other drug use, sexual health, weight, nutrition, and exercise, mental health, personal safety, violence, and grade point average (ACHA, 2005).

Chapter II: Review of Literature

Sleep

Sleeping is necessary and something that the typical human will spend one third of their life in the sleeping state (Jenson, 2003). However, for many, sleep has become frustrating and difficult to obtain due to sleep disorders. It has been regarded as common knowledge that we all require 8 hours a sleep per night, however many don't get this recommended amount of undisturbed sleep whether it be due being refreshed after less or due to sleep disturbances. Professor James B. Maas of Cornell (1998), a psychology and sleep expert, extends the eight hours per night claim to nine or ten hours of sleep per night for many and states "Between the seventh and eighth hour is when we get almost an hour of REM (rapid eye movement) sleep, the time when the mind repairs itself, grows new connections and puts it all together. REM sleep occurs about every 90 minutes, and the periods of REM sleep get longer as the night progresses. If you're a six-hour sleeper, you're missing that last, important opportunity to repair and to prepare for the coming day." (Maas, 1998). Insufficient sleep has also been linked to chronic diseases such as diabetes, cardiovascular disease, obesity, and depression (Center for Disease Control, 2007).

As with many health concerns, it often takes years of unhealthy habits to show their health consequences. Sleep deprivation falls into this category, however, it also has immediate implications such as affects on cognition as well as a vital role in the immune system. These implications should be of great concern to the sleep deprived college student, considering many college student's primary responsibility is their academic success and experience. As noted in the introduction, as many as 73% of students report occasional sleep disturbances and another 15% (n=191) were found to have poor sleep quality overall using the Sleep Quality Index (SQI)

(Buboltz, Brown, & Soper, 2001). The SQI is an 8-item self-report scale; those scoring a 0 or 1 were considered to have good sleep quality and those scoring a 2-8 were considered to have poor quality of sleep (Buboltz, Brown & Soper, 2001). The results are similar to those found in original standard Finnish sample, except for the poor sleeper classification; There were more poor sleepers among college students than in standard population, 15% versus 9% respectively (Buboltz, Brown & Soper, 2001). Moreover, the college student population had higher frequencies for many of the sleep difficulties questioned including taking longer than 30 min. to fall asleep, difficulties falling asleep more than three times a week, morning tiredness, and waking too early. Buboltz, Brown and Soper (2001) concluded that the college student population had a reduced quality of sleep when compared to the standard population, noting that the quality of sleep (not the quantity) of sleep is related to overall well-being and health.

Furthermore, Buboltz, Brown and Soper (2001) study's recommendations suggest: "Universities and college authorities should acknowledge that students' sleep habits and patterns probably are significant concerns that warrant educational programs and interventions. The officials may want to provide students with training about appropriate sleep behaviors and explain how those habits and patterns are related to adjustment and performance."

While no research was found on how many universities offer this training and education, through a simple online search the educational programs seemed to be limited to only a few universities. Additional research such as this project may provide additional evidence to support the suggestion made above.

Sleep disorders. When chronic sleep deprivation is occurring, it is often due to a sleep disorder. As reported by the National Institute of Health (NIH) (2006), among the most common sleep disorders are insomnia, sleep apnea, restless leg syndrome, and narcolepsy.

Insomnia is the inability to initiate or to maintain sleep (CDC, 2007). There are two types of insomnia, primary and secondary; secondary of which is the most common type (NIH, 2009b). Secondary insomnia, also known as comorbid insomnia, is a symptom or a side effect of another problem i.e. medications or medical conditions (NIH, 2009b). Oppositely, primary insomnia is not due to medical conditions or medications, but is often triggered by chronic stress or emotional upset (NIH, 2009b). Insomnia can cause problems with focusing, learning, and remembering as well as creating a feeling of irritability; moreover, insomnia is also associated with several health concerns of which will be discussed later (NIH, 2009b).

Sleep apnea is defined as having one or more pauses in breathing or shallow breaths while you sleep (NIH, 2010a). The most common form of sleep apnea is obstructive sleep apnea; this occurs when there is a collapse or blockage of the airway during sleep (NIH, 2010a). While most often this condition is experienced by those who are overweight, anyone can be affected (NIH, 2010a). The lesser common form of sleep apnea is central sleep apnea; this form is experienced when the area of the brain that controls breathing does not send the correct signals to the breathing muscles resulting in no breathing for brief periods of time (NIH, 2010a). A number of health concerns associated with sleep apnea will be discussed in subsequent sections.

Restless leg syndrome (RLS) is a condition that results in a strong urge to move your legs, and upon doing so relieves the strange unpleasant feeling that occurs with the disorder (NIH, 2010b). RLS makes it difficult to fall and to stay asleep and therefore often causing daytime sleepiness (NIH, 2010b). While the severity of the condition can range from mild to

severe, it can have significant impacts on learning, work and other daily activities as well as your health (NIH, 2010b).

Narcolepsy is a condition characterized by severe daytime sleepiness; those who suffer from narcolepsy fall asleep suddenly even during conversation, eating, or other activities (NIH, 2010c). The cause of narcolepsy is unknown, but a chemical found in the brain that promotes wakefulness, hypocretin, is found at low levels in those with narcolepsy (NIH, 2010c). Similar to the other sleep disorders discussed, those with narcolepsy often find it difficult to function as school, work, and home due to the extreme tiredness (NIH, 2010c). Direct health effects will be discussed in the next section.

Health effects. There continues to be a debate on the actual role of sleep plays in the immune system, regardless, it does appear to have an effect on it. While the actual molecular mechanisms may still be unknown, sleep deprivation and primary sleep disorders show a decrease in important immune cell numbers (Bryant, Trinder, & Curtis 2004). Those decreased immune cell numbers will rise back to normal levels after recovery sleep according to some studies, while other studies have reported to the contrary (Bryant, Trinder, & Curtis, 2004). Because of this decrease in the immune system, students become more susceptible to illness and therefore miss class more often and miss more opportunity to learn, affecting their academic performance.

Individual sleep disorders do have some unique consequences, but because each disorder results in loss of sleep, they share many of the health ailments associated with sleep disorders. The sleep disorders discussed previously are all associated with significant immediate morbidities including nighttime distress, impaired cognitive functioning including alertness,

concentration and memory, impaired daytime functioning and increased risks of accidents (Zammit, 2007).

Narcolepsy and sleep apnea have some of the more unique conditions associated with sleep disorders. Narcolepsy may cause cataplexy, hallucinations, and sleep paralysis (NIH, 2010c). Sleep apnea is also associated with other health ailments that one may not necessarily originally associate with sleep disorders including high blood pressure, heart attack, stroke, obesity, diabetes, heart failure, and arrhythmias (NIH, 2010a). Insomnia is also associated with depression and a sense of anxiousness (NIH, 2009). RLS is also associated with depression and the addition of mood swings (NIH, 2010b). While individual sleep disorders do have some specific health impairment results, they also share many significant impacts to health. One of these shared consequences is the increased chance of work-related or driving accidents (NIH, 2010a).

