PREDICTORS OF SLEEP QUANTITY AND QUALITY IN COLLEGE STUDENTS

by

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B.A., Eastern Illinois University, 1994
M.A., Eastern Illinois University, 1998

A Dissertation
Submitted in Partial Fulfillment of the Requirements for the
Doctor of Philosophy in Education degree with a concentration in Health Education

Department of Health Education and Recreation
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DISSERTATION APPROVAL

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AN ABSTRACT OF THE DISSERTATION OF

ERIC S. DAVIDSON, for the DOCTOR OF PHILOSOPHY degree in EDUCATION, presented on *DATE OF DEFENSE, at Southern Illinois University Carbondale.

TITLE: PREDICTORS OF SLEEP QUANTITY AND QUALITY IN COLLEGE STUDENTS

MAJOR PROFESSOR: Dr. Roberta Ogletree

(Begin the abstract here, typewritten and double-spaced. A thesis abstract should consist of 150 words and a dissertation abstract should consist of 350 or less including the heading. A page and one-half is approximately 350 words. Document should not be right justified.)

DEDICATION

I would like to make a number of important dedications with this dissertation study. First, I would like to dedicate this study to Jill Davidson, my wife. Our journey to this place has been long and filled with unexpected blessings, detours, challenges and adversity. Despite it all, our marriage has survived and thrived. This success is just as much yours as it is mine.

Second, I would like to dedicate this study to my three wonderful children: Emily Christine, Timothy Sean, and Abigail Grace. You three have sacrificed more than anyone else during this process, but remained loving, patient, and understanding. I hope that my doctoral journey is an inspiration for your educational and life pursuits.

Third, I would like to thank my parents, Donald and Peggy Davidson. Thank you for allowing me to become the person I am, and supporting me to become one of the first in our extended family to not only go to college, but to be the first to earn a doctoral degree.

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The path leading to the successful completion of this dissertation and my doctoral process was one that I did not take alone. Countless others supported and encouraged me throughout this journey.

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CHAPTER 1

INTRODUCTION

With the hiring of the first official college health educator at the University of Minnesota in 1954 (Sloane & Conant-Sloane, 1986), universities and colleges began to devote resources and staffing to create educational programs and interventions to help prevent and address health-related problems of students. By the mid 1980s, most college health education programs, regardless of number of staff, generally specialized in "health-risk appraisals, the management of stress, nutrition, sexuality, substance abuse, and cost-effective strategies for helping students manage self-limiting conditions" (Turner & Hurley, 2002, p.315). Since the creation and administration of the American College Health Association's National College Health Assessment, health education and promotion programs have begun to increase focus and attention on the sleep needs of their student populations.

Results from 30,093 students on postsecondary campuses and universities who self-selected to participate in the Fall 2010 American College Health Association (ACHA) National College Health Assessment (American College Health Association [ACHA], 2010a) indicated that 59.5% reported not getting enough sleep so that they felt rested when they woke up in the morning three or more days per week out of the last seven days. Additionally, 41.4% of students reported that, out of the last seven days, they had more than a little problem, a big problem, or a very big problem with sleepiness during their daytime activities. Furthermore, 14.3% of students reported that during the past seven days they awoke too early and could not get back to sleep three or more days a week, whereas 60.8% reported feeling tired, lethargic, or sleepy during three or more

days out of the last seven. When asked how often in the past seven days they had gone to bed because they could not stay awake any longer, or how often they had an extremely hard time falling asleep, 31.6% and 23.4% respectively indicated such problems at least during three of the past seven days. When asked if, within the last 12 months, sleep difficulties had affected their academic performance, 18.4% reported that such difficulties had led them to receive a lower assignment grade, 4.7% indicated that such difficulties had led them to a lower course grade, 1.0% reported that they had received an incomplete or dropped a class as a result of sleep difficulties, and 1.3% reported that sleep difficulties had caused a significant disruption in thesis, dissertation, research, or practicum work. Since 2000, sleep has consistently been listed as a top academic impediment to academic performance, third only to problems pertaining to stress and cold/flu/sore throat (ACHA, 2010a, 2009a, 2009b, 2008a, 2008b, 2007a, 2007b, 2006a, 2006b, 2005a, 2005b, 2004a, 2004b, 2003a, 2003b, 2002a, 2002b, 2001a, 2001b, 2000).

Statement of the Problem

As a result of increased calls for accountability by external forces (e.g., legislatures, parents, business and commerce, and accrediting agencies), institutions of higher education are being called upon to demonstrate, at the institutional, divisional, unit, and programmatic levels, that students are learning and being transformed both in and outside of the academic classroom (Frederick & Barnett, 2009; Council for Higher Education Accreditation, 2001; Wingspread Group, 1993). Consequently, those providing health education and promotion services and programs in higher education can no longer only report metrics that report operational processes and satisfaction levels; college health educators must demonstrate that their services and programs impact

learning, change health-related behaviors, and promote and contribute to the successful attainment of the missions of their unit, division, and overall institution. Since sleep problems are cited as a leading health impediment to academic success, it is important that college health education practitioners gain a better understanding of what factors influence sleep quality and quantity to enhance outreach, education and other interventions.

Need for the Study

Whereas sleep is often thought of as a common health issue among college students, few, if any, researchers have comprehensively evaluated correlates and predictors of sleep quality and quantity within this population. Most often, studies of this type are used by researchers to assess particular categories of correlates and predictors (e.g., emotional and mental health, student employment, substance abuse, etc.). This study assessed how a multitude of student demographic and student involvement variables related to and predicted sleep quantity and sleep quality.

Significance to Health Education

Health education and promotion practitioners within higher education are challenged to show evidence that their programs and interventions support the learning and academic missions of the institutions in which they work. If factors promoting or hindering sleep quantity and quality can be determined, several implications will exist.

First, findings may allow college health promotion practitioners to determine what factors may correlate to and/or predict positive sleep quantity and sleep quality. Once analyzed, risk and protective factors and behaviors affecting sleep quantity and

quality may be determined, and these may be utilized to shape individual, group and ecological program planning efforts.

Second, such findings may allow health education and promotion programs to better allocate resources in developing and implementing programs directed to groups of students at greater risk or in greater need. Traditionally, sleep has not been viewed as a priority issue to address. With increased recognition of sleep hygiene as an important health concern within college populations, in conjunction with coupled with the financial hardships institutions of higher education are currently facing, such information may improve practice and outcomes related to sleep, thus leading to improved retention and academic success.

Last, the health education and promotion office of the institution involved in this study may garner a better understanding of the behaviors relating to both sleep quantity and quality of its undergraduate-level students. University health education staff, student affairs professionals, faculty and administrators may better understand the dynamics of sleep quantity and quality and, therefore, will be able to design and implement programming and interventions that may better address student sleep needs.

Purpose of the Study

The purpose of this study was to determine correlations among various demographic factors, sleep quantity, and sleep quality among randomly selected college students at a Midwestern four-year research university with high research activity. The second purpose of this study was to determine which factors predicted sleep quantity and quality.

Research Design

A descriptive correlational and predictive correlational, cross-sectional research design was employed for this study. Descriptive correlational design is used to examine the relationship(s) among multiple variables, whereas predictive correlational design is used to predict the value of one variable, established by the values of other variables (Burns & Grove, 2005). Additionally, correlational research uses variables that usually cannot be manipulated for use in experimental or quasi-experimental design (Issac & Michael, 1995). Cross-sectional survey design allows researchers to collect self-reported data to understand and make conclusions regarding a specific population at a specific time (Lavrakas, 2008).

Research Questions

1. What is the relationship between potential predictor variables and self-reported average weekday sleep length?
2. What is the relationship between potential predictor variables and self-reported average weekend sleep length?
3. What is the relationship between potential predictor variables and self-reported sleep quality?
4. What are the direct and indirect effects of potential predictor variables on self-reported weekday sleep length?
5. What are the direct and indirect effects of potential predictor variables on self-reported weekend sleep length?
6. What are the direct and indirect effects of potential predictor variables on self-reported sleep quality?

7. Does empirical data support the proposed causal model for self-reported weekday sleep length?
8. Does empirical data support the proposed causal model for self-reported weekend sleep length?
9. Does empirical data support the proposed causal model for self-reported sleep quality?

Study Sample

The study sample consisted of traditionally aged (18 to 24 years) undergraduate students, who were enrolled in randomly selected core curriculum courses, who attended a large, four-year research university that is fully accredited by the Higher Learning Commission of the North Central Association of Colleges and Schools (Southern Illinois University, 2001). According to Austin (2008), traditional college students are between the ages of 17 and 25 and usually fall within adolescent or early adulthood developmental stages. Bean and Metzner (1985) define traditional students as "residing on campus, 18 to 24 years old, and attending college full-time" (p.488), whereas Stewart and Rue (1983) suggest that traditional students are those under the age of 25.

Instrumentation

Three instruments previously developed by other researchers were used within this study. These three measures were *The Pittsburgh Sleep Quality Index, The Pittsburgh Sleep Diary, and The Medical Outcomes Study Short Form Health Survey (MOS SF-36)*.

To measure sleep quality, *The Pittsburgh Sleep Quality Index* (*PSQI*), developed by Buysse, Reynolds III, Monk, Berman, and Kupfer (1989), was used. The *PSQI* is

comprised of 19 self-rated items which measure sleep quality over the past month, and it can differentiate between those individuals who get a good or bad night's sleep. The 19 self-rated items are divided into seven different scores that measure subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medications, and daytime dysfunction. Each of the seven components is equally weighted on a scale that ranges from 0-3; scales are then summed to determine a global *PSQI* score which ranges from 0-21. Lower scores indicate better sleep quality, and higher scores indicate poorer sleep quality.

To measure sleep behaviors indicating sleep quantity, portions of *The Pittsburgh Sleep Diary* were used to measure participants' typical sleep-wake schedules for the semester in which the survey was completed. *The Pittsburgh Sleep Diary* reveals sleep patterns, which in many cases, conform to those found when objective sleep actigraphy measures are taken (Monk et. al., 1994).

The Medical Outcomes Study Short Form Health Survey (MOS SF-36), developed by Ware and Sherbourne (1992), consists of 36 items that measured 8 domains of perceived health status, well being, and functioning (see Appendix C). According to Ware and Sherbourne (1992), the *MOS SF-36* was developed as a brief, yet comprehensive and psychometrically sound standardized health status assessment tool that could be utilized in the clinical setting, as well as in research studies. The 36 self-rated items are divided into 8 domains: physical functioning, role limitations caused by physical health problems, role limitations caused by emotional problems, energy/fatigue, emotional well being, social functioning, pain, and general health (See Table 2). Each of the 8 domains are scored using the Likert method of summated ratings (Ware &

Sherbourne, 1992), and are transformed linearly to a score ranging from 0 to 100, with higher scores representing better perceived functioning and health status. In addition, two summary measures that assess physical and mental wellness and function exist (See Table 2).

Data Collection

Approval from the Human Subjects Committee of Southern Illinois University Carbondale (SIUC) was granted. A classroom-administered survey was conducted in randomly selected undergraduate university core curriculum course sections whose teaching faculty members consented to allow data collection to occur within regularly scheduled class periods. Data collection occurred during late-February to early-March.

Data Analysis

Quantitative data were collected and analyzed in this study. Data were collected from participants who reported being traditional undergraduate students 18-24 years of age. Data were analyzed using the Statistical Package for the Social Sciences (SPSS) 18.0 (SPSS Inc, 2009). Statistics computed for all variables included frequencies, percentages, measures of central tendencies, and measures of dispersion. Other statistics to determine significance included Pearson's product-moment coefficient correlations, multiple regression analyses and path analyses. An alpha level of .05 was used to determine statistical significance.

Assumptions

1. Participants responded honestly to survey items.
2. Participants understood survey items and interpreted them as the researcher intended.

3. Participants responded accurately to survey items based on actual perceptions and behaviors.
4. Participants enrolled in the university core curriculum classes surveyed were similar to other students at the university at which the study occurred.
5. Surveys used in this study were valid and reliable, thus are accurate in measuring intended constructs.

Limitations

1. Length of survey may have lead some students to discontinue the survey or abstain from answering some survey items.
2. Recall of sleep behaviors and quality may have be limited as one tried to remember past sleeping situations, thus creating potential for less precise data responses.
3. Students at the institution in which the study occurred may not be representative of all traditionally aged college students.
4. Students surveyed were those whose faculty allowed data collection to occur in their core curriculum class.
5. Students surveyed were not asked to provide information regarding their class schedules, which may have impacted their self-reported sleep quality and/or quantity.

Delimitations

1. Only undergraduate students aged 18-24, were included in data analysis.
2. Sleep-related behaviors, sleep quality, and measures of academic success were delimited to those included in the survey tools.

3. Students from a single university were studied.
4. Students were recruited from randomly selected undergraduate, university core curriculum courses.

Definition of Terms

Sleep Length – The amount of time spent between going to bed and waking up minus the estimated time it takes to go to sleep.

Sleep Quality – "Quantitative aspects of sleep, such as sleep duration, sleep latency, or number of arousals, as well as more purely subjective aspects, as "depth" or restfulness of sleep" (Buysse et al., 1989).

Sleep Time – The amount of time between going to bed and waking up, subtracting the estimated time to fall asleep once in bed.

Traditionally Aged Student – College students between the ages of 17-25 who usually fall within adolescent or early adulthood developmental stages (Austin, 2008).

Weekday Sleep – Sleep that occurs Sunday through Thursday nights.

Weekend Sleep – Sleep that occurs on Friday and Saturday nights.

Summary

The sleep behaviors of college students and the impact of such behaviors on traditional and progressive measures of academic performance are receiving additional focus and attention, as college health and promotion programs attempt to link services, programs, and interventions with the missions of their units, divisions, and institutions. Practitioners and evaluators of health education and promotion programs within higher education need to gain a better understanding of these relationships in order to better plan, implement, and assess health education services, programs, and interventions. To

address this need, a descriptive and predictive, correlational, cross-section research design was employed to determine whether relationships among demographic variables, reported sleep behaviors and sleep quality of a sample of undergraduate students exist.

CHAPTER TWO

LITERATURE REVIEW

Overview

The purpose of this chapter is to review relevant literature to provide a foundation and rationale supporting the need for this study. This chapter covers the following specific topics: health, health education/promotion and academic success; sleep length; sleep times and wake times; sleep-wake cycles; sleep satisfaction and sleep quality; sleep problems in college students; and factors relating to poor sleep quantity and quality in college students.

Purpose of the Study

The purpose of this study was to determine correlations among various demographic factors, sleep quantity, and sleep quality among randomly selected college students at a Midwestern four-year research university with high research activity. The second purpose of this study was to determine which factors predicted sleep quantity and quality.

Research Questions

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Health, Health Education/Promotion, and Academic Success

Health-related programming on university and college campuses has existed for quite some time. Initially, health-related programming focused on physical education and personal hygiene (Keeling, 2003). Over time, health programming developed into a fee-based service offered to students or a segregated fee-funded medical and mental health care system seen as a revenue-generating auxiliary function. As the era of civil rights dawned upon campuses, health care and other student affairs services were provided to meet basic consumer needs and individual rights (Bickel & Lake, 1999). Once university personnel, particularly student affairs professionals, focused on student needs and rights, health programming and interventions evolved into both a student development activity and an academic support service. Only in recent years have health-

related services and programming been seen as instruments to assist in enhancing student engagement, and community building, and as being critical to helping institutions of higher education in fulfilling their missions (Keeling, 2003).

In the early 1900s, Storey suggested health deficiencies as a factor limiting the success of college graduates (Means, 1962). In their work with coordinated school health programs, McKenzie and Richmond (1998) suggested that school systems intentionally address children's health issues, or must deal with them out of necessity. Likewise, colleges and universities must either proactively address their students' health issues as a priority relating to the successful attainment of institutional mission or respond to the negative outcomes associated with unhealthy student behaviors. In a presentation delivered at the 2003 American College Health Association annual meeting, Luoluo Hong quoted Richard Keeling, a past president of the association, as defining health as "not primarily/exclusively medical, clinical, individual or illness-based, but that which embraces broader qualities/states of wellness, social justice and human dignity; creates and enhances capacity (e.g. for interpersonal engagement, academic performance, personal development, etc.); and has implications at the population/community level" (Hong, 2003). Silverman, Underhile and Keeling (2008) later promoted the connection between health and academics by adding, "The health and well-being of students — from the broadest perspective — contribute to, and indeed, make possible student success. Health creates capacity; students whose health status is positive and flourishing have greater ability and readiness to learn and engage fully in all meaningful educational experiences inside and outside the classroom" (p. 7).

A paradigm shift in the world of health promotion within higher education appears to be emerging. During recent decades, a call has emerged for a stronger connection between the work of health promotion and the general missions that most universities stress. In a keynote address originally delivered at the 1986 annual meeting of the American College Health Association (ACHA), which was later published in the Journal of American College Health, Burns, a long time advocate for the integration of health education in higher education, was quoted:

> … as long as we believe that education has something to do with helping individuals achieve their maximum potential for self-development, the development of connection to others, and effective contribution to a lively democracy and its institutions, we cannot achieve the mission of higher education without dealing in some way with health. If we believe we can, we do so at the risk of ignoring major personal, environmental, and political dimensions of education. (1990, p. 104)

Burns (1999) later stressed the interconnectivity between health and learning by commenting that undergraduate education could be greatly improved when health would receive an academic focus, and that a good undergraduate education could result in improved health and decreased disease and illness.

The implementation of the American College Health Association's National College Health Assessment during the end of the twentieth century helped enable "both ACHA and institutions of higher education to adequately identify factors affecting academic performance, respond to questions and concerns about the health of the nation's students, develop a means to address these concerns, and ultimately improve the health

and welfare of those students" (American College Health Association, 2010b, para. 1). Within the survey, students are asked to indicate if 25 physical or mental health issues and complaints have contributed to their receiving a lower grade on an exam or important project, receiving a lower grade in the course, receiving a grade of "incomplete," or dropping an academic course. Since the spring of 2000, the top five impediments to academic success identified by students in all fall and spring survey cohorts are: stress, cold/flu/sore throat, sleep, concern for family or friends, and relationship difficulties (ACHA, 2009a, 2009b, 2008a, 2008b, 2007a, 2007b, 2006a, 2006b, 2005a, 2005b, 2004a, 2004b, 2003a, 2003b, 2002a, 2002b, 2001a, 2001b, 2000).

In the new millennium, college health promotion programs have started working toward strengthening the connection between individual and community health with the general academic mission of learning (Zimmer, Hill, & Sonnad, 2003). Beginning in 2001, higher education health promotion programs began to be guided by the American College Health Association's *Standards of Practice for Health Promotion in Higher Education* (American College Health Association Standards of Practice for Health Promotion in Higher Education Committee, 2001). These standards, later revised in 2005, promote the connection of health with academic success by defining the mission and mission objectives of health promotion professionals (American College Health Association Standards of Practice for Health Promotion in Higher Education Committee, 2005a). According to the standards:

> The mission of health promotion in colleges and universities is to advance the health of students and to contribute to the creation of healthy and socially just campus communities. Thus, health promotion professionals strive to: reduce risk

> for individual illness and injury, enhance health as a strategy to support student learning, and advocate for safety, social justice, economic opportunity, and human dignity. (ACHA Standards of Practice for Health Promotion in Higher Education Committee, 2005a, p. 2)

The *Standards of Practice for Health Promotion in Higher Education* document is comprised of six standards. The first of these, *Integration with the Learning Mission of Higher Education*, is described as "Effective practice of health promotion in higher education requires professionals to incorporate individual and community health promotion initiatives into the learning mission of higher education" (p. 3). Such incorporation is suggested by several actions including planning and implementing interventions and programs that support student learning, infusing health promotion into formal academic curricula, programs and research, and enacting a research agenda that examines the relationships of individual, group and environmental health-related factors, and behaviors associated with student learning. The ACHA further reinforced the connection between health and learning when it released *Vision into Action: Tools for Professional and Program Development* (ACHA Standards of Practice for Health Promotion in Higher Education Committee, 2005b), that advocated that health promotion offices serve the mission of student learning through the creation of healthy learning environments and support for all students. In 2006, after working with leaders of ACHA's Health Promotion Section, the Council for the Advancement of Standards in Higher Education (2006) issued a similar statement in its standards regarding health promotion. This statement indicates that "the purpose of health education and wellness programming is to assist students in leading healthier lives, and engage individuals who

will become political, social and economic decision makers, thereby advancing the collective health of the community" (p. 200).

Sleep Length

Researchers often use common measure of average length or amount of sleep students get when conducting studies related to American college students. Much of the literature indicates that students get approximately seven to eight hours of sleep per weeknight. Buboltz, Brown, and Soper (2001) actually found that in a sample of 191 undergraduate students, total sleep time for a weekday was 8 hours and 2 minutes. Hawkins and Shaw (1992) reported that the mean amount of time students spent in bed during the 21 days in which data were collected was 7 hours and 56 minutes. Oginska and Pokorski (2006) found similar results in that college students slept an average of 7 hours and 48 minutes. Thacher (2008) found that 48 students who did not engage in a single night of total sleep deprivation reported a mean total sleep time of 7 hours and 31 minutes, while 72 students who reported engaging in a single night of total sleep deprivation reported a mean total sleep time of 7 hours and 1 minute. Forquer, Camden, Gabriau, and Johnson (2008) found that students were sleeping less; the mean average length of sleep reported during the week by their study's participants was 7 hours and 12 minutes.

Many of the researchers studying sleep times report sleep during a brief period of time and are not longitudinal. In a study collecting sleep log information three times over the course of a semester, Hawkins and Shaw (1992) found a progressive decline in the amount of time spent in bed. During the first data collection, students spent a mean of 482.74 minutes (8 hours and 2 minutes) in bed, as compared to a mean of 469.17 minutes

(7 hours and 49 minutes) in bed at the third data collection point. Pilcher and Ott (1998) also collected 7-day sleep logs during three collection periods. However, unlike Hawkins and Shaw's (1992) findings, students reported time spent asleep increased significantly. It is important to note that Pilcher and Ott (1998) collected data during the spring semester, whereas it is unclear what semester Hawkins and Shaw (1992) collected their data. It is possible that the difference in results could have occurred as a result of data being collected during different terms.

Over time, it appears that students are spending shorter periods of time sleeping. More and more students appear to be sleeping fewer than seven hours a night. Using data collected over a 30 year period from over 9,543 students who were asked to estimate their sleep duration to the nearest half hour, Hicks, Fernandez, and Pellegrini (2001b) noted a significant reduction over the three decades. Between 1969 and 2001, the median hours of sleep decreased from 7 hours and 45 minutes to 6 hours and 39 minutes. In a follow-up study updating normative data collected during the 2000-2001 academic year with data previously collected during the 1978-1979 and 1988-1989 academic years, Hicks, Fernandez, and Pellegrini (2001c), asked students to "report the number of hours that they usually slept each night to the nearest half hour" (p. 660). Although changes between the 1988-1989 and 2000-2001 administrations were not statistically significant, the average amount of sleep during the first administration was 7 hours and 18 minutes; during the 1988-1989 administration, the average amount of sleep was 6 hours and 52 minutes; during the 2000-2001 administration, the average amount of sleep was 6 hours and 51 minutes. Other researchers corroborate the findings of Hicks, Fernandez, and Pellegrini. In Oginska and Pokorski's study (2006) where the average amount of sleep

was over 7 hours, 13.9% of university students reported getting less than 6 hours and 30 minutes of sleep, and 22.6% showed sleep deficits on weeknights as measured by the Epworth Sleep Scale. Breslau, Roth, Rosenthal, and Andreski (1997) found similar results in their study of 1007 randomly selected young adults belonging to a health maintenance organization. They observed that average participants slept six hours and 42 minutes during the week.

It appears that American college students sleep more than their peers from other countries. A handful of studies, mainly originating from Asian nations, indicate that these international students, on average, slept approximately six hours per night. In a study involving first-year Taiwanese students, the average weekday sleep time reported by participants was six hours and 24 minutes (Yang, Wu, Hsieh, Liu, & Lu, 2003). In questionnaires administered to 1,414 Korean university students, Ban and Lee (2001) found the mean amount of sleep to be six hours and 42 minutes. In a study of fourth year Hong Kong medical students, Yeung, Chung, and Chan (2008) observed that the average length of sleep reported was five hours and 54 minutes. No studies appear to exist that examine the sleep habits of international students studying within the United States. As a result, it is difficult to determine if international students acclimate to American sleep culture or retain the sleep habits of their country of origin.

Sleep Times and Wake Times

The amount of sleep is an area that is frequently researched. However, some researchers suggest that when one sleeps and wakes up may be equally important. In studies focusing on American students, Beaulieu (1991) found that bedtime had an effect on levels of alertness during the daytime. Students who were most alert in the morning

retired on average at 11:46 p.m., whereas those indicating they were most alert during the afternoon went to bed on average at 12:16 a.m. and those indicating they were most alert during the evening went to bed on average at 12:53 a.m. Beaulieu found that similar trends were reported for wake-up times, with "morning alerts" waking on average at 7:23 a.m., "afternoon alerts" waking on average at 8:00 a.m., and "evening alerts" waking on average at 8:20 a.m.

A few other researchers report mean American college student bedtimes and mean rise times. Forquer, Camden, Gabriau, and Johnson (2008) found that during weekdays the average student went to bed at 12:24 a.m. during the weekday and awoke at 8:12 a.m. Brown, Soper, and Buboltz (2001) report that the mean time that students went to bed and awoke during the workweek occurred at 11:24 p.m. and 7:39 a.m. respectively. In another study, these three researchers found similar wake-up times; an average weekday bedtime was reported as being 11:40 p.m., and an average wake-up time was reported as being 7:42 a.m. (Buboltz, Brown, & Soper, 2001).

There are several researchers that have focused on students from other nations. In studying first-year Australian psychology students, Lack (1986) found that the average lights-out time occurred at 11:08 p.m., as compared to the average lights-out time of 12:36 p.m. during weekends. The researchers focusing on students from Asian nations find slightly different and later sleep times, with a majority of students going to bed after midnight. Ban and Lee (2001) found that in Korean university students the average reported bedtime was 12:56 a.m.; over one-quarter of the students (26.4%) reported going to bed at 2:00 a.m. or later. Yeung, Chung, and Chan (2008) found that the average time students reported falling asleep was 1:16 a.m. Yang, Wu, Hsieh, Liu, and Lu (2003)

found that during school days, the average time to go to sleep for first-year Taiwanese students taking a required health education course was 1:24 a.m. Tsai and Li (2004a) found that during weekdays, the average bedtime for females was 1:27 a.m., while the average weekday bedtime for males was 1:40 a.m. During the weekends, the average female bedtime occurred at 1:21 a.m., while the average male bedtime occurred at 1:45 a.m.

Similar trends are found when examining wake-up times. Lack (1986) found that participants reported an average wake-up time of 7:11 a.m. during the week, compared to an average wake-up time of 8:45 during the weekends. Yeung, Chung, and Chan (2008) found that the average reported wake-up time was 7:24 a.m. Yang, Wu, Hsieh, Liu, and Lu (2003) found that the average wake-up time during school days for first-year Taiwanese students taking a required health education course was 7:49 a.m. During non-school days, the average reported wake-up occurred at 10:19 a.m. Tsai and Li (2004a) found that during weekdays, females had an earlier average rise time of 8:27 a.m. compared to the average rise time of 8:39 a.m. for males.

Sleep-Wake Cycles

Brown and Buboltz (2002) recommend that students maintain regular and consistent sleep-wake cycles, or going to sleep and waking up at the same time, as a sleep hygiene recommendation. It is common for many college students to sleep longer hours on the weekend in order to make up for sleep lost during the work week (Pilcher & Walters, 1997; Brown, Soper, & Buboltz, 2001; Brown, Buboltz, & Soper, 2002; Machado, Variella, & Andrade, 1998). The percentage of college students maintaining a consistent sleep-wake schedule appears to have decreased. Between 1978 and 1992, the

percentage of college students reporting that they maintained consistent sleep schedules dropped from 16% to 6.6% (Hicks, Johnson, & Pelligrini, 1992).

Maintaining a consistent sleep-wake schedule is strongly recommended; however, few researchers have assessed the impacts of this practice. Manber, Bootzin, Acebo, and Carskadon (1996), found that subjects who maintained a consistent sleep-wake schedule by going to sleep and waking up within a preassigned one-hour period were more likely to report less sleepiness than subjects who slept at least 7.5 hours. Furthermore, participants whose sleep-wake cycles were regulated reported greater levels of alertness and improved sleep. In studying female, first-year undergraduates at a Brazilian College, Machado, Varella, and Andrade (1998) found that students with morning classes were more likely to shift sleep-wake times on the weekends. Students who held jobs in addition to their student responsibilities were less likely to shift their bedtimes.

There is an ample body of literature that examines the weekday and weekend differences in duration of sleep, sleep times, and wake times. The number of hours college students sleep during the weekends is different than that amount slept during the workweek. Forquer, Camden, Gabriau, and Johnson (2008) found that the mean average length of sleep reported during the weekend was 84 minutes longer than the mean average length of sleep reported during the week. Hawkins and Shaw (1992) also reported that students spent less time in bed during the week than weekends. Breslau, Roth, Rosenthal, and Andreski (1997) found in their study involving young adults that the average participant increased his or her amount of sleep by 42 minutes on the weekends.

Differences in weekday and weekend sleep and wake times also have been reported. In their study on delayed sleep phase syndrome in university students, Brown, Soper, and Buboltz (2001) found that students reported going to bed on average 113 minutes later during the weekends than during weekdays. They also found in another study that students went to bed later on weekends on average by 97 minutes (Buboltz, Brown, & Soper, 2001). Lack (1986) found that students reported going to bed on average 88 minutes later during the weekends than during weekdays. Forquer, Camden, Gabriau, and Johnson (2008) found that in the 313 students completing an e-mail survey, weekend bedtimes were later than by more than an hour. Yang, Wu, Hsieh, Liu, and Lu (2003) found that first-year Taiwanese students taking a required health education course reported going to bed an average 28 minutes later on weekends than during weekdays.

Concerning wake-up times, Brown, Soper, and Buboltz (2001) found that students woke up on average 110 minutes later during the weekends than weekdays. They also found in another study that students woke up later on weekends on average by 117 minutes (Buboltz, Brown, & Soper, 2001). Similarly, Forquer, Camden, Gabriau, and Johnson (2008) reported that weekend rise times were more than two hours later than weekday rise times. Lack (1986) found that students reported waking up an average of 94 minutes later during the weekend than during the week. Surprisingly, despite a smaller amount of difference between weekday and weekend sleep times, Yang, Wu, Hsieh, Liu, and Lu (2003) found that students were likely to wake up on average 2.5 hours later during the weekend than during weekdays.

Sleep Satisfaction and Sleep Quality

Although sleep quantity or sleep length is often discussed as an important factor of sleep, one's sleep quality and satisfaction with that sleep quality may be just as important (Pilcher, Ginter & Sadowski, 1997). In two studies in which subjects completed a seven-day sleep log, Pilcher, Ginter, and Sadowski (1997) found that measures of health, emotion, life satisfaction, fatigue, and sleepiness were better related to sleep quality than sleep quantity. Likewise, Pilcher and Ott (1998) reported that subjective health and well-being were found to be more closely related to sleep quality than to sleep quantity. Generally, as both overall average and daily sleep quality deteriorated, participants were more likely to make complaints regarding both physical and psychological health and well-being. Hawkins and Shaw (1989) found significant differences between levels of sleep satisfaction and in what time students left home in the morning. Those indicating that they were satisfied with their sleep left home on a mean average of 94 minutes after awakening, whereas those participants who indicated sleep dissatisfaction generally left home on a mean average of 126 minutes after awakening.

Several researchers have used the Pittsburgh Sleep Quality Index to determine positive and negative sleep quality of college students. These researchers typically use a cutoff score of between four and six to differentiate good-quality sleep from poor-quality sleep, with lower numbers indicating better sleep quality. Using a PQSI global cutoff score of four or more to define poor sleep quality, Carney, Edinger, Meyer, Lindman, and Istre (2006) designated 43% of the 18- to 39- year-olds as being poor sleepers. In their study of Japanese graduate students, Pallos, Gergley, Yamada, Miyazaki, and Okawa, (2007) found that 25.6% of their respondents' global scores were greater than six, a

conservative cutoff designating poor sleep quality. When differentiating gender within this study, 27.7% of males and 20.0% of females were assessed as having poor sleep quality.

During the past three decades, college student satisfaction with sleep has decreased. Hicks, Fernandez, and Pellegrini (2001c) compared the reported sleep satisfaction of students in 1978, 1988, and 2000. Over this period a statistically significant increase in dissatisfaction was observed. In 1978, approximately 24% of students reported dissatisfaction, as compared with 53% in 1988 and 71% in 2000. "Put differently, the students in 2000 were 2.96 times more likely to express dissatisfaction with their sleep than students in 1978" (p. 660).

Sleep Problems in College Students

Over time, the number of students indicating some form of sleep problems has increased. Hicks, Conti, and Pellegrini (1992) reported that between 1982 and 1992 the percentage of students reporting sleep problems rose from 26.7% to 68.3%. Other studies indicate large numbers of students reporting sleep problems. Buboltz, Brown, and Soper (2001) reported that 73% of college students indicated some form of occasional sleep problems. In a different study, the three researchers reported that 21.9% of students frequently or almost always experienced some form of sleep problem (Brown, Buboltz, & Soper, 2001). In their study of 1,922 first-year students, Yang, Wu, Hsieh, Liu, and Lu (2003) found that 44% reported some type of sleep problem, with insufficient sleep being the most common (23.9%). Ban and Lee (2001) report that within their study, subjective sleep disturbances were commonly found, with 6.5% of participants

indicating that they had severe sleep disturbances and an additional 29.7% indicating that they had moderate sleep disturbances.

Women reported more sleep difficulty symptoms than men (Buboltz, Brown, & Soper, 2001). Women were more likely than men to have symptoms of "difficulty falling asleep, disturbed night sleep, frequent nocturnal awakenings, and poorer sleep quantity." Buboltz et al. (2001) also found that 30% of female respondents and 18% of male respondents and reported experiencing insomnia within the three months prior to data collection; 15.8% of females and eight percent of males and reported three or more instances per week in which they had difficulty falling asleep. Furthermore, 18.8% of the females and 10.5% of the males indicated that their night's sleep was disturbed at least three times a week. Last, Buboltz et al. (2001) reported that over half of the respondents, 55.2% of females and 53.7% of males, felt tiredness during mornings. Oginska and Pokorski (2006) indicated similar findings in that women showed a greater need of sleep and higher levels of daytime sleepiness than males.