Students and sleep. The increased sleep disorders among college students are in due part to the ever competitive work market, increased pressure to maintain high grades, and the increased levels of stress and anxiety. Moreover, schedule variability is synonymous to a college student's life including irregular class times, late nights, timing of social events, etc., this variability is related to sleep disturbances as well (Jensen, 2003).

College students may have earned the notorious reputation of sleeping the day away, or habitual 'nappers', or simply just sleeping too much. However, recent studies are providing information to refute this reputation. Sleep disorders among college students have been steadily increasing since the 1950's (Carskadon & Taylor, 1997). In a study by Buboltz Jr, Brown, and Soper (2001) revealed that 73% of college students reported occasional sleep problems and 15% suffered from chronic poor sleep, compared to only 10% of the adult population has recorded

sleep disorders (CDC, 2007). Among first year university students in Taiwan, 44% recorded sleep related issues (Yang, Wu, Hsieh, Liu, & Lu, 2003). Within this population more males than females experienced insomnia, where females reported more often having poorer quality of sleep than males (Yang et al., 2003).

Brown, Buboltz and Soper (2002) used the Pittsburgh Sleep Quality Index (PSQI) and the Sleep Hygiene Awareness and Practice Scale (SHAPS) on a southern university sample to analyze college students' sleep hygiene knowledge and practices. It was found that the simply having good sleep-hygiene knowledge is very weakly correlated with good sleep hygiene and is not correlated with good quality of sleep. Where sleep hygiene is defined as "behavioral practices based on our understanding of sleep physiology and pharmacology, which have been identified to promote good sleep (Hauri, 1977). However, there is a stronger relationship between good sleep hygiene practices and good quality of sleep (Brown, Buboltz, & Soper, 2002). In addition, it was also found that the regression model used to examine sleep-hygiene practices and quality of sleep suggested a much more complicated relationship (Brown, Buboltz,& Soper, 2002); therefore requiring further investigation into the phenomenon. Examples provided by Brown, Buboltz, and Soper (2002) include changing practices such as maintaining a consistent sleep/wake cycle and satisfying one's thirst prior to bed time are easy changes, however controlling one's worry maybe a much more difficult task. While Brown, Buboltz, and Soper (2002) mention that altering one's sleep/wake schedule maybe an easy change, it may prove to be much more difficult as explained above by Jensen (2003).

Differences in preferred timing of sleep behavior may also have a significant impact on the quality of sleep a student receives and their academic performances and presence. It was found in a study by Cortesi, Giannotti, Ottaviano, and Sebastiani (2002) that students who

preferred going to sleep later and waking later experienced more sleep disorders, more daytime sleepiness, fell asleep in class more often and did poorer academically than those students who preferred earlier bed times and preferred earlier wake times. Physiological changes occur during puberty that increase the preference to go to sleep later (Carskadon, Vieira, & Acebo, 1993), but it can also be socially influenced (Czeisler, 1995).

Sleep and GPA. There is significant evidence that sleep disturbances can affect academic performance. While there are still results indicating no affect, flaws in the studies may be to blame. Notable flaws or shortcomings include measuring GPA as the sole source of academic success and using only one sleep disturbance factor as a measure of sleep disturbances.

Because elementary school often has many more measures of academic achievement and success than do colleges or universities, it may be easier to see academic shortcomings due to sleep disturbances. Many studies have examined the relationship betweens sleep and academic achievement among elementary school children unlike the few studies focusing on college students.

In a study performed by Ravid, Afek, Suraiya, Shahar, and Pillar (2009), it was found that there is a significant positive correlation between sleep efficiency and academic achievements in reading, writing, math, and overall achievement. These results occurred when sleep efficiency was defined as percent of true sleep time from total time in bed (Ravid et al., 2009). In this study, academic achievement was measured using the formal end of year exam that tests reading, writing and math as well as using the teacher's personal evaluation of the child's performance during the year (Ravid et al., 2009. Both assessments, test and teacher evaluation, were graded using a using a 3-point scale (1=failure, 2=good, and 3=very good), then

the two scores were aveaged; children who had an achievement score of less than 1.33 were considered as failed first graders (Ravid et al., 2009).

Ravid et al. (2009) found further supporting evidence by looking at students suffering from sleep awakenings, sleep-breathing disorders, periodic leg movements, as well as parasomnia symptoms (all symptoms of poor sleep quality); these students had a negative correlation with academic achievement. These sleep disturbances were recorded through the Technion sleep questionnaire developed by Pillar and Lavie (1998) and through a one-week ambulatory actigraphy sleep recording (Ravid et al., 2009). The actigraphy records sleep movements that register above a predetermined threshold, indicating sleep disturbances (Ravid et al., 2009). In addition to these findings Ravid et al. also found that there were significant sleep pattern difference among students who failed the first grade and those that passed. Sleep disturbances were measured with both subjective and objective measures. When using the objective measure, of those students who failed the first grade, 66% of them had lower than 90% sleep efficiency, where as those students who passed the first grade, only 8% had a sleep efficiency of less than 90% (Ravid et al. 2009). These finding again indicate a need to examine the affects of sleep disturbances on college students' academic performances.

In this study performed by Ravid et al. (2009), as in any study had strengths and weaknesses. A less sensitive actigraphy was used over a polysomnography; while the polysomnography may have provided a better insight into the students' sleep disturbances, it was not feasible to use in-home for each student for the one-week recording period (Ravid et al., 2009). It was deemed more important to allow the student to sleep at home in hopes of a more natural sleep for that student (Ravid et al., 2009). Additionally, the number of first graders failing is minimal; therefore the study group was quite small (n=6), which makes generalization

more difficult (Ravid et al., 2009). A wider recruitment may be necessary to gather a larger study sample. Lastly, much of the academic achievement is based on a one-attempt end of the year test. For students who are poor test takers, this method may not be the most ideal. However, including the teacher's opinion does help counter balance this downfall.

In a study performed by Paul, Panton, and Marzigliano (2008) academic performance was examined in reference to healthy habits practiced by university students. Healthy sleep habits were included in this study; results indicated that sleep habits had no affect on academic performance (Paul, Panton, & Marzigliano, 2008). Results were contradicting to those found in the study performed by Kelly, Kelly, and Clanton (2001); they found that long sleepers seemed to have higher GPA's than short sleepers. However, males did show similar results in Paul, Panton, and Marzigliano's 2008 study. Males seemed to earn higher GPA's if they were longer sleepers, unlike females, where they showed a slight decline when they were longer sleepers (Paul, Panton, & Marzigliano, 2008). In this study sleep habits were solely measured by length of sleep and academic performance was measured by grade point average (GPA). Because individuals' sleep needs differ and multiple factors lead to quality sleep, solely using the length of sleep as a predictor may not be the most accurate measure when examining the effects of sleep on academic performance. In addition, GPA may not be the best predictor for academic performance; other elements such as inquiring about classes dropped or unnecessary struggles due to sleep disturbances or anxiety would be more descriptive of the situation.

Therefore a more comprehensive study performed by Meijer (2008) may provide a more accurate description of the affects of sleep on academic performance. Meijer (2008) studied sleep patterns and academic achievement among seventh and eighth graders in 12 different schools; instead of looking solely at GPA as an indicator of academic achievement, the

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researcher looked at both functioning at school and actual school grades. By using a multi-group analysis, a students' chronic sleep deprivation significantly contributed to students' self-reported academic achievement (Meijer, 2008). Meijer (2008) also found that there was a significant relationship between chronic sleep deprivation and functioning at school. Functioning at school was measured through the School Perception Questionnaire (Meijer et al., 2000) and through the Achievement Motivation Scale (Hermans, 1983); questions inquired about how a student felt about their performance and effort. School achievement was measured by a self-report of their grades earned on their most recent report card; this method was used to account for the lack of consistency among grading scales between schools. The questionnaire asked if the marks on their last report card were unsatisfactory, satisfactory, or good in Dutch language, English language, Mathematics, Biology, Geography, and History. The attempt to create a consistent scale was appropriate; the self-reported subjective nature of this reporting is problematic. Studies examining academic achievement beyond grades and subjective nature must continue to gain a better understanding of the true affect of chronic sleep deprivation has on students.

As pronounced through many studies, sleep deficiencies pose a great threat to the long and short-term well-being of a person and can have a significant negative impact on academic performance. Cognitive functioning, a major component of academic performance was examined by Barnett, and Cooper (2008) in reference to sleep quality. Participants' cognitive functioning was examined through four cognitive tasks: switching of attention, verbal interference, sustained attention, and maze. While sleep quality was measured through a questionnaire, inquiring about difficulty falling asleep, frequent night awakenings, breathing difficulties, snorting, gasping, or loud snoring, or problems staying awake during the day. Participants were matched up according to sleep quality; a good sleeper was matched with a poor

sleeper. A participant was regarded a good sleeper when achieving six or more hours of sleep, while a poor sleeper was categorized by less than 6 hours of sleep. Those participants in the 'poor sleepers' group had significantly more errors; additionally, "bad sleepers" were significantly slower when given the "switching of attention" test (Barnett & Cooper, 2008). Interestingly, examined in this same study was the affects of more difficult task components were unaffected by a night's sleep of less than six hours (Barnett & Cooper, 2008).

This study did not distinguish between those who chronically suffered from sleep disturbances from those who simply had a poor night of sleep. Moreover, subjects who may have had sleep disturbances, but still had over 6 hrs of perceived sleep were not considered poor sleepers, even if their sleep quality may have been compromised. More specific categorization should be used to determine quality of sleep.

Anxiety

Anxiety is defined as a "feeling of uneasiness, tension, and sense of immediate danger" (Barker, 2003, p.26). While anxiety can be temporarily felt by most at some point, it can also be chronic and affect some for 6 months or more and at this point can be coined as an anxiety disorder (National Institute of Mental Health, 2010).   Therefore anxiety can be better explained in two broad categorizations, trait anxiety or state anxiety. "*State anxiety* is defined as an unpleasant emotional arousal in face of threatening demands or dangers. A cognitive appraisal of threat is a prerequisite for the experience of this emotion" (Lazarus, 1991)*. "Trait anxiety,* on the other hand, reflects the existence of stable individual differences in the tendency to respond with state anxiety in the anticipation of threatening situations", (Schwarzer, 1997).

Anxiety disorders are the most common mental health problems in adults (Zvolensky, McNeil, Proter, & Stewart, 2001), the prevalence rate of anxiety disorders are as high as 17% in

the United States (Kessler, Olfson, Bergland, 1998). The typical onset of anxiety disorders is the late teens and the early twenties (Wittchen & Hoyer, 2001), making college students one of the most susceptible populations for developing anxiety disorders. The new added internal and external stresses and separation feelings can contribute to the development; it has been found that increased external stressors lead to increased anxiety symptoms (Chandavarkar, Azzam, Mathews, 2007).

While external stressors are found to increase anxiety symptoms, it is found that susceptibility to anxiety can be determined early in life (Gross & Hen, 2004), indicating some biological determinants. The susceptibility is seen early in life and the tendency of an individual to have somewhat consistent levels of anxiety over a lifetime demonstrates fundamental differences in the brain composition (Gross & Hen, 2004). However, it is still believed that the environment plays a significant role in the development of anxiety (Gross & Hen, 2004). Moreover, in a twins study (monozygotic versus dizygotic) revealed that 30-40% of the variance in occurrence of anxiety can be attributed to genetic variation (Hettema, Neale & Kendler, 2001). Lastly, early environmental risk factors for adult anxiety depend on the presence of a specific genetic variation (Gross & Hen, 2004).

Despite the original origin of anxiety, specific types of anxiety are found among college students. A particular anxiety disorder just recently found in high proportions among college students is Separation Anxiety Disorder (SAD); it occurs upon separation from parents or other attached figure and is a disorder usually reserved for children (American Psychiatric Association, 2000). However, in recent research it has been examined in college students, as many as 21% of college students experience symptoms of adult SAD (Seligman & Wuyek, 2007). Resulting factors may include school refusal and nightmares disturbing sleep (Seligman & Wuyek, 2007).

Test anxiety is another anxiety disorder plaguing the college population. While it was difficult to find prevalence rates of test anxiety among college students, a study performed by Driscoll, Evans, Ramsey, and Wheeler (2009) found that 34% of university students suffered from high-test anxiety and 27% suffered from moderately high-test anxiety using the Westside Test Anxiety Scale. It was noted however, that it is a growing trend. Birenbaum & Nasser (1994) found test anxiety to be one of the most debilitating influences in schools. Despite the young sample, it was found that high-anxious first and eighth grade students were more likely to score lower on academic achievement measures than their counterparts (Grover, Ginsburg, Ialongo, 2007). Moreover, a follow-up study was performed seven years later; it was found that those same high-anxious students scored significantly lower on academic achievement measures than their non-anxious counterparts (Grover, Ginsburg, Ialongo, 2007). While this study was performed originally using first graders and again when they were eighth graders, the continued pattern of poorer academic success implies that this phenomenon may not be localized to the youth.