College students often have problems falling asleep. Brown, Soper, and Buboltz (2001) found that 19.3% of students cited falling asleep as one of the sleep difficulties occurring "frequently" or "almost always." In another study, the trio of researchers reported that 15.8% of female and 8% of male students reported difficulty falling asleep three or more times a week (Buboltz, Brown, & Soper, 2001). In his study of Australian students, of the related sleep difficulties reported frequently or almost every night or day occurrences, Lack (1986) found that the most prominent difficulty was falling asleep (18%). Forquer, Camden, Gabriau, and Johnson (2008) discovered that it took over 30 minutes to fall asleep for almost a third of their study's participants.

Another common sleep problem found in college students centers on difficulties staying asleep. Of 313 students completing an e-mail survey, 26% reported at least one awakening during a typical night, with an additional 21% indicating that they woke up two to three times during a typical night's sleep (Forquer, Camden, Gabriau, & Johnson, 2008). Brown, Soper, and Buboltz (2001) found that 10.9% of students cited staying asleep as one of the sleep difficulties occurring "frequently" or "almost always." Lack (1986) found similar results, in that 9% reported difficulty staying asleep. In another study, 18.8% of females and 8.4% of males reported waking most nights (Buboltz, Brown, & Soper, 2001).

Brown, Soper, and Buboltz (2001) found that students cited early-morning awakenings as one of their leading sleep difficulties. In this study, 25.2% of students indicated that they experienced early-morning awakenings "frequently" or "almost always." In his study of Australian students, of the related sleep difficulties reported frequently or almost every night or day occurrences, Lack (1986) found that the second most prominent difficulty was early morning awakenings.

One sleep-hygiene recommendation made to college students is to avoid taking naps (Buboltz, Loveland, Jenkins, Brown, Soper, & Hodges, 2006; Brown, Buboltz, & Soper, 2006). Brown, Soper, and Buboltz (2001) found that 15.1% students cited daytime napping as one of the sleep difficulties occurring "frequently" or "almost always." Within Lack's (1986) study, 7.6% of respondents indicated that they frequently took naps. In terms of nap length, students reported an average nap time of 30 minutes each day (Pilcher, Ginter, & Sadowski, 1997).

One of the most commonly researched and reported sleep problems within collegiate populations is that of daytime sleepiness. Students whose sleep is disrupted reported significantly higher daytime sleepiness (Bonnet, 1985; Alapin, Fichten, Libman, Creti, Bailes, & Wright, 2000). Reported percentages of the occurrence of this problem vary greatly. Over half of the 191 undergraduate students completing Buboltz, Brown and Sopor's (2001) study reported feeling tired during the morning hours. When separating by gender, more women (55.1%) than men (53.7%) indicated this problem. In a study comprised mainly of sophomores and juniors, 42% reported symptoms of excessive daytime sleepiness (Edens, 2006). Similarly, Yeung, Chung, and Chan's (2008) study of second-year through fourth-year Hong Kong medical students, 42.6% of students reported Epworth Sleepiness Scale scores higher than 10, the criteria often used to define excessive daytime sleepiness. On the lower end of the spectrum, 7.6% of Australian students indicated feeling drowsy and lethargic at least once during the day (Lack, 1986). Breslau, Roth, Rosenthal, and Andreski (1997), found that young adults who reported shorter sleep lengths and indicated greater difficulty in falling asleep were more likely to experience daytime sleepiness. When examining potential determinants of daytime sleepiness, significant results were obtained for variables of number of hours of sleep during weekdays, length of time needed to fall asleep, snoring, depression, and anxiety.

Brown, Soper, and Buboltz (2001) found that 11.5% of participants met the criteria for Delayed Sleep Phase Syndrome as indicated by late sleep onset times, challenges staying asleep, and significantly later sleep-wake cycle times during the weekend than during the week. Lack (1986) also found that 16.6% of the subjects met

the criteria of Delayed Sleep Phase Syndrome; those meeting the Delayed Sleep Phase Syndrome criteria reported not only having less sufficient sleep, but higher degrees of drowsiness, and irritability.

Insomnia is another collegiate sleep difficulty that has been given some attention by researchers. Prevalence of this problem varies greatly. Women were found to report greater presence of insomnia (30%) within the last three months than were their male counterparts (18%) (Buboltz, Brown, & Soper, 2001). Yang, Wu, Hsieh, Liu, and Lu (2003) reported that 14.4% of their overall study sample reported insomnia. However, only 3.8% of participants described themselves as insomniacs (Lack, 1986). Pires De Souza (1996) examined the quality of life between insomniacs and those without insomnia. Insomniacs were found to score significantly lower in areas of sleep quality; quality of awakening; physical, emotional, and mental well-being; and relationships, which suggests a lower quality of life. Of these factors, noninsomniacs significantly scored the highest in the areas of quality of sleep, defined as "a night's sleep with fewer than two awakenings and without the need of sleeping pills" and mood/mental state, referred to as "depression, tension, disposition, vitality, happiness, and pleasure modes of behavior or feelings, among other characteristics" (p.170).

Factors Relating to Poor Sleep Quantity and Quality

Numerous studies have been conducted to examine and determine how various factors and variables associate with, correlate to, or predict poor sleep quantity or sleep quality. In reviewing the studies focusing on college students, high school students, and young adults, several categories relating to poor sleep frequently emerge. These areas include academic class level/standing, age, collegiate academic performance, emotional

well-being, extra-curricular status, gender, international student status, leadership status, marital status, perceived or actual health status, substance use/abuse, veteran status, volunteering status, and work status.

Sleep and academic level/standing.

Academic classification or status level appears to affect sleep of college students, with younger students experiencing poorer sleep. Singleton and Wolfson (2009) found that first- and second-year students slept less than fourth-year students; however, they attributed such findings to the fact that, at the particular institution, the majority of students enrolled in 8:00 a.m. classes were first- or second year students. Miller, Danner, and Staten (2008) found similar results in that lowerclassmen were more likely to be short sleepers. Tsau and Li (2004a) also found that although seniors had greater sleep latency on the weekends, freshmen rose earlier and had shorter sleep time than other academic class levels.

Possessing a college education also appears to positively impact sleep. In a study of young adults participating in an Health Maintenance Organization (HMO), Breslau et al. (1997) found that level of education significantly related to weekday hours of sleep, with persons with some college education reporting a shorter average of hours slept than persons with either lower or higher levels of education. Hale (2005) specifically looked at how marital status and educational background were associated with higher-risk sleep durations. A higher percentage of those with college educations tended to fall within the middle range of sleep (6.5 – 8.5 hours/night), whereas those with and without high school degrees tended to sleep less than 6.5 hours or more than 8.5 hours.

Sleep and age.

Despite the fact that a large amount of research examining the relationship between age and sleep has been conducted, conclusive findings do not exist. A few studies indicate that age appears to affect sleep. Younger college students and subjects were found to be more likely to fall asleep during the day (Jean-Louis et al., 1998), report greater sleep and sleep need, longer sleep onset, and more difficulties falling asleep (Lack, 1986). Other studies indicate that older college students are more likely to experience poorer sleep. Howell, Jahrig, and Powell (2004) found a significant correlation between age and overall scores on the Pittsburgh Sleep Quality Index, with older students having higher total scores, indicating poorer sleep quality. Ban and Lee (2001) found that average sleep duration decreased with age, but they were unable to find statistically significant findings. In a study with high-school students, Chung and Cheung (2008) found that older high school students reported shorter sleep, later bedtimes, and longer weekend sleep. In some studies, no statistically significant relationships between sleep and age were found. In these studies, age was not correlated with sleep length (Kelly, 2004a; Kelly 2004b), or sleep habits of older adults, and college students were reported to be statistically similar (Pilcher, Schoeling, & Prosansky, 2000).

Sleep and collegiate academic performance.

Many studies assessing the relationship between sleep and academic success/performance have been conducted, but the majority of these have focused on students from kindergarten to senior-high school educational levels (Singleton & Wolfson, 2009). Of two reviews looking at the relationship between sleep and academic performance, one conducted by Wolfson and Carskadon (2003) and the other conducted by Curcio, Ferrara, and De Gennaro (2006), only five studies focused on college students

(Lack, 1986; Kelly, Kelly & Clanton, 2001; Trockel, Barnes, & Egget, 2000; Gray & Watson, 2002; Howell, Jahrig, & Powell, 2004).

Grade-point average (GPA) is generally considered the primary measurement of academic performance in higher education (Pascarella & Terenzini, 2005). The five studies noted within the reviews conducted by Wolfson and Carskadon (2003) and Curcio, Ferrara, and De Gennaro (2006) primarily examined the relationship between sleep behaviors and grades or GPAs. Lack (1986) found that those earning lower grades were more likely to report delayed sleep phase syndrome. Kelly et al. (2001) reported that those sleeping more than nine hours a night possessed significantly higher GPAs (mean GPA = 3.24) than those who slept less than six hours a night (mean GPA = 2.74). Gray and Watson (2002) reported that lower grades were associated with both later bedtimes and later rise times. Trockel et al. (2000) analyzed several health-related variables, including sleep, and their effect on first-year, on-campus residential students' GPAs. Of all the variables, "weekday and weekend wake-up times had the largest relative effects on semester grade-point average" (p. 128). When all independent variables and weekday wake-up times were controlled, predicted GPA decreased by 0.115 points on a standard four-point scale for every hour of delayed weekday wake time. Howell et al. (2004) failed to find a significant relationship between grades and Epworth Sleepiness Scale scores. However, they did report that among those carrying a full-time academic course load, students earning lower grades were more likely to have poorer sleep quality scores.

Other studies not included within the two reviews conducted by Wolfson and Carskadon (2003) and Curcio, Ferrara, and De Gennaro (2006) also have examined the

relationship between sleep and academic success within college populations. In an effort to better understand the phenomenon known as "the all-nighter" or as a "single night of total sleep deprivation," Thacher (2008) found a significant difference in that undergraduate students who reported never having used a single night of total sleep deprivation had a mean average GPA of 3.18 compared to a mean average GPA of 2.99 of those pulling an "all-nighter." Following the implementation of a social marketing campaign addressing sleep, evaluators found that students reporting greater sleep quality also showed a significantly higher GPA (McGee, Salafsky, & Hamilton, 2006). Within the same evaluation, students with higher GPAs also reported significantly earlier bedtimes, earlier wake-up times, and higher number of hours slept compared to those with lower GPAs. Peters, Joireman, and Ridgeway (2005) surveyed 231 undergraduate students and found that students who were more likely to consider future consequences reported significantly higher GPAs, less sleep dissatisfaction, fewer sleep difficulties, fewer occurrences of oversleeping.

Sleep and emotional well-being.

The relationship between emotional well-being and sleep is one of the largest areas of study. Several researchers document a relationship between mood, emotion, stress, and sleep. However, determining whether a lack of sleep contributes to poor emotional well-being or vice-versa has been challenging. It is possible that each contributes to the other, developing a cycle that is difficult to interrupt. Jean-Louis et al. (1998) found that college students with increased negative mood states were more likely to fall asleep during the daytime. Buboltz et al. state, "the most common negative mood state associated with poor sleep is depression" (2006, p. 17). Likewise, Moo-Estrella,

Perez-Benitez, Solis-Rodriguez, and Arankowsky-Sandoval (2005) and Breslau et al., (1997) found that students with depressive symptoms reported a higher degree of drowsiness during daytime classes. Poor sleep also has been found to be related to dissatisfaction with one's life or living standards (Kelly, 2004a; Pallos et al., 2007). Depression also has been found to be significantly different in insomniacs as compared to noninsomniacs (Pires De Souza, 1996), and associated with poor sleep quality (Pilcher, Ginter, & Sadowski, 1996).

Anxiety, stress, and worry also have been found to be associated with poor sleep (Kelly, 2004b; Carney & Waters, 2006; McCann & Stewin, 1988; Breslau et al., 1997; Pires De Souza, 1996; and Pilcher et al., 1997). Kelly (2004b) found that shorter sleep duration was related to increased worry and anxiety students might have, particularly regarding relationships. In the step-wise hierarchical regression Kelly performed, this negative relationship accounted for 6% of the variance in sleep. In another study using a simple regression with life satisfaction scores as a predictor and sleep length as the dependent variable, Kelly found that sleeping less was associated with lower life satisfaction (2004a). Levels of anxiety also were found to positively correlate with sleep length, especially for students whose worrying was reported above the median level. Similarly, Lund, Reider, Whiting, and Prichard (2009) found that, overall, 20% of students reported that stress interfered with sleep at least once a week, and that poor-quality sleepers reported more psychological health problems. Within their study, they also discovered that 24% of the variance found in *PSQI* scores was accounted for by stress and tension. Vranesh, Madrid, Bautista, Ching, and Hicks (1999) reported that students who had a higher level of concern regarding their ability to use their time

effectively were more likely to indicate problems with sleep. High levels of test anxiety also have been found to relate to decreased time sleeping (Hicks, Pellegrini, & Hawkins, 1979) and increased sleep disturbance (Blankstein, Flett, Watson, & Koledin, 1990).

Sleep and extracurricular status.

Unlike other health topics such as alcohol, tobacco use, and sexual health, little is known about how one's involvement or affiliation with extracurricular activities relates to sleep quantity or sleep quality. Few, if any, studies appear to exist that describe the impact upon differences in sleep quality and quantity of the number of student organizations memberships, or the affiliation or non-affiliation with particular reference groups. Only one study was found that examines sleep and extra-curricular affiliation. In studying the number of hours spent sleeping per day and comparing Greek and non-Greek students, Scott-Sheldon, Carey, and Carey (2008) found that Greeks slept a statistically significant longer amount than non-Greeks. This finding is surprising, since one would assume that involvement in a higher number of student extracurricular activities, or a greater amount of time spent on such activities, would place more time demands on an individual, which in turn could impact hours slept and overall sleep quality.

This lack of descriptive research is of concern, especially since a question about group affiliation and involvement has become a common question in many national-level collegiate surveys. For example, the Core Alcohol and Other Drug Survey asks for information concerning the respondent's affiliation as a non-participant, a participant, a member, or a leader of a wide array of extracurricular activities (Southern Illinois University, Carbondale, 2006). The National College Health Assessment – II specifically

asks if the respondent belongs to a fraternity or sorority (ACHA, 2010b). Although not health-related, the National Survey of Student Engagement (Indiana University Center for Postsecondary Research, 2000) asks for the number of hours per week spent participating in many of the same types of co-curricular activities listed in the Core Alcohol and Other Drug Survey.

Sleep and gender.

When examining the relationship between sleep and gender, several consistencies across the literature are found. Females tend to experience more sleep difficulties than do males (Lack, 1986; Peters, Joireman, & Ridgeway, 2005; Tsau & Li, 2004a; Brown, Soper, & Buboltz, 2001; Lindberg, Jansen Gislason, Bjornsson, Hetta, & Brown, 1997; Buboltz, Brown & Soper, 2001). Females appear to also obtain less sleep (Lack, 1986; Tsau & Li, 2004a), have poorer sleep quality (Tsau & Li, 2004a; Chung & Cheung, 2008; and Howell et al., 2004), and daytime sleepiness (Lindberg, et al., 1997; Chung & Chueng, 2008). Males are found to spend more time sleeping and staying in bed (Manber et al., 1996; Tsau & Li, 2004a; and Ban & Lee, 2001) as well as be more likely to oversleep (Peters et al., 2005). In addition, a number of other researchers report no significant differences between gender and sleep (Kelly, 2004a; Kelly, 2004b; Pilcher et al., 1997; and Breslau et al., 1997).

Sleep and international student status.

Numerous studies exist that examine sleep quantity and quality of collegiate students in other nations (Ban & Lee, 2001; Chung & Cheung, 2008; Lack, 1986; Machade, Varella, & Andrade, 1998; Pallos et al., 2007; Tsai & Li, 2004a, Tsai & Li, 2004b; Yang, Wu, Hsieh, Liu, & Lu, 2003). However, no researchers have examined

how international student status may affect sleep patterns of those attending institutions of higher education within the United States. Given that international students represent a special population generally receiving additional academic and social services and support from their host institutions, this lack of research is somewhat surprising.

Sleep and leadership status.

Unlike other health topics, no researchers have studied how the number or types of student leadership positions held impact differences in sleep quantity and sleep quality. This lack of research appears to extend itself to leadership outside of collegiate student populations. One would assume that holding a higher-level positions or a larger number of positions would place a greater number of time demands on an individual, which in turn could impact hours slept and overall sleep quality.

Sleep and marital status.

Findings concerning the relationship of marital status and sleep are inconclusive. Few researchers have examined these relationships, and ad none have specifically addressed college students relationship status and sleep. Hale (2005) specifically looked at how marital status and educational background were associated with higher-risk sleep durations. She found that individuals who were single, widowed, or separated/divorced were at increased risk of both short sleeping (< 6.5 hours/night) and long sleeping (>8.5 hours/night). Likewise, Breslau et al. (1997) found that single persons were more likely to report significantly shorter sleep during weekdays and weekends, as well as significantly higher amounts of daytime sleepiness than those who were married. However, in another study, those who were married were 2.65 times more likely to have

significantly poorer sleep quality, as measured by the *Pittsburgh Sleep Quality Index (PSQI*) (Pallos et al., 2007).

Sleep and perceived and actual health status.

Several studies have indicated linkages between perceived and actual health status with sleep. Those perceiving themselves to have bad health have been more likely to report poorer sleep and sleep disturbances (Pallos et al., 2007; Ban & Lee, 2001). Ban and Lee (2001) found that students who perceived themselves as unhealthy indicated a higher risk of having subjective sleep disturbances. Pilcher et al. (1996) found that increased physical complaints were correlated with poor sleep quality. Similarly, junior high students who reported a higher number of illnesses and lower scores on a measure of general health reported poorer sleep (Tanaka et al., 2003).

Sleep and residential status.

Only one study appears to exist that examines how residential situations and the different environmental factors associated with different living conditions impact sleep quantity and quality in collegiate student populations. This is surprising since one might assume that differences in communal living arrangements, physical layout of residential facilities (high-rise vs. single floor), and number of roommates would impact sleep. In a study examining the relationship between sleep habits and academic motivation, Edens (2006) found that students residing in residence halls experienced more excessive daytime sleepiness than students living off-campus.

Sleep and substance abuse.

Student alcohol and substance abuse is considered to be a leading student affairs issue (Biscaro, Broerk, & Taylor, 2004). Consequently, several researchers have

examined the connection of alcohol, tobacco, and other drug use with sleep. In a study examining the relationships among alcohol consumption, sleep, and academic performance, Singleton and Wolfson (2009) found that alcohol consumption was a significant predictor of one's sleep duration, later sleep schedules, increased sleep during weekends, and increased delays between weekday and weekend bedtimes. In a study of Korean college students, Ban and Lee (2001) found that more frequent drinking was associated with self-reported sleep insufficiency and sleep disturbances. Jean-Louis et al. (1998) found that students who were more likely to fall asleep during the daytime were more likely to drink increased amounts of alcohol. Contrary to these findings, Breslau et al. (1997) found that alcohol abuse or dependence was unrelated to the amount of daytime sleepiness, and Lund, Reider, Whiting, and Prichard (2009), reported that alcohol consumption was not a significant predictor to sleep quality.

Meanwhile, students who smoke have been found to be more likely to fall asleep during the day (Jean-Louis et al., 1998) and experience poor sleep and sleep disturbances (Pallos et al., 2007; Ban & Lee, 2001). Reidel, Durrance, Lichstein, Taylor, and Bush (2004) found that although light smoking was linked to insomnia, heavier smokers did not experience any sleep problems or difficulties. Phillips and Danner (1995) found that cigarette smokers were more likely to report difficulties falling asleep and staying asleep, and increased daytime sleepiness that nonsmokers.

Caffeine also has been found to be associated with poor sleep quantity and quality. Depending upon one's tolerance and sensitivity to caffeine, Nelig, Daval, and Debry (1992) found that even one cup of coffee could disrupt an individual's sleep. Those with increased caffeine intake have been found to experience greater difficulty

sleeping (Ban & Lee, 2001; Roehrs, Vogel & Roth, 1997). It is important to note that Lund, Redier, Whiting, and Prichard (1999) found that caffeine consumption was not a significant predictor of sleep quality.

Sleep and veteran status.

As a student population expected to increase in size in the coming years, little is known about the unique experiences and issues student veterans will be bringing with them to the arena of higher education (DiRamio, Ackerman & Mitchell, 2008). Few researchers have specifically examined the relationship between veteran student status and health; none have examined sleep within this emergent population. Several studies examining sleep within veterans exist (Lewis, Creamer, & Failla, 2009; Chapman, Lehman, Elliot & Clark, 2006; Mustafa, Erokwu, Ebose & Strolh, 2005); however, many of these either are comprised of older veterans from conflicts other than Iraq and Afghanistan seeking services through the Veterans Administration, or examine sleep difficulties as a result of Post Traumatic Stress Disorder or traumatic brain injury (Lewis, Creamer, & Failla, 2009; Ruff, Ruff & Wang, 2009).

As more active-duty, reserve, and National Guard members return to the United States after serving in combat zones, and then seek higher education, institutions of higher education will need to focus additional resources and services to meet the needs that this special population has. Already, efforts to do so have been initiated at the state and federal levels. The U.S. Department of Education recently solicited Requests for Proposals for Centers of Excellence for Veteran Student Success intended to coordinate services to address the academic, financial, physical, and social needs of veteran students (U.S. Department of Education, 2010). The State of Illinois also recently passed the

Illinois Higher Education Veterans Service Act, Public Act 096-0133 (2009), requiring all Illinois two- and four-year institutions with over 1000 students to hire a veteran services coordinator, develop a website highlighting services and programs intended for veteran students, and inventory veteran student utilization of a variety of services and programs. Additional information on the health behaviors and needs, including sleep quantity and quality, will be needed to help veteran students be academic successful.

Sleep and volunteer status.

Between 2007 and 2009, over 27% of all college students engaged in some form of volunteerism, with some states reporting volunteer rates over 40% (Corporation for National and Community Service, 2010). Several initiatives have been put into place to encourage college students to volunteer and develop a philosophy of a "lifetime of service" (Corporation for National and Community Service, 2006). Although college student volunteering and service learning are topics gaining increased research attention, most researchers have only described volunteering trends and activities of college students, and the impact of volunteering on cognitive, social, citizenship, and identity outcomes (Astin & Sax, 1998; Batchelder & Root, 1994; Giles & Eyler, 1994).

Only one study examines the effects of volunteering on the health of college students. In examining the relationship between social capital, defined as volunteering, and collegiate binge drinking, Weitzman and Kawachi (2000), found that individuals from campuses with higher amounts of volunteering consumed less alcohol. However, no researchers have examined the relationship between sleep and volunteering in collegiate populations. One might assume that a higher number of hours volunteered

would place a greater number of time demands on an individual, which in turn, could impact hours slept and overall sleep quality.

Sleep and work status.

The relationship between student work status and sleep appears more conclusive. Miller, Danner and Staten (2008) found that college students working over 20 hours per week were 1.45 times more likely to be short sleepers than those working under 20 hours. Although not a primary focus, Brown, Soper and Buboltz (2001) found a positive correlation between the number of hours students were employed and poor sleep quality. By contrast, in studying first-year female students, Machado, Variella, and Andrade (1998) reported that students who did not hold jobs were more likely to maintain consistent bedtimes. However, Edens (2006) was unable to find a significant relationship between the number of hours students worked and reports of excessive daytime sleepiness.

Studies indicating on the relationship between teenagers, young adults' sleep habits, and employment appear more plentiful. Carskadon (1990) found results similar to those of Miller, Danner, and Staten (2008), in that teenagers who worked more than 20 hours a week slept less, went to bed later, and were sleepier than those working fewer than 20 hours a week. Young adults who were full-time employees had significantly shorter sleep than those who were employed part-time or not employed, as well as scored higher daytime sleepiness ratings than those not employed (Breslau et al., 1997). It also has been found that teens who work are more likely to have their sleep and nap duration affected (Teixeira, Fisher, & Nagai, 2004; Vinha, Cavalcante & Andrade, 2002).

Path Analysis

Developed by geneticist Sewall Wright in 1930 (International Encyclopedia of the Social Sciences, 2008; Lani, 2009), path analysis is an extension of multiple regression, and is usually used to study causal models, based on a researcher's conceptualization of the patterns and relationships among relevant variables (Pedhazur, 1982; Carducci, 1979). Path analysis is used to test the fit of the correlation matrix against two or more causal models being compared by the researcher (Garson, 2008). Stage, Carter and Nora provide a short description of path analysis:

> "Researchers use path analysis most frequently to analyze data related to a prescribed causal model. With path analysis, researchers conduct a series of regressions to analyze influences on dependent variables within the model. Frequently dependent variables serve as independent variables for later regressions within the model. In some models, but not all, there is one ultimate dependent variable of interest to the researcher. A regression is conducted for each dependent variable and effects are calculated across regressions for cumulative effects" (2004, p.5)

Although used to study causal models, path analysis is not a technique for discovering causes or establishing causality (Carducci, 1979; Bryman & Cramer, 2005).

As a result of the complexity involved in examining the relationship between multiple variables, path analyses often employ a path diagram. The path diagram is simply a graphic illustration of theoretically based causal relationships conceptualized by the researcher between the relevant variables (Stage, Carter, & Nora, 2004). The path

diagram then only represents one of the multitudes of possibilities that the relevant variables may be related.

Casual models may be considered recursive or non-recursive (Lani, 2009). A recursive causal model is one way, or unidirectional. Within this model there are no feedback loops or reciprocal relationships. A non-recursive model may be multi-directional and include feedback loops and relationships that are reciprocal. When conducting path analysis, there is an assumption that the causal model should be linear (Lani, 2009; Garson, 2008), therefore, causal models should be recursive.

Within a path diagram, three types of variables are often found: exogenous, endogenous, and residual. (Pedhazur, 1982; Garson, 2008; Carducci, 1979). Exogenous variables are those whose variation is considered to be caused outside of the causal model (Pedhazur, 1982; Carducci, 1979). Endogenous variables are those whose variation is considered to be caused within the causal model (Pedhazur, 1982; Carducci, 1979). Depending upon the path diagram created to conceptualize the relationships between variables, variation of an endogenous variable may be impacted by either an exogenous or endogenous variable. Residual variables are those that account for the variation which is not included or explained in the causal model (Pedhazur, 1982; Carducci, 1979).

Once diagrammed, the next step in performing a path analysis involves calculating the path coefficients. Path coefficients are determined by developing structural equations which indicate the structure of hypothesized relationships in a causal model (Bryman & Cramer, 2005). For each structural equation, the researcher regresses the particular endogenous variable on each of the variables the researcher conceptualizes having an influence on it. (Carducci, 1979). Each path coefficient is a partial regression

coefficient calculated by the regression of a specific endogenous variable (International Encyclopedia of the Social Sciences, 2008). With all other variables within the causal model being held constant, the path coefficient indicates the direct influence of a particular variable on the specific endogenous variable (Carducci, 1979).

Two types of path coefficients are generally used within path analysis: unstandardized and standardized (Stage, Carter, & Nora, 2004). Unstandardized path coefficients are impacted by the measurement of the variable thus cannot be used to conclude the proportional importance of a variable within the model. Standardized path coefficients are sample specific, thus do not allow comparisons across studies (Pedhazur, 1982, Carducci, 1979). They are estimated from correlates, thus allowing for comparisons among the relative importance of the variables used within a study.

Once path coefficients have been calculated, the causal model is trimmed as a means of eliminating variables from the model that have no significant impact on the dependent variable (Pedhazur, 1982). Trimming usually occurs by removing or deleting path coefficients that do not meet a priori criteria of statistical significance and or meaningfulness (Pedhazur, 1982; Heise, 1969). When testing involves more than one path coefficient within an equation for possible deletion, an F test should be used. However, it is possible that tests of some path coefficients will be found not to be statistically significant, while the overall test of the model may be found to be statistically significant. Furthermore, with large sample sizes, regression coefficients with little meaningfulness may be found to be statistically significant. Instead of using statistical significant, some researchers prefer to use a criterion of meaningfulness. Many researchers set an arbitrary criterion in which all beta coefficients below .05 are deleted.

Following the trimming process, the decomposition of proposed causal model takes place, with analysis focusing on the direct, indirect, and spurious effects. The direct effect refers to the degree that a variable has on an endogenous variable, while all other variables are held constant. The indirect effect refers to the degree that a variable produces change in an endogenous variable, based on its influence in changing a mediating variable (Carducci, 1979). Indirect effects are determined by multiplying the path coefficients along each pathway leading to an endogenous variable (Bryman & Cramer, 2005, Pedhazur, 1982). Spurious effects, or noncasual effects, represent the influence of variables outside of the causal model.

Once the model has been trimmed, it becomes known as being "overidentified" (Pedhazur, 1982). Paths that have been deleted provide reflections about particular variables not directly impacting other variables. Therefore, significance testing for overidentified models should be conducted. Pedhazur (1982) suggests using Specht's (1975) approach in which a Chi-Square test may be obtained by using squared residual path coefficients. First, the generalized squared multiple correlation, $R^2_{m,}$ must be calculated. In a fully recursive model, R_i^2 is the ordinary squared multiple correlation of the *i*th equation and $(1\text{-}R_i^2)$ is the squared residual path coefficient.

$$R^2_m = 1 - (1\text{-}R_1^2)\,(1\text{-}R_2^2) \quad \ldots\, (1\text{-}R_i^2)$$

For an overidentified model, one can calculate a similar statistic (M) using the same formula, based on the retention and deletion of paths. Once both R^2_m and M have been found a measure of goodness of fit can be created by using the formula

$$Q = 1 - R^2_m / 1\text{-}M$$

To determine statistical significance, a researcher would use a goodness of fit test in which:

$$W = -(N-d) \log_e (1 - R^2_m / 1-M)$$

N represents the sample size; d represents the number of deleted paths. A critical value is determined by a Chi-Square critical value with the degrees of freedom being represented by the number of deleted paths. If W is greater than the W_{crit}, the null hypothesis would be rejected, indicating that the full model equaled the reduced model, and that the full model fits the data better than the reduced model, or one or more of the deleted paths contributes to the full model. If W is less than the W_{crit}, then the null hypothesis is retained, and that the reduced model fits the data better than the full model, and that the deleted paths did not contribute to the model.

Several have written about and summarized the assumptions that guide path analysis (Heise, 1969; Pedhazur 1982; Carducci, 1979; Garson, 2008; Stage, Carter & Nora, 2004). Those commonly noted include:

1. Relationships among the variables within the model should be linear and recursive.
2. Associations among the variables within the model should be additive.
3. Associations among the variables within the model should be causal.
4. All error terms are not correlated among the various variables.
5. Error terms are not correlated among themselves
6. Variables are measured on an interval scale.

Summary

This chapter reviewed relevant literature that provided a foundation and rationale supporting the need for this study. This chapter first introduced the reasons that practitioners and evaluators of health education and promotion programs within higher education need to gain a better understanding of the relationships between health and academic success in order to better plan, implement, and assess health education services, programs and interventions. Then a review of studies focusing on the sleep length, sleep times, wake times, sleep-wake cycles, sleep satisfaction, and sleep quality of college students was presented, followed by a review of sleep problems frequently experienced by college students and factors relating to poor sleep quality and quantity were set forth. Lastly, an explanation of path analysis was provided.

CHAPTER THREE

METHODS

Overview

The purpose of this chapter is to highlight the protocol implemented for this study, focusing on the study's purpose, research questions, research design, sample, instrumentation, data collection, and data analysis.

Purpose of the Study

The purpose of this study was to determine correlations among various demographic factors, sleep quantity, and sleep quality among randomly selected college students at a Midwestern four-year research university with high research activity. The second purpose of this study was to determine which factors predicted sleep quantity and quality.

Research Questions

1. What is the relationship between potential predictor variables and self-reported average weekday sleep length?
2. What is the relationship between potential predictor variables and self-reported average weekend sleep length?
3. What is the relationship between potential predictor variables and self-reported sleep quality?
4. What are the direct and indirect effects of potential predictor variables on self-reported weekday sleep length?
5. What are the direct and indirect effects of potential predictor variables on self-reported weekend sleep length?

6. What are the direct and indirect effects of potential predictor variables on self-reported sleep quality?
7. Does empirical data support the proposed causal model for self-reported weekday sleep length?
8. Does empirical data support the proposed causal model for self-reported weekend sleep length?
9. Does empirical data support the proposed causal model for self-reported sleep quality?

Research Design

A descriptive correlational and predictive correlational, cross-sectional research design was employed for this study. Descriptive correlational design is used to examine the relationship(s) among multiple variables, whereas predictive correlational design is used to predict the value of one variable, established by the values of other variables (Burns & Grove, 2005). Additionally, correlational research uses variables that usually cannot be manipulated for use in experimental or quasi-experimental design (Issac & Michael, 1995). Cross-sectional survey design allows researchers to collect self-reported data to understand and make conclusions regarding a specific population at a particular place in time (Lavrakas, 2008).

Study Sample

The study sample consisted of traditionally aged (18 to 24 years) undergraduate students enrolled in randomly selected core curriculum courses, who attended a large, four-year research university that is fully accredited by the Higher Learning Commission of the North Central Association of Colleges and Schools (Southern Illinois University,

Carbondale [SIUC, 2010). According to Austin (2008), college students fall into two groups: traditional and nontraditional students, with traditional students being between the ages of 17 and 25 and usually falling within developmental stages of adolescence or early adulthood. Bean and Metzner (1985) define traditional students as "residing on campus, 18-24 years old, and attending college full-time (p. 488). Stewart and Rue (1983) suggest that traditional students are those under the age of 25. Survey instruments were administered to students attending randomly selected undergraduate university core curriculum courses during the Spring 2011 academic term. Data were collected from students under 18 and over 25 years of age; however, their data were removed from the data set, preventing their inclusion in the data analysis.

This institution was selected because of the researcher's affiliation with the institution as a doctoral student, geographical proximity of the researcher to the institution, and access to participants who met the desired criteria (traditionally aged college students attending a four-year institution of higher education). On October 15, 2010, the institution's official Fall 2010 semester reporting date, a total of 20,037 students were enrolled with the university, of which 15,137 (75.5%) were enrolled as undergraduate students. (SIUC, 2010) Undergraduate demographics included 6984 females (46.1%), 8479 males (56.0%), 13,266 full-time students (87.6%), and 1872 part-time students (12.4%). Regarding age, 2,381 undergraduate students were 25 years of age or older (15.7%). In terms of race and ethnicity, demographics included 10,097 white, non-Hispanic (66.7%), 3,109 black, Non-Hispanic (20.5%), 824 Hispanic (5.4%), 279 Asian/Pacific Islander 1.8(%), 298 international or "non-resident aliens" (1.9%), and 419 (2.7%) whose race/ethnicity were unknown (SIUC, 2010).