While there are many types of anxiety disorders, the above research suggests that most if not all may result in both sleep disturbances and poor academic performance. Moreover, anxiety has been found negatively correlated to IQ scores (Hopko, Crittendon, Grant, & Wilson, 2005).

Anxiety has also been seen to influence academic performance. As noted earlier, some students are plagued with test anxiety; this type of anxiety was of focus in a study performed by Peleg (2009) when examining academic performance. Peleg (2009) used a sample of Arabic adolescents; while the purpose of this study was to compare the test anxiety among students with learning disabilities and their counterparts the findings have important implications. It was found that, although, those with learning disabilities had greater test anxiety, regardless of

learning ability, the higher the level of test anxiety the lower the academic achievement (Peleg, 2009).

Test anxiety levels were assessed using the Test Anxiety Questionnaire developed by Friedman and Bendas-Jacob (1997). An average was calculated using the three subscale scores; those with a lower score reflect lower levels of test anxiety and those with higher scores reflect higher test anxiety levels (Peleg, 2009). Academic achievement was measured through a score provided by the registrar's office; the score was a mean score of the previous semester's final grades, a score 1-100 (Peleg, 2009). A t-test was performed comparing academic scores among students with high-test anxiety and those with low-test anxiety. Results indicated that among those with no learning disability, those with high anxiety had lower academic scores ($M = 52.43$, $SD = 14.74$) than those with low anxiety ($M = 71.87$, $SD = 14.86$), with a T value of 2.34 indicating a significant at a .05 level.

This study provides significant evidence supporting the idea that anxiety (test anxiety) effects academic achievement. This study was performed using a rather small sample size, and a non-diverse cultural minority group; generalizations should be made very carefully. Future studies should aim to use a more diverse population to allow for more generalizations. Secondly, the self-report nature of this study when reporting feelings may be difficult for participants to express (Peleg, 2008); therefore an inaccurate anxiety representation may be portrayed. Lastly, it would be beneficial for future research to consider other forms or general anxiety disorder when examining test anxiety.

Sleep and Anxiety Comorbidity

Readily available patient literature often makes a link between mental health problems and sleep disturbances. Anxiety appears to have a unique relationship with sleep compared to

other mental health problems, such as depression. When looking at a non-clinical sample, Mayers, Grabau, Campbell, and Baldwin (2009) found that variances in sleep timing perception scores were more explained by anxiety than depression. Moreover, those experiencing poor sleep timing were highly associated with higher anxiety than depression (Mayers et al., 2009). Sleep timing perceptions is a broad encompassing term including the time it takes to fall asleep, the number of wakings after sleep onset and their length, early morning waking, total sleep time, sleep efficiency (time spent sleeping compared to the time spent in bed) and sleep satisfaction (sleep quality, ease of sleep initiation, feeling refreshed on waking and noting to what extent the participant felt they had enough sleep) (Mayers et al., 2009).

While there is substantial evidence confirming the commonality of the insomnia and anxiety comorbidity, it is often difficult to determine which is the cause and which is the effect. Nonetheless the comorbidity of the two conditions is commonly recognized. While it is not often reported, Harvard Mental Health Letter (2009) noted that insomnia can be a risk factor for anxiety. Moreover, In addition to being a risk factor anxiety, insomnia can worsen the symptoms of anxiety or prevent recovery (Harvard Medical School, 2009). However, the effects of the comorbidity have not received much attention in peer-reviewed research, especially in the growing college population.

While many people suffer from sleep disturbances occasionally, those who seek medical attention through psychiatric practices or primary care givers often display a variety of comorbidities (Roth & Roehrs, 2003). More specifically, over 50% of those with sleep disturbances seeking psychiatric services display comorbidities of some type and 50% of those who seek services from primary care givers experience comorbidities with their insomnia (Roth & Roehrs, 2003). According to the Harvard Mental Health Letter (2009), as many as 80% of

psychiatric patients experience sleep disturbances compared to only 10-18% of the general

population (Harvard Medical School, 2009). With the increased stresses and anxiety

experienced by college students, this alarming number of sleep disturbances reported among this

population raises much concern about the health and academic performances of the students.

Continued research by Roth (2009) found that those with chronic insomnia have

significant rates of experiencing 1 or more comorbidities of psychiatric or medical conditions.

Common comorbid insomnia conditions include depression, chronic pain, respiratory conditions,

and diabetes (Roth, 2009). While this study does confirm that comorbid insomnia is a common

occurrence, it does not distinguish directionality. Paavonen et al. (2002) noted that children with

severe sleep disturbances had higher levels of psychiatric symptoms according to the Rutter B2

scale, a scale teachers complete to evaluate students' psychiatric symptoms. Sleep disturbances

were determined using sleep questions from the Children's Depression Inventory (CDI) and the

Rutter A2 scale (RA), (Paavonen et al., 2002). The CDI is a standardized 27-item self-report

questionnaire measuring childhood depression and the RA is a 36-item survey for parents

inquiring about a child's psychiatric symptoms (Paavonen et al., 2002). While the participants in

the study were 8-9 year old Finnish students, the findings give no reason to believe that this

phenomenon is isolated to this subpopulation. Moreover, those reporting any sleep difficulties

more often displayed psychiatric symptoms; symptoms increased as a more severe sleep problem

was recorded (Paavonen et al., 2002).

Often research focuses on those categorized as 'clinical' cases of anxiety or insomnia.

However, many suffering from sleep disturbances and anxiety are either not at the clinical level

or are not formally diagnosed but suffer from many of the adverse symptoms regularly.

Therefore Barnett and Cooper's (2008) research may have a significant impact on a more

generalized population experiencing some the adverse affects of a poor nights sleep and or anxiety. Barnett and Cooper (2008) found through their study examining the effects of a poor night sleep that the most pronounced effect was on self-reported well-being and mood. Moreover, those who had less than six hours of sleep the night before reported a decrease in well-being and an increase in depression, anxiety and stress (Barnett & Cooper, 2008). This study resulted in significant differences in self-reported anxiety even after one night of poor sleep, but did not venture to examine anxiety after chronic sleep deprivation or disturbances.

Academic Performance

A number of variables play a role in a student's academic performance, and many of the variables may be interconnected as well. As previously discussed both sleep and anxiety can have a variety of affects on students. An additional variable affecting students' academic performance is attendance; which may often be interconnected to the sleep and anxiety variables mentioned above. Because anxiety can affect sleep and sleep deprivation can affect the immune system, all of these variables play a role in classroom attendance.

Students enroll in classes each semester with the understanding the class has particular meeting times set up to learn the course material a certain number of times per week and for a set number of weeks. However, student absenteeism rates are on average 25% on any given day; this figure can be defended by even the highest regarded professor (Friedman, Rodriguez, & McComb, 2001). While there is a number of reasons why students miss class including family obligations, emergencies, transportation issues, lack of preparation, anticipated boredom and illnesses, it is likely that there are factors that have yet to be readily linked to absenteeism that may comprise a significant portion of absenteeism in the college classroom.