In order for a large enough sample size to be obtained it will be important to ensure that the statistical procedures utilized were powerful enough to detect significance. Issac and Michael (1995) indicate that larger sample sizes will result in "smaller sampling errors, greater reliability, and increase the power of the statistical test applied to the data" (p. 101). To determine an appropriate sample size for this study, multiple sources were consulted.

According to Hill (1998), the minimal sample size for a descriptive study employing a population size of 15,000, when considering a confidence interval of 95% and a sampling error of +/- 5%, is 375 students. Hill determined this number using an adapted sample size table originally developed by Krejcie and Morgan (1970). The population size of SIUC is derived from the approximate 15,000 undergraduate students enrolled with the university during the Fall 2010 semester.

Since this study's purpose focused on correlation and prediction, and employed multiple regression analyses, other means to determine sample size were used. When analyzing data using multiple regression, the ratio of cases to independent variables should be strongly considered when determining an appropriate sample size. Generally, such sample sizes should be determined based on several issues including, "the desired power, alpha level, number of predictors, and expected size effects" (Tabachnick & Fidell, 2001, p.117). Several suggestions concerning an appropriate sample size have been previously given. Miles and Shevlin (2001) made note that some researchers suggest that a regression analysis should be comprised of more than 100 participants or 20 participants for each independent variable to be used. Howell (2002) promoted a sample size of one participant for every independent variable to be used, plus an

additional 40 participants. Green (1991) suggested that the sample size for testing multiple correlations be equal to or greater than the number of independent variables to be used multiplied by eight plus an additional 50 subjects ($N \geq 50 + 8k$, where $k =$ the number of independent variables). Green also suggested that when testing for individual predictors, sample size should be equal to or larger than 104 plus the number of independent variables ($N \geq 104 + k$, where $k =$ the number of independent variables). Being conservative, Miles and Shevlin's (2001) suggestion was used for this study; therefore factoring an approximate number of 20 independent variables, a minimum of 400 participants were needed to test the multiple regressions.

Instrumentation

Three self-report instruments were used to collect data for this study: the *Pittsburgh Sleep Quality Index*, a sleep journal modified from *The Pittsburgh Sleep Diary*, and *the Medical Outcomes Study Short Form Health Survey (MOS SF-36).* In addition, several questions concerning student involvement, health, and demographics were used.

The Pittsburgh Sleep Quality Index.

The *Pittsburgh Sleep Quality Index (PSQI)*, developed by Buysse, Reynolds, Monk, Berman and Kupfer (1989), consists of 19 self-rated items that measure sleep quality over the past month and help differentiate between those who get a good night's sleep and those for whom sleep quality is lacking (See Appendix A). According to Buysse et al. (1989), the *PSQI* was "developed with several goals: (1) to provide a reliable, valid, and standardized measure of sleep quality; (2) to discriminate between "good" and "poor" sleepers; (3) to provide an index that is easy for subjects to use and

for clinicians and researchers to interpret; and (4) to provide a brief, clinically useful assessment of a variety of sleep disturbances that might affect sleep quality" (p. 194). Furthermore, the *PSQI* was designed to measure sleep during the past month, serving as an intermediate measure between post-sleep inventories, which generally collect data regarding the previous night's sleep, and survey-type questionnaires that, at the time the *PSQI* was developed, generally assessed the occurrence of sleep difficulties over the past 12 months. Buysse et al., (1989) also indicated that the 19 items in the *PSQI* were derived from their own clinical intuition and clinical interactions with those presenting with sleep disorders, a review of the scholarly literature focusing on existing sleep questionnaires, and clinical use of the instrument during an 18-month-long field test.

The 19 self-rated items are divided into seven different components: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medications, and daytime dysfunction (See Table 1). Each of the seven components is equally weighted on a scale that ranges from 0 to 3. Scales are then summed to determine a global *PSQI* score which ranges from 0 to 21, with lower scores indicating higher sleep quality and higher scores indicating lower sleep quality.

Table 1

Pittsburgh Sleep Quality Index Component Scales and Scale Items

Pittsburgh Sleep Quality Index Component	**Scale Items**
PSQISLPQUAL – Overall sleep Quality	6
PSQILATEN - Sleep Latency	2, 5a
PSQIDURAT – Duration of Sleep	4
PSQIHSE – Sleep Efficiency	4,1, 3
PSQIDISTB – Sleep Disturbance	5b, 5c, 5d, 5e, 5f, 5g, 5h, 5i, 5j
PSQIMEDS – Need Meds to Sleep	7
PSQIDAYDYS - Day Dysfunction Due to Sleepiness	8, 9

PSQI Component scores were derived by a variety of means. The Overall Sleep Quality Scale (PSQISLPQUAL) was determined by assigning a "0" to "very good," "1" to "fairly good," "2" to "fairly bad," and "3" to "very bad."

The Sleep Latency Scale (PSQILATEN) score was determined through answers provided by items 2 and 5a. When scoring item 2, a "0" was assigned to those indicating that it took fewer than 15 minutes to fall asleep, a "1" to those indicating that it took 16 to 30 minutes to fall asleep, a "2" to those indicating that it took 31 to 60 minutes to fall asleep, and a "3" to those who indicated that it took over 60 minutes to fall asleep. When scoring item 5a, a "0" was assigned to those who indicated that they did not have any trouble getting to sleep within the past month, a "1" to those who indicated that they did not have trouble getting to sleep less than once a week, a "2" to those who indicated that had a problem getting to sleep once or twice a week, and a "3" to those indicating that they have had trouble getting to sleep three or more times a week. Scores from items 2 and 5a were then added. If the sum of these numbers equaled "0," they were assigned "0"; if the sum equaled "1" or "2" they were assigned a component score of "1"; if the sum equaled "3" or "4", they were assigned a component score of "2"; and if the sum equals either a "5" or a "6", they were assigned a component score of 3.

The Sleep Duration Score (PSQIDURAT) was assigned a "0" if the response given was greater than seven hours of actual sleep reported. A "1" was assigned if the response given was to six to seven hours of sleep reported, a "2" to five to six hours of sleep reported, and a "3" to five or fewer hours of sleep reported.

The component score for Sleep Efficiency (PSQIHSE) was calculated by dividing the number of hours slept, as reported in item 4, by the number of hours spent in bed, which was determined by subtracting the reported bedtime in item 1 from the time reported getting up from item 3. The final component score was derived by assigning a "0" to sleep efficiency greater than 85%, a "1" to sleep efficiency ranging between 75-84%, a "2" to sleep efficiency ranging between 65-74%, and a "3" to any sleep efficiency below 65%.

To determine the Sleep Disturbance Component Score (PSQIDISTB), all items from 5b to 5j were assigned a score of "0" if disturbance had not occurred during the past month, a "1" if disturbance occurred less than once a week, a "2" if disturbance occurred once or twice a week, and a "3" if disturbance occurred three or more times a week. All scores were then added. If the sum of all scores was zero, then a component score of "0" was assigned. If the sum of scores equaled 1 to 9, a component score of "1" was assigned. If the sum of scores ranged between 10 and 18, and 19 and 27, component scores of "2" and "3" respectively were assigned.

The Use of Sleeping Medication Component Score (PSQIMEDS) was determined by examining the response to item 7. Responses indicating that medications had not been taken to help the respondent get to sleep were assigned a "0." If it was reported that medications were used less than once a week to help get to sleep, a score of "1" was assigned. If it was reported that medications were used to get to sleep once or twice a week, or three or more times a week, then scores of "2" and "3" were respectively assigned.

The Daytime Dysfunction Component Score was derived from items 8 and 9. If responses to item 8 indicated that there were no instances of "having trouble staying awake while driving, eating meals, or engaging in social activity within the past month," the item was assigned a score of "0." If these activities had occurred once or twice, the item was assigned a score of "1." If these activities had occurred "once or twice each week" or "three or more times each week," the item was assigned a score of "2" or "3" respectively. For item 9, if responses indicated that there had been "no problem at all" in keeping up enough enthusiasm to get things done, the item was assigned a score of "0." If the response indicated that it has been "only a very slight problem," then a score of "1" was assigned. If the response indicated that it has been "somewhat of a problem" or "a very big problem," then a score of 2 or 3 was respectively assigned. To compute the final component score, the scores from items 8 and 9 were added. If the sum of these numbers equaled "0" they were assigned "0"; if the sum equaled "1" or "2" they were assigned a component score of a "1"; if the sum equaled "3" or "4", they were assigned a component score of a "2"; and if the sum equaled either a "5" or "6", they were assigned a component score of 3.

Buyesse et al. (1989) first administered *The Pittsburgh Sleep Quality Index* during an 18-month-long field test to three groups of subjects. The first group was comprised of 52 "good" sleepers who presented as healthy subjects without any complaints relating to sleep, the second group was comprised of 34 "poor" sleepers who presented with a major depressive disorder, and the last group was comprised of 62 "poor" sleepers who were selected from a clinical sample of outpatients referred to a sleep evaluation center

diagnosed with either Disorder of Initiating and Maintaining Sleep or Disorders of Excessive Somnolence.

During the initial study (Buysse et al., 1989) a high degree of internal consistency was observed among the seven component scores of the *PSQI*; a Cronbach α of 0.83 was computed. Furthermore, a strong correlation also was found among individual items. To assess test-retest reliability, 91 patients completed the *PSQI* on two separate occasions, with an average of 28.2 days between administrations. No significant differences were observed through paired *t*-tests for the global *PSQI* scores and the seven individual component scores between tests/administrations. Pearson's product-moment correlations also were performed to determine how stable both the global and component scores would be between the test and retest occasions; a coefficient of 0.85 was computed for the global *PSQI* score. The highest component coefficient was found for sleep latency (0.84), whereas the lowest component coefficient was found for medication use (0.65). The *PSQI* also was found to be a valid instrument in differentiating control participants from patients; furthermore, the *PSQI*'s validity was supported to a limited extent by polysomnographic findings, a machine that reads biophysical changes which occur during sleep.

Additional studies further support the validity and reliability of the *PSQI*. Moderate to high correlations were observed when calculating Pearson's product-moment correlation coefficients between the global *PSQI* score and the seven component scores (Carpenter & Andrykowski, 1998). Researchers found the *PSQI* to have high construct validity with sleep problems and sleep restlessness and found the instrument to differentiate good sleepers and bad sleepers. Grandner, Kripke, Yoon, and Youngstedt

(2006) also found the *PSQI* global score to be significantly correlated with six of the seven components at the 0.0005 level. When assessing criterion validity, Grandner et al. (2006) found significant correlations between the *PSQI* global score and the sleep diary entries. Overall test-retest reliability of the *PSQI* global score has been found to be quite high as well, with 0.90 reliability two days after administration, and 0.87 on an average of 45 days later (Backaus, Junghanns, Broocks, Riemann & Hohagen, 2002).

The Pittsburgh Sleep Diary.

Participants were asked to retrospectively indicate their typical bed time, sleep time, and wake time during the semester in which the survey was administered. These questions were modeled after questions from *The Pittsburgh Sleep Diary* (Monk et. al., 1994), a sleep log created at the Sleep and Chronobiology Center, Western Psychiatric Institute and Clinic, University of Pittsburgh School of Medicine, the same center responsible for developing *The Pittsburgh Sleep Quality Index*. The Pittsburgh Sleep Diary includes a variety of questions relating to sleep times, wake times, naps, meals, intake of alcohol, tobacco, caffeine and other drugs, and mood. Those completing the Pittsburgh Sleep Diary complete one half of the diary prior to going to bed, and then complete the other half upon waking. The Pittsburgh Sleep Diary was found to have high test-retest reliability when measuring number of awakenings, perceived sleep quality, timing of going to bed, lights out, and getting up. Furthermore, the Pittsburgh Sleep Diary revealed sleep patterns which conformed to findings from objective sleep actigraphy measures.

For this study, participants were asked to indicate only the time they typically went to bed, time they typically fell asleep, time they typically woke up, and number of

naps taken for each day of the week (See Appendix B). Whereas the *PSD* diary is designed to be completed daily, participants were asked to provide times these activities were engaged during the semester in which the study was administered.

The Medical Outcomes Study Short Form Health Survey (*MOS SF-36*).

The *Medical Outcomes Study Short Form Health Survey (MOS SF-36)*, developed by Ware and Sherbourne (1992), consists of 36 items which measure 8 domains of perceived health status, well being, and functioning (see Appendix C). According to Ware and Sherbourne (1992), the *MOS SF-36* was developed as a brief, yet comprehensive and psychometrically sound standardized health status assessment tool that could be utilized in the clinical setting, as well as in research studies. Ware and Sherbourne indicate that in developing the instrument that most of the 36 items were "adapted from instruments that have been used for 20 to 40 years or longer" (1992, p. 474).

The 36 self-rated items are divided into 8 domains: physical functioning, role limitations caused by physical health problems, role limitations caused by emotional problems, energy/fatigue, emotional well being, social functioning, pain, and general health (See Table 2). Each of the 8 domains are scored using the Likert method of summated ratings (Ware & Sherbourne, 1992), and are transformed linearly to a score ranging from 0 to 100, with higher scores representing better perceived functioning and health status. In addition, two summary measures that assess physical and mental wellness and function exist (See Table 2).

The reliability and internal consistency of the *MOS SF-36* has been extensively utilized and researched extensively. According to Ware, "with rare exceptions, published

reliability statistics have exceeded the minimum standard of .70 recommended for measures used in group comparisons in more than 25 studies; most have exceeded .80" (2004, p. 24). Furthermore, the median reliability coefficients for each of the 8 *MOS SF-36* scales was equal to or greater than .80 in the first published 15 studies, except for social functioning, which had a median reliability across studies of 0.76 (Ware, Snow, Kosinski, & Gandek, 1993). Furthermore, the *MOS SF-36* also has been documented to have strong validity. Comparisons of the *MOS SF-36* to other widely used generic health surveys shows strong content validity in that it includes eight of the most widely used health concepts (Ware, 2004). In relation to the longer Medical Outcomes Study measures, the *MOS SF-36* has been shown to demonstrate strong empirical validity in studies examining physical and mental health (McHorney, Ware, & Raczek, 1993).

Table 2

The Medical Outcomes Study Short Form Health Survey (MOS SF-36) Scales and Scale Items

MOS Short Form Health Survey (*MOS SF-36*)	**Scale Items**	**Summary Component Measure**
Physical Functioning	3, 4, 5, 6, 7, 8, 9, 10, 11,12	Physical Health
Role Limitations Due to Physical Health	13, 14, 15, 16	Physical Health
Role Limitations Due to Emotional Problems	17, 18, 19	Mental Health
Energy/Fatigue	13, 17, 29, 31	Mental Health
Emotional Well Being	24, 25, 26, 28, 30	Mental Health
Social Functioning	20, 32	Mental Health
Pain	21, 22	Physical Health
General Health	1, 33, 34, 35, 36	Physical Health

Demographic questions.

Numerous demographic questions were asked within the survey (Appendix D). These demographic questions inquired about designations and behaviors as academic classification, academic standing**,** age, alcohol use, gender, grade point average, hours spent in extracurricular activities/student organizations, hours spent volunteering, hours spent working, marital status, number of leadership positions held, number of semester hours currently enrolled in, race/ethnicity, residential status, tobacco use, and veteran status. Such questions were selected as a result of their use within previous sleep studies and their inclusion in other national collegiate surveys.

Data Collection

Approval from the Southern Illinois University-Carbondale (SIU-C) Human Subjects Committee was sought and granted. A classroom-based survey was administered to students attending selected undergraduate courses within the university core curriculum. Classes were selected in a random cluster sample manner. Cluster sampling is defined as "the selection of groups of individuals, called clusters, rather than single individuals. All individuals in a cluster are included in the sample; the clusters are preferably selected randomly from the larger population of clusters" (Fraenkel & Wallen, 2003, p.G-1). Advantages of cluster sampling include greater ease less expense, and higher efficiency (McDermott & Sarvela, 1999).

The clusters were determined from a list of all sections of on-campus core curriculum courses which were generated from a query made through the SIUC Banner Class Search online tool. The SIUC Banner Class Search online tool generated a list of all core curriculum courses available, arranged in alphabetical order by department and

numerical order by section. After the list was generated, all off-campus and online core curriculum courses were removed. Once the online and off-campus sections had been removed, each remaining section was given a numerical designation based upon its departmental, course, and sectional placement listing. Using these numerical designations along with a random digit table (Glass & Hopkins, 1996), approximately 30 sections were initially selected as classes from which to solicit participation. The reason that 30 sections were selected is that according to the 2008-2009 University Core Curriculum Highlights, the average core curriculum section had 29 students. This number of sections would compensate for classes whose actual size was much lower than 29, as well as account for faculty members who declined to allow data collection in their classes. Due to a number of core curriculum faculty non-responses or declinations to the request for permission to collect data in their classroom, this selection process was repeated to gain access to additional classes.

Neutens and Rubinson (2002) indicate that some of the advantages of surveys include "(1) a savings of money and time, especially compared with the interview technique, (2) no interviewer bias, (3) greater assurance of anonymity, (4) completion by the respondent at his or her convenience, (5) accessibility to a wide geographic region, (6) accurate information due to the fact that respondents can consult records before answering, and (7) identical wording for all respondents" (p.107). McDermott and Sarvela (1999) promote surveys as the "best method for social scientists to describe, explain, or explore a population that is too large to observe directly" (p. 244). Furthermore, they indicate that surveys allow regulated and uniform data-collection techniques and consistent data-analysis methods.

Direct administration of paper-and-pencil surveys to groups has a number of advantages. These advantages include a usually high response rate (The Ergonomics Society, 2010; Colorado State University, 2010; Trochim, W.M, 2006; Fraenkel & Wallen, 2003; Pennsylvania Department of Health, 2001; Edwards, Thomas, Rosenfeld, & Booth-Kewley, 1997; Fowler, F.J., 1993), low cost in administering (Pennsylvania Department of Health, 2001; Edwards, Thomas, Rosenfeld, & Booth-Kewley, 1997; Fowler, F.J., 1993), surveyor control of the conditions in which data is collected (The Ergonomics Society, 2010; Pennsylvania Department of Health, 2001; Edwards, Thomas, Rosenfeld, & Booth-Kewley, 1997), short administration times (Fraenkel & Wallen, 2003), survey administrator can explain the purpose of the survey (The Ergonomics Society, 2010; Fraenkel & Wallen, 2003; Pennsylvania Department of Health, 2001; Edwards, Thomas, Rosenfeld, & Booth-Kewley, 1997), and respondents can ask questions (The Ergonomics Society, 2010; Trochim, W.M, 2006; Fraenkel & Wallen, 2003; Pennsylvania Department of Health, 2001; Edwards, Thomas, Rosenfeld, & Booth-Kewley, 1997).

Direct administration of a paper-and-pencil survey to groups contains a number of disadvantages. These disadvantages include a need for facilities in which to administer the survey (Fraenkel & Wallen, 2003), required training of the survey questioner (Fraenkel & Wallen, 2003), a literate sample to complete the survey (Fraenkel & Wallen, 2003) and the bringing together of respondents (Colorado State University, 2010).

Furthermore, Fraenkel and Wallen (2003), indicate four additional disadvantages of this method with regard to the recruitment and retention of participants. The researcher may be enthusiastic about the study, but have difficulty convincing faculty to

allow access into their classrooms. Once in the classroom, it may be difficult to convince participants that their responses will remain anonymous and confidential. In addition, participants may attempt to answer in a socially desirable fashion, providing answers that they believe the researcher seeks. Last, some participants may believe that they are implicitly being coerced to complete the survey based on the presence of faculty or peers within the classroom.

Courses in that the survey was administered were solicited through contacts made with individual instructors teaching university core-curriculum classes. Dr. Patsy Manfredi, Director of the University Core Curriculum, endorsed the study and indicated his willingness for the researcher to note such endorsement in course recruitment materials. The researcher established contact with course instructors initially through e-mail (Appendix E). When needed, follow-up, via telephone and, in person was made. Steps were taken to address the four participant recruitment disadvantages noted by Fraenken and Wallen (2003). To help increase faculty response, the initial e-mail included a brief introduction of the study, the researcher's specific request to administer the survey in the university core curriculum courses, an indication that their particular course and section had been randomly selected, the estimated amount of time it would take to administer the surveys, and the two-week time period during which data collection would take place. In addition, endorsement of the study and data collection by Dr. Patsy Manfredi, Director of the University Core Curriculum, was noted. To address the concern that participants' responses would be anonymous and confidential, as well as to reduce any feelings of implicit coercion participants may have felt, faculty members

also were asked to vacate the classroom during the time in which the survey was administered.

Data were collected during the last weeks of February and the first weeks of March 2011, with a goal of at least 500 to 600 participants. When scheduling and arranging data-collection efforts with faculty and instructors, the researcher receive rough estimates of how many students were registered within each section in which data collection was to occur. Initial estimates were derived from information provided through the Banner Information System, and validated from information provided by course instructors. The researcher continued to schedule data collection from course sections until approximately 900 registered students were assumed to be potentially available to participate. In order to achieve the desired sample size, this oversampling number was selected to counteract possible absenteeism rates, incomplete surveys, and other factors that could have negatively impacted sample size.

To enhance student participation in the survey, a lottery incentive was offered. Porter and Whitcomb (2003) recommend the use of lottery incentives, suggesting that "college students are more price sensitive than the average person. If so, lottery incentives may have an impact on response rates in student surveys while not having any impact on response rates in surveys of the general population" (2003, p. 390). A total of 20 gift cards, valued at $5.00 each were raffled to students who deposited a raffle entry card at the end of each data-collection period. The raffle cards asked for each individual's name, e-mail, local address, and if their entry was chosen, their preference for a gift card to Buffalo Wild Wings, Starbucks, or Wal-Mart. Once all data-collection activities were terminated, the researcher's children randomly pulled 20 cards out of a

container. The gift cards specified were then mailed to each individual at the address provided.

McDermott and Sarvela (1999) recommend that researchers institute a supervised format when collecting self-administered surveys "because it allows for more consistent instructions, simultaneous administration, and availability to answer questions and the monitoring of completion" (p. 251). Edwards, Thomas, Rosenfeld, and Booth-Kewley (1997), also stress the need for a structured introduction when administering surveys. They suggest that such an introduction include: an invitation to the participants to complete the survey, a brief description of the survey topic, a description of why the survey is being conducted, and an explanation of how the survey results will be used. In addition, Edwards et al. (1997) suggest that researchers also inform participants regarding the confidentiality and anonymity of responses, as well as reduce evaluation apprehension, or the belief that they are being evaluated or that they can "flunk" the survey to increase response rates.

Following these suggestions, the researcher used a supervised format and a script with which he invited potential subjects to participate, provided an explanation of the study and a description of why the survey was being conducted, and disclosed the manner that the survey results were to be used (See Appendix F). Finally, students were invited to enter the lottery to win one of the survey incentives. Once the introductory script had been read to the students, the researcher distributed informed consent forms, survey instruments, and, if needed, writing utensils to the students. Following the distribution of these materials, the researcher verbally presented the informed consent form and directions for completing the survey instruments. Students were requested to use their

informed-consent form to cover their answers when completing the survey. Students who were ineligible to take the survey because they were under 18 or because they had previously completed the survey in another course, or who did not wish to participate in the study, were asked to indicate their status on the survey's informed consent sheet, return the survey without completing it, and quietly occupy themselves until their classmates had completed the survey. Three sealed boxes were placed at the front of the classroom, one each for the informed consent form, the completed survey, and the incentives raffle entry form. Students were asked to turn in surveys as they completed them, rather than turning them in at the same time as their classmates, to help determine when survey administration was completed. Depending upon the time in which the survey was administered (beginning of class vs. end of class) and the instructor's preference, students either returned to their seats for classroom instruction, or were released. At the conclusion of every data collection period, surveys were transported to a secure location.

Pilot Study

Prior to actual data collection, a pilot study was conducted. Pilot studies serve many purposes. "Pilot testing provides invaluable opportunities to learn about the validity, reliability, and usability of instruments" (Dignan, 1995, p. 64). According to McDermott and Sarvela (1999), "Pilot tests are useful in helping us estimate response rates for our instrument" (p. 169). Pilot studies also allow researchers to check statistical procedures (Isaac & Michael, 1997).

The pilot study for this research tested the likely success of recruiting core curriculum classes and individual participants, logistical issues associated with survey

administration and data collection procedures, the amount of time required to complete the survey, survey organization, and the magnitude of financial and personnel resources needed for survey administration. Also, the pilot study allowed the researcher to conduct a preliminary test of data coding, data entry, quality control procedures of the data set, and data analysis procedures to be used.

Recommendations regarding the number of participants for a pilot study vary. Issac and Michael (1995) suggest a pilot study sample size of 10 to 30, whereas Dillman indicates that for a pilot study, "a sample of 100 to 200 is generally drawn, but may be larger if resources allow" (2007, p. 146). Sudman and Bradburn (1986) recommend 20 to 50 subjects for a pilot test. The researcher recruited 40 to 60 participants for this pilot study. All methods and protocols planned for the primary research study were implemented for the pilot study.

Data Analysis

Data were entered into an SPSS 18.0 data file by the researcher. Data were analyzed from all participants who were 18 years of age and older who had not reached their 25th birthday. Every item on the survey, including those items left unanswered, was coded and organized into an SPSS spreadsheet for analysis. Blank items were coded as "." to signify missing data. Surveys missing more than 10% of data were excluded from the data analysis. To assess the quality and accuracy of data entry, the recommendation of McDermott and Sarvela (1999) to check 10% of the primary study sample was followed. To ensure accuracy, every tenth case's data computer entry was checked with the original survey forms. Rather than waiting until the conclusion of data entry, these checks occurred at the conclusion of each daily batch of data that was entered. In

addition, McDermott and Sarvela's (1999) recommendation to inspect range scores of entered data to determine if coding is within acceptable ranges was conducted.

All statistical analyses were conducted through the use of the Statistical Package for Social Sciences (SPSS) 18.0. Univariate statistics, including frequencies, percentages, measures of central tendency (statistical means), and measures of dispersion (standard deviation and range), were calculated for each survey and demographic item.

Research question one.

To determine if significant relationships existed between potential predictor variables and self-reported weekday sleep, Pearson's product-moment correlations coefficients were analyzed. Numerous demographic variables obtained through self-report survey questions served as the independent variables (See Table 3). The average length of sleep for weekdays, derived from data recorded for Sunday through Thursday nights, was used as the dependent variable. Length of sleep was determined by subtracting the estimated time to fall asleep once in bed from the amount of time between going to bed and waking up. To allow standardization on a continuum to occur for comparisons for bedtime and wake time, all times were converted to military time. Twenty-four hours was then added to times between 1:00 a.m. through 11:59 a.m. An alpha level of .05 was used to determine statistical significance.

Table 3

Research Question 1 – Potential Predictor Variables and Weekday Sleep Length

RSQ	IV	DV	Statistical Test
What is the relationship between potential predictor variables and self-reported average weekday sleep length?	Age	Average Weekday Sleep Length	Pearson product coefficient correlation
	Cigarettes/Week	Average Weekday Sleep Length	Pearson product coefficient correlation
	Drinks/Week	Average Weekday Sleep Length	Pearson product coefficient correlation
	GPA	Average Weekday Sleep Length	Pearson product coefficient correlation
	Hours Week/Volunteering	Average Weekday Sleep Length	Pearson product coefficient correlation
	Hours Week/Working	Average Weekday Sleep Length	Pearson product coefficient correlation
	Hours/Week Extracurricular	Average Weekday Sleep Length	Pearson product coefficient correlation
	MOS SF-36 Mental Score	Average Weekday Sleep Length	Pearson product coefficient correlation
	MOS SF-36 Physical Score	Average Weekday Sleep Length	Pearson product coefficient correlation
	Roommates	Average Weekday Sleep Length	Pearson product coefficient correlation
	Semester Hours	Average Weekday Sleep Length	Pearson product coefficient correlation
	Student Leadership Positions	Average Weekday Sleep Length	Pearson product coefficient correlation

Research question two.

To determine if significant relationships existed between potential predictor variables and self-reported weekend sleep, Pearson's product-moment correlations coefficients were analyzed. Numerous demographic variables obtained through self-report survey questions served as the independent variables (See Table 4). The average length of sleep for the weekend, derived from data collected for Friday and Saturday nights, was used as the dependent variable (See Table 4). Length of sleep was determined by subtracting the estimated time to fall asleep once in bed from the amount

of time between going to bed and waking up. To allow standardization on a continuum to occur for comparisons for bedtime and wake time, all times were converted to military time. Twenty-four hours was then added to times between 1:00 a.m. through 11:59 a.m. An alpha level of .05 was used to determine statistical significance.

Table 4

Research Question 2 – Potential Predictor Variables and Weekend Sleep Length

RSQ	IV	DV	Statistical Test
What is the relationship between potential predictor variables and self-reported average weekend sleep length?	Age	Average Weekend Sleep Length	Pearson product coefficient correlation
	Cigarettes/Week	Average Weekend Sleep Length	Pearson product coefficient correlation
	Drinks/Week	Average Weekend Sleep Length	Pearson product coefficient correlation
	GPA	Average Weekend Sleep Length	Pearson product coefficient correlation
	Hours Week/Volunteering	Average Weekend Sleep Length	Pearson product coefficient correlation
	Hours Week/Working	Average Weekend Sleep Length	Pearson product coefficient correlation
	Hours/Week Extracurricular	Average Weekend Sleep Length	Pearson product coefficient correlation
	MOS SF-36 Mental Score	Average Weekend Sleep Length	Pearson product coefficient correlation
	MOS SF-36 Physical Score	Average Weekend Sleep Length	Pearson product coefficient correlation
	Roommates	Average Weekend Sleep Length	Pearson product coefficient correlation
	Semester Hours	Average Weekend Sleep Length	Pearson product coefficient correlation
	Student Leadership Positions	Average Weekend Sleep Length	Pearson product coefficient correlation

Research question three.

To determine if significant relationships existed between potential predictor variables and self-reported sleep quality, numerous demographic variables obtained

through self-report survey served as the independent variables. The Pittsburgh Sleep Quality Index Global Score served as the dependent variable. Pearson's product-moment correlations coefficients were analyzed (See Table 5). An alpha level of .05 was used to determine statistical significance.

Table 5

Research Question 3 – Potential Predictor Variables and Self Reported Sleep Quality

RSQ	IV	DV	Statistical Test
What is the relationship between potential predictor variables and self-reported sleep quality?	Age	Overall Sleep Quality	Pearson product coefficient correlation
	Cigarettes/Week	Overall Sleep Quality	Pearson product coefficient correlation
	Drinks/Week	Overall Sleep Quality	Pearson product coefficient correlation
	GPA	Overall Sleep Quality	Pearson product coefficient correlation
	Hours Week/Volunteering	Overall Sleep Quality	Pearson product coefficient correlation
	Hours Week/Working	Overall Sleep Quality	Pearson product coefficient correlation
	Hours/Week Extracurricular	Overall Sleep Quality	Pearson product coefficient correlation
	MOS SF-36 Mental Score	Overall Sleep Quality	Pearson product coefficient correlation
	MOS SF-36 Physical Score	Overall Sleep Quality	Pearson product coefficient correlation
	Roommates	Overall Sleep Quality	Pearson product coefficient correlation
	Semester Hours	Overall Sleep Quality	Pearson product coefficient correlation
	Student Leadership Positions	Overall Sleep Quality	Pearson product coefficient correlation

Research question four.

To determine if empirical data supported the proposed causal model for self-reported weekday sleep length (See Figure 1), path analysis was utilized to determine the

standardized regression coefficients for each endogenous variable presented in the model. Once determined, standardized regression coefficient paths with a criterion of meaningfulness less than 0.05 were deleted, and a new "trimmed" model to explain self-reported weekday sleep length was used. Again, multiple regression analyses were used to determine the standardized regression coefficients for each endogenous variable presented in the "trimmed" model.

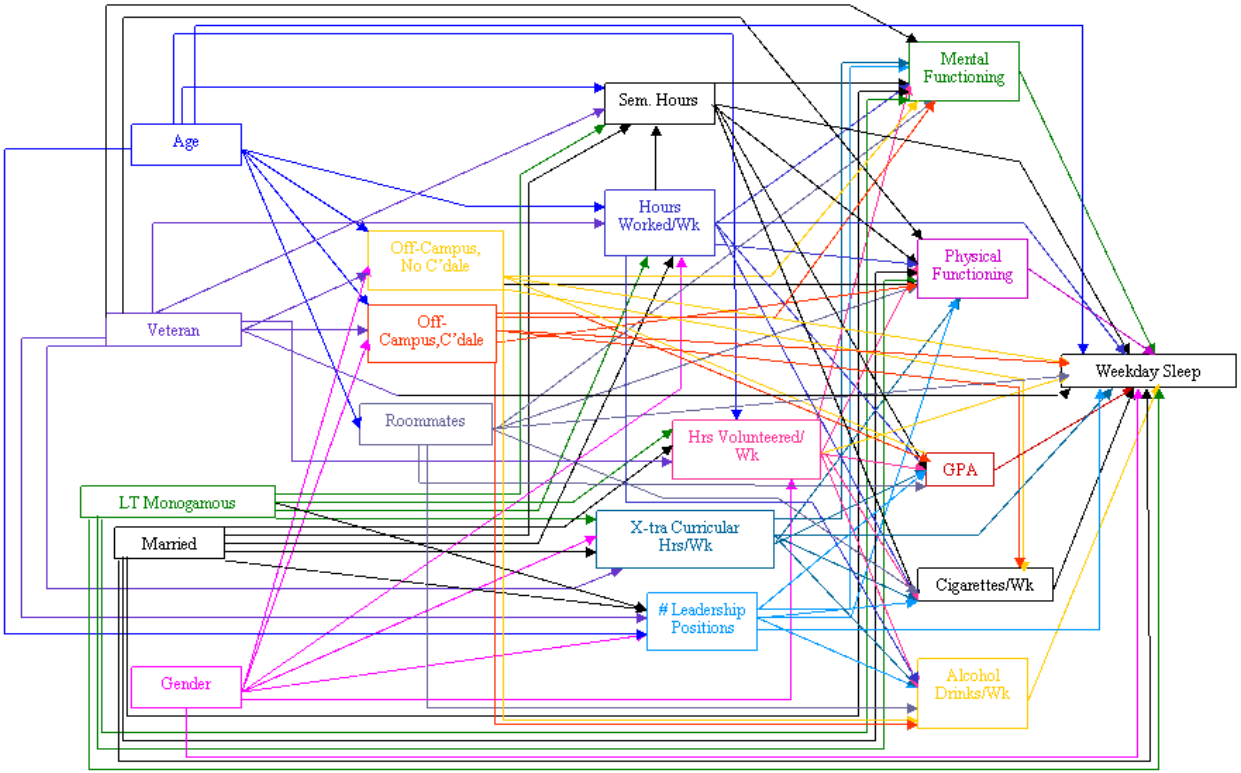

Figure 1. Proposed Path Analysis Model - Weekday Sleep Length

Research question five.