The student and the academic world benefit from high attendance rates. For example, students who have higher grade point averages have lower rates of absenteeism, the temporal relationship is not apparent, but the relationship exists (Friedman et al). Therefore causality may be one of two cases, students who have higher grade point averages may enjoy school more therefore have a greater desire to attend class; or students may receive a better understanding of the course material with greater attendance allowing them to do better academically in the course. To confirm the first reason and rebut the latter, a study performed by St. Clair (1999) examined academic performance when attendance was mandatory and no academic improvement was noted and actually negatively impacted the students' motivation.

There are many factors relating to a student's decision to attend class or to not. There is reason to believe that sleep quality may effect this decision, there was no research found to examine the relationship. After looking at the effect of sleep on the immune system, it can be determined that sleep deprivation leads to a reduced immune system. This can lead to the inference that sleep deprivation may cause increased illness and more missed days of class. However, further research should be conducted to provide further evidence to support this inference.

Conclusion

Sufficient evidence has been provided associating anxiety and insomnia as common comorbid conditions and furthermore connecting the previous to disrupted daily function. A gap in this literature review has led to the questioning of how college students are affected by this comorbidity, more specifically how is their academic performance affected by these conditions. By examining these relationships

Chapter III: Methods

Instrumentation

Secondary data was used to analyze the research hypotheses; the data was retrieved by American College Health Association (ACHA) through the distribution of the National College Health Assessment (NCHA) retrieved the data. ACHA developed the ACHA-NCHA to facilitate health service providers, faculty, researchers, and student affairs professionals to better understand the health status of the diverse college student population (ACHA, 2005). The survey is nationally recognized and assesses college students' health habits, behaviors, and perceptions. Specific topics covered by the NCHA includes alcohol, tobacco, and other drug use, sexual health, weight, nutrition, and exercise, mental health, and personal safety and violence. The NCHA is distributed during both the spring and fall semesters.

The NCHA was developed by a diverse group of college health professionals and was pilot tested in 1998-1999 (ACHA, 2009). Individual institutions have the option to choose their target population, however only those participants at institutions who have distributed the survey in a random method were included in the national database (ACHA, 2009). The randomized distribution and the use of institutions nationally distributed allow the data to be generalizable. However, because institutions are self-selecting, the data cannot be regarded as generalizable to all college students in the United States; during the pilot study of 2000, the data was compared with results from nationally representative samples and determined to be comparable (ACHA, 2009).

Reliability and Validity tests were performed in comparison with other national studies with similar questions (ACHA, 2009). The following provides the process to which the ACHA had determined reliability and validity:

- comparing relevant percentages with nationally representative databases,

- performing item reliability analyses comparing overlapping items with a nationally representative database,

- conducting construct validity analyses comparing ACHA-NCHA results with a nationally representative database, and

- conducting measurement validity comparing results of the ACHA-NCHA with a nationally representative database.

The data sets used for evaluation of reliability and validity are:

- National College Health Risk Behavior Survey CDC 1995

- Harvard School of Public Health 1999 College Alcohol Study (CAS)

- United States Department of Justice: The National College Women Sexual Victimization Study 2000 (NCWSV)

- ACHA-National College Health Assessment 1998, Spring 1999 and Fall 1999 Pilots, ACHA-NCHA Spring 2000

The series of comparisons and statistical analyses, in a sense, used triangulation, in that information from various resources were independently used to achieve the goal of demonstrating the reliability and validity of the ACHA-NCHA, and thus its utilization and its ability to represent the population of students. The analyses employed different national databases, covered different approaches, and utilized different statistical procedures to accomplish the evaluation. All in all, the ACHA-NCHA appears to be both reliable and valid and of empirical value for representing the nation's students. (ACHA, 2009).

The NCHA was first distributed in 2000 and was only offered in the paper format; it is now offered both on paper and online (ACHA, 2009). The survey is now on its second form, known as ACHA-NCHA II, and was first implemented in the fall of 2008 (ACHA, 2009). The ACHA-NCHA II is the format that was used for this research and is the subject of the reliability and validity tests mentioned above.

Participants

The fall 2009 data set was used for this research. The fall 2009 NCHA had 57 institutions distribute the survey, compiling 34,208 individual participants (ACHA, 2009). Institutions participating in the distribution of the survey include both two-year and four-year public and private organizations (ACHA, 2009). The institutions represent a variety of geographic regions, Carnegie Foundation Classifications, and campus settings (ACHA, 2009).

More specifically, 57 post-secondary institutions comprise the fall 2009 sample; 31 institutions were public and 26 were private institutions. Of those institutions three were 2-year institutions, 51 were 4-year institutions, and 3 were categorized as other. The institutions represent every region within the US, however the Midwest has fewer institutions participating. The regional distribution of institutions is as follows: Northeast:18, Midwest: 3, South: 19, and West: 15. It should also be noted that two institutions outside the US also participated in this survey. Campuses are not only representative of every region in the US, but also represent a variety of campus settings including, 10 campuses are set in a very large city (population over 500,000), 3 in a large city (population 250,000-499,999), 3 in a small city (population 50,000-249,000), 14 in a large town (population 10,000-49,000), 3 in a small town (population 2,500-9,999) and 2 are set in a rural community (population < 2,500). Campus sizes range from <2,500 to >20,000 students; 15 institutions have less than 2,500, 9 institutions have 2,500-4,999

students, 10 have 5,000-9,999 students, 12 have 10,000-19,999 students, and 11 institutions have more than 20,000 students enrolled. Lastly, campuses can be broken down into Carnegie Classifications as follows: 3 institutions are categorized as Associates Colleges, 14 are Baccalaureate Colleges, 14 are Masters Colleges and Universities, 20 are Research Institutions, 4 are Special focus institutions, and 2 are categorized as Miscellaneous or Not Classified.

Measures

The National College Health Assessment contains a variety of health questions; therefore questions pertaining to current research were isolated for analysis. The variables to be examined were anxiety, sleep disorders, and GPA, as well as basic demographic information.

To examine anxiety levels and sleep disorders, question 31 from the survey was used (see Appendix). The question states, "Within the last 12 months, have you been diagnosed or treated by a professional for any of the following?" 15 conditions were listed, but for analyses, three were chosen: Anxiety, Insomnia and Other Sleep disorder. The respondent could answer: (1) No; (2) Yes, diagnosed but not treated; (3) Yes, treated with medication; (4) Yes, treated with psychotherapy; (5) Yes, treated with medication and psychotherapy; or (6) Yes, other treatment.