To determine if empirical data supported the proposed causal model for self-reported weekend sleep length (see Figure 2), path analysis was utilized to determine the standardized regression coefficients for each endogenous variable presented in the model. Once determined, the paths with standardized regression coefficients with a criterion of meaningfulness less than 0.05 were deleted, and a new "trimmed" model to explain self-reported weekend sleep length was used. Again, multiple regression analyses were used to determining the standardized regression coefficients for each endogenous variable presented in the "trimmed" model.

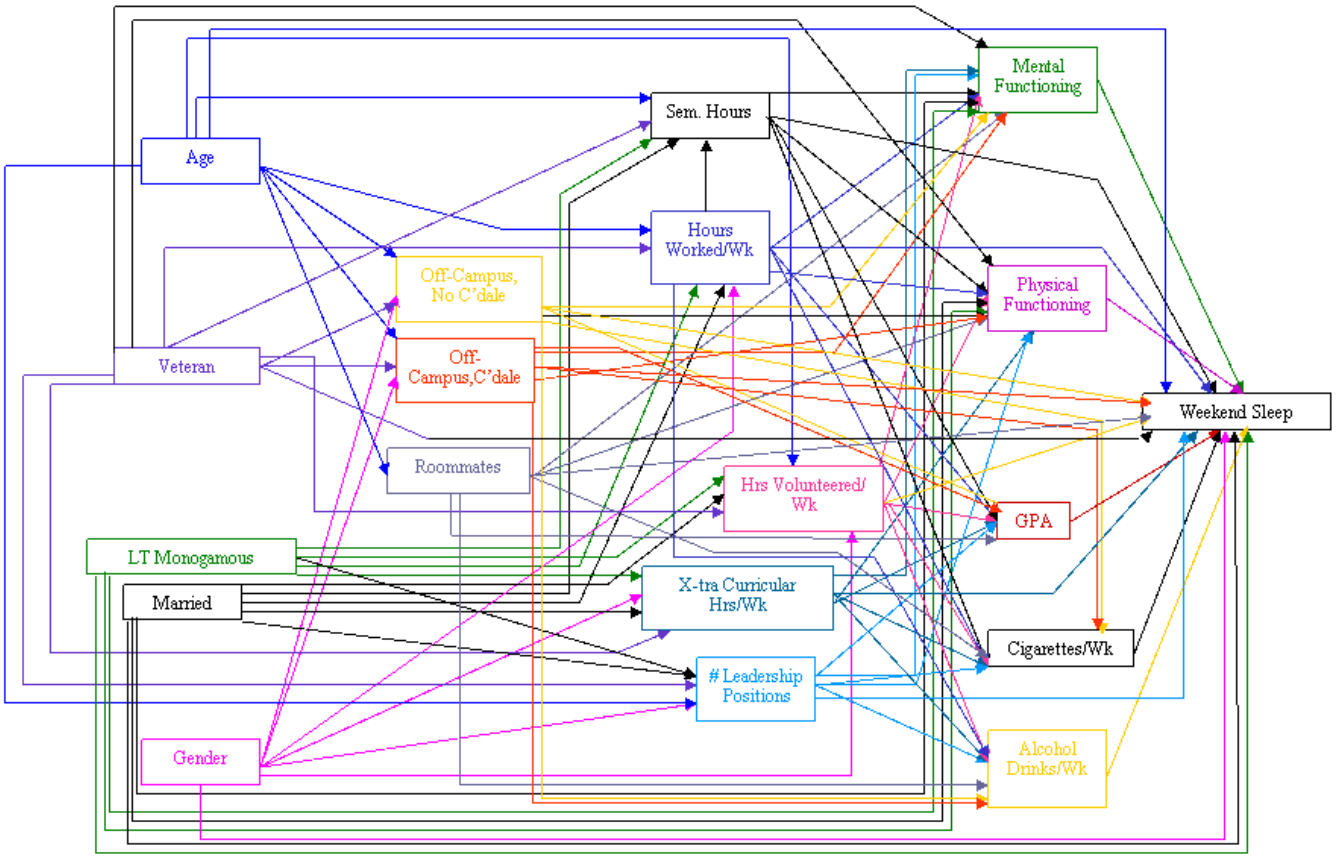

Figure 2. Proposed Path Analysis – Weekend Sleep Length

Research question six.

To determine if empirical data supported the proposed causal model for self-reported sleep quality (See Figure 3), path analysis was utilized to determine the standardized regression coefficients for each endogenous variable presented in the model. Once determined, the paths with standardized regression coefficients with an absolute criterion of meaningfulness value less than 0.05 were deleted, and a new "trimmed" model to explain self-reported weekday sleep quality was used. Again, multiple regression analyses were used to determining the standardized regression coefficients for each endogenous variable presented in the "trimmed" model.

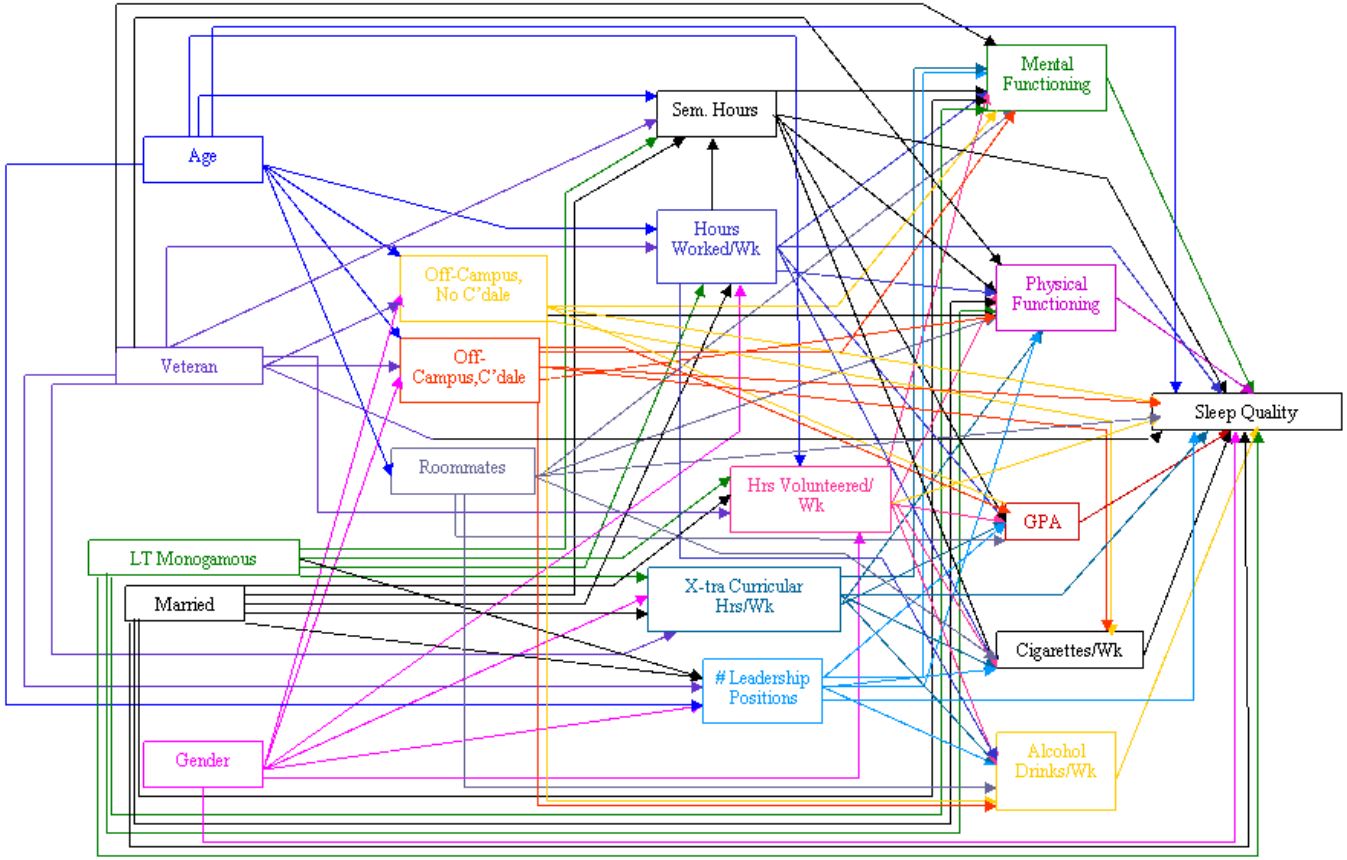

Figure 3. Proposed Path Analysis Model – Sleep Quality

Research question seven.

To determine the direct and indirect effects of potential predictor variables on self-reported weekday sleep, the standardized regression coefficients for each variable were used, following the recommendations of Bryman and Cramer (2005). The direct impact was determined by noting the standardized regression coefficient from the regression analysis between the independent exogenous variable and the dependent endogenous variable. Indirect effects were determined by multiplying the standardized regression coefficients for each indirect pathway between the independent exogenous variable and independent and dependent endogenous variables. To determine the total effect of independent exogenous variable on self-reported weekday sleep length, both the indirect and direct effects were added together.

Research question eight.

To determine the direct and indirect effects of potential predictor variables on self-reported weekend sleep, the standardized regression coefficients for each variable were used, following the recommendations of Bryman and Cramer (2005). The direct impact was determined by noting the standardized regression coefficient from the regression analysis between the independent exogenous variable and the dependent endogenous variable. Indirect effects were determined by multiplying the standardized regression coefficients for each indirect pathway between the independent exogenous variable and independent and dependent endogenous variables. To determine the total effect of independent exogenous variable on self-reported weekend sleep length, both the indirect and direct effects were added together.

Research question nine.

To determine the direct and indirect effects of potential predictor variables on self-reported sleep quality, the standardized regression coefficients for each variable were used, following the recommendations of Bryman and Cramer (2005). The direct impact was determined by noting the standardized regression coefficient from the regression analysis between the independent exogenous variable and the dependent endogenous variable. Indirect effects were determined by multiplying the standardized regression coefficients for each indirect pathway between the independent exogenous variable and independent and dependent endogenous variables. To determine the total effect of independent exogenous variable on self-reported sleep quality, both the indirect and direct effects were added together.

Summary

The purpose of this chapter was to describe the protocol to be implemented for this study, focusing on the study's purpose, research questions, research design, sample, instrumentation, data collection, and data analyses. The purpose of this study was to determine how certain demographic and lifestyle variables correlated and predicted sleep quantity and quality. A descriptive, correlational, cross-sectioned research design was employed within this study. Undergraduate students at Southern Illinois University attending randomly selected University Core Curriculum were invited to complete an in-class survey consisting of the *Pittsburgh Sleep Quality Index*, a modified version of the Pittsburgh Sleep Journal, and the *Medical Outcomes Study Short Form Health Survey – 36 (MOS SF-36)*. The research questions were answered through the analysis of

descriptive statistics, Pearson's product-moment coefficient correlations, and path analyses. An alpha level of .05 was used to determine statistical significance.

CHAPTER FOUR

RESULTS

Overview

The purpose of this chapter is to highlight the results of this study. Findings related to sleep quantity and sleep quality were determined from 460 undergraduate students attending randomly selected core curriculum courses during the spring 2011 semester. An explanation of statistical analyses performed is also included.

Purpose of the Study

The purpose of this study was to determine correlations among various demographic factors, sleep quantity, and sleep quality among randomly selected college students at a Midwestern four-year research university with high research activity. The second purpose of this study was to determine which factors predicted sleep quantity and quality.

Research Questions

1. What is the relationship between potential predictor variables and self-reported average weekday sleep length?
2. What is the relationship between potential predictor variables and self-reported average weekend sleep length?
3. What is the relationship between potential predictor variables and self-reported sleep quality?
4. What are the direct and indirect effects of potential predictor variables on self-reported weekday sleep length?

5. What are the direct and indirect effects of potential predictor variables on self-reported weekend sleep length?
6. What are the direct and indirect effects of potential predictor variables on self-reported sleep quality?
7. Does empirical data support the proposed causal model for self-reported weekday sleep length?
8. Does empirical data support the proposed causal model for self-reported weekend sleep length?
9. Does empirical data support the proposed causal model for self-reported sleep quality?

Sample Demographics

Study participants were recruited and sampled from 18 sections of University Core Curriculum courses at a large, four-year research university. Of the 887 students enrolled in these 18 sections, 326 (36.75%) students did not show for class, leaving 561 (63.25%) students sampled. Of these 561 students, 12 (2.14%) indicated that they had previously taken the survey in another course. Forty-one (7.31%), were excluded from the study because the participants exceeded the study's age requirements. An additional 44 students (7.84%) were excluded from the study due to unfinished surveys. Four (0.71%) other surveys were excluded from survey due to missing over 10% of the data. A total of 460 (82.0%) surveys were utilized for data entry.

Of the 460 participants in the study sample, 51.7% (n = 238) were female and 48.3% (n = 222) were male. Concerning ethnicity, 284 participants were White, non-Hispanic (61.7%), 116 were Black, non-Hispanic (25.2%), 22 were Hispanic (4.8%), 14

were Asian/Pacific Islander (3.0%) and 3 were International/Non-Resident Aliens (0.7%). An additional 21 students indicated their race as "mixed" (4.6%). A summary listing of frequencies and percentages for demographic variables may be found in Table 6.

The largest proportion of students indicated that they were 19 years of age (n = 154, 33.5%), followed by 20 year olds, (n = 86, 18.7%), 18 year olds (n = 78, 17.0%), 21 year olds (n = 69, 14.8%), 22 year olds (n = 47, 10.2%), 23 year olds (n = 15, 3.3%) and 24 year olds (n = 12, 2.6%). The majority of participants (n = 294, 63.9%) were primarily freshman and sophomore classification level students (n = 184, 40.0%; n = 110, 23.9% respectively). In assessing number of reported semester hours currently being taken, 93.6% (n = 431) reported being enrolled in over 12 or more semester hours. Those students who reported taking 14 - 16 semester hours represented 54.3% (n = 250) of the sample. Fourteen participants did not report the number of hours they were taking. The mean reported grade point average of the students within the sample was 3.06/4.00. A total of 411 participants (89.3%) indicated that they were in good academic standing, while 14 participants (3%) and 35 participants (7.6%) reported that they were on academic warning and academic probation, respectively.

The majority of students (n = 265, 57.6%) reported that they lived on campus within university owned housing. Of the remaining 42.4%, 156 students (33.9%) reported that they lived off-campus within the community that their institution resided in, and 39 students (8.5%) indicated that the lived off campus, out-of-town, and commuted to school. A breakdown of students living alone or with parents indicated that 89.1% (n = 410) lived without their parents while at school.

Participants were asked to indicate their current relationship status. The status most commonly selected was "single, not within a long-term, monogamous relationship" (n = 278, 60.45%), followed by "within a long-term monogamous relationship" (n = 172, 37.40%). Ten participants (2.2%) indicated that they were married or partnered. No participants indicated that they were divorced or widowed.

In examining military service status, 446 (97%) of the participants indicated that they were non-veterans. Of the 14 participants indicating that they were veterans, 5 (1.1%) indicated that they had served with the National Guard or Military Reserves, but had never been called to active duty. Of the 9 participants who had served on active duty, 5 (1.1%) had served with the army, navy, air force, marines and/or coast guard, and 4 (0.9%) indicated that they had with the National Guard and/or military reserves.

Table 6

Demographics of Study Participants (n = 460)

Demographic Variable	Frequency (n)	Percentage (%)
Gender		
Male	222	48.3
Female	238	51.7
Age		
18	78	17.0
19	154	33.5
20	86	18.7
21	68	14.8
22	47	10.2
23	15	3.3
24	12	2.6
Ethnicity		
White, non-Hispanic	284	61.7
Black, non-Hispanic	116	25.2
Hispanic	22	4.8
Asian/Pacific Islander	14	3.0
International or "non-resident aliens"	3	0.7
Mixed ethnicity/mixed race	21	4.6
Academic Classification		
Freshmen	184	40.0
Sophomore	110	23.9
Junior	94	20.4
Senior	72	15.7
Academic Standing		
In good academic standing	411	89.3
Academic warning	14	3.0
Academic probation	35	7.6
Semester Hours Currently Enrolled		
0-6	8	1.7
7-12	83	18.04
13-18	341	74.13
19+	14	3.04
Missing data	14	3.04

Table 6 continued

Demographics of Study Participants (n = 460)

Demographic Variable	Frequency (n)	Percentage (%)
Cumulative Semester Hours		
0-30	187	40.7
31-60	92	20.0
61 - 90	68	14.8
90-120	47	10.2
121 +	24	5.2
Missing Data	24	5.2
Residence		
Live on-campus,	265	57.6
Live off-campus, in	156	33.9
Live off-campus, out	39	8.5
Military Status		
Non-veteran	446	97.0
Veteran, National Guard/Reserves, not active	5	1.1
Veteran, Main Service Branches	5	1.1
Veteran, National Guard/Reserves, active	4	0.9
Relationship Status		
Single, no long-term	278	60.4
Long-term monogamous	172	37.4
Married or partnered	10	2.2

Pittsburgh Sleep Quality Index Preliminary Data Analysis

Data collected from the 460 participants who completed the survey were used to determine measures of central tendency and dispersion for component scores of the *PSQI*. Table 7 summarizes these findings.

Component 1: Subjective Sleep Quality was derived from the question 6, "How would you rate your sleep quality overall?" A total of 35 (7.6%) participants reported

"very good" sleep quality overall, with 300 (65.20%) reporting "fairly good" sleep quality overall, 108 (23.50%) reporting "fairly bad" sleep quality, and 17 reporting "very bad" sleep quality overall. Scores ranged from 0-3. The median and mode scores for question 6 were 2.00.

Component 2: Sleep Latency was derived from question 2, "How long (in minutes) has it usually taken you to fall asleep each night?" and question 3, "How often have you had trouble sleeping because you cannot get to sleep within 30 minutes?" The majority of participants (n = 263, 57.27%) reported falling asleep in 20 minutes or less. Scores for question 2 ranged from 1-160 minutes. The mean length of minutes to fall asleep was 24.87 (*SD* = 19.93). A total of 107 participants (23.30%) indicated that they had no instances of taking more than 30 minutes to get to sleep within the past 30 days. Of the majority indicating some difficulty getting to sleep within 30 minutes, 120 participants (26.1) indicating that they experienced this less than once a week, 145 (31.5%) once or twice a week, and 88 (19.1%) three or more times a week. Scores ranged from 0-3. The median and mode scores for question 3 were a 2.00.

Component 3: Sleep Duration was derived from question 4, "How many hours of actual sleep did you get at night?" Most participants (n = 167, 36.30%) reported getting over 7 hours of sleep a night, followed by 6-7 hours of sleep (n = 142, 30.87%), 5-6 hours of sleep (n = 116, 25.22%) and less than 5 hours of sleep (n = 35, 7.61%). Scores ranged from 0-11 hours of sleep. The mean hours of sleep reported was 6.74 (*SD* = 1.44).

Component 4: Habitual Sleep Efficiency was derived from question 4, "How many hours of actual sleep did you get at night?," question 3, "When have you usually

gotten up in the morning" and question 1, "When have you usually gone to bed at night? With regards to question 3, or the morning wake time, the majority of students (n = 255, 55.43%) woke up between 7:00 – 9:00 a.m. The range of wake times, as reported by the *PSQI*, was from 2:00 a.m. to 12:00 p.m. The mean wake-up time, as reported by the PQSI, was 8:03:24 a.m. (*SD* = 1:18:23). For question 1, or "when have you usually gone to bed," 25.9% (n = 119) reported going to bed at midnight, while 17.39% (n = 80) reported going to sleep after 2:00 a.m. Bedtimes ranged from 7:00 p.m. to 5:00 a.m. The mean bed-time, as reported by the *PSQI*, was 12:23:32 a.m.

Component 5: was derived from questions 5b – 5j, which asked participants to indicate if the situations listed caused them to have trouble sleeping during the past 30 days, less than once a week, once or twice a week, or three or more times a week. The three highest reported conditions were: "waking up in the middle of the night or early morning (n = 375, 81.52%) "feel too hot" (n = 301, 65.43) and "have to get up to use the bathroom" (n = 230, 50.00%). Scores ranged from 0-3. These three items resulted in respective mode scores of 3.00, 2.00, and 1.00.

Component 6 was derived from question 7, "How often have you had trouble staying awake while driving, eating meals, or engaging in social activity?" The majority of participants (n = 273, 59.35%) indicated that this situation had not occurred within the last 30 days, followed by 23.49% (n = 108) who reported experiencing this "less than once a week," 12.39% (n = 57), who experienced this "once or twice a week" and 4.78% (n = 22) who experienced this three or more times a week. Scores ranged from 0-3. Both mode and median scores were 0.00.

The Global *PSQI* Sleep Quality score is then derived from adding all seven component scores. The majority of participants (60.7%) scored a six or greater, which is indicative of poor sleep quality (Buysse et al., 1989). Actual scores ranged from 1-17, with a mean score of 6.67 with a median score of 6.00 and a mode score of 5.00.

Table 7

Measures of Tendency and Dispersion for Pittsburgh Sleep Quality Index Component Scores

Component	n	Mean	Std. Deviation	Variance	Range	Min	Max
Subjective Sleep Quality	460	1.23	0.64	0.41	4.00	0.00	3.00
Sleep Latency	459	1.40	0.93	0.87	4.00	0.00	3.00
Sleep Duration	460	1.04	0.96	0.92	4.00	0.00	3.00
Habitual Sleep Efficiency	456	0.37	0.74	0.55	4.00	0.00	3.00
Sleep Disturbances	460	1.19	0.52	0.27	4.00	0.00	3.00
Use of Sleeping Medication	460	0.27	0.70	0.49	4.00	0.00	3.00
Daytime Dysfunction	460	1.15	0.83	0.70	4.00	0.00	3.00
Global *PSQI* Score	455	6.67	3.08	9.51	16.00	1.00	17.00

Sleep Diary Preliminary Data Analysis

Data collected from the 460 participants who completed the survey were used to determine measures of central tendency and dispersion for time to bed, minutes to fall asleep, time awake, time in bed, total sleep time, overall average weekday sleep total, and overall average weekend sleep total. Tables 8-11 summarize these findings.

Participants were asked to indicate the typical time during the current semester they would go to bed on each night of the week. On Sunday nights, the majority of respondents (n = 283, 61.52%) went to bed between 11:00 p.m. and 1:00 a.m. Bed times ranged from 7:00 p.m. to 5:00 a.m., with a mean bedtime of 12:15:12 a.m. (*SD* = 1:29:35). Similar results were found for the remainder of the weeknights, with 65.65% (n = 302), 66.30% (n = 305), 62.17% (n = 286), and 60.43% (n = 278), reporting going to bed during the same time period. Between Sunday and Thursday nights, the mean bedtimes also were after midnight, slowly progressing later within the week. Participants on average turned in at 12:17:17 a.m. (*SD* = 1:27:29) on Mondays, 12:25:56 a.m. (*SD* = 1:23:35) on Tuesday nights, 12:26:24 (*SD* = 1:27:06) on Wednesday nights, and 12:28:23 a.m. (*SD* = 1:31:54) on Thursday nights. During Friday and Saturday nights, a later shift in bedtimes was observed by 2 hours. During both nights, the majority of participants (n = 261, 56.74%, Friday; n = 276, 60.00%, Saturday) reported going to bed between 1:00 a.m. and 3:00 a.m. On Friday night, mean bedtime was 1:59:04 a.m. (*SD* = 1:48:04) and on Saturday night, the mean bedtime was 2:14:17 a.m. (*SD* = 1:40:10). Table 8 summarizes measures of central tendency and dispersion.

Participants were asked to indicate the typical time during the current semester they would wake-up each morning of the week. Weekday wake-up times appear to be

approximately two hours earlier than the weekend wake-up times. The majority of participants indicated that they woke up between 7:00 a.m. to 9:00 a.m. Monday – Friday, while on Saturday and Sunday mornings, the majority reported waking up between 9:00 a.m. to 11:00 a.m. On Mondays, the mean wake-up time was 8:04:07 a.m. (*SD* = 1:28:45). For the remainder of the work week, participants on average reported waking up at 8:11:57 (*SD* = 1:32:25) on Tuesdays, 8:09:12 a.m. (*SD* = 1:28:39) on Wednesdays, 8:12:05 (*SD* = 1:31:13) on Thursdays, and 8:19:05 a.m. (*SD* = 1:45:58) on Fridays. During the weekends, the mean Saturday wake-up time was 10:27:12 a.m. (*SD* = 2:08:14) and on Sundays, the mean wake-up time was 10:21:45 (*SD* = 2:07:29). Table 9 summarizes measures of central tendency and dispersion.

Amount of total time in bed was determined by the number of minutes between the time reported going to bed and the time in which participants woke up. During Sunday nights, minutes spent in bed ranged from 180 minutes (3.00 hours) to 915 minutes (15.5 hours). The mean amount of time spent in bed on Sunday was 468.80 minutes (7.81 hours) (*SD* = 98.15). On Monday nights, the range of minutes spent in bed was 85 minutes (1.42 hours) to 1120 minutes (18.67 hours). The mean amount of time spent in bed on this typical night was 474.66 minutes (7.91 hours) (*SD* = 102.54). On Tuesday nights, minutes spent in bed ranged from 180 minutes (3.00 hours) to 840 minutes (14.00 hours). The mean amount of minutes spent in bed this night was 463.28 (7.72 hours) (*SD* = 95.73). On Wednesday night, the range of minutes spent in bed was 140 minutes (2.33 hours) to 780 minutes (13.00 hours). The mean average amount of time spent in bed was 465.68 minutes (7.76 hours) (*SD* = 96.14). During Thursday nights, students reported spending between 150 minutes (2.50 hours) and 870 minutes in bed

(14.50 hours) in bed. The mean amount of time reportedly spent in bed on Thursday nights was 470.70 minutes (7.85 hours) (*SD* = 100.77). On Friday nights, the range of minutes spent in bed was 180 minutes (3.00 hours) to 960 minutes (16.00 hours). The mean number of minutes spent in bed on a typical Friday night was 507.74 (8.46 hours) (*SD* = 112.59). On Saturday nights, students reported spending between 150 minutes and 870 minutes in bed. The mean average amount of time spent in bed on a typical Saturday night was 487.18 minutes (8.12 hours) (*SD* = 112.62). Table 10 summarizes measures of central tendency and measures of dispersion.

Total time sleeping was derived by subtracting the amount of minutes reported it took to actually fall asleep from the amount of time sent in bed. During Sunday nights, minutes spent in sleep ranged from 165 minutes (2.75 hours) to 900 minutes (15.00 hours). The mean amount of time spent asleep on Sunday was 448.43 minutes (7.47 hours) (*SD* = 100.37). On Monday nights, the range of minutes spent asleep was 85 minutes (1.42 hours) to 1120 minutes (18.67 hours). The mean amount of time spent asleep on this typical night was 452.70 minutes (7.55 hours) (*SD* = 103.31). During Tuesday nights, minutes spent asleep ranged from 175 minutes (2.92 hours) to 830 minutes (13.83 hours). The mean amount of minutes spent asleep this typical night was 441.55 minutes (7.36 hours) (*SD* = 97.42). On Wednesday night, the range of minutes spent asleep was 115 minutes (1.92 hours) to 770 minutes (12.83 hours). The mean average amount of time spent asleep was 443.65 minutes (7.39 hours) (*SD* = 96.21). During Thursday nights, students reported sleeping between 145 minutes (2.42 hours) and 860 minutes (14.33 hours). The mean amount of time reportedly spent asleep on Thursday nights was 449.44 (7.49 hours) (*SD* =102.04). On Friday nights, the range of

minutes spent asleep was 179 minutes (2.98 hours) to 900 minutes (15.00 hours). The mean number of minutes spent in asleep on a typical Friday night was 490.48 minutes (8.17 hours) (*SD* = 113.65). On Saturday nights, students reported spending between 120 minutes (2.00 hours) and 860 minutes (14.33 hours) asleep. The mean amount of time spent asleep on a typical Saturday night was 471.71 minutes (7.86 hours) (*SD* = 113.76). Table 11 summarizes measures of central tendency and measures of dispersion.

Regarding overall average weekday sleep total, excluding time spent in bed awake, the majority of students (59.35%, n = 273) reported sleeping between 420 minutes (7 hours) to 540 minutes (9 hours) during the average weeknight. The amounts of overall sleep total during the average weekday ranged from 163 minutes (2.72 hours) to 643 minutes (10.71 hours). The mean length of overall weekday sleep total was 447.13 minutes (7.45 hours) (*SD* = 76.84). During the weekends, the majority of students (n = 232, 50.43%) reported sleeping between 420 minutes (7 hours) to 540 minutes (9 hours) during the average weekend night. The mean length of overall sleep total during the average sleep total weekend night was 481.10 minutes (8.02 hours) (*SD* = 101.24). Table 11 summarizes measures of central tendency and dispersion.

Table 8

Measures of Tendency and Dispersion for Daily Bedtimes

Item	n	Mean	Std. Deviation	Variance	Range	Min	Max
Sunday Night	460	12:15:12 am	1:29:35	28899808.63	10:00:00	7:00:00 pm	5:00:00 a.m.
Monday Night	460	12:17:17 am	1:27:19	27559257.89	11:50:00	5:10:00 pm	5:00:00 am
Tuesday Night	460	12:25:56 am	1:23:35	25153048.17	9:0:00	8:00:00 pm	5:00:00 am
Wednesday Night	460	12:26:14 am	1:27:06	27313580.56	8:00:00	9:00:00 pm	5:00:00 am
Thursday Night	460	12:28:23 am	1:31:54	30405324.66	11:00:00	7:00:00 pm	6:00:00 am
Friday Night	460	1:59:04 am	1:48:04	42045894.02	12:00:00	8:00:00pm	8:00:00 am
Saturday Night	460	2:14:17 am	1:40:10	36120744.83	11:00:00	9:00:00 pm	8:00:00 am

Table 9

Measures of Tendency and Dispersion for Daily Waketimes

Item	n	Mean	Std. Deviation	Variance	Range	Min	Max
Monday Morning	460	8:04:07 am	4:08:32	28364266.17	14:00:00	2:00:00 am	4:00:00 pm
Tuesday Morning	460	8:11:57 am	4:18:56	30753576.06	12:30:00	2:30:00 am	3:00:00 pm
Wednesday Morning	460	8:09:13 am	4:08:05	28302031.63	13:00:00	2:00:00 am	3:00:00 pm
Thursday Morning	460	8:12:05 am	4:15:21	29960104.67	11:30:00	2:30:00 am	2:00:00 pm
Friday Morning	460	8:19:05 am	4:56:48	40433030.16	16:45:00	2:00:00 a.m.	6:45:00 pm
Saturday Morning	460	10:27:12 am	5:58:74	59198670.95	12:00:00	5:00:00 am	5:00:00 p.m.
Sunday Morning	460	10:21:45 am	5:56.65	58512734.87	12:00:00	5:00:00 am	5:00:00 pm

Table 10

Measures of Tendency and Dispersion for Daily Total Time in Bed

Item	n	Mean	Std. Deviation	Variance	Range	Min	Max
Sunday Night	459	468.80	98.15	9633.39	735.00	180.00	915.00
Monday Night	460	474.66	102.54	10515.37	1040.00	90.00	1130.00
Tuesday Night	460	463.28	95.73	9163.82	660.00	180.00	840.00
Wednesday Night	460	465.68	96.14	9243.68	640.00	140.00	780.00
Thursday Night	460	470.70	100.77	10155.36	720.00	150.00	870.00
Friday Night	459	507.74	112.59	12676.81	780.00	180.00	960.00
Saturday Night	459	487.19	112.62	12683.02	720.00	150.00	870.00

Table 11

Measures of Tendency and Dispersion for Daily Total Time Sleeping

Item	n	Mean	Std. Deviation	Variance	Range	Min	Max
Sunday Night	459	448.43	100.37	10074.52	735.00	165.00	900.00
Monday Night	459	452.70	103.31	10672.90	1035.00	85.00	1120.00
Tuesday Night	459	441.55	97.42	9491.51	655.00	175.00	830.00
Wednesday Night	459	443.65	96.21	9256.33	655.00	115.00	770.00
Thursday Night	459	449.44	102.04	10411.82	715.00	145.00	860.00
Friday Night	457	490.48	113.65	12915.93	721.00	179.00	900.00
Saturday Night	457	471.71	113.76	12941.34	740.00	120.00	860.00
Average Weekday Sleep	458	447.13	76.84	5905.13	480.00	163.00	643.00
Average Weekend Sleep	457	481.10	101.24	10250.143	621.00	179.00	800.00

Medical Outcomes Study Short Form-36 (*MOS SF-36*) Preliminary Data Analysis

The physical functioning scale of the *MOS SF-36* was derived from survey questions 19 – 28. Measures of central tendency and dispersion for these items can be found in Table 12. Two-hundred and seventy-seven participants (60.2%) indicated that their health did not limit their ability to participate in vigorous activities as running, lifting and strenuous sports, where as 82.83% (n = 381), indicated that their ability to participate in moderate activities as playing golf, bowling, or vacuuming was not impaired. More than four out of every five participants reported that their health did not impair their ability to bathe or dress (n = 410, 89.13%), walk one block (n = 403, 87.61%), lift or carry groceries (n = 395, 85.87%), and climb one flight of stairs (n = 392, 85.23%). An identical number of participants responded that their health did not impair their ability to bend, kneel or stoop, and walk more than one mile (n = 364, 79.13%). Climbing several flights of stairs was the activity for that the fewest participants indicated their health did not impact (n = 292, 63.48%).

Table 12

Measures of Tendency and Dispersion for Individual Items in the MOS SF-36 Physical Functioning Scale

Item	n	Yes, Limited A Lot n(%)	Yes, Limited A Little n(%)	No, Not Limited At All n(%)	Mean	Std Dev	Variance
Vigorous activities, such as running, lifting heavy objects, participating in strenuous activities	460	37(8.0)	146(31.7)	277(60.2)	2.52	0.64	0.41
Moderate activities as moving a table, pushing a vacuum cleaner, bowling, and playing golf	460	20 (4.30)	59(12.8)	381(82.8)	2.78	0.51	0.26
Lifting or carrying groceries	460	16(3.5)	49(10.7)	395(85.9)	2.82	0.46	0.22
Climbing several flights of stairs	460	36(7.8)	132(28.7)	292(63.5)	2.56	0.64	0.40
Climbing one flight of stairs	460	29(6.3)	39(8.5)	392(85.2)	2.79	0.54	0.29
Bending, kneeling, or stooping	460	30(6.5)	66(14.3)	364(79.1)	2.73	0.57	0.33
Walking more than a mile	460	34(7.4)	62(13.5)	364(79.1)	2.72	0.59	0.35
Walking several blocks	460	29(6.3)	55(12.0)	376(81.7)	2.75	0.56	0.31
Walking one block	460	29(6.3)	28(6.1)	403(87.6)	2.81	0.53	0.28
Bathing or dressing myself	460	36(7.8)	14(3.0)	410(89.1)	2.81	0.57	0.31

The role limitations due to physical health scale is derived from survey questions 29-32. Measures of central tendency and dispersion for these items can be found in Table 13. Participants could answer yes or no as to whether their physical health impacted their work or regular daily activities. The majority of participants indicated that they were not limited in their work or activities (n = 400, 86.96%), did not have difficulty performing the work or activities (n = 376, 81.74%), did not have to cut down the time spent on work or other activities (n = 363, 78.91), and did not accomplish less than they would have liked (n = 285, 61.96%).

Table 13

Measures of Tendency and Dispersion for Individual Items in the MOS SF-36 Role Limitations Due to Physical Health Scale

Item	n	Yes n(%)	No n(%)
Cut down the amount of time you spent on work or other activities	460	97(21.1)	363(78.9)
Accomplished less than you would like	460	175(38.0)	285(62.0)
Were limited in the kind of work or other activities	460	60(13.0)	400(87.0)
Had difficulty performing the work or other activities (for example, it took extra effort)	460	84(18.3)	376(81.7)

The role limitations due to emotional problems scale is derived from survey questions 33-35. Measures of central tendency and dispersion for these items can be found in Table 14. The majority of participants indicated that emotional problems were not impacting their work or regular daily activities. Over three-fourths of the participants indicated that they did not have to cut down the amount of time spent on work or other

activities (n = 350, 76.09%). Three hundred and thirty-seven participants (73.26%) reported that their emotional health did not impair their ability to perform their work and activities as "carefully usual." Last, 63.70% (n = 293) participants reported that their emotional problems did not impact their ability to accomplish what they would have liked.

Table 14

Measures of Tendency and Dispersion for Individual Items in the MOS SF-36 Role Limitations Due to Emotional Scale

Item	n	Yes n(%)	No n(%)
Cut down the amount of time you spent on work or other activities	460	110(23.9)	350(76.1)
Accomplished less than you would like	460	167(36.3)	293(63.7)
Didn't do work or other activities as carefully usual	460	123(26.7)	337(73.3)

The energy/fatigue scale is derived from questions 39, 43, 45, and 47. Measures of central tendency and dispersion for these items can be found in Table 15. The majority of respondents indicated that they felt full of pep a good bit of the time, most of the time, or all of the time (n = 250, 54.35%). Likewise, 282 participants (61.30%) indicated that they had a lot of energy a good bit of the time, most of the time, or all of the time. When asked about their lack of energy, 301 participants (65.43%) indicated that they felt work out only some, a little, or none of the time, whereas only 248 (53.91%) participants responded that they felt tired only some, a little, or none of the time.

The emotional well being scale is derived from survey questions 40, 41, 42, 44, and 46. Measures of central tendency and dispersion for these items can be found in

Table 16. The majority of participants appear to demonstrate positive emotional well-being. Three hundred and sixteen respondents (68.70%) indicated that they felt calm and peaceful a good bit of, most or, or all of the time. Likewise, 360 (78.26%) reported having been a happy person good bit of, most or, or all of the time. When asked if they had been very nervous people, feeling so down that nothing could cheer them up, and feeling downhearted and blue, only 18.91% (n = 87), 9.57% (n = 44), and 13.26% (n = 61) of participants respectively indicated they experienced this a good bit of, most or, or all of the time.

Table 15

Measures of Tendency and Dispersion for Individual Items in the MOS SF-36 Energy Scale

Item	n	AOTT n(%)	MOTT n(%)	AGBT n(%)	SOTT n(%)	ALOTT n(%)	NOTT n(%)	Mean	Std Dev	Variance
Did you feel full of pep?	460	22(4.8)	99(21.5)	129(28.0)	136(29.6)	50(10.9)	24(5.2)	3.36	1.22	1.48
Did you have a lot of energy	460	43(9.3)	114(24.8)	125(27.2)	118(25.7)	47(10.2)	13(2.8)	3.11	1.24	1.53
Did you feel warn out?	460	25(5.4)	47(10.2)	87(18.9)	137(29.8)	126(27.4)	38(8.3)	3.88	1.30	1.68
Do you feel tired?	460	55(12.0)	77(16.7)	80(17.4)	137(29.8)	94(20.4)	17(3.7)	3.41	1.39	1.93

Note: AOTT = All of the Time; MOTT = Most of the Time; AGBT = A Good Bit of the Time; SOTT = Some of the Time; ALOTT = A Little of the Time; NOTT = None of the Time

Table 16

Measures of Tendency and Dispersion for Individual Items in the MOS SF-36 Emotional Well Being Scale

Item	n	AOTT n(%)	MOTT n(%)	AGBT n(%)	SOTT n(%)	ALOTT n(%)	NOTT n(%)	Mean	Std Dev	Variance
Have you been a very nervous person?	460	16(3.5)	29(6.3)	42(9.1)	80(17.4)	174(37.8)	119(25.9)	4.57	1.32	1.74
Have you ever felt so down in the dumps that nothing could cheer you up?	460	5(1.1)	10(2.2)	29(6.3)	57(12.4)	135(29.3)	224(48.7)	5.13	1.10	1.22
Have you ever felt calm & peaceful?	460	59(12.8)	146(31.7)	111(24.1)	83(18.0)	54(11.7)	7(1.5)	2.89	1.27	1.61
Have you felt downhearted & blue?	460	3(0.7)	13(2.8)	45(9.8)	83(18.0)	162(35.2)	154(33.5)	4.85	1.12	1.25
Have you been a happy person	460	83(18.0)	179(38.9)	98(21.3)	69(15.0)	28(6.1)	3(0.7)	2.54	1.16	1.36

Note: AOTT = All of the Time; MOTT = Most of the Time; AGBT = A Good Bit of the Time; SOTT = Some of the Time; ALOTT = A Little of the Time; NOTT = None of the Time

The social functioning scale is derived from survey questions 36 and 48. Question 36 asked participants to indicate the extent that their physical health or emotional problems interfered with normal social activities. Almost half of the participants (n = 225, 48.91%) indicated that there was no interference of social activities by these two issues. Question 48 asked how much time the participant's physical health or emotional problems interfered with normal social activities. Exactly 50% (n = 230) of the participants indicated that there was no interference of social activities by physical health or emotional problem. Measures of central tendency and dispersion for these items can be found in Table 17.

The pain scale is derived from questions 37 and 38. Based on the four weeks prior to the survey, 85.43% (n = 393) of the participants indicated that they experienced no pain, very mild pain, or mild pain. During the same time period, 316 (68.69%) of participants indicated that there was no interference of normal work as a result of pain. Measures of central tendency and dispersion for these items can be found in Table18.

The general health scale is derived from survey questions 17, 33, 34, 35 and 36. Measures of central tendency and dispersion for these items can be found in Table19. The majority of participants (n = 239, 51.96%) indicated that they had very good or excellent health, whereas 64.13% (n = 295) reported that the statement, "My health is excellent" was either mostly true or definitely true. Only a small portion of participants (n = 32, 6.97%) expected their health to get worse. Eighty participants (17.39%) believed there to be truth in the statement, "I seem to get sick a little easier than other people," whereas 278 participants (60.43%) believed there to be truth in the statement, "I am as healthy as anyone I know."

Table 17

Measures of Tendency and Dispersion for Individual Items in the MOS SF-36 Social Functioning Scale

Item	n	NAA n(%)	Slightly n(%)	Moderately n(%)	QAB n(%)	Extremely n(%)	Mean	Std Dev	Variance
During the past 4 weeks, to what extent has your physical health or emotional problems interfered with your normal social activities with family, friends, neighbors, or groups?	460	225(48.9)	145(31.5)	54(11.7)	30(6.5)	6(1.3)	1.80	0.97	0.95

Note: NAA = Not At All; QAB = Quite A Bit

Item	n	AOTT n(%)	MOTT n(%)	SOTT n(%)	ALOTT n(%)	NOTT n(%)	Mean	Std Dev	Variance
During the past 4 weeks, how much of the time has your physical health or emotional problems interfered with your normal social activities with family, friends, neighbors, or groups?	460	8(1.7)	20(4.3)	74(16.1)	128(27.8)	230(50.0)	4.20	0.97	0.95

AOTT = All of the Time; MOTT = Most of the Time; AGBT = A Good Bit of the Time; SOTT = Some of the Time; ALOTT = A Little of the Time; NOTT = None of the Time

Table 18

Measures of Tendency and Dispersion for Individual Items in the MOS SF-36 Pain Scale

Item	n	None n(%)	Very Mild n(%)	Mild n(%)	Moderate n(%)	Severe n(%)	Very Severe	Mean	Std Dev	Variance
How much bodily pain have you had during the past 4 weeks	460	129(28.0)	168(36.5)	96(20.9)	53(11.5)	12(2.6)	2(0.4)	2.25	1.09	1.19

Note: NAA = Not At All; QAB = Quite A Bit

Item	n	NAA n(%)	Slightly n(%)	Moderately n(%)	QAB n(%)	Extremely n(%)	Mean	Std Dev	Variance
During the past 4 weeks, how much did pain interfere with your normal work (including both work outside the home and housework)	460	316(68.7)	93(20.2)	34(7.4)	13(2.8)	4(0.9)	1.47	0.82	0.67

AOTT = All of the Time; MOTT = Most of the Time; AGBT = A Good Bit of the Time; SOTT = Some of the Time; ALOTT = A Little of the Time; NOTT = None of the Time

Table 19

Measures of Tendency and Dispersion for Individual Items in the MOS SF-36 General Health Scale

Item	n	Excellent	Very Good	Good	Fair	Poor	Mean	Std Dev	Variance
In general, would you say your health is:	460	61(13.3)	178(38.7)	172(37.4)	44(9.6)	5(1.1)	2.47	0.88	0.77

Item	n	DT	MT	DK	MF	DF	Mean	Std Dev	Variance
I seem to get sick a little easier than other people	460	22(4.8)	58(12.6)	46(10.0)	136(29.6)	198(43.0)	3.93	1.21	1.46
I am healthy as anybody I know	460	100(21.7)	178(38.7)	103(22.4)	57(12.4)	22(4.8)	2.40	1.10	1.21
I expect my health to get worse	460	5 (1.1)	27(5.9)	95(20.7)	120(26.1)	213(46.3)	4.11	1.00	1.21
My health is excellent	460	75(16.3)	220(47.8)	95(20.7)	51(11.1)	19(4.1)	2.39	1.02	1.04

Note: DT = Definitely True, MT = Mostly True, DK = Don't Know, MF = Mostly False, DF = Definitely False

The *MOS SF-36* instrument requires that its individual items are recoded, transforming them into a linear score. Once recorded, each item's score ranges from 0 – 100 with higher scores indicating more favorable health states. Individual items within each scale are then averaged together to create the scale scores. Means of scale scores ranged from 54.12 to 86.50. Measures of central tendency and dispersion for each of the 8 scales can be found in Table 20.

Physical functioning scale scores ranged from 0 to 100. Three hundred sixty-one participants (78.48%) scored 85 or higher, surpassing the mean score of 84.2 achieved for this scale in the norming of the original SF-36 (Ware, 2004). Almost half of the participants (n = 214, 46.52) received a maximum score of 100. The mean score obtained for this scale in this study was 86.50 (*SD* = 22.29). As a collective, this study's participants indicated greater physical functioning than those participants in the norming activities of the original SF-36.

Role limitations due to physical health scores ranged from 0 to 100. A maximum score was achieved by 57.39% (n = 264) of the participants. This same proportion also exceeded the mean score of 80.9 achieved in the norming of this scale for the original SF-36 (Ware, 2004). However, the mean score obtained for this scale in this study was 77.39 (*SD* = 32.12). As a collective, participants in this study indicated more role limitations due to physical health scores than those participants in the norming activities of the original SF-36.

Role limitations due to emotional problems scores ranged from 0 to 100. Two hundred and sixty-nine participants (58.48%) received a maximum score of 100. This same proportion also exceeded the mean score of 81.3 achieved in the norming of this

scale for the original SF-36 (Ware, 2004). The mean score obtained for this scale in this study was 71.05 (*SD* = 38.75). As a collective, participants in this study indicated higher role limitations due to physical health scores than those participants in the norming activities of the original SF-36.

Energy scores ranged from 5 to 95. One hundred and sixty-five participants (35.87%) exceeded the mean score of 60.9 achieved in the norming of this scale for the original SF-36 (Ware, 2004). Only five participants (1.09%) received a maximum score of 100. The mean score obtained for this scale in this study was 54.12 (*SD* = 19.34). As a collective, participants in this study indicated lower energy than those participants in the norming activities of the original SF-36.

Emotional wellbeing scores ranged from 16 to 100. A majority of participants (n = 250, 54.35%) exceeded the mean score of 74.7 achieved in the norming of this scale for the original SF-36 (Ware, 2004). Sixteen participants (3.49%) received a maximum score of 100. The mean score obtained for this scale in this study was 72.49 (*SD* = 17.70). As a collective, participants in this study indicated worse emotional wellbeing than those participants in the norming activities of the original SF-36.

Social functioning scores ranged from 12.5 to 100. Two hundred and sixty-two participants (56.96%) exceeded the mean score of 83.3 achieved in the norming of this scale for the original SF-36 (Ware, 2004). A maximum score of 100 was received by 171 (37.17%) of the participants. The mean score obtained for this scale in this study was 80.03 (*SD* = 21.66). As a collective, participants in this study indicated worse social functioning than those participants in the norming activities of the original SF-36.

Pain scores ranged from 10 to 100. Three hundred and thirty-six participants (73.04%) exceeded the mean score of 75.2 achieved in the norming of this scale for the original SF-36 (Ware, 2004). A maximum score was received by 125 (27.17%) of the participants. The mean score obtained for this scale in this study was 81.59 (*SD* = 18.91). As a collective, participants in this study indicated greater pain than those participants in the norming activities of the original SF-36.

General health scores ranged from 15 to 100. Two hundred and twelve participants (46.09%) exceeded the mean score of 71.9 achieved in the norming of this scale for the original SF-36 (Ware, 2004). A maximum score was received by 21 (4.57%) of the participants. The mean score obtained for this scale in this study was 68.95 (*SD* = 18.59). As a collective, participants in this study indicated worse general health than those participants in the norming activities of the original SF-36.

From these eight scale scores, two component scores measuring physical health and mental health are derived. The physical health component score is computed by taking the average of the physical functioning, role limitations due to physical health, bodily pain and general health scales. The mental health component score is computed by taking the average of the energy, social functioning, role limitations due to emotional health, and emotional well being scale. Measures of central tendency and dispersion for each of the two component scores can be found in Table 20.

Physical health component scores ranged from 30.63 to 100. The greater majority of participants (n = 432, 93.91%) exceeded the mean score of 50, indicated by Ware (2004). Eleven participants (2.39%) received a maximum score. The mean score of the component within this study was 78.61 (*SD* = 15.41). As a collective, participants in this

study indicated greater physical health than those participants in the norming activities of the original SF-36.

Mental health component scores ranged from 14.63 to 100. The greater majority of participants (n = 432, 93.91%) exceeded the mean score of 50 indicated by Ware (2004). Eleven participants (2.39%) received a maximum score. The mean score of the component within this study was 78.61 (*SD* = 15.41). Three hundred and seventy-five (81.53%) of the participants exceeded the mean score of 50, indicated by Ware (2004). The mean score of this component within this study was 69.41 (*SD* = 19.22). As a collective, participants in this study indicated greater mental health than those participants in the norming activities of the original SF-36.

Table 20

Measures of Tendency and Dispersion for MOS SF-36 Scales and Components

Item	n	Mean	Std. Deviation	Variance	Range	Min	Max
MOS SF-36 Physical Scale	460	86.50	22.29	496.87	100.00	0.00	100.00
Role Limitations due to Physical Health Scale	460	77.39	32.12	1031.85	100.00	0.00	100.00
Role Limitations due to Emotional Problems Scale	460	71.01	38.75	1501.27	100.00	0.00	100.00
Energy/Fatigue Scale	460	54.12	19.34	374.01	95.00	5.00	100.00
Emotional Well-Being Scale	460	72.49	17.71	313.35	16.00	84.00	100.00
Social Functioning Scale	460	80.03	21.66	469.29	12.50	87.50	100.00
Pain Scale	460	81.59	18.91	357.74	10.00	90.00	100.00
General Health Scale	460	68.95	18.52	342.95	15.00	85.00	100.00
Physical Health Component	460	78.61	15.41	237.49	69.38	30.63	100.00
Mental Health Component	460	69.41	19.22	369.51	85.38	14.63	100.00

Additional Independent Variables

A number of other additional independent variables were used to provide demographic information. The n-sizes, means, standard deviations, variance, range, minimum and maximum for each additional independent variable can be found in Table 21. When determining means, all participants were included in computation, including those answering none to the questions.

Alcohol consumption was measured by the average number of drinks consumed in a typical week during the current semester. Almost one-third of the respondents (n = 149, 32.40%) reported that they typically would not consume alcohol during a typical week. An addition 27.17% (n = 125) indicated that they consumed between 1-5 drinks during the typical week. The average number of drinks consumed in a typical week ranged from 0 to 100. The mean number of drinks consumed in typical week was 8.89 (*SD* = 13.58.).

Tobacco use was measured by the average number of cigarettes smoked in a typical week during the current semester. A majority of the participants (n = 373, 81.10%) indicated that they did not smoke during a typical week. Twenty-six participants (4.8%) reported smoking more than 30 cigarettes during a typical week. The average number of cigarettes smoked per week ranged from 0 to 100. The mean number of cigarettes smoked in a typical week was 4.43 (*SD* = 14.40).

Employment was measured by the number of hours spent working during the typical week. Most participants (n = 243, 52.80%) reported working no hours during a typical week. Almost one-fourth of the sample (n = 108, 23.48%) indicated working 20

or more hours per week. The number of hours spent working ranged from 0 to 80. The mean number of hours reported worked during a typical week was 8.90 (*SD* = 12.22).

Amount of volunteering was measured by the number of hours spent volunteering during a typical week. Over 7 out of 10 (n = 333, 72.40%) indicated that they did not volunteer at all during the typical week. Eighty-eight participants (19.13%) reported volunteering between 1 to 5 hours during the typical week. Overall, the number of hours spent volunteering during the typical week ranged from 0 to 60. The mean number of hours reported volunteering during a typical week was 1.67 (*SD* = 4.63).

Extracurricular involvement was measured by the number of hours spent involved in extra-curricular involvement and student organizations during the typical week. The largest majority of students (n = 196, 42.6%) did not spend any hours during a typical week involved in extra-curricular activities or student organizations. Less than a third of participants (n = 142, 30.87%) reported spending between 1-5 hours a week involved in extracurricular pursuits, whereas 26 students (5.65%) spent over 20 hours a in similar activities. The number of hours spent engaged in extra-curricular activities or student organizations ranged from 0 to 62. The mean number of hours reported being involved in extra-curricular activities and student organizations was 4.48 (*SD* = 6.91).

Leadership was measured by the number of student or university leadership positions held during the current academic year. The majority of participants (n = 377, 82.00%) indicated that they did not hold a leadership position. Of the participants holding positions, 12.6% (n = 58) reported holding one position, and 3.7% (n = 17) reported holding two positions. The range of leadership positions held was 0 to 20. The mean number of leadership positions held was 0.32 (*SD* = 1.31).

The quantity of roommates/dwelling co-occupants was measured by the number of individuals that participants indicated lived with them. The greatest proportion of participants (n = 218, 47.4%) reported living with one other person. Almost one in five participants (n = 91, 19.8%) indicated that they lived alone. The range of the number of individuals living with participants was from 0 to 40. The mean number of individuals living with participants was 1.63 (*SD* = 3.09).

Table 21

Measures of Tendency and Dispersion for Additional Independent Variables

Item	n	Mean	Std. Deviation	Variance	Range	Min	Max
Drinks/Week	460	8.89	13.58	184.53	100.00	0.00	100.00
Cigarettes/Week	460	4.43	14.40	207.43	100.00	0.00	100.00
Hours/Week Working	459	8.90	12.22	149.30	80.00	0.00	80.00
Hours/Week Volunteering	460	1.67	4.62	21.40	60.00	0.00	60.00
Hours/Week Extra-Curricular	459	4.49	6.91	47.76	62.00	0.00	62.00
Student Leadership Positions	460	0.32	1.31	1.72	20.00	0.00	20.00
Roommates	459	1.63	3.09	9.57	40.00	0.00	40.00

Research Question One Results

A total of 15 Pearson's product moment correlations were conducted to determine if significant relationships existed between self-reported average weekday sleep length and predictor variables (Table 22). Alpha levels were adjusted using the multi-stage Bonferroni method advocated by both Larzelere and Mulaik (1977) and Holm (1979). After this adjustment, only the *MOS SF-36* mental score was found to be significantly correlated ($r = 0.16$, (433); $p = .001$) with self-reported average weekday sleep length.

Research Question Two Results

A total of 15 Pearson's product moment correlations were conducted to determine if significant relationships existed between self-reported average weekend sleep length and predictor variables (Table 22). Alpha levels were adjusted using the multi-stage Bonferroni method advocated by both Larzelere and Mulaik (1977) and Holm (1979). No statistically significant correlations were found among self-reported average weekend sleep length and predictor variables.

Research Question Three Results

A total of 15 Pearson's product moment correlations were conducted to determine if significant relationships existed between self-reported global sleep quality and predictor variables (Table 22). Alpha levels were adjusted using the multi-stage Bonferroni method advocated by both Larzelere and Mulaik (1977) and Holm (1979). Statistically significant relationships were found between global sleep quality and the *MOS SF-36* mental score ($r = -.47$ (433); $p = .000$) and global sleep quality the *MOS SF-36* physical score ($r = -.47$ (433); $p = .000$). All other correlations were not found to be statistically significant.

Table 22

Intercorrelations for Sleep Related Dependent Variables and Potential Predictor Variables

Measure	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Average Weekday Sleep Length	--														
2. Average Weekend Sleep Length	.33**	--													
3. *PSQI* Global Score	-.28**	-.07	--												
4. *MOS SF-36* Physical	.10*	-.09*	-.47**	--											
5. *MOS SF-36* Mental	.16**	-.03	-.47**	.58**	--										
6. Drinks/Week	.02	-.03	.13**	-.08	-.06	--									
7. Cigarettes/Week	.02	-.03	.11*	-.16**	-.09	.23**	--								
8. Hours/Week Working	-.11*	-.12*	.01	.11*	-.05	-.02	-.02	--							
9. Hours/Week Volunteering	-.00	-.05	.04	.03	.01	-.02	-.09*	.10*	--						
10. Extracurricular	-.08	-.02	.01	-.03	-.04	-.00	-.03	.003	.20**	--					
11. Leadership Positions	-.03	.06	.05	-.04	-.02	.02	-.03	-.01	.06	.16**	--				
12. Roommates	-.07	-.05	-.05	.09	.06	.09	-.02	-.02	.04	.11*	.06	--			
13. GPA	-.05	.04	-.07	.06	-.01	-.02	-.09	.08	-.04	.04	.01	.01	--		
14. Semester Hours	-.08	-.02	-.02	.08	.04	.09	-.06	.05	.13**	.11*	.09	.24**	.12*	--	
15. Age	-.08	-.08	.02	.11*	-.01	.08	.04	.37**	.11*	-.13**	.06	.06	.06	.05	--

Notes: ** = $p \leq .01$, * = $p \leq .05$

Research Question Four Results

To determine the direct and indirect effects of potential predictor variables within the proposed causal model for self-reported weekday sleep length, multiple regression analyses were computed for each endogenous variable in the model as part of a path analysis. Computations for Multiple R's, R Square, AdjustedR Square, Standard Error of the Estimate, ANOVA table, Unstandardized Coefficients, Standardized Coefficients, *t*-score and significance level for each multiple regression analysis, except for the dependent variable, within the full sleep model can be found in Appendices H-T. The same computations within the full model for the weekday sleep length can be found in Appendix U. Computations for Multiple R's, R Square, AdjustedR Square, Standard Error of the Estimate, ANOVA table, Unstandardized Coefficients, Standardized Coefficients, *t*-score and significance level for each multiple regression analysis, except for the dependent variable, within the trimmed sleep model can be found in Appendices X-AJ. The same computations within the trimmed model for the weekday sleep length dependent variable can be found in Appendix AK. Figure 4 displays the pathway diagram for the proposed model. Standardized beta coefficients, that serve as path coefficients can be found in Table 23.

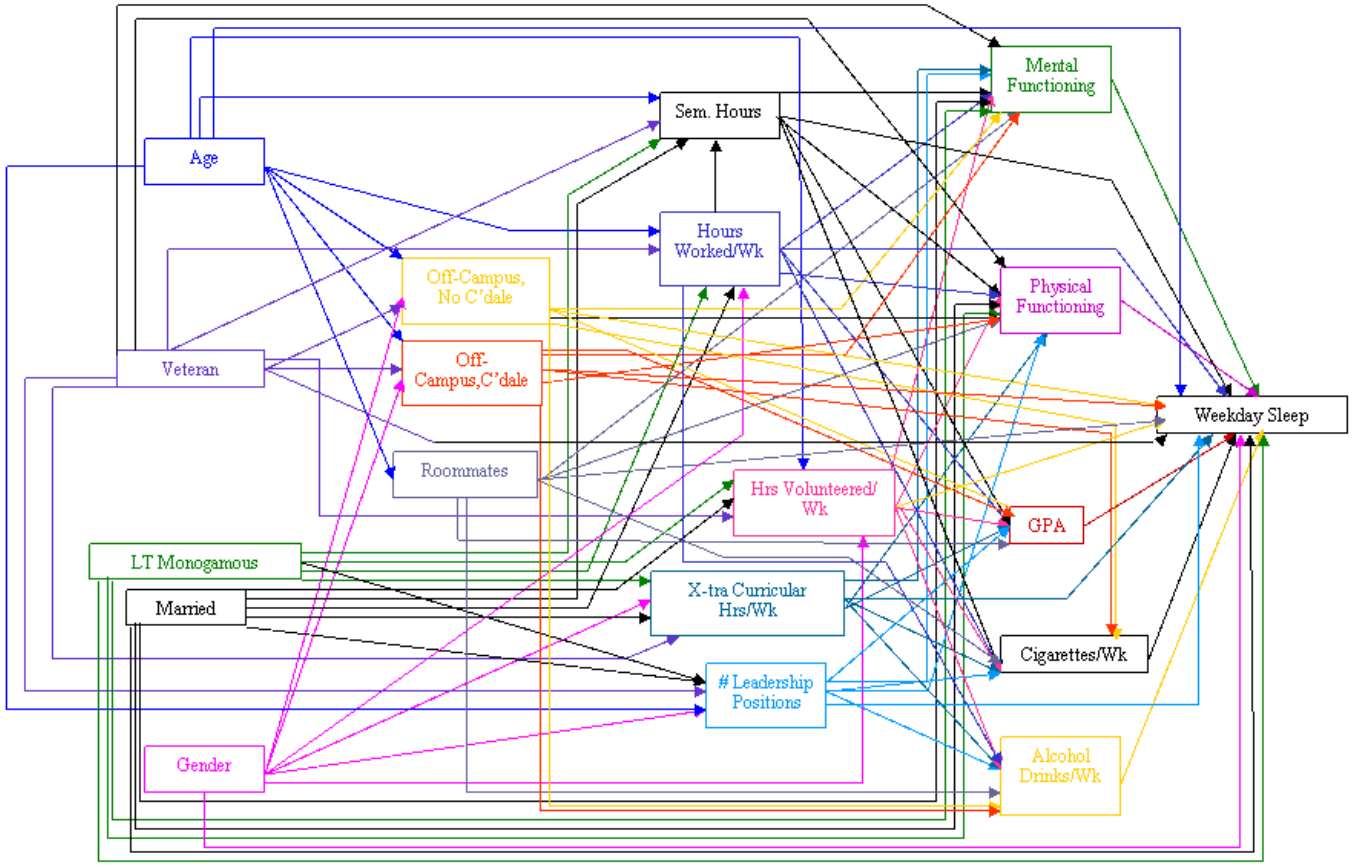

Figure 4. Proposed Path Analysis – Weekday Sleep Length

Table 23

Path Coefficients/Standardized Beta Coefficients for Causal Model of Weekday Sleep Length

Independent Variable	Dependent Variable	Standardized Beta Coefficient
Age	Hours/Week Extracurricular	-.142
Age	Hours/Week Volunteering	.105
Age	Hours/Week Working	.381
Age	Off Campus, In	.510
Age	Off Campus, Out	.164
Age	Roommates	.058
Age	Semester Hours	.036
Age	Student Leadership Positions	.008
Age	Weekday Sleep Length	-.195
Cigarettes/Week	Weekday Sleep Length	.016
Drinks/Week	Weekday Sleep Length	.017
GPA	Weekday Sleep Length	-.030
Hours/Week Extracurricular	Cigarettes/Week	-.008
Hours/Week Extracurricular	Drinks/Week	-.037
Hours/Week Extracurricular	GPA	.053
Hours/Week Extracurricular	*MOS SF-36* Mental Score	-.020
Hours/Week Extracurricular	*MOS SF-36* Physical Score	-.023
Hours/Week Extracurricular	Weekday Sleep Length	-.077
Hours/Week Volunteering	Cigarettes/Week	-.097
Hours/Week Volunteering	Drinks/Week	-.041
Hours/Week Volunteering	GPA	-.077
Hours/Week Volunteering	*MOS SF-36* Mental Score	.030
Hours/Week Volunteering	*MOS SF-36* Physical Score	.031
Hours/Week Volunteering	Weekday Sleep Length	.005
Hours/Week Working	Cigarettes/Week	-.015
Hours/Week Working	Drinks/Week	-.033
Hours/Week Working	GPA	.030

Table 23 continued

Path Coefficients/Standardized Beta Coefficients for Causal Model of Weekday Sleep Length

Independent Variable	Dependent Variable	Standardized Beta Coefficient
Hours/Week Working	*MOS SF-36* Mental Score	-.097
Hours/Week Working	*MOS SF-36* Physical Score	.074
Hours/Week Working	Semester Hours	.040
Hours/Week Working	Weekday Sleep Length	-.115
LT Monogamous Relationship	Hours/Week Extracurricular	.001
LT Monogamous Relationship	Hours/Week Volunteering	.072
LT Monogamous Relationship	Hours/Week Working	.113
LT Monogamous Relationship	*MOS SF-36* Mental Score	.012
LT Monogamous Relationship	*MOS SF-36* Physical Score	-.044
LT Monogamous Relationship	Semester Hours	-.009
LT Monogamous Relationship	Student Leadership Positions	-.019
LT Monogamous Relationship	Weekday Sleep Length	.000
Married	Hours/Week Extracurricular	-.037
Married	Hours/Week Volunteering	.024
Married	Hours/Week Working	.037
Married	*MOS SF-36* Mental Score	.045
Married	*MOS SF-36* Physical Score	-.047
Married	Semester Hours	-.069
Married	Student Leadership Positions	-.029
Married	Weekday Sleep Length	-.016
Off-Campus, In	Cigarettes/Week	.074
Off-Campus, In	Drinks/Week	.137
Off-Campus, In	GPA	.048
Off-Campus, In	*MOS SF-36* Mental Score	.094
Off-Campus, In	*MOS SF-36* Physical Score	.124
Off-Campus, In	Weekday Sleep Length	.056

Table 23 continued
Path Coefficients/Standardized Beta Coefficients for Causal Model of Weekday Sleep Length

Independent Variable	Dependent Variable	Standardized Beta Coefficient
Off-Campus, Out	Cigarettes/Week	-.009
Off-Campus, Out	Drinks/Week	-.043
Off-Campus, Out	GPA	.115
Off-Campus, Out	*MOS SF-36* Mental Score	.063
Off-Campus, Out	*MOS SF-36* Physical Score	.085
Off-Campus, Out	Weekday Sleep Length	.056
MOS SF-36 Mental Score	Weekday Sleep Length	.113
MOS SF-36 Physical Score	Weekday Sleep Length	.047
Roommates	Cigarettes/Week	-.010
Roommates	Drinks/Week	.082
Roommates	GPA	-.016
Roommates	*MOS SF-36* Mental Score	.045
Roommates	*MOS SF-36* Physical Score	.057
Roommates	Weekday Sleep Length	-.097
Semester Hours	Cigarettes/Week	-.048
Semester Hours	Drinks/Week	.084
Semester Hours	GPA	.240
Semester Hours	*MOS SF-36* Mental Score	.034
Semester Hours	*MOS SF-36* Physical Score	.057
Semester Hours	Weekday Sleep Length	-.077
Sex	Hours/Week Extracurricular	.120
Sex	Hours/Week Volunteering	.004
Sex	Hours/Week Working	-.011
Sex	Off Campus, In	.011
Sex	Off Campus, Out	-.019
Sex	Student Leadership Positions	.085
Sex	Weekday Sleep Length	-.055
Student Leadership Positions	Cigarettes/Week	-.019
Student Leadership Positions	Drinks/Week	.028
Student Leadership Positions	GPA	.004
Student Leadership Positions	*MOS SF-36* Mental Score	-.016

Table 23 continued

Path Coefficients/Standardized Beta Coefficients for Causal Model of Weekday Sleep Length

Independent Variable	Dependent Variable	Standardized Beta Coefficient
Student Leadership Positions	*MOS SF-36* Physical Score	-.029
Student Leadership Positions	Weekday Sleep Length	.014
Veteran	Hours/Week Extracurricular	-.019
Veteran	Hours/Week Volunteering	-.025
Veteran	Hours/Week Working	-.099
Veteran	*MOS SF-36* Mental Score	.004
Veteran	*MOS SF-36* Physical Score	-.015
Veteran	Off Campus, In	-.012
Veteran	Off Campus, Out	.037
Veteran	Semester Hours	.033
Veteran	Student Leadership Positions	-.016
Veteran	Weekday Sleep Length	.064

A criterion of meaningfulness was set at 05. Those paths with standardized beta coefficients less than an absolute value of .05 were deleted from the original weekday sleep length model. Through this trimming process alcoholic drink consumed per week, cigarettes smoked per week, grade point average, number of leadership positions occupied, hours spent volunteering per week, and *MOS SF-36* Physical Score were eliminated from the model.