To create the anxiety variable for analysis, the question was made dichotomous, categorizing the No's into one group and the entire Yes's into another group. To analyze sleep disorders, the condition "Insomnia" and "Other sleep disorders" were grouped together, and then separated dichotomously as done with anxiety.

To inquire about academics, question number 63 was used (see Appendix). The question states, "What is your approximate cumulative grade average?" The respondent can choose A, B, C, D/F, or N/A. This measure will be analyzed as a categorical variable. However, the

participants that selected 'N/A' or that did not respond to the question were eliminated from the pool of data used for analysis.

Analysis

An initial crosstabs procedure was performed to check for empty cells, if there are no empty cells the analysis could proceed with the ordinal logistic regression (OLR). Beyond cell sizes, two important tests, the model convergence and the score test for the proportional odds assumption, must be satisfied to accept the results from the OLR analysis.

The ordinal regression was selected over other regression analyses to account for the ordered nature of the dependent variable (GPA), in contrast to the multinomial regression analysis, which does not account for order. Because the GPA question on the survey was not defined to the students on the survey, and could have different definitions at different participating universities, the variable cannot be considered interval. While there is a distinct order to the GPA responses, it is not possible to determine the exact distance between each letter grade. The dependent variable, GPA, was coded so that 1 = D/F, 2 = C, 3 = B, and 4 = A. The independent variables, physician diagnosed anxiety and physician diagnosed sleep disorder, were coded as 0 = No disorder and 1= Yes disorder.

Chapter IV: Results

Descriptive Statistics

Preliminary data analysis included descriptive statistics of only those participants that satisfied the GPA requirement of answering the question and not selecting the response "N/A". Demographic summary can be found in Table 1-3. Demographics that were considered include gender, year in school, race, and fraternity/sorority affiliation. The gender question's possible

answers include female (1), male (2), and transgender (3). When asked what year in school the participant was, they were able to select from the following: 1st year undergraduate (1), 2nd year undergraduate (2), 3rd year undergraduate (3), 4th year undergraduate (4), 5th year undergraduate or more (5), Graduate/Professional (6), Not seeking a degree (7), or Other (8). The race question allowed for the selection from seven categories, White, Non Hispanic, Black Non Hispanic, Hispanic/Latino, Asian/Pacific Islander, American Indian/Alaskans Native/Native Hawaiian, Biracial/Multicultural, and Other. For each race the coding was 0=No and 1=Yes. The following tables describe the descriptive statistics of the sample including demographics and frequency counts. Additionally, it was asked if the participant was an International student, the respondent could choose No (1) or Yes (2). Lastly, the student was asked about their affiliation with a fraternity or sorority, they could choose No (1) or Yes (2).

Table 1

Demographic Frequencies and Percents of Participants Used in the Study

Variable	Freq. N	GPA A		B		C		D/F	
Gender									
Male	10890	65	0.6%	1458	13.4%	5511	50.6%	3856	35.4%
Female	20027	88	0.4%	2246	11.2%	10072	50.3%	7621	38.1%
Transgender	37	5	13.5%	12	32.4%	12	32.4%	15	40.5%
Year in School									
1st year	8506	63	0.7%	1129	13.3%	4613	54.2%	2701	31.8%
2nd year	5812	51	0.9%	892	15.3%	2990	51.4%	1879	32.3%
3rd year	5867	14	0.2%	778	13.3%	3131	53.4%	1944	33.1%
4th year	4750	7	0.1%	515	10.8%	2478	52.2%	1750	36.8%
5th year +	1955	19	1.0%	327	16.7%	1116	57.1%	493	25.2%
Graduate	3835	1	0.0%	58	1.5%	1175	30.6%	2601	67.8%
Non-degree	95	3	3.2%	11	11.6%	37	38.9%	44	46.3%
Other	162	2	1.2%	16	9.9%	78	48.1%	66	40.7%
Race									
White	22955	88	0.4%	2383	10.4%	11389	49.6%	9095	39.6%
Black	1979	16	0.8%	507	25.6%	1108	56.0%	348	17.6%
Hispanic/Latino	1937	17	0.9%	315	16.3%	1085	56.0%	520	26.8%
Asian/Pacific Isl.	3992	29	0.7%	515	12.9%	1972	49.4%	1476	37.0%
Am. Indian	684	13	1.9%	147	21.5%	351	51.3%	173	25.3%
Biracial	1032	11	1.1%	155	15.0%	541	52.4%	325	31.5%
Other	753	6	0.8%	109	14.5%	381	50.6%	257	34.1%
Int. Student									
No	27500	134	0.5%	3374	12.3%	13980	50.8%	10012	36.4%
Yes	3529	25	0.7%	356	10.1%	1658	47.0%	1490	42.2%

Table 2

Demographic Frequencies and Percents of Participants Used in the Study

	Freq.	Sleep Disorder			
Variable	N	No		Yes	
Gender					
Male	10890	10515	96.6%	375	3.4%
Female	20027	18966	94.7%	1061	5.3%
Transgender	37	25	67.6%	12	32.4%
Year in School					
1st year	8506	8196	96.4%	310	3.6%
2nd year	5812	5554	95.6%	258	4.4%
3rd year	5867	5588	95.2%	279	4.8%
4th year	4750	4506	94.9%	244	5.1%
5th year +	1955	1828	93.5%	127	6.5%
Graduate	3835	3616	94.3%	219	5.7%
Non-degree	95	87	91.6%	8	8.4%
Other	162	152	93.8%	10	6.2%
Race					
White	22955	21795	94.9%	1160	5.1%
Black	1979	1900	96.0%	79	4.0%
Hispanic/Latino	1937	1859	96.0%	78	4.0%
Asian/Pacific Isl.	3992	3856	96.6%	136	3.4%
Am. Indian	684	628	91.8%	56	8.2%
Biracial	1032	962	93.2%	53	7.0%
Other	753	700	93.0%	53	7.0%
Int. Student					
No	27500	26220	95.3%	1280	4.7%
Yes	3529	3349	94.9%	180	4.1%

Table 3

Demographic Frequencies and Percents of Participants Used in the Study

Variable	Freq. N	Anxiety No		Yes	
Gender					
Male	10890	10223	93.9%	569	5.2%
Female	20027	17531	87.5%	2363	11.8%
Transgender	37	19	51.4%	17	45.9%
Year in School					
1st year	8506	7833	92.1%	596	7.0%
2nd year	5812	5243	90.2%	528	9.1%
3rd year	5867	5198	88.6%	611	10.4%
4th year	4750	4165	87.7%	542	11.4%
5th year +	1955	1666	85.2%	273	14.0%
Graduate	3835	3437	89.6%	383	10.0%
Non-degree	95	81	85.3%	13	13.7%
Other	162	141	87.0%	17	10.5%
Race					
White	22955	20260	88.3%	2531	11.0%
Black	1979	1842	93.1%	109	5.5%
Hispanic/Latino	1937	1777	91.7%	137	7.1%
Asian/Pacific Isl.	3992	3779	94.7%	180	4.3%
Am. Indian	684	600	87.7%	77	11.3%
Biracial	1032	904	87.6%	114	11.0%
Other	753	679	90.2%	68	9.0%
Int. Student					
No	27500	24603	89.5%	2677	9.7%
Yes	3529	3206	90.8%	286	8.1%

The crosstabs analyses of the independent variables Anxiety and Sleep Disorder against the dependent variable (GPA) are displayed in Table 4. These analyses results indicated there were no empty cells, and further analyses could be conducted.