Following trimming, the model contained five exogenous variables (age, long term monogamous, married, sex, and veteran). The model also contained eight endogenous variables (hours/week extracurricular hours, hours/week working, *MOS SF-36* Mental Score, off-campus in, off-campus out, roommates, semester hours, and weekday sleep). Additional multiple regression analyses were run to determine path

coefficients. A diagram of the trimmed model for weekday sleep length can be found in Figure 5. Computations for Multiple R's, R Square, AdjustedR Square, Standard Error of the Estimate, ANOVA table, Unstandardized Coefficients, Standardized Coefficients, *t*-score and significance level for each multiple regression analysis can be found in Appendices X – AJ and Appendix AK.

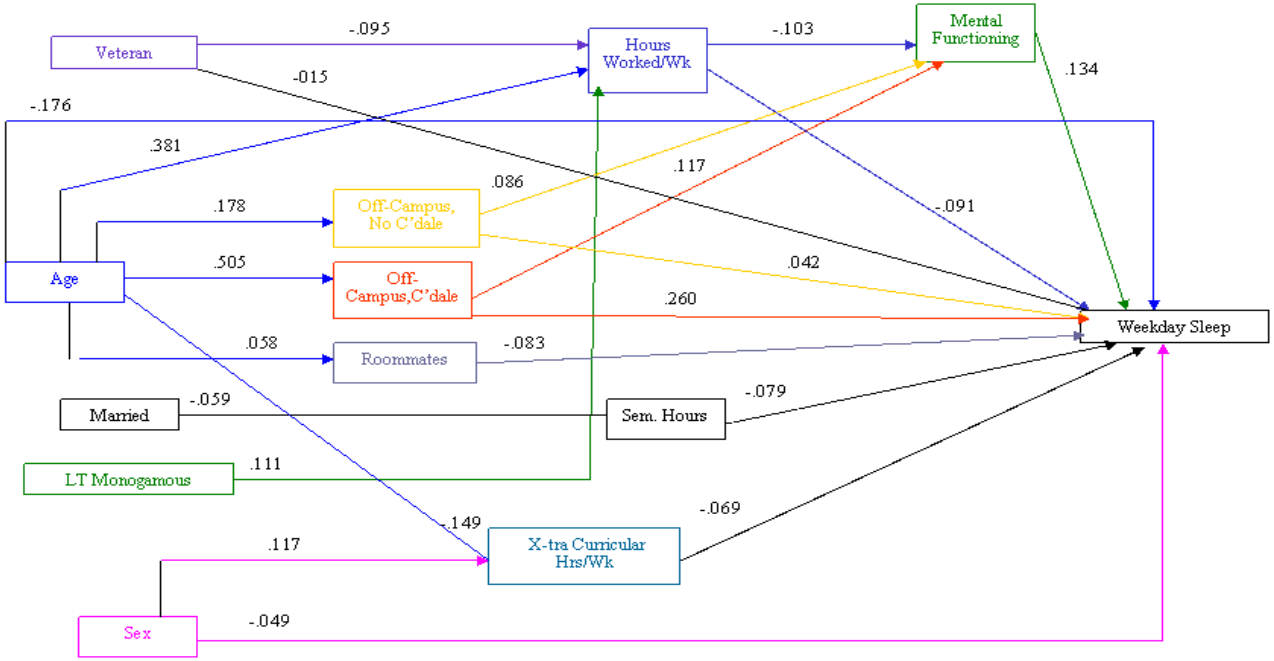

Figure 5. Trimmed Path Analysis – Weekday Sleep Length

Twelve of the 13 variables were associated with weekday sleep length. Ten variables with meaningful direct relationships with weekday sleep length were:
age, hours spent in extracurricular involvement, Hours/Week Working, living off-campus in, living off-campus, out, *MOS SF-36* Mental Score, number of roommates, number of semester hours, sex and veteran. The direct effect refers to the degree that a variable has on an endogenous variable, while all other variables are held constant (Carducci, 1979). Seven variables with indirect relationships with weekday sleep length include: age, living off-campus in, living off-campus, out, long-term relationship, married, sex, and veteran. The indirect effect refers to the degree that a variable produces change in an endogenous variable, based on its influence in changing a mediating variable (Carducci, 1979).

Multiple R's, R squares, and residual path coefficients for the endogenous variables can be found in Table 24. Residual path coefficients for the eight endogenous variables ranged from .863 (Off Campus, In) to .998 (Roommates and Semester Hours). These values show the impact of those variables not included in the causal path model of weekday sleep length.

The direct, indirect, and spurious effects of each independent and dependent variable found in the Weekday Sleep Length trimmed model can be found in Table 25. All other effects not reported include exogenous variables which are correlated, therefore, they are unanalyzed. The decomposition of effects among variables within the trimmed causal pathway model for weekday sleep length may be found in Table 25.

Table 24

Path Analysis of Weekday Sleep Length: Mutilple R's, R-Square, and Residual Path Coefficients for Endogenous Variables in Trimmed Causal Model

Endogenous Variable	Multiple R	R Square	Residual
Off Campus, In	.505	.255	.863
Off-Campus, Out	.178	.032	.984
Roommates	.058	.003	.998
Semester Hours	.059	.003	.998
Hours/Week Working	.397	.157	.918
Hours/Week Extracurricular	.170	.029	.985
MOS SF-36 Mental Score	.131	.017	.991
AveWeekdaySleep	.313	.098	.950

Within the trimmed causal pathway model for weekday sleep length, living off-campus in Carbondale had the strongest direct effect (.260) on weekday sleep length. The variable also had an indirect effect of .016, which was mediated through *MOS SF-36* Mental Score. Students living off-campus within Carbondale reported greater average weekday sleep length than students residing on campus.

Age had a direct negative effect (-.176) on average weekday sleep. The variable also had an indirect effect of .016, which was mediated through hours/week extracurricular, hours/week working, off-campus in, off-campus out, and roommates. Younger college students slept longer during the week than older college students.

MOS SF-36 Mental Score had a direct effect (.134) on average weekday sleep. Those students who scored higher on *MOS SF-36* Mental Score slept longer.

Work had a direct negative effect (-.091) on average weekday sleep and a negative indirect effect (-.014) mediated through *MOS SF-36* Mental Score. Students who worked less hours per week reported sleeping longer on weekdays than those students who worked more hours per week

Number of reported roommates had a negative direct effect on average weekday sleep length (-.083). Students who reported fewer roommates reported sleeping longer than students who reported more roommates.

Average number of hours involved in extra-curricular or student organizations had a negative direct effect (-.080) on average weekday sleep. Students spending more hours involved in extracurricular activities reported sleeping fewer hours during weekdays than those reporting less involvement.

Semester hours had a negative direct effect on average weekday sleep (-.079). Students enrolled in fewer semester hours reported sleeping longer during weekdays than those students enrolled in more semester hours

Sex had a negative direct impact (-.049) on average weekday sleep and a negative indirect effect (-.008) mediated through number of hours spent involved in extra-curricular activities. Females were more likely to report sleeping more during weekdays than males.

Off-Campus, Out had a direct impact (.042) on average weekday sleep length. The variable also had an indirect effect of .012, which was mediated through *MOS SF-36* Mental Score. Those students living off-campus outside of Carbondale reported greater average weekday sleep length than those who reported living on campus.

Veteran had a direct impact (.015) on average weekday sleep. The variable also had an indirect effect of .011, which was mediated through hours/week working and *MOS SF-36* Mental Score. Students who were active duty veterans slept less than students who were not veterans.

The other variables within the trimmed weekday sleep length causal path model had indirect effects on average weekday sleep length, ranging from -.014 to .114. The indirect effects of Long-term monogamous relationship on average weekday sleep length were mediated through hours worked/week and *MOS SF-36* Mental Score. Married's indirect effects were mediated through semester hours.

Table 25

Path Analysis of Weekday Sleep Length: Decomposition of Effects Among Variables in the Trimmed Causal Model of Weekday Sleep Length

Independent Variable	Dependent Variable	Correlation	Direct	Indirect	Spurious (Unanalyzed)
Age	Extra-Curricular	-.125	-.149	---	.024
Age	Hours/Week Working	.371	.381	---	-.010
Age	*MOS SF-36* Mental Score	-.008	---	.035	-.043
Age	Off-Campus, In	.505	.505	----	.000
Age	Off-Campus, Out	.178	.178	----	.000
Age	Roommates	.058	.058	----	.000
Age	Weekday Sleep	-.081	-.176	.114	-.019
Extra-Curricular	Weekday Sleep	-.080	-.069	---	.149
Hours/Week Working	*MOS SF-36* Mental Score	-.053	-.103	----	.05
Hours/Week Working	Sleep Weekday	-.112	-.091	-.014	.007
LT Monogamous Relationship	Hours/Week Working	.154	.111	----	.043
LT Monogamous Relationship	*MOS SF-36* Mental Score	-.014	----	-.011	-.003
LT Monogamous Relationship	Weekday Sleep	-.022	----	-.012	.034
Married	Semester Hours	-.059	-.059	----	.00
Married	Weekday Sleep	-.055	----	.005	-.060
MOS SF-36 Mental Score	Weekday Sleep	.156	.134	----	.022
Off-Campus, In	*MOS SF-36* Mental Score	.074	.117	----	-.043
Off-Campus, In	Weekday Sleep	.127	.260	.016	-.149
Off-Campus, Out	*MOS SF-36* Mental Score	.028	.086	----	-.058
Off-Campus, Out	Weekday Sleep	-.072	.042	.012	-.126

Table 25 continued

Path Analysis of Weekday Sleep Length: Decomposition of Effects Among Variables in the Trimmed Causal Model of Weekday Sleep Length

Independent Variable	Dependent Variable	Correlation	Direct	Indirect	Spurious (Unanalyzed)
Roommates	Weekday Sleep	-.068	-.083	---	.015
Semester Hours	Weekday Sleep	-.079	-.079	----	.000
Sex	Extra-Curricular	.086	.117	----	-.031
Sex	Weekday Sleep	-.067	-.049	-.008	-.010
Veteran	Hours Worked/Week	.008	-.095	---	.103
Veteran	*MOS SF-36* Mental Score	.031	---	.010	.021
Veteran	Weekday Sleep	-.003	.015	.010	-.028

Research Question Five Results

To determine the direct and indirect effects of potential predictor variables within the proposed causal model for self-reported weekend sleep length, multiple regression analyses were computed for each endogenous variable in the model. Computations for Multiple R's, R Square, AdjustedR Square, Standard Error of the Estimate, ANOVA table, Unstandardized Coefficients, Standardized Coefficients, *t*-score and significance level for each multiple regression analysis, except for the dependent variable, within the full sleep model can be found in Appendices H-T. The same computations within the full model for the weekday sleep length can be found in Appendix V. Computations for Multiple R's, R Square, AdjustedR Square, Standard Error of the Estimate, ANOVA table, Unstandardized Coefficients, Standardized Coefficients, *t*-score and significance level for each multiple regression analysis, except for the dependent variable, within the trimmed sleep model can be found in Appendices X-AJ. The same computations within the trimmed model for the weekday sleep length dependent variable can be found in Appendix AL. Figure 6 displays the pathway diagram for the proposed model. Standardized beta coefficients, which serve as path coefficients can be found in Table 26.

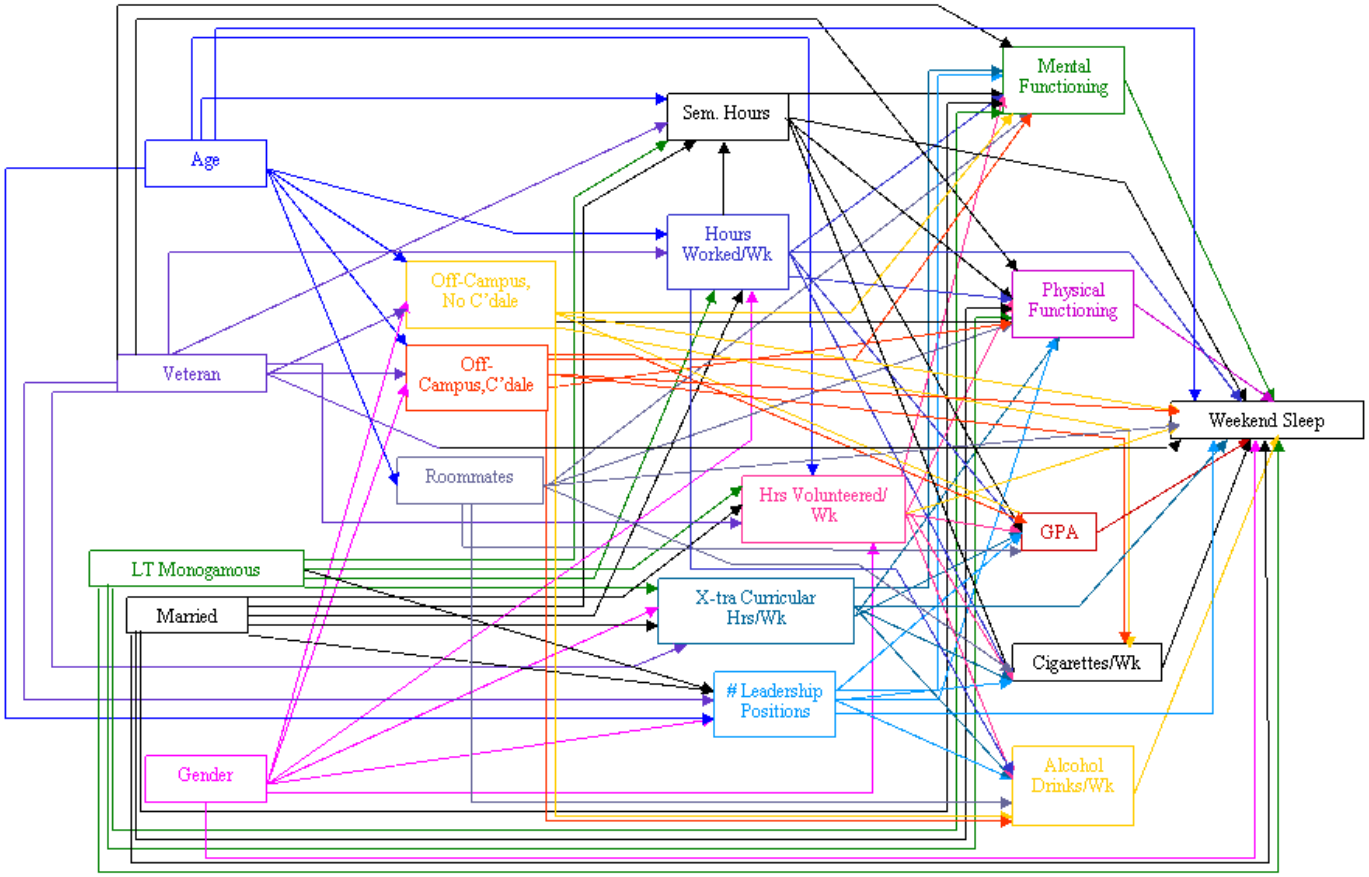

Figure 6. Proposed Path Analysis – Weekend Sleep Length

Table 26

Path Coefficients/Standardized Beta Coefficients for Causal Model of Weekend Sleep Length

Independent Variable	**Dependent Variable**	**Standardized Beta Coefficient**
Age	Hours/Week Extracurricular	-.142
Age	Hours/Week Volunteering	.105
Age	Hours/Week Working	.381
Age	Off Campus, In	.510
Age	Off Campus, Out	.164
Age	Roommates	.058
Age	Semester Hours	.036
Age	Student Leadership Positions	.008
Age	Weekend Sleep Length	-.058
Cigarettes/Week	Weekend Sleep Length	-.039
Drinks/Week	Weekend Sleep Length	.026
GPA	Weekend Sleep Length	.050
Hours/Week Extracurricular	Cigarettes/Week	-.008
Hours/Week Extracurricular	Drinks/Week	-.037
Hours/Week Extracurricular	GPA	.053
Hours/Week Extracurricular	*MOS SF-36* Mental Score	-.020
Hours/Week Extracurricular	*MOS SF-36 Physical Score*	-.023
Hours/Week Extracurricular	*Weekend Sleep Length*	-.016
Hours/Week Volunteering	*Cigarettes/Week*	-.097
Hours/Week Volunteering	Drinks/Week	-.041
Hours/Week Volunteering	GPA	-.077
Hours/Week Volunteering	*MOS SF-36* Mental Score	.030
Hours/Week Volunteering	*MOS SF-36* Physical Score	.031
Hours/Week Volunteering	Weekend Sleep Length	-.051
Hours/Week Working	Cigarettes/Week	-.015
Hours/Week Working	Drinks/Week	-.033
Hours/Week Working	GPA	.030

Table 26 continued

Path Coefficients/Standardized Beta Coefficients for Causal Model of Weekend Sleep Length

Independent Variable	Dependent Variable	Standardized Beta Coefficient
Hours/Week Working	*MOS SF-36* Mental Score	-.097
Hours/Week Working	*MOS SF-36* Physical Score	.074
Hours/Week Working	Semester Hours	.040
Hours/Week Working	Weekend Sleep Length	-.107
LT Monogamous Relationship	Hours/Week Extracurricular	.001
LT Monogamous Relationship	Hours/Week Volunteering	.072
LT Monogamous Relationship	Hours/Week Working	.113
LT Monogamous Relationship	*MOS SF-36* Mental Score	.012
LT Monogamous Relationship	*MOS SF-36* Physical Score	-.044
LT Monogamous Relationship	Semester Hours	-.009
LT Monogamous Relationship	Student Leadership Positions	-.019
LT Monogamous Relationship	Weekend Sleep Length	.059
Married	Hours/Week Extracurricular	-.037
Married	Hours/Week Volunteering	.024
Married	Hours/Week Working	.037
Married	*MOS SF-36* Mental Score	.045
Married	*MOS SF-36* Physical Score	-.047
Married	Semester Hours	-.069
Married	Student Leadership Positions	-.029
Married	Weekend Sleep Length	-.045
Off-Campus, In	Cigarettes/Week	.074
Off-Campus, In	Drinks/Week	.137
Off-Campus, In	GPA	.048
Off-Campus, In	*MOS SF-36* Mental Score	.094
Off-Campus, In	*MOS SF-36* Physical Score	.124
Off-Campus, In	Weekend Sleep Length	.021

Table 26 continued

Path Coefficients/Standardized Beta Coefficients for Causal Model of Weekend Sleep Length

Independent Variable	Dependent Variable	Standardized Beta Coefficient
Off-Campus, Out	Cigarettes/Week	-.009
Off-Campus, Out	Drinks/Week	-.043
Off-Campus, Out	GPA	.115
Off-Campus, Out	*MOS SF-36* Mental Score	.063
Off-Campus, Out	*MOS SF-36* Physical Score	.085
Off-Campus, Out	Weekend Sleep Length	.004
MOS SF-36 Mental Score	Weekend Sleep Length	.027
MOS SF-36 Physical Score	Weekend Sleep Length	-.076
Roommates	Cigarettes/Week	-.010
Roommates	Drinks/Week	.082
Roommates	GPA	-.016
Roommates	*MOS SF-36* Mental Score	.045
Roommates	*MOS SF-36* Physical Score	.057
Roommates	Weekend Sleep Length	-.063
Semester Hours	Cigarettes/Week	-.048
Semester Hours	Drinks/Week	.084
Semester Hours	GPA	.240
Semester Hours	*MOS SF-36* Mental Score	.034
Semester Hours	*MOS SF-36* Physical Score	.057
Semester Hours	Weekend Sleep Length	-.012
Sex	Hours/Week Extracurricular	.120
Sex	Hours/Week Volunteering	.004
Sex	Hours/Week Working	-.011
Sex	Off Campus, In	.011
Sex	Off Campus, Out	-.019
Sex	Student Leadership Positions	.085
Sex	Weekend Sleep Length	-.094
Student Leadership Positions	Cigarettes/Week	-.019
Student Leadership Positions	Drinks/Week	.028
Student Leadership Positions	GPA	.004
Student Leadership Positions	*MOS SF-36* Mental Score	-.016

Table 26 continued

Path Coefficients/Standardized Beta Coefficients for Causal Model of Weekend Sleep Length

Independent Variable	Dependent Variable	Standardized Beta Coefficient
Student Leadership Positions	*MOS SF-36* Physical Score	-.029
Student Leadership Positions	Weekend Sleep Length	.071
Veteran	Hours/Week Extracurricular	-.019
Veteran	Hours/Week Volunteering	-.025
Veteran	Hours/Week Working	-.099
Veteran	*MOS SF-36* Mental Score	.004
Veteran	*MOS SF-36* Physical Score	-.015
Veteran	Off Campus, In	-.012
Veteran	Off Campus, Out	.037
Veteran	Semester Hours	.033
Veteran	Student Leadership Positions	-.016
Veteran	Weekend Sleep Length	.082

A criterion of meaningfulness was set at 05. Those paths with standardized beta coefficients less than an absolute value of .05 were deleted from the original weekend sleep length model. Through this trimming process, alcoholic drinks consumed per week, cigarettes smoked per week, and *MOS SF-36* Mental Score were eliminated from the model.

Following trimming, the model contained five exogenous variables (age, long-term, monogamous, married, sex, and veteran. The model also contained 11 endogenous variables (grade point average, hours/week extracurricular hours, hours/week working, hours/week volunteering, leadership positions, *MOS SF-36* Physical Score, off-campus in, off-campus out, roommates, semester hours, and weekday sleep). Additional multiple regression analyses were run to determine path coefficients. A diagram of the trimmed model for weekend sleep length can be found in Figure 7. Computations for Multiple R's,

R Square, Adjusted R Square, Standard Error of the Estimate, NOVA table, Unstandardized Coefficients, Standardized coefficients, *t*-score, and significance level for each multiple regression analysis can be found in Appendices X – AJ and Appendix AL.

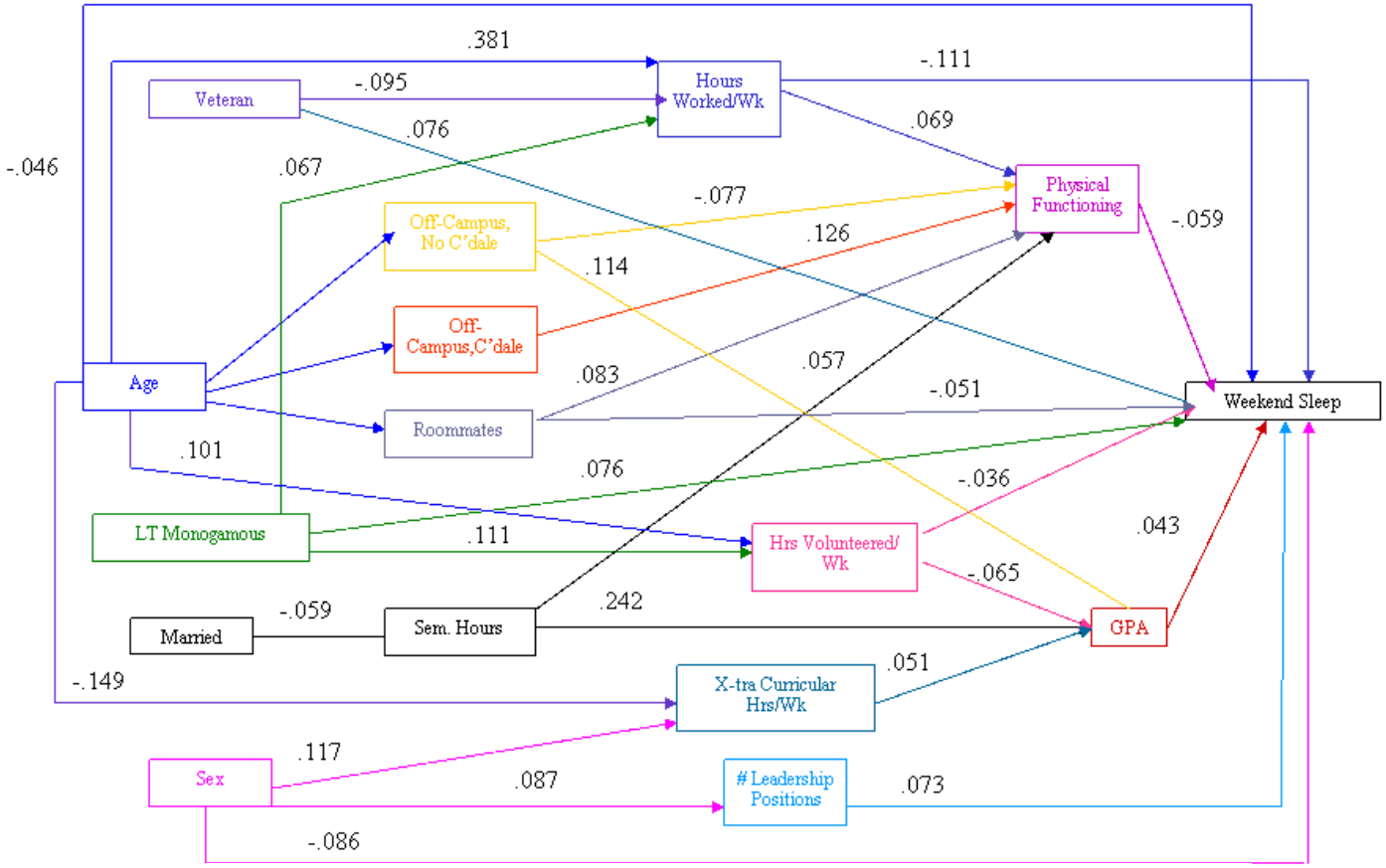

Figure 7. Trimmed Path Analysis – Weekend Sleep Length

Fifteen of the 16 variables were associated with weekend sleep length. Nine of the 16 variables had direct relationships with weekend sleep length. These variables were: age, number of Hours/Week Working, number of hours volunteered per week, leadership positions, long-term monogamous relationship, *MOS SF-36* Physical Score, number of roommates, sex, and veteran. Twelve of the 16 variables had indirect relationships with weekend sleep length. These variables were age, number of hours/week extracurricular, number of Hours/Week Working, number of Hours/Week Volunteering, long-term monogamous relationship, married, Off-Campus, In, Off-Campus, Out, number of roommates, semester hours, sex, and veteran.

MultipleR's, R squares, and residual path coefficients for the endogenous variables can be found in Table 27. Residual paths for the 11 endogenous variables ranged from .863 (Off Campus, In) to .998 (roommates and semester hours). These values show the impact of those variables not included in the causal path model of weekday sleep length.

Table 27

Path Analysis of Weekend Sleep Length: Mutilple R's, R-Square, and Residual Path Coefficients for Endogenous Variables in Trimmed Causal Model

Endogenous Variable	Multiple R	R Square	Residual
Grade Point Average	.275	.076	.961
Hours/Week Extracurricular	.170	.029	.985
Hours/Week Working	.397	.157	.918
Hours/Week Volunteering	.128	.016	.992
Off Campus, In	.505	.255	.863
Off-Campus, Out	.178	.032	.984
Roommates	.058	.003	.998
Semester Hours	.059	.003	.998
Student Leadership Positions	.087	.008	.996
MOS SF-36 Physical Score	.209	.044	.978
AveWeekendSleep	.228	.052	.974

The direct, indirect, and spurious effects of each independent and dependent variable found in the weekend sleep length trimmed model can be found in Table 28. All other effects not reported include exogenous variables which are correlated, therefore, they are unanalyzed. The decomposition of effects among variables within the trimmed causal pathway model for weekday sleep length may be found in Table 28.

Within the trimmed causal pathway model for weekend sleep length, hours/week working had the largest negative direct effect (-.111). Hours per week also had a negative indirect effect (-.004) on weekend sleep length which was mediated through *MOS SF-36* Physical Score. Students who reported working more hours during the week indicated shorter average weekend sleep lengths than those who worked less

Sex had negative direct effects (-.086) on average weekend sleep length. The variable also had an indirect effect which was mediated through hours/week extracurricular, number of leadership positions, and grade point average. Males reported sleeping less on weekends than females.

Long-term monogamous relationship had a direct effect (.076) on average weekend sleep length. It also had a negative indirect effect (-.015), which was mediated through hours/week working, hours/week volunteering, grade point average, and *MOS SF-36* Physical Score. Individuals in long-term monogamous relationships reported longer average weekend sleep lengths than those who reported being single.

Student Leadership Positions had a direct effect (.073) on average weekend sleep length. Individuals with more leadership positions reported longer average weekend sleep length than those serving less leadership positions.

MOS SF-36 Physical Score had a negative direct effect (-.059) on average weekend sleep length. Students who scored lower *MOS SF-36* Physical Score scores reported greater weekend sleep length than those who scored higher *MOS SF-36* Physical Score scores.

Roommates had a negative direct effect (-.051) on average weekend sleep length. Roommates also had a negative indirect effect (-.005) which was mediated through *MOS SF-36* Physical Score. Students reporting fewer roommates slept longer on the weekends than those who had more roommates.

Veteran had a direct effect (.076) on average weekend sleep length. Veteran-Active also had an indirect effect (.011) which was mediated through hours/week working and *MOS SF-36* Physical Score. Active duty veterans reported greater average weekend sleep length than non-veterans.

Age had a direct negative effect (-.046) on average weekend sleep length. The variable also had a negative indirect effect (-.055), which was mediated through grade point average, off-campus – out, off-campus – in, roommates, hours/week working, hours/week extra-curricular activities, and *MOS SF-36* Physical Score, roommates, Younger students reported greater average weekend sleep than the older students within the sample.

Grade Point Average had a direct effect (.043) on average weekend sleep length. Students with higher grade point averages reported greater average weekend sleep than students with lower grade point averages.

Hours volunteered had a negative direct effect (-.036) on average weekend sleep length. The variable also had a negative indirect effect (-.003), which was mediated

through grade point average. Students who reported volunteering less slept longer during the weekends than students who reported spending more hours volunteering.

The other variables within the trimmed weekend sleep length causal path model had indirect effects on average weekend sleep length, ranging from -.023 to .051. The indirect effects of off-campus, in were mediated through *MOS SF-36* Physical Score. The indirect effects of semester hours were mediated through grade point average and *MOS SF-36* Physical Score. The indirect effects of hours/week extracurricular were mediated through grade point average. The indirect effects of married on weekend sleep length were mediated through semester hours, grade point average, and *MOS SF-36* Physical Score. The indirect effects of off-campus pout were mediated through grade point average and *MOS SF-36* Physical Score. The indirect effects of sex were mediated through hours/week extracurricular, grade point average, and number of leadership positions.

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Table 28

Path Analysis of Weekday Sleep Length: Decomposition of Effects Among Variables in the Trimmed Causal Model of Weekend Sleep Length

Independent Variable	Dependent Variable	Correlation	Direct	Indirect	Spurious (Unanalyzed)
Age	Grade Point Average	.062	---	.006	.056
Age	Hours/Week Extracurricular	-.125	-.149	---	.024
Age	Hours/Week Volunteering	.110	.101	---	.009
Age	Hours/Week Working	.371	.381	---	-.01
Age	*MOS SF-36* Physical Score	.105	---	.108	-.003
Age	Off-Campus, Out	.178	.178	---	.000
Age	Off-Campus, In	.505	.505	---	.000
Age	Roommates	.058	.058	---	.000
Age	Weekend Sleep	-.083	-.046	-.055	.018
Grade Point Average	Weekend Sleep	.038	.043	---	-.005
Hours/Week Extracurricular	Grade Point Average	.039	.051	---	-.012
Hours/Week Extracurricular	Weekend Sleep	-.022	---	.002	-.024
Hours/Week Volunteering	Grade Point Average	-.038	-.065	---	.027
Hours/Week Volunteering	Weekend Sleep	-.045	-.036	-.003	-.006
Hours/Week Working	*MOS SF-36* Physical Score	.109	.069	---	.040
Hours/Week Working	Weekend Sleep	-.116	-.111	-.004	-.001
Student Leadership Positions	Weekend Sleep	-.038	.073	---	-.111
LT Monogamous Relationship	Grade Point Average	.033	---	-.004	.037
LT Monogamous Relationship	Hours/Week Working	.154	.111	---	.043
LT Monogamous Relationship	Hours/Week Volunteering	.080	.067	---	.013
LT Monogamous Relationship	*MOS SF-36* Physical Score	-.029	---	.008	-.037
LT Monogamous Relationship	Weekend Sleep	.065	.076	-.015	.004

Table 28 continued

Path Analysis of Weekday Sleep Length: Decomposition of Effects Among Variables in the Trimmed Causal Model of Weekend Sleep Length

Independent Variable	Dependent Variable	Correlation	Direct	Indirect	Spurious (Unanalyzed)
Married	Grade Point Average	.011	---	-.014	.025
Married	*MOS SF-36* Physical Score	-.031	---	-.003	-.028
Married	Semester Hours	-.059	-.059	---	.000
Married	Weekend Sleep	-.072	---	-.001	-.071
MOS SF-36 Physical Score	Weekend Sleep	.099	-.059	---	.158
Off-Campus, In	*MOS SF-36* Physical Score	.124	.126	---	-.002
Off-Campus, In	Weekend Sleep	-.047	---	.007	-.054
Off-Campus, Out	Grade Point Average	.114	.114	---	.000
Off-Campus, Out	*MOS SF-36* Physical Score	.075	.077	---	-.002
Off-Campus, Out	Weekend Sleep	-.044	---	.000	-.044
Roommates	*MOS SF-36* Physical Score	.093	.083	---	.010
Roommates	Weekend Sleep	-.049	-.051	-.005	.007
Semester Hours	Grade Point Average	.241	.242	---	.001
Semester Hours	*MOS SF-36* Physical Score	.081	.057	---	.024
Semester Hours	Weekend Sleep	-.019	---	.007	-.026
Sex	Grade Point Average	-.052	---	.006	-.058
Sex	Hours/Week Extracurricular	.086	.117	---	-.031
Sex	Student Leadership Positions	.087	.087	---	.000
Sex	Weekend Sleep	-.107	-.086	.009	-.012
Veteran	Hours/Week Working	.008	-.095	---	.103
Veteran	*MOS SF-36* Physical Score	.003	---	-.007	.010
Veteran	Weekend Sleep	.035	.076	.011	.052

Research Question Six Results

To determine the direct and indirect effects of potential predictor variables within the proposed causal model for self-reported sleep quality, multiple regression analyses were computed for each endogenous variable in the model. Computations for Multiple R's, R Square, AdjustedR Square, Standard Error of the Estimate, ANOVA table, Unstandardized Coefficients, Standardized Coefficients, *t*-score and significance level for each multiple regression analysis, except for the dependent variable, within the full sleep model can be found in Appendices H-T. The same computations within the full model for the weekday sleep length can be found in Appendix W. Computations for Multiple R's, R Square, AdjustedR Square, Standard Error of the Estimate, ANOVA table, Unstandardized Coefficients, Standardized Coefficients, *t*-score and significance level for each multiple regression analysis, except for the dependent variable, within the trimmed sleep model can be found in Appendices X-AJ. The same computations within the trimmed model for the weekday sleep length dependent variable can be found in Appendix AM. Figure 8 displays the pathway diagram for the proposed model. A summary of standardized beta coefficients, which serve as path coefficients, can be found in Table 29.