Table 4

Crosstab Analysis of Independent Variables Against Dependent Variable

Predictor	N	GPA							
		A		B		C		D/F	
Anxiety									
No	27992	134	0.5%	3303	11.8%	14101	50.4%	10454	37.3%
Yes	2984	25	0.8%	410	13.7%	1509	50.6%	1040	34.9%
Sleep									
No	29775	141	0.5%	3537	11.9%	14987	50.3%	11110	37.3%
Yes	1467	20	1.4%	216	14.7%	758	51.7%	473	32.2%

When using the initial model (Sleep, Anxiety, Sleep x Anxiety), the OLR results confirmed the convergence model was satisfied as well as the overall model test. The overall test of the null hypothesis is significant at the .05 level ($\Delta\chi^2(3) = 26.02$, $p < .0001$); therefore the null hypothesis can be rejected and it can be said the model without predictors is as good as the model with predictors. Additionally, the proportional odds assumption was satisfied ($\Delta\chi^2(6) = 5.93$, $p = .214$); indicating that the logit surfaces are parallel and that the odds ratios can be interpreted as constant across all possible cut points of the outcome.

In this preliminary ordinal analysis with the initial model, it was determined that the interaction between those with sleep disorders and those with anxiety were not statistically significant (N= 31,242, $p = .766$). The results from this analysis lead to the rejection of both hypotheses 3 and 4:

   3. Students who have been physician diagnosed with comorbid anxiety and a sleep disorder will have a lower GPA than those students who have not been physician diagnosed with the comorbid conditions of anxiety and a sleep disorder.

4. Students who have been physician diagnosed with the comorbid condition of anxiety and a

sleep disorder will have a lower GPA than those students who have only been physician

diagnosed with one of the disorders, anxiety or a sleep disorder.

Summarized results of the first model can be found in Table 5. After rejecting hypotheses 3

and 4, a subsequent analysis was run using only the main effects, anxiety and sleep (model 2) to

examine hypotheses 1 and 2 further.

Table 5
Initial Ordinal Logistic Regression, Model 1

Predictor	B	SE	Wald Statistic	p
Anxiety	0.07	0.04	2.89	0.089
Sleep Disorder	0.23	0.07	9.28	0.002
Anxiety * Sleep Disorder	-0.03	0.11	0.09	0.766

Note. CI = confidence interval for odds ratio (OR)

Table 6 reports the results from the ordinal regression analysis using Model 2. While

both anxiety disorders and sleep disorders are negatively associated with GPA, this analysis

revealed that only sleep disorders were a significant predictor of GPA ($p = <.0001$). Therefore

hypothesis 2 could be accepted "Students who have been physician diagnosed with a sleep

disorder will have a lower GPA than those students who have not been physician diagnosed with

a sleep disorder". For students suffering from sleep disorders, there is an expected increase of

0.217 in the log odds with each unit increase in GPA, given the anxiety variable in the model is

held constant. Moreover, for those same students, the odds of earning a "D/F" GPA versus the

combined "A", "B" and, "C" GPA is 1.24 greater when diagnosed with a sleep disorder, given

that the anxiety variable in the model is held constant. Likewise, the odds of the combined

"D/F" and "C" GPA are 1.24 times greater than the combined "A" and "B" GPA, given that all

other variables are held constant. However, this same analysis revealed that hypothesis 1 "Students who have been physician diagnosed with anxiety will have a lower GPA than those students who have not been physician diagnosed with anxiety" could be rejected.

Table 6
Ordinal Logistic Regression Predicting GPA, Model 2

Predictor	B	SE	OR	CI	Wald Statistic	p
Anxiety	0.07	0.04	1.07	[.99,1.16]	2.96	0.086
Sleep Disorder	0.22	0.06	1.24	[1.12,1.38]	9.28	0.002

Note. *CI* = confidence interval for odds ratio (OR)

Because of the non-significant findings for the prediction ability of anxiety in Model 2, a third model was proposed looking solely at sleep as the predictor for GPA. The final model OLR resulted in *B*=.25, *SE*=.05, *OR*=1.28, *CI*=[1.16, 1.42], *Wald Statistic*=23.12, *p*<.0001. Therefore in the final model, for those who suffer from a sleep disorder they are 1.28 times more likely to earn a "D/F" GPA versus the combined "A", "B" and, "C" GPA and 1.28 times more likely to earn a "C" than an "A" and "B" combined.

Chapter V: Discussion

Interestingly, only 3.4% and 5.3% of males and females, respectively, have been diagnosed with a sleep disorder. Research suggests, as many as 15% of college students suffer from chronic sleep problems, however, physician diagnosed was not a criterion for prior studies. Similarly, anxiety levels among this population are lower than the 17% prevalence rate that research by Kessler, Olfson, Bergland (1998) suggests. This study reveals that only 5.2% of men and 11.8% of females have been diagnosed with anxiety. The physician diagnosed criterion for this research places stringent limits on the prevalence rates that much of previous research did not employ. Additionally, young adulthood and increased stress in life is a time when symptoms

of both anxiety and sleep disorders begin appearing, it is quite possible that many students may be experiencing symptoms, but have yet to seek medical help due to the very recent onset. Unlike the general public where they may have had years to seek medical attention and therefore have a higher prevalence rate.

However, the purpose of this research was to determine the effects of anxiety and sleep disorders, and more specifically the comorbidity of the two conditions, on academic performance, GPA, in college students. Four hypotheses were developed to find the impact of these disorders on the GPA. Only one of the four hypotheses were supported, which was unexpected.

Because the initial analysis (Model 1) revealed there was no significant effect on GPA from the comorbid condition of anxiety and sleep disorder condition, the third and the fourth (see below) hypotheses were not supported.

3. Students who have been physician diagnosed with comorbid anxiety and a sleep disorder will have a lower GPA than those students who have not been physician diagnosed with the comorbid conditions of anxiety and a sleep disorder.