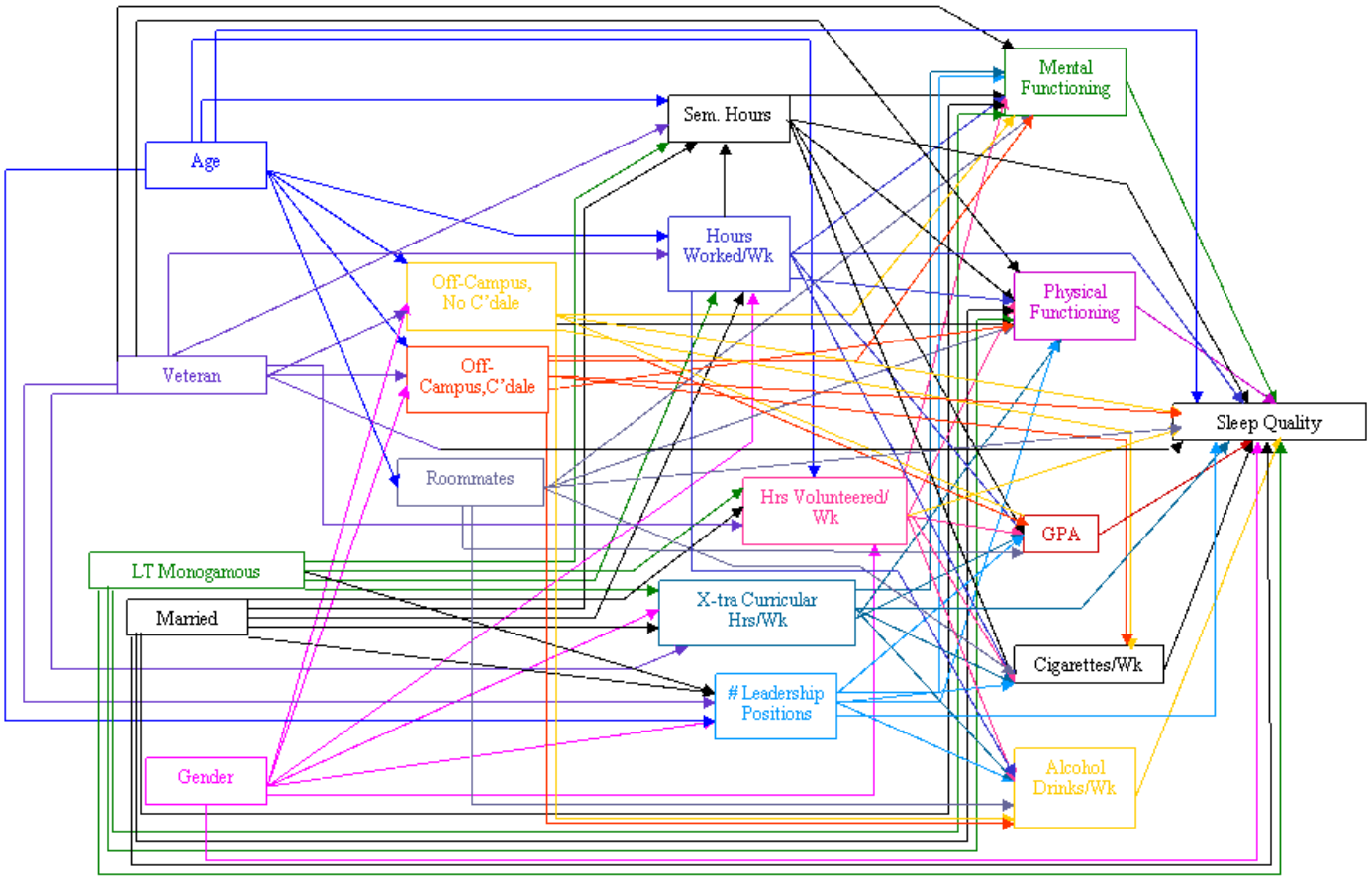

Figure 8. Proposed Path Analysis – Sleep Quality

Table 29

Path Coefficients/Standardized Beta Coefficients for Causal Model of Sleep Quality

Independent Variable	Dependent Variable	Standardized Beta Coefficient
Age	Hours/Week Extracurricular	-.142
Age	Hours/Week Volunteering	.105
Age	Hours/Week Working	.381
Age	Off Campus, In	.510
Age	Off Campus, Out	.164
Age	Roommates	.058
Age	Semester Hours	.036
Age	Student Leadership Positions	.008
Age	*PSQI* Sleep Quality	.072
Cigarettes/Week	*PSQI* Sleep Quality	.021
Drinks/Week	*PSQI* Sleep Quality	.094
GPA	*PSQI* Sleep Quality	-.066
Hours/Week Extracurricular	Cigarettes/Week	-.008
Hours/Week Extracurricular	Drinks/Week	-.037
Hours/Week Extracurricular	GPA	.053
Hours/Week Extracurricular	*MOS SF-36* Mental Score	-.020
Hours/Week Extracurricular	*MOS SF-36* Physical Score	-.023
Hours/Week Extracurricular	*PSQI* Sleep Quality	-.017
Hours/Week Volunteering	Cigarettes/Week	-.097
Hours/Week Volunteering	Drinks/Week	-.041
Hours/Week Volunteering	GPA	-.077
Hours/Week Volunteering	*MOS SF-36* Mental Score	.030
Hours/Week Volunteering	*MOS SF-36* Physical Score	.031
Hours/Week Volunteering	*PSQI* Sleep Quality	.067
Hours/Week Working	Cigarettes/Week	-.015
Hours/Week Working	Drinks/Week	-.033
Hours/Week Working	GPA	.030

Table 29 continued

Path Coefficients/Standardized Beta Coefficients for Causal Model of Sleep Quality

Independent Variable	Dependent Variable	Standardized Beta Coefficient
Hours/Week Working	*MOS SF-36* Mental Score	-.097
Hours/Week Working	*MOS SF-36* Physical Score	.074
Hours/Week Working	Semester Hours	.040
Hours/Week Working	*PSQI* Sleep Quality	.000
LT Monogamous Relationship	Hours/Week Extracurricular	.001
LT Monogamous Relationship	Hours/Week Volunteering	.072
LT Monogamous Relationship	Hours/Week Working	.113
LT Monogamous Relationship	*MOS SF-36* Mental Score	.012
LT Monogamous Relationship	*MOS SF-36* Physical Score	-.044
LT Monogamous Relationship	Semester Hours	-.009
LT Monogamous Relationship	Student Leadership Positions	-.019
LT Monogamous Relationship	*PSQI* Sleep Quality	.043
Married	Hours/Week Extracurricular	-.037
Married	Hours/Week Volunteering	.024
Married	Hours/Week Working	.037
Married	*MOS SF-36* Mental Score	.045
Married	*MOS SF-36* Physical Score	-.047
Married	Semester Hours	-.069
Married	Student Leadership Positions	-.029
Married	*PSQI* Sleep Quality	-.011
Off-Campus, In	Cigarettes/Week	.074
Off-Campus, In	Drinks/Week	.137
Off-Campus, In	GPA	.048
Off-Campus, In	*MOS SF-36* Mental Score	.094
Off-Campus, In	*MOS SF-36* Physical Score	.124
Off-Campus, In	*PSQI* Sleep Quality	-.100

Table 29 continued

Path Coefficients/Standardized Beta Coefficients for Causal Model of Sleep Quality

Independent Variable	Dependent Variable	Standardized Beta Coefficient
Off-Campus, Out	Cigarettes/Week	-.009
Off-Campus, Out	Drinks/Week	-.043
Off-Campus, Out	GPA	.115
Off-Campus, Out	*MOS SF-36* Mental Score	.063
Off-Campus, Out	*MOS SF-36* Physical Score	.085
Off-Campus, Out	*PSQI* Sleep Quality	.080
MOS SF-36 Mental Score	*PSQI* Sleep Quality	-.308
MOS SF-36 Physical Score	*PSQI* Sleep Quality	-.271
Roommates	Cigarettes/Week	-.010
Roommates	Drinks/Week	.082
Roommates	GPA	-.016
Roommates	*MOS SF-36* Mental Score	.045
Roommates	*MOS SF-36* Physical Score	.057
Roommates	*PSQI* Sleep Quality	-.014
Semester Hours	Cigarettes/Week	-.048
Semester Hours	Drinks/Week	.084
Semester Hours	GPA	.240
Semester Hours	*MOS SF-36* Mental Score	.034
Semester Hours	*MOS SF-36* Physical Score	.057
Semester Hours	*PSQI* Sleep Quality	.016
Sex	Hours/Week Extracurricular	.120
Sex	Hours/Week Volunteering	.004
Sex	Hours/Week Working	-.011
Sex	Off Campus, In	.011
Sex	Off Campus, Out	-.019
Sex	Student Leadership Positions	.085
Sex	*PSQI* Sleep Quality	.032
Student Leadership Positions	Cigarettes/Week	-.019
Student Leadership Positions	Drinks/Week	.028
Student Leadership Positions	GPA	.004
Student Leadership Positions	*MOS SF-36* Mental Score	-.016

Table 29 continued

Path Coefficients/Standardized Beta Coefficients for Causal Model of Sleep Quality

Independent Variable	Dependent Variable	Standardized Beta Coefficient
Student Leadership Positions	*MOS SF-36* Physical Score	-.029
Student Leadership Positions	*PSQI* Sleep Quality	.022
Veteran	Hours/Week Extracurricular	-.019
Veteran	Hours/Week Volunteering	-.025
Veteran	Hours/Week Working	-.099
Veteran	*MOS SF-36* Mental Score	.004
Veteran	*MOS SF-36* Physical Score	-.015
Veteran	Off Campus, In	-.012
Veteran	Off Campus, Out	.037
Veteran	Semester Hours	.033
Veteran	Student Leadership Positions	-.016
Veteran	*PSQI* Sleep Quality	-.096

A criterion of meaningfulness was set at 05. Those paths with standardized beta coefficients less than an absolute value of .05 were deleted from the original sleep quality model. Through this trimming process, cigarettes, Student Leadership Positions, extra-curricular hours, Hours/Week Volunteering, and sex were eliminated from the model.

Following trimming, the model contained six exogenous variables and 13 endogenous. Additional multiple regression analyses were run to determine path coefficients. A diagram of the trimmed model for weekend sleep length can be found in Figure 9. Computations for Multiple R's, R Square, Adjusted R Square, Standard Error of the Estimate, NOVA table,

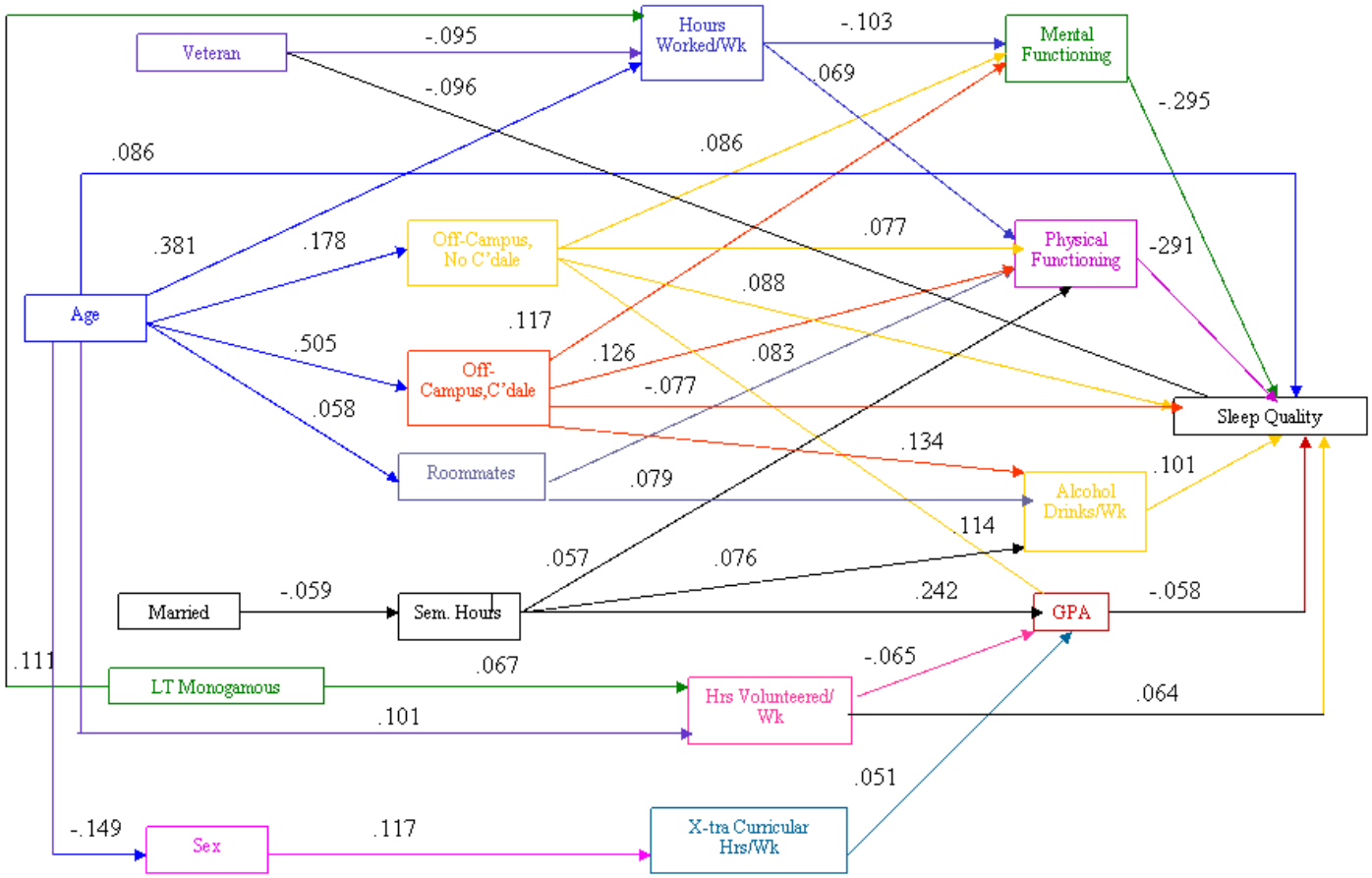

Figure 9 - Trimmed Path Analysis – Weekend Sleep Length

Unstandardized Coefficients, Standardized coefficients, *t*-score, and significance level for each multiple regression analysis can be found in Appendices X – AJ and Appendix AM.

Eighteen of the 19 variables were associated with sleep quality. Nine variables with meaningful direct relationships with sleep quality were: age, alcoholic drinks, grade point average, hours/week working, hours/week volunteering, *MOS SF-36* Mental Score, *MOS SF-36* Physical Score, Off-Campus, In, Off-Campus, Out, and veteran. Twelve variables with indirect relationships with sleep quality include: age, hours/week extracurricular, Hours/Week Working, hours/week volunteering, long-term monogamous relationship, married, Off-Campus, In, Off-Campus, Out, roommates, semester hours, sex, and veteran.

Multiple R's, R squares, and residual path coefficients for the endogenous variables can be found in Table 30. Residual paths for the 13 endogenous variables ranged from .825 (sleep quality) to .998 (roommates and semester hours). These values show the impact of those variables not included in the causal path model of weekday sleep length.

The direct, indirect, and spurious effects of each independent and dependent variable found in the sleep quality trimmed model can be found in Table 31. All other effects not reported include exogenous variables which are correlated, therefore, they are unanalyzed. The decomposition of effects among variables within the trimmed causal pathway model for sleep quality may be found in Table 31.

Table 30

Path Analysis of Sleep Quality: Mutilple R's, R-Square, and Residual Path Coefficients for Endogenous Variables in Trimmed Causal Model

Endogenous Variable	Multiple R	R Square	Residual
Off Campus, In	.505	.255	.863
Off-Campus, Out	.178	.032	.984
Roommates	.058	.003	.998
Semester Hours	.059	.003	.998
Hours/Week Working	.397	.157	.918
Hours/Week Volunteering	.128	.016	.992
MOS SF-36 Mental Score	.131	.017	.991
MOS SF-36 Physical Score	.209	.044	.978
GPA	.275	.076	.961
Drinks/Week	.185	.034	.983
Sleep Quality	.565	.319	.825

In the sleep quality trimmed model, *MOS SF-36* Mental Score had the strongest negative direct effect (-.295) on sleep quality. Those with greater *MOS SF-36* Mental Score scores reported lower sleep quality scores which indicate better sleep quality. *MOS SF-36* Physical Score also had a negative direct effect (-.291) on sleep quality. Those with greater *MOS SF-36* Physical Score scores reported lower sleep quality scores which indicate better sleep quality.

Alcohol had a direct effect (.101) on sleep quality. The more alcoholic drinks that a student reported drinking during the week, the higher the sleep quality score the student reported, indicating worse sleep quality.

Veteran had a negative direct effect (-.096) on sleep quality and a negative indirect effect (-.0002) mediated through hours/week working and *MOS SF-36* Mental Score. Veterans who had served in active duty reported lower sleep quality scores, indicating better sleep quality than non-veterans.

Off-Campus, Out had a direct effect (.088) on sleep quality and an indirect effect (-.054) mediated through grade point average and *MOS SF-36* Mental Score. Those living off-campus outside of Carbondale were more likely to report lower sleep quality scores, indicating greater sleep quality, than those living on-campus.

Age had a direct effect (.086) on sleep quality and a negative indirect effect (-.054) mediated through grade point average, hours/week extracurricular, hours/week working worked, *MOS SF-36* Mental Score, Off-Campus, In, Off-Campus, Out, and roommates,. The older a student reported themselves as being, the higher their sleep quality score. Older students reported worse sleep quality.

Off-Campus, In had a negative direct effect (-.077) on sleep quality and a negative indirect effect (-.058) mediated through, *MOS SF-36* Mental Score. Students living off-campus, within Carbondale were more likely to report lower sleep quality scores than those living on-campus.

Hours/week volunteering had a direct effect (.064) on sleep quality and an indirect effect (.005) mediated through *MOS SF-36* Mental Score. The more hours a student worked, the greater the sleep quality score reported. The more hours a student worked, worse sleep quality was indicated.

Grade point average had a negative direct effect (-.063) on sleep quality. Students with higher grade point average, tended to report lower sleep quality scores. Students with higher grade point averages reported better sleep quality than those students with lower grade point averages.

The other variables within the trimmed weekend sleep length causal path model had indirect effects on average weekend sleep length, ranging from -.023 to .051. The indirect effects of hours/week working on weekend sleep length were mediated through *MOS SF-36* Physical Score. The indirect effects of semester hours were mediated through drinks/week, grade point average and *MOS SF-36* Physical Score. The indirect effects of roommates on weekend sleep length were mediated through *MOS SF-36* Physical Score. The indirect effects of long-term monogamous on weekend sleep length were mediated through grade point average, hours/week working, hours/week volunteering, and *MOS SF-36* Physical Score. The indirect effects of hours/week extracurricular were mediated through grade point average. The indirect effects of married on weekend sleep length were mediated through semester hours, drinks/week, grade point average, and *MOS SF-36* Physical Score. The indirect effects of sex were mediated through drinks/week, hours/week extracurricular, and grade point average.

Table 31

Path Analysis of Sleep Quality: Decomposition of Effects Among Variables in the Trimmed Causal Model of Sleep Quality

Independent Variable	Dependent Variable	Correlation	Direct	Indirect	Spurious (Unanalyzed)
Age	Drinks/Week	.076	---	.072	.004
Age	Extra Curricular	-.125	.149	---	-.274
Age	GPA	.062	---	.013	.049
Age	Hours/Week Working	.371	.381	---	-.010
Age	Hours/Week Volunteering	.110	.101	---	.009
Age	*MOS SF-36* Mental Score	-.008	---	.035	-.043
Age	*MOS SF-36* Physical Score	.105	---	.108	-.003
Age	Off-Campus, In	.505	.505	---	.000
Age	Off-Campus, Out	.178	.178	---	.000
Age	Roommates	.058	.058	---	.000
Age	Sleep Quality	.018	.086	-.054	-.014
Drinks/Week	Sleep Quality	.128	.101	---	.027
Extra Curricular	Grade Point Average	.039	.051	---	-.012
Extra Curricular	Sleep Quality	.005	---	.003	.002
GPA	Sleep Quality	-.070	-.058	---	-.012
Hours/Week Working	*MOS SF-36* Mental Score	-.053	-.103	---	.050
Hours/Week Working	*MOS SF-36* Physical Score	.109	.069	---	.040
Hours/Week Working	Sleep Quality	.012	---	.051	-.039
Hours/Week Volunteering	Grade Point Average	-.038	-.065	---	.027
Hours/Week Volunteering	Sleep Quality	.041	.064	.004	-.027
LT Monogamous Relationship	Grade Point Average	.033	---	-.004	.037
LT Monogamous Relationship	Hours/Week Volunteering	.080	.067	---	.013
LT Monogamous Relationship	Hours/Week Working	.154	.111	---	.043

Table 31 continued

Path Analysis of Sleep Quality: Decomposition of Effects Among Variables in the Trimmed Causal Model of Sleep Quality

Independent Variable	**Dependent Variable**	**Correlation**	**Direct**	**Indirect**	**Spurious (Unanalyzed)**
LT Monogamous Relationship	*MOS SF-36* Mental Score	-.014	---	-.011	-.003
LT Monogamous Relationship	*MOS SF-36* Physical Score	-.029	---	.008	-.037
LT Monogamous Relationship	Sleep Quality	.050	---	.006	.044
Married	Drinks/Week	-.065	---	-.005	-.060
Married	Grade Point Average	.011	---	-.014	.025
Married	*MOS SF-36* Physical Score	-.031	---	-.003	-.028
Married	Semester Hours	-.059	-.059	---	.000
Married	Sleep Quality	-.021	---	.001	-.022
MOS SF-36 Mental Score	Sleep Quality	-.468	-.295	---	-.173
MOS SF-36 Physical Score	Sleep Quality	-.465	-.291	---	-.174
Off-Campus, In	Drinks/Week	.139	.134	---	.005
Off-Campus, In	*MOS SF-36* Mental Score	.074	.117	---	-.043
Off-Campus, In	*MOS SF-36* Physical Score	.124	.126	---	-.002
Off-Campus, In	Sleep Quality	-.099	-.077	-.058	.036
Off-Campus, Out	Grade Point Average	.038	.114	---	-.076
Off-Campus, Out	*MOS SF-36* Mental Score	.028	.086	---	-.058
Off-Campus, Out	*MOS SF-36* Physical Score	.072	-.077	---	.149
Off-Campus, Out	Sleep Quality	.062	.088	-.054	.028
Roommates	Drinks/Week	.089	.079	---	.010
Roommates	*MOS SF-36* Physical Score	.093	.083	---	.010
Roommates	Sleep Quality	-.053	---	-.016	-.037
Semester Hours	Drinks/Week	.089	.076	---	.013
Semester Hours	Grade Point Average	.241	.242	---	-.001

Table 31 continued

Path Analysis of Sleep Quality: Decomposition of Effects Among Variables in the Trimmed Causal Model of Sleep Quality

Independent Variable	Dependent Variable	Correlation	Direct	Indirect	Spurious (Unanalyzed)
Semester Hours	*MOS SF-36* Physical Score	.093	.057	---	.036
Semester Hours	Sleep Quality	-.021	---	-.023	.002
Sex	Extra Curricular	.086	.117	---	-.031
Sex	Grade Point Average	-.052	---	.006	-.058
Sex	Sleep Quality	-.010	---	.000	-.010
Veteran	Hours/Week Working	.008	-.095	---	.103
Veteran	*MOS SF-36* Mental Score	.031	---	.010	.021
Veteran	*MOS SF-36* Physical Score	.003	---	-.007	.010
Veteran	Sleep Quality	-.054	-.096	.005	.037

Research Question Seven Results

To determine whether empirical data supported the proposed full causal model of weekday sleep length over the proposed reduced model of weekday sleep length, proportion of variance (generalized squared multiple correlation) was found for both the proposed full and reduced models. The proportion of variance for the full model was .6002 and the proportion of variance for the reduced model was .4823.

Chi-Square analyses were then computed. Based upon the Chi-Square results the null hypothesis that the full weekday sleep model equaled the reduced weekday sleep model was retained ($X^2 = 93.799$, df = 74, $p \geq .05$). Therefore, the Chi-Square test suggested that the full model fits the data better than the reduced model, and that one or more of the deleted paths did contribute to the model.

Research Question Eight Results

To determine whether empirical data supported the proposed full causal model of weekend sleep length over the proposed reduced model of weekend sleep length, proportion of variance (generalized squared multiple correlation) was found for both the proposed full and reduced models. The proportion of variance for the full model was .5716 and the proportion of variance for the reduced model was .5224.

Chi-Square analyses were then computed. Based upon the Chi-Square results the null hypothesis that the full weekday sleep model equaled the reduced weekday sleep model was retained ($X^2 = 84.821$, df = 65, $p \geq .05$). Therefore, the Chi-Square test indicated that the full model fits the data better than the reduced model, and that one or more of the deleted paths did contribute to the model.

Research Question Nine Results

To determine whether empirical data supported the proposed full causal model of sleep quality over the proposed reduced model of sleep quality length, proportion of variance (generalized squared multiple correlation) was found for both the proposed full and reduced models. The proportion of variance for the full model was .6926 and the proportion of variance for the reduced model was .6585.

Chi-Square analyses were then computed. Based upon the Chi-Square results the null hypothesis that the full weekday sleep model equaled the reduced weekday sleep model was retained ($X^2 = 37.872$, df = 62, $p \geq .05$). Therefore, the Chi-Square test indicated that the full model fits the data better than the reduced model, and that one or more of the deleted paths did contribute to the model.

CHAPTER FIVE

SUMMARY, CONCLUSIONS, DISCUSSIONS AND RECOMMENDATIONS

Overview

The purpose of this chapter is to review this study's results and provide conclusions. Discussion of these results is provided. Further, this chapter provides an overview of study limitations and suggestions for future research and health education practice.

Purpose of the Study

The purpose of this study was to determine correlations among various demographic factors, sleep quantity, and sleep quality among randomly selected college students at a Midwestern four-year research university with high research activity. The second purpose of this study was to determine which factors predicted sleep quantity and quality.

Summary of the Study

A descriptive correlational and predictive correlational cross-sectional research design was employed for this study. Research questions used to determine correlations, prediction and causal models of sleep quantity and quality included:

1. What is the relationship between potential predictor variables and self-reported average weekday sleep length?
2. What is the relationship between potential predictor variables and self-reported average weekend sleep length?
3. What is the relationship between potential predictor variables and self-reported sleep quality?

4. What are the direct and indirect effects of potential predictor variables on self-reported weekday sleep length?
5. What are the direct and indirect effects of potential predictor variables on self-reported weekend sleep length?
6. What are the direct and indirect effects of potential predictor variables on self-reported sleep quality?
7. Does empirical data support the proposed causal model for self-reported weekday sleep length?
8. Does empirical data support the proposed causal model for self-reported weekend sleep length?
9. Does empirical data support the proposed causal model for self-reported sleep quality?

During the month prior to the 2011 spring break, 561 participants were sampled from 18 sections of University Core Curriculum courses at a large, four-year research university. Of these, data from 460 students were included in the final data analysis. Students completed surveys comprised of the *Pittsburgh Sleep Quality Index* and the *MOS SF-36*, completed a sleep diary, and demographic questions. Demographic items included sex, age, race/ethnicity, classification in school, current number of semester hours, drinks consumed per week, hours/week working, military status, and residential status.

Descriptive statistics, correlations, and path analyses were performed to answer the research questions. Pearson's product moment correlations were computed to determine relationships between potential predictor variables and the dependent variables

of average weekday sleep length, average weekend sleep length, and overall sleep quality. When performing correlations, alpha levels were adjusted using the multi-stage Bonferroni method advocated by both Larzelere and Mulaik (1977) and Holm (1979). Path analyses were used to determine the direct and indirect effects of potential predictor variables on the three dependent variables.

The mean average sleep length during the week was 7 hours and 27 minutes whereas during the weekend it was 8 hours and one minute. The mean average global *PSQI* sleep quality score was 6.67.

Average weekday sleep length was found to be significantly correlated only with *MOS SF-36* Mental Score. No significant correlations were found between any of the potential predictor variables and the dependent variables of average weekend day sleep length. Overall sleep quality was found to be significantly correlated with *MOS SF-36* Mental Score and *MOS SF-36* Physical Score. Three reduced models, one for each of the three dependent variables, were produced. Through Chi-Square testing, full models for average weekday sleep length and overall sleep quality were found to fit the data as well as the reduced models, and deleted paths did contribute to the models. Through Chi-Square testing, the reduced model for overall sleep quality indicated that the full model fitted the data better than the reduced model and that one or more of the deleted paths did contribute to the model.

Conclusions

1. Students appear to be getting approximately 7.5 hours of sleep during the week and 8 hours of sleep during the weekend.
2. The majority of college students report poor sleep quality.

3. Emotional functioning greatly impacts sleep quality and weekday sleep length. Better emotional well-being leads to better sleep.
4. Physical functioning impacts weekend sleep length. Poorer physical wellbeing leads to poorer sleep on the weekends.
5. Number of hours/week working impacts average weekday sleep length, average weekend sleep length and sleep quality. Increased work hours lead to poorer sleep.
6. Students living on-campus sleep less and have poorer sleep quality than those students living off-campus. Students living outside the community in which the institution resides report greater sleep lengths and sleep quality than those off-campus students living within the community that the institution resides.
7. As traditional college students get older, sleep length and quality decrease.
8. Grade point average does not predict good or poor weekday sleep length, and has minor influence on weekend sleep length and sleep quality. Students with higher grade point averages sleep longer on weekends, and have better sleep quality than students with lower grade point averages.
9. Hours of involvement in extra-curricular activities may slightly impact average weekday sleep length but does not appear to impact weekend sleep length or sleep quality. Those spending more time in extracurricular activities sleep less during the week than those who are not engaged.
10. Number of leadership positions held appears to only impact weekend day sleep length. Those with more leadership positions spend more time sleeping on the weekends than those holding fewer leadership positions.

11. Weekend day sleep length appears to be positively affected by being in a long-term monogamous relationship. Relationship status appears to have no effect on weekday sleep length or overall sleep quality.
12. Drinks consumed per week only impacts sleep quality. Increased drinks per week leads to decreased sleep quality.
13. The number of cigarettes smoked per week appears to only impact weekend sleep length.
14. Veterans sleep longer on the weekends and have better sleep quality than non-veterans.
15. Volunteering negatively impacts weekend sleep length. Students who volunteer sleep less on the weekends than non-volunteers.

Discussion

Although other studies looking at numerous predictors of sleep quantity and quality exist, this appears to be the first study to incorporate the combination of all of the potential predictor variables. As a result, new information concerning what variables may correlate, predict, and effect sleep quantity and quality directly and indirectly may be gained.

The average duration of nightly sleep length in this study ranged from a minimum of seven hours and 21 minutes (Tuesday night) to eight hours and ten minutes (Friday night). At first impressions, these findings do not seem to grossly deviate from the reported sleep lengths found by other researchers (Buboltz, Brown, & Sopor, 2001; Hawkins and Shaw, 1992; Oginska & Pokorski, 2006; Thacher, 2008). However, when comparing differences between weekday and weekend sleep lengths, differences begin to

emerge. During the workweek, the average weekday sleep length was seven hours and 21 minutes. This amount is more closely in line with Forquer, Camden, Gabriau, and Johnson (2008) who reported an average daily sleep length of seven hours and 12 minutes, but much further away from Buboltz et al. (2001) and Hawkins and Shaw (1992), who reported average weekday sleep lengths of eight hours and two minutes and seven hours and 56 minutes respectively.

The proportion of college students exceeding the *PSQI* global sleep quality cut-off score appears large. Higher *PSQI* global scores indicate worse sleep quality. Most studies use a cut-off score ranging from four to six. Within this study, over 60% of the respondents *PSQI* global sleep quality scores were 6 or higher. Researchers conducting earlier studies report much lower *PSQI* global scores. Carney et al. (2006) reported that only 43% of 18-39 year olds exceeded a cut-off score of four. Pallos et al. (2007) reported that only 25.6% of tier respondents exceeded a cut-off score of 6. However, researchers conducting more recent studies report percentages which are much closer to those found in this study. Becker, Adams, Orr and Quilter (2008) who reported that 62% of their student sample indicated poor sleep, while Lund et al. (2010) indicated that over 60% of their sample were categorized as poor-quality sleeps through the use of the *PSQI*.

This study found that mental functioning was correlated with weekday sleep length and overall sleep quality. The effect of mental functioning on sleep appears consistent with findings of Campos-Morales, Valencia-Flores, Castana-Meneses, Castaneda-Figueiras, and Martinez-Guerro's results (2005). They found that poor sleep quality was correlated with negative mood state. Alapin et al. (2000), Dinges et al. (1997), and Jean-Loius et al. (1998), and Lund et al. (2010) found that those with less

sleep or who slept at inappropriate times experienced greater negative mood states. Within the reduced causal models, mental functioning was found to have directly impact weekday sleep length and overall sleep quality, consistent with the findings of Verlander, Benedict and Hanson (1999) and Gray and Watson (2002) in which emotional well being was found to predict sleep quality. Similarly, Ginsberg (2006) found that academic worry scores attributed for 5% of the variance in sleep length.