4. Students who have been physician diagnosed with the comorbid condition of anxiety and a sleep disorder will have a lower GPA than those students who have only been physician diagnosed with one of the disorders, anxiety or a sleep disorder.

One would naturally assume that if individually sleep disorders or anxiety are negatively associated with GPA that having both disorders would also be negatively associated GPA. However, the OLR analysis revealed the opposite. One theory to explain these results would be that those students who have been diagnosed with both an anxiety disorder and a sleep disorder

are more likely to be receiving treatment (i.e. medication, therapy, etc.) and therefore the disorders have little or no negative effect on their academic performance.

In response to the above results, a second analysis was completed focusing on the two main effects. Here, the analysis revealed that only sleep disorders had a significant effect on a student's GPA, therefore supporting the second hypothesis:

2. Students who have been physician diagnosed with a sleep disorder will have a lower GPA than those students who have not been physician diagnosed with a sleep disorder.

This finding aligns with previous research suggesting sleep deficiencies and disorders have negative effects on academic success. The current study defined sleep disorders more stringently than many previous studies. In this study a physician, rather than self-reports of sleep disorders must have diagnosed participants with a sleep disorder. This helps validate the findings that sleep disorders do have a negative impact on academic success. Therefore, universities may promote student's addressing their sleep issues to see if they are serious. Furthermore, if they are, then they can begin to treat and deal with the disorder to better their wellbeing and avoid any negative academic impact.

Despite an anxiety disorder's negative effect on GPA, it was not statistically significant ($p = 0.086$); therefore the first hypothesis was rejected:

1. Students who have been physician diagnosed with an anxiety disorder will have a lower GPA than those students who have not been physician diagnosed with an anxiety disorder.

This study is among the few studies that examine the effects on academic achievement by anxiety as diagnosed by a physician, which makes it difficult to compare to previous works.

Much of the previous research regarding anxiety and academic success has been focused on test anxiety solely. Unlike the previous research using test anxiety as the predictor, where significant a negative impact on academic achievement was found; the current study did not find such significance. This research considers all possible sources of anxiety, as long as a physician has diagnosed it. It is unknown whether a physician in fact diagnosed those participants in previous studies or not.

The lack of significant results may be due to reality or may be explained by one of the following theories. As mentioned above, the collapsing of the variable anxiety into 'yes' or 'no' and not accounting for treatments may have an effect on the outcome of the analysis. For example, a student that has been diagnosed with an anxiety disorder and is taking medication, may therefore have their anxiety under control and therefore it is not interrupting their academic success.

Another proposed theory might be that because anxiety is a condition that causes an increased fear, the fear of failing or doing poorly may over power the negative effects of the disorder. However, the fear is still not strong enough to create a positive association with grades, therefore still providing evidence that anxiety does have a negative impact on the academic success of students.

Recommendations

Future research should consider treatment solutions for anxiety and sleep disorders in analysis, to provide a better insight into the issue. In addition, this research is only accounting for those who have been physician diagnosed, which may be excluding many students who may be suffering from similar ailments as those diagnosed, but who have chosen not to seek out a

physician. It may be necessary to see how many college students actually suffer from anxiety disorder symptoms, but have not sought out a physician.

Future research should also consider collecting GPA data so that it is a continuous variable, which may provide additional insight. Additionally, a stricter definition of GPA should be provided to the student to insure a more congruous scale between respondents.

As anxiety disorders and sleep disorders continue to become more prevalent among college students, it is important to continue research to determine the causes and effects of these disorders. It is necessary to address these issues to improve the many dimensions of wellness that are affected by anxiety and sleep disorders, including intellectual wellness.

Conclusion

College students represent a unique sector of the population, where new and evermore demanding stressors are appearing. The increased demand on this youthful population is having detrimental effects on their wellbeing. Colleges should make the wellbeing of their students a priority; by doing so student will be healthier in all dimensions of wellness, as well as, better prepared for life after college. This research did provide some relevant information to the literature breadth, however there is a need to continue research in this area due to the growing nature of the disorders in this population.

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Appendix A

IRB Approval

June 13, 2011

MEMORANDUM

TO: Amanda Grimes
                             Bart Hammig

FROM: Ro Windwalker
                             IRB Coordinator

RE: New Protocol Approval

IRB Protocol #:   11-06-669

Protocol Title: *Anxiety and Sleep Disorder Comorbidity: Affecting the*
                             College Students' Performances?

Review Type: ☒ EXEMPT ☐ EXPEDITED ☐ FULL IRB

Approved Project Period: Start Date: 06/13/2011 Expiration Date:
06/12/2012

Your protocol has been approved by the IRB. Protocols are approved for a maximum
period of one year. If you wish to continue the project past the approved project period
(see above), you must submit a request, using the form *Continuing Review for IRB
Approved Projects*, prior to the expiration date. This form is available from the IRB
Coordinator or on the Research Compliance website (http://vpred.uark.edu/210.php).
As a courtesy, you will be sent a reminder two months in advance of that date.
However, failure to receive a reminder does not negate your obligation to make the
request in sufficient time for review and approval.   Federal regulations prohibit
retroactive approval of continuation. Failure to receive approval to continue the project
prior to the expiration date will result in Termination of the protocol approval. The IRB
Coordinator can give you guidance on submission times.

This protocol has been approved for 35,000 participants. If you wish to make *any*
modifications in the approved protocol, including enrolling more than this number, you
must seek approval *prior to* implementing those changes.   All modifications should be
requested in writing (email is acceptable) and must provide sufficient detail to assess
the impact of the change.

If you have questions or need any assistance from the IRB, please contact me at 210
Administration Building, 5-2208, or irb@uark.edu.

Appendix B

American College Health Association

National College Health Assessment Data Usage Approval

American College Health Association

891 Elkridge Landing Road, Suite 100
Linthicum, MD 21090
Tel: (410) 859-1500
Fax: (410) 859-1510
www.acha.org

December 10, 2010

Amanda Grimes
University of Arkansas
HPER BLDG 308
Fayetteville, AR 72701

Dear Amanda,

Thank you for submitting a request to utilize ACHA-NCHA data in your study, "Anxiety and Sleep Disorder Comorbidity: Affecting the College Students' Performances." Your request has been approved and enclosed you will find a CD containing the Fall 2009 ACHA-NCHA Reference Group dataset.

I have enclosed a copy of our data use guidelines and agreement for your information. Your signed copy is on file in my office. Please note that additional studies using the ACHA-NCHA data acquired through this request require submission of a new data use request to the ACHA-NCHA Program Office.

As stated in the agreement, we would appreciate a copy of any final products that result from your research.

Please don't hesitate to contact me if you have any questions.

Best of luck in your efforts,

Mary Hoban, PhD, CHES
Director, ACHA-NCHA Program Office

Enclosure: ACHA-NCHA Data Use Guidelines and Agreement