This study's results indicate that physical functioning only was correlated with sleep quality. Furthermore, physical functioning was found to have had leading direct effects on weekend sleep length. These findings are consistent with findings from the studies of Ban and Lee (2001), Pilcher, Ginter, and Sadowsky (1997), Pires De Souza (1996) and Pallos et al. (2007) that reported that students who perceived themselves to be less healthy slept less and Becker et al.'s (2008) results that indicate that students who are less physically active have higher odds of reporting poor sleep quality over those who are physically active.

This study did not find any statistically significant correlations between average hours worked per week and sleep length or sleep quality. However, within the path analyses, work was found to directly impact weekday sleep length, weekend sleep length, and overall sleep quality, consistent with Miller, Danner and Staten's (2008) findings; students who worked more hours reported shorter sleep lengths than those who worked less hours.

Prior to this study, only Edens (2006) had examined the influence of college students' residential status on sleep. Consistent with Eden's findings, the results of this study indicate that students residing on campus experience worse sleep than those living-

off campus. The effect of living off-campus directly impacted weekday sleep length and quality. Those living off-campus outside of the community in which the institution have greater weekday sleep length and overall sleep quality than those living off-campus in the community in which the institution resides.

Within the larger body of research focusing on sleep and age, conclusive findings supporting a relationship between do not appear to exist. Consistent with Kelly (2004a, 2004b), but inconsistent with Howell, Jahrig, and Powell (2004), age was not a statistically significant correlate with sleep length or quality However, results from the reduced causal models indicate that age directly affected average weekday sleep length, average weekend day sleep length and overall sleep quality, that are consistent with Ban and Lee's (2001) findings and Chung and Cheung's (2008) work with high school students.

Numerous researchers have examined the relationship between grade point average and sleep and have found significant relationships to exist (Lack, 1986; Kelly et al., 2001; Gray & Watson, 2002; Trockel et al., 2000). However, within this study, no statistically significant correlates between grade point average and any of the three dependent variables were found. However, grade point average was found to have one of the lowest direct effects on both weekend sleep length and overall sleep quality within the reduced causal model. One difference between this study and many of the others is that grade point average was included as an independent variable, rather than a dependent variable.

Prior to the current study, no researchers examined the relationship between college student leadership and sleep. Conventional wisdom might lead one to believe

that increased leadership involvement would lead to decreased sleep length and poorer sleep quality. In this study, the number of leadership positions was not statistically significant correlated with sleep quantity or sleep quality. However, through the full weekend sleep length casual model, the number of leadership positions did appear to negatively affect the amount of hours one slept during the weekend.

Prior to the current research, no researchers investigated the relationship between the number of hours engaged in extracurricular activities per week with sleep. Conventional wisdom might lead one to believe that that increased hours of involvement in extracurricular activities would lead to decreased sleep length and poorer sleep quality. Results of this study indicated that the number of hours of extracurricular involvement during a typical week did not produce statistically significant correlates with sleep quantity or sleep quality. However, through the weekday sleep length reduced casual models, the number of hours of extracurricular involvement negatively impacted the amount of hours one slept during the weekdays.

Prior to this study, no researchers examined the relationship between dating or marital relationship status of college students and sleep. The current study's results were inconsistent with Pallos et al. (2007) who found that, within general populations, being married negatively impacted sleep quality. However, within the causal models, being within a long-term monogamous relationship was found to have positive, direct effects only on weekend sleep length. For college students, being within a long-term monogamous relationship appeared to increase weekend sleep length over their peers who were single. Perhaps being within a long-term commitment allows individuals to limit the time engaged in social activities that would otherwise restrict sleep times.

Unlike Lund, Reider, Whiting and Prichard's (2009) research, within this study, alcohol was found to have a direct impact on overall sleep quality. In fact, the average number of drinks consumed per week was found to have the second highest direct effect on sleep quality. These results are consistent with the Ban and Lee's (2001) and Becker et al.'s (2008) research results that indicate that alcohol impacts sleep quality.

Although several researchers have found a relationship between tobacco use and sleep problems and difficulties (Jean-Louis et al., 1998; Pallos et al., 2007; Ban & Lee, 2001; and Phillips & Danner, 1995), within this study, the average number of cigarettes smoked per week did not significantly correlate with average weekday sleep length, average weekend day sleep length, or overall sleep quality.

Although a significant number of researchers have examined the relationship between veteran status and sleep, none have focused on the sleep quantity and quality of student veterans. Based on studies examining sleep and veterans in general, an assumption that student veterans would have less sleep quantity and poorer sleep quality could be assumed (Lewis, Creamer, & Failla, 2009; Chapman et al., 2006; Mustafa et al., 2005). However, being a veteran was shown to positively affect sleep length on both weekdays and weekends, as well as positively impact overall sleep quality through the reduced sleep models.

With the tremendous focus on volunteering in collegiate populations, one would assume that a body of literature concerning its effects on the health of college students would be gaining increased attention. No other research exists which looks at the relationship of college students, volunteerism, and sleep. The number of hours volunteered during a typical week did not significantly correlate with average weekday

sleep length, average weekend sleep length, or overall sleep quality. However, number of hours volunteering per week was found to have the lowest negative direct impact on weekend sleep. The more one reported volunteering, the less hours slept on the weekend.

Limitations

Limitations regarding the study sample exist. The study used a small sample (n = 460) from one university, derived from general education courses. Although efforts to randomly recruit classes from the general education course list were made, ultimately data were collected only from courses whose faculty members were willing to give up instructional time to allow data collection. Furthermore, class attendance can be considered an issue. Only 63.25% of the students registered for the classes in that data were collected were in attendance on the days of data collection. In some classes, less than 50% of registered students were in attendance. Although absence can be contributed to a number of factors including illness, poor weather, faculty disclosure of data collection, data collection in a class meeting following a class exam or test, lack of sleep and poor sleep quality may also have contributed to such high absenteeism rates. Overall results might have been different had a smaller number of students been absent.

Another limitation that exists concerns the self-reporting of several key variables as sleep wake times, sleep times, grade point average, number of semester hours currently enrolled, average number of drinks consumed per week, which could not be verified though other means. It is possible that subjects answered questions based on their perception of what they thought that the researcher would find desirable, faulty or impaired recall (example - time one went to bed as a result of alcohol impairment) and selective memory.

Limitations concerning the time of classes in that data were collected also may have impacted results. The majority of classes in that data were collected were held during the morning hours. The latest class that data collection was held began at 3:00. Data were not collected from one evening, night, or weekend classes.

Recommendations for Future Research

After examining the findings of this study, the following recommendations are suggested for future research on the sleep quality and quantity of college students.

1) Extend study sample to include all students, regardless of age. This sample focused on traditional students aged 18-24. During data collection, the researcher was surprised by the number of non-traditional students who approached him to discuss "biases" with the survey instruments, indicating that they thought that the survey was designed for younger and traditional students. For example, the question concerning whether the respondent lived with their parents was brought up frequently.
2) Redefine military status variables. Although not observed during the pilot study, students with military experience found the definitions confusing, and approached the researcher for guidance during the actual study. One former military student focused on the researcher's intention when he asked, "Are you asking if I was deployed to a combat zone?" Asking if students had been in the military and if they had been deployed to a combat zone would have reduced the number of variables created for dummy coding, while providing the actual information the researcher was hoping to acquire.

3) Improve operational definitions for certain variables by using other measures. For example, alcohol use was simply defined by one measure of quantity (average number of drinks per week). Other measures such as frequency (days per week alcohol consumed) or experience with negative consequences (fights, arguments, hangovers) might more closely relate or predict sleep quantity and quality. Likewise, other variables such as, volunteering, extra-curricular involvement, leadership, and academic success could be revised and altered.
4) Use methods other than recall of typical sleep and wake times to assess sleep length and quantity. Study participants were asked to report average sleep length for the past two weeks based on recall. As a result, reported sleep lengths may be inaccurate. Having students keep diaries and entering sleep and wake times as they occur may provide more accurate data.
5) Replicate study using samples from other geographic locations to determine if results observed were typical of collegiate populations.
6) Replicate study using samples from similar and different types of institutions of higher education (community colleges, private institutions, urban) to determine if any differences in sleep quality or quantity exist.
7) Replicate study during different times of the academic calendar to determine if differences in sleep quality or quantity exist.
8) Examine how possible environmental predictors of residence and sleep environment (quiet lifestyle floors, predominantly freshmen, residence hall verses greek housing) impact sleep quality or quantity.

9) Examine in greater detail the role of collegiate student leadership is in sleep quality and quantity using additional measures of leadership other than number of leadership positions.
10) Conduct a longitudinal study covering the course of the academic year to determine what changes in sleep quality and quantity occur.

Recommendations for Health Education Practice

Recommendations to the field of health education are based on the results of this study and current trends regarding sleep programming and interventions being delivered by health education and health promotion programs within higher education settings.

1) Continue initiatives to collect data assessing sleep related awareness, knowledge, beliefs and behaviors of college students. Assessment results can be used to better develop individual, group, community and environmental strategies to improve sleep quality and quantity.
2) Continue initiatives to collect data assessing those factors that appear to directly impact college student's sleep length and quality (e.g. mental well being, hours worked per week, student engagement). Assessment results can be used to better develop individual, group, community and environmental strategies to improve these conditions, which in turn, should logically impact sleep in a positive direction.
3) Continue initiatives to plan, implement, and evaluate data driven individual, group, community and environmental strategies, designed on health behavior theories, intended to improve protective behaviors and factors and reduce or eliminate risk behaviors and factors related to sleep. For example, better design

of on-campus living spaces and enforcement of quiet hours may improve sleep length and sleep quality, reducing the differences found between on-campus students and off-campus students. Initiatives found to be effective should be disseminated to the field for implementation.

4) Continue initiatives to plan, implement, and evaluate data driven individual, group, community and environmental strategies, designed on health behavior theories, intended to improve protective behaviors and factors and reduce or eliminate risk behaviors and factors related to other health issues which may directly and indirectly be related to sleep. For example, students working more hours per week were more likely to sleep less during the week. Programs focusing on sleep hygiene could be incorporated into employee wellness programs, particularly in settings where large numbers of college students are employed. Initiatives found to be effective should be disseminated to the field for implementation.
5) Determine sleep as a priority topic within introductory health and other health related academic course offerings, with emphasis on sleep hygiene instruction, and skill building strategies related to variables having an important impact (emotional wellness, physical wellness, scheduling/priority management, interpersonal skills). Younger students were more likely to sleep less and report poorer sleep quality. Since younger students often take introductory courses during their first semesters, providing such interventions may be very timely.
6) Address sleep quantity and quality of those within the discipline of health education. When providing health education services, health educators should be

adequately rested. During academic preparation, as well as during professional development opportunities, health educators should receive education and training on proper sleep hygiene techniques that they can integrate into their personal lives.

Recommendations for Institutions of Higher Education

1) Several of the factors directly impacting sleep could be used by health education, health promotion, and student affairs practitioners to identify potential sub-populations that could benefit from receiving of comprehensive sleep education programs including brief assessment, screening and motivational interviewing of sleep quality and sleep problems, individual and group delivered sleep hygiene educational interventions, and social marketing utilizing social media. These sub-populations include: on-campus students, younger students, employed students, student leaders, students involved in extracurricular activities, males, and students with low grade point averages.
2) With on-campus students indicating lesser sleep lengths and poorer sleep quality, universities, particularly residence life and greek affairs units overseeing residential facilities, should review and put into place environmental strategies and policies that are sleep promoting. Suggestions include setting and enforcing quiet hours, reduced hours of operation of campus services during the late night/early morning hours. Furthermore, redesign of current living spaces, as well as better design of future living spaces which are more accommodating to

enhanced sleep hygiene (single floor buildings verses multi-floor buildings, facilities that house fewer students per floor/building/room) should be considered.

3) Since younger students were more likely to sleep less and report poorer sleep quality, universities should consider providing sleep related educational programs and interventions to new and incoming students through new student orientation programs, pre-matriculation on-line educational programming, first-year student programming and courses.
4) To help improve the sleep of younger students, universities should also consider providing sleep related educational programs and interventions to the families of new and incoming students through new student orientation programs, pre-matriculation on-line educational programming, parent/family club initiatives, and social media.
5) While many universities monitor the number of hours that student employees work for financial reasons, it may be wise to review hours worked to determine if the sleep lengths and quality of students may be negatively impacted, and when possible redistribute times hours are worked to help promote better sleep.
6) Since working students were likely to have shorter sleep lengths and poorer sleep quality, university health education and promotion practitioners, student affairs practitioners, and human resource professionals are encouraged to develop brief assessment and screening programs addressing sleep length and quality for on-campus student employees. Furthermore, they are encouraged to open such programming for students employed off-campus.

7) Address sleep indirectly, by directly reinforcing factors that promote positive sleep quality and quantity, and reducing factors that hinder sleep quality and quantity. University staff and faculty are encouraged to express concern to their students who may be over-engaged in activities as student leadership positions, extra-curricular pursuits, and employment.
8) Develop programs and interventions that address emotional well being, physical health, emotional wellbeing, stress, and transitions in an attempt to reduce and improve factors that impede sleep.

Summary

The purpose of this study was to determine correlations among various demographic factors, sleep quantity, and sleep quality among randomly selected college students at a Midwestern four-year research university with high research activity. The second purpose of this study was to determine factors that directly and indirectly impact sleep quantity and quality. Results indicate that despite the majority of students report getting approximately seven to eight hours of sleep per night, many are experiencing poor sleep quality. A small number of significant correlations were found to exist between sleep quality and a few of the predictor variables. Path analysis indicated that full models explained the direct and indirect causes of weekday sleep length and overall sleep quality better than the proposed reduced models. Recommendations for future research, including replications of this study, as well as recommendations for health educators and institutions of higher education to improve sleep length and quality of college students also is included.

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APPENDICES

APPENDIX A: PITTSBURGH SLEEP QUALITY INDEX)

*The following questions relate to your usual sleep habits during the **past 30 days only**. Your answers should indicate the most accurate reply for the majority of days and nights in the past 30 days. Please answer all questions.*

1. When have you usually gone to bed at night? _____
2. How long (in minutes) has it usually take you to fall asleep each night? _____
3. When have you usually gotten up in the morning? _____
4. How many hours of actual sleep did you get at night? _____ (This may be different than the number of hours you spend in bed.)

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

5. How often have you had trouble sleeping because you...

	Not during the past 30 days	*Less than once a week*	*Once or twice a week*	*Three or more times a week*
(a) Cannot get to sleep within 30 minutes ……	_____	_____	_____	_____
(b) Wake up in the middle of the night or early morning	_____	_____	_____	_____
(c) Have to get up to use the bathroom ……	_____	_____	_____	_____
(d) Cannot breathe comfortably …….....	_____	_____	_____	_____
(e) Cough or snore loudly ……...	_____	_____	_____	_____
(f) Feel too cold …….....	_____	_____	_____	_____
(g) Feel too hot …….	_____	_____	_____	_____
(h) Had bad dreams …….	_____	_____	_____	_____
(i) Have pain ……..	_____	_____	_____	_____
(j) Other reason(s), please describe: _____	_____	_____	_____	_____

6. How would you rate your sleep quality overall?

___Very good ___Fairly good ___Fairly bad ___Very bad

7. How often have you taken medicine (prescribed or "over the counter") to help you sleep?

_____Not during the past 30 days _____Less than once a week _____Once or twice a week _____Three or more times a week

8. How often have you had trouble staying awake while driving, eating meals, or engaging in social activity?

_____Not during the past 30 days _____Less than once a week _____Once or twice a week _____Three or more times a week

9. 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

APPENDIX B: THE PITTSBURGH SLEEP DIARY

Considering your typical sleep habits for the past month, please fill out this sleep diary

Day	a. Typical Time You Went to Bed	b. Minutes it took you to fall asleep	c. Typical Time you woke	d. Typical # of daytime naps took during this day
9. Monday				
10. Tuesday				
11. Wednesday				
12. Thursday				
13. Friday				
14. Saturday				
15. Sunday				

APPENDIX C: MEDICAL OUTCOMES STUDY SHORT FORM -36 (MOS SF-36)

In general, would you say your health is:

a) Excellent
b) Very good
c) Good
d) Fair
e) Poor

Compared to one year ago, how would you rate your health in general **now**?

a) Much better now than one year ago
b) Somewhat better now than one year ago
c) About the same
d) Somewhat worse now than one year ago
e) Much worse now than one year ago

The following items are about activities you might do during a typical day. Does your health now limit you in these activities? If so, how much?

(Circle One Number on Each Line)

	Yes, Limited A Lot	Yes, Limited a Little	No, Not Limited At All
Vigorous activities, such as running, lifting heavy objects, participating in strenuous sports	1	2	3
Moderate activities, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf	1	2	3
Lifting or carrying groceries	1	2	3
Climbing **several** flights of stairs	1	2	3
Climbing **one** flight of stairs	1	2	3
Bending, kneeling, or stooping	1	2	3
Walking **more than a mile**	1	2	3
Walking **several blocks**	1	2	3
Walking **one block**	1	2	3
Bathing or dressing myself	1	2	3

During the **past 4 weeks**, have you had any of the following problems with your work or other regular daily activities **as a result of your physical health**?

(Circle One Number on Each Line)

	Yes	No
Cut down the amount of time you spent on work or other activities		
Accomplished less than you would like		
Were limited in the **kind** of work or other activities		
Had **difficulty** performing the work or other activities (for example, it too extra effort)		

During the **past 4 weeks**, have you had any of the following problems with your work or other regular daily activities **as a result of any emotional problems** (such as feeling depressed or anxious)?

(Circle One Number on Each Line)

	Yes	No
Cut down the **amount of time** you spent on work or other activities		
Accomplished less than you would like		
Didn't do work or other activities as **carefully** usual		

During the **past 4 weeks**, to what extent has your physical health or emotional problems interfered with your normal social activities with family, friends, neighbors, or groups?

a) Not at all
b) Slightly
c) Moderately
d) Quite a bit
e) Extremely

How much bodily pain have you had during the past 4 weeks?
a) None
b) Very Mild
c) Mild
d) Moderate
e) Severe
f) Very Severe

During the past 4 weeks, how much did pain interfere with your normal work (including both work outside the home and housework)?
a) Not at all
b) Slightly
c) Moderately

d) Quite a bit
e) Extremely

These questions are about how you feel and how things have been with you during the past 4 weeks. For each question, please give the one answer that comes closest to the way you have been feeling. How much of the time during the past 4 weeks…

(Circle One Number on Each Line)

	All of the Time	Most of the Time	A Good Bit of the Time	Some of the Time	A Little of the Time	None of the Time
Did you feel full of pep?	1	2	3	4	5	6
Have you been a very nervous person?	1	2	3	4	5	6
Have you felt so down in the dumps that nothing could cheer you up?	1	2	3	4	5	6
Have you felt calm and peaceful?	1	2	3	4	5	6
Did you have a lot of energy?	1	2	3	4	5	6
Have you felt downhearted and blue?	1	2	3	4	5	6
Did you feel worn out?	1	2	3	4	5	6
Have you been a happy person?	1	2	3	4	5	6
Do you feel tired?	1	2	3	4	5	6

During the past 4 weeks, how much of the time has your physical health or emotional problems interfered with your social activities (like visiting with friends, relatives, etc.?

Circle One Number
a) All of the time
b) Most of the time
c) Some of the time

d) A little of the time
e) None of the time

How TRUE or FALSE is each of the following statements for you.

	Definitely True	Mostly True	Don't Know	Mostly False	Definitely False
I seem to get sick a little easier than other people	1	2	3	4	5
I am as healthy as anybody I know	1	2	3	4	5
I expect my health to get worse	1	2	3	4	5
My health is excellent	1	2	3	4	5

APPENDIX D: OPEN ENDED/DEMOGRAPHIC QUESTIONS

Please answer the following open-ended questions

Question	Answer
31. During this semester, what is the average number of drinks (a drink is defined as a 12 ounce can of beer, a glass of wine) you consumed in a typical week?	
32. During this semester, what is the average number of cigarettes smoked in a typical week?	
33. During this semester, how many hours did you spend working during the typical week?	
34. During this semester, how many hours did you spend volunteering during the typical week?	
35. If you worked, what times do you work shifts generally begin (include A.M. or P.M.)	
36. If you worked, what times did your work shifts generally end (include A.M. or P.M.)	
37. During this semester, how many hours did you spend involved in extra-curricular activities/student organizations during the typical week?	
38. How many student or university leadership positions (Presidents, Vice-President, Committee Chair, etc.) have you held during this academic year?	
37. How many people live with you?	
38. Please provide us with your current cumulative college GPA out of a 4.00 scale (if a first semester freshmen, please provide your cumulative high school GPA.	
39. Please indicate the number of semester hours you are currently taking.	
40. Please indicate the cumulative number of semester hours you will have completed at the end of this semester.	
41. Please provide your age.	

Please circle the answer to the following questions which best apply to you:

42. Please indicate your current academic standing with the university.
a) I am in good standing,
b) I am on academic warning,
c) I am on academic probation,
d) I am on academic dismissal

43. Please indicate your current academic classification with the university.
a) Freshmen
b) Sophomore

c) Junior
d) Senior
e) Graduate student

44. Please indicate your gender.
a) Male
b) Female

45. Please indicate your current relationship status.
a) Single, not within a long-term monogamous relationship
b) Within a long-term monogamous relationship
c) Married or partnered
d) Divorced
e) Separated
f) Widowed

46. Please indicate your ethnicity/race.
a) White, non-Hispanic
b) black, Non-Hispanic
c) Hispanic
d) Asian/Pacific Islander
e) international or "non-resident aliens"
f) Mixed ethnicity/mixed race

47. Please indicate your military service status.
a) I am non-veteran
b) I am a veteran who has served with the National Guard or Military Reserves, but was never called to active duty
c) I am a veteran who has served on active duty in the US Army, Navy, Air Force, Marine Corps or Coast Guard
d) I am a veteran who has served on active duty with the National Guard or Military Reserves
e) I am a veteran who has served with the National Guard or Military Reserves, but was never called to active duty

48. Please indicate your current local residence status
a) I live on-campus/within university owned-housing
b) I live off-campus within the community of my institution
c) I live off-campus out of town and commute

49. Do you live with your parents or other guardians?
a) Yes
b) No

APPENDIX E: FACULTY E-MAIL SOLICITATION

From: Eric S. Davidson

Subject: Research Request

Dear Core Curriculum Class Faculty Member,

I am Eric Davidson, a doctoral student in the Department of Health Studies and Recreation at Southern Illinois University Carbondale. I am e-mailing today to ask for your assistance in a research study examining factors relating and effecting the sleep quality of college students. The findings of this study may be used to impact health education programming at SIUC, as well as other universities.

I would like to request your permission to administer a survey to your Department Designation/Course Number/Section Number/Course Title sometime during the weeks of October 18-22 or October 25-29. This survey will include questions regarding sleep and wake times, sleep habits, emotional wellness, student involvement, and demographic factors. Patsy Manfredi, Chair of the University Core Curriculum, has endorsed this study.

The above course and section was randomly selected of all on-campus University Core Curriculum courses from a list obtained from the Banner Class Listing. Your e-mail address was obtained through this listing.

The survey will take students approximately 10 to 20 minutes to complete. All responses will be kept confidential within reasonable limits. Only people directly involved with this project will have access to the surveys. To increase student comfort with the survey, I would like to request that you vacate the classroom during the time in which the survey is administered.

If you do not respond to this survey you will be contacted again with this request 1 time during the next 2 weeks.

Questions about this study can be directed to me or to my supervising professor, Dr. Roberta Ogletree, Department of Health Education and Recreation, SIUC, Carbondale, IL 62901-4632. Phone (618) 453-2777). This project has been reviewed and approved by the SIUC Human Subjects Committee. Questions concerning your rights as a participant in this research may be addressed to the Committee Chairperson, Office of Research Development and Administration, SIUC, Carbondale, IL 62901-4709. Phone (618) 453-4533. E-mail: siuhsc@siu.edu

Thank you for taking the time to assist me in this research.

Eric S. Davidson
217/549-4354
esdavidson@eiu.edu

APPENDIX F: INTRODUCTORY SCRIPT/INSTRUCTIONS

Hello!

My name is Eric Davidson, and I am a graduate student seeking my Doctoral degree in the Department of Health Education and Recreation at Southern Illinois University Carbondale.

I am here today to ask for your participation in a research study examining factors relating and effecting the sleep quantity and quality of college students. The findings of this study may be used to impact health education programming promoting sleep at SIUC, as well as other universities.

Those agreeing to participate in the study will be asked to fill a survey questionnaire that will include questions regarding sleep and wake times, sleep habits, emotional wellness, student involvement, and demographic factors.

The survey will take approximately 10 to 20 minutes to complete. All your responses will be kept confidential within reasonable limits. Only people directly involved with this project will have access to the surveys.

In a few minutes I will be distributing informed consent forms, survey packets, and raffle tickets. If you are currently under the age of 18, I would ask that you refrain from taking the survey. If you are under 18, or if you do not wish to participate in the study, or have previously completed the survey in another course, please indicate this on the surveys that will be distributed, and quietly occupy yourselves until your classmates have completed the survey.

Everyone is eligible to enter a raffle to win one of 20 $5 gift cards to either Starbucks, Buffalo Wild Wings or Wal-Mart. To enter the raffle, please complete the raffle tickets included in your packets.

Completion and return of this survey indicate voluntary consent to participate in this study. Once you've completed our survey, please return your informed consent form, survey forms, and raffle tickets and place them in the appropriately marked and sealed boxes.

Questions about this study can be directed to me or to my supervising professor, Dr. Roberta Ogletree, Department of Health Education and Recreation, SIUC, Carbondale, IL 62901-4632. Phone (618) 453-2777

This project has been reviewed and approved by the SIUC Human Subjects Committee. Questions concerning your rights as a participant in this research may be addressed to the Committee Chairperson, Office of Research Development and Administration, SIUC, Carbondale, IL 62901-4709. Phone (618) 453-4533. E-mail: siuhsc@siu.edu

Thank you for taking the time to assist me in this research.

Eric S. Davidson

217/549-4354
esdavidson@eiu.edu

APPENDIX G: INFORMED CONSENT

Informed Consent Form

Title of Research: Predictors of Sleep in College Students

Investigator: Eric Davidson, Doctoral Student, Dept. of Health Education & Recreation

Confidentiality: All information gathered form the study will remain confidential. Your identity as a participant will not be disclosed to any unauthorized person; only the researcher and the SIUC Human Subjects Board (the committee that approved this research project) will have access to research materials, which will be kept in a locked drawer. Any references to your identity that would compromise your anonymity will be removed or disguised prior to the preparation of the research reports and publications.

Withdrawal Without Prejudice: Participation in this study is voluntary; refusal to participate will involve no penalty. You are free to withdraw consent and discontinue participation in this project at any times without prejudice from the researcher.

Costs and/or Paymnets to Subjects for Participation in Research: There will be no costs for participating in this research. Also, you will not be paid to participate in this research. However, you may enter yourself into a raffle to win 1 of 20 $5.00 giftcards to either Starbucks or Buffalo Wild Wings.

Potential Risks Associated with the Study: There are no risks involved with this study. However, if as a result of your participation you wish to learn ways of improving your sleep, or address any concerns regarding your mental health, you are encouraged to contact the SIUC Wellness Center at 618/453-4519 or the SIUC Counseling Center at 618/453-5371. Both offices are located within the Student Health Center.

Questions: Any questions concerning the research project can be directed to either Eric Davidson, the primary researcher at 217/549-4354 or Dr. Roberta Ogletree (Eric's faculty advisor for this project) at 618/453-2777. Questions regarding your rights as a participant in this research should be directed to: Committee Chairperson, Office of Research Development and Administration, Southern Illinois University, Carbondale, IL 62901-4709; phone 618/453-4533; e-mail: siuhsc@siu.edu.

Agreement: This agreement states that you have received a copy of this informed consent. Your signature below indicated that you agree to participate in this study.

_____	_____	_____
Signature of Subject	Date	Subject Name (Printed)

APPENDIX H : LINEAR REGRESSION ANALYSIS FOR PATH ANALYSIS WITH DEPENDENT VARIABLE OFF-CAMPUS, IN - SLEEP FULL MODELS

Model Summary			
R	**R^2**	**Adj. R^2**	**SEE**
.505	.255	.250	.410

Full Regression Model					
Model	**SS**	**df**	**MS**	**F**	**Sig.**
Regression	24.968	3	8.323	49.464	.000
Residual	73.023	434	.168		
Total	97.991	437			

Individual Predictors					
Predictor	**B**	**Std. Error**	**β**	**t-value**	**Sig.**
Constant	-2.861	.288		-9.921	.000
Age	.160	.014	.510	11.719	.000**
Sex	.010	.040	.011	.250	.803
Veteran	-.033	.116	-.012	-.284	.776

*p < .05
**p<.01

APPENDIX I: LINEAR REGRESSION ANALYSIS FOR PATH ANALYSIS WITH DEPENDENT VARIABLE OFF CAMPUS, OUTSIDE OF CARBONDALE - SLEEP FULL MODELS

Model Summary			
R	**R^2**	**Adj. R^2**	**SEE**
.183	.033	.027	.278

Full Regression Model					
Model	**SS**	**df**	**MS**	**F**	**Sig.**
Regression	1.157	3	.386	4.989	.002
Residual	33.546	434	.077		
Total	34.703	437			

Individual Predictors					
Predictor	**B**	**Std. Error**	**β**	**t-value**	**Sig.**
Constant	-.509	.195		-2.604	.010
Age	.031	.009	.164	3.314	.001**
Sex	-.011	.027	-.019	-.399	.690
Veteran	.059	.079	.037	.752	.453
*p < .05					
**p<.01					

APPENDIX J: LINEAR REGRESSION ANALYSIS FOR PATH ANALYSIS WITH DEPENDENT VARIABLE NUMBER OF ROOMMATES - SLEEP FULL MODELS

Model Summary			
R	**R^2**	**Adj. R^2**	**SEE**
.058	.003	.001	3.158

Full Regression Model					
Model	**SS**	**df**	**MS**	**F**	**Sig.**
Regression	14.848	1	14.848	1.489	.223
Residual	4338.374	435	9.973		
Total	4353.222	436			

Individual Predictors					
Predictor	**B**	**Std. Error**	**β**	**t-value**	**Sig.**
Constant	-.767	1.999		-.383	.702
Age	.122	.100	.058	1.220	.223
*p < .05					
**p<.01					

APPENDIX K: LINEAR REGRESSION ANALYSIS FOR PATH ANALYSIS WITH DEPENDENT VARIABLE SEMESTER HOURS ENROLLED - SLEEP FULL MODELS

Model Summary			
R	**R^2**	**Adj. R^2**	**SEE**
.094	.009	-.003	2.550

Full Regression Model					
Model	**SS**	**df**	**MS**	**F**	**Sig.**
Regression	24.091	5	4.818	.741	.593
Residual	2712.122	417	6.504		
Total	2736.213	422			

Individual Predictors					
Predictor	**B**	**Std. Error**	**β**	**t-value**	**Sig.**
Constant	13.320	1.787		7.456	.000
Age	.060	.092	.036	.654	.514
Hours/Week Working	.008	.011	.040	.749	.454
LT Monogamous	-.047	.262	-.009	-.181	.857
Married	-1.149	.834	-.069	-1.379	.169
Veteran	.468	.728	.033	.642	.521
*p < .05					
**p<.01					

APPENDIX L: LINEAR REGRESSION ANALYSIS FOR PATH ANALYSIS WITH DEPENDENT VARIABLE NUMBER OF HOURS WORKED/WEEK - SLEEP FULL MODELS

Model Summary			
R	**R^2**	**Adj. R^2**	**SEE**
.399	.159	.149	11.039

Full Regression Model					
Model	**SS**	**df**	**MS**	**F**	**Sig.**
Regression	9922.747	5	1984.549	16.287	.000
Residual	52517.331	431	121.850		
Total	62440.078	436			

Individual Predictors					
Predictor	**B**	**Std. Error**	**β**	**t-value**	**Sig.**
Constant	-52.113	7.277		-7.161	.000
Age	3.028	.374	.381	8.100	.000**
LT Monogamous	2.784	1.137	.113	2.449	.015*
Married	2.942	3.606	.037	.816	.415
Sex	-.256	1.117	-.011	-.230	.819
Veteran	-6.710	3.156	-.099	-2.126	-.034

*p < .05
**p<.01

APPENDIX M: LINEAR REGRESSION ANALYSIS FOR PATH ANALYSIS WITH DEPENDENT VARIABLE EXTRA-CURRICULAR INVOLVEMENT/WEEK - SLEEP FULL MODELS

Model Summary			
R	**R^2**	**Adj. R^2**	**SEE**
.175	.031	.019	6.938

Full Regression Model					
Model	**SS**	**df**	**MS**	**F**	**Sig.**
Regression	655.796	5	131.159	2.725	.019
Residual	20745.167	431	48.133		
Total	21400.963	436			

Individual Predictors					
Predictor	**B**	**Std. Error**	**β**	**t-value**	**Sig.**
Constant	16.989	4.574		3.715	.000
Age	-.662	.235	-.142	-2.818	.005**
LT Monogamous	.018	.715	.001	.025	.980
Married	-1.710	2.266	-.037	-.755	.451
Sex	1.682	.702	.120	2.397	.017*
Veteran	-.751	1.984	-.019	-.379	.705

*p < .05
**p<.01

APPENDIX N: LINEAR REGRESSION ANALYSIS FOR PATH ANALYSIS WITH DEPENDENT VARIABLE NUMBER OF LEADERSHIP POSITIONS - SLEEP FULL MODELS

Model Summary			
R	**R^2**	**Adj. R^2**	**SEE**
.095	.009	-.003	1.334

Full Regression Model					
Model	**SS**	**df**	**MS**	**F**	**Sig.**
Regression	6.934	5	1.387	.779	.565
Residual	769.030	432	1.780		
Total	775.963	437			

Individual Predictors					
Predictor	**B**	**Std. Error**	**β**	**t-value**	**Sig.**
Constant	.105	.879		.120	.904
Age	.007	.045	.008	.154	.878
LT Monogamous	-.051	.137	-.019	-.372	.710
Married	-.261	.436	-.029	-.598	.550
Sex	.227	.135	.085	1.685	.093
Veteran	-.121	.381	-.016	-.316	.752

*p < .05
**p<.01

APPENDIX O: LINEAR REGRESSION ANALYSIS FOR PATH ANALYSIS WITH DEPENDENT VARIABLE NUMBER OF HOURS VOLUNTEERED/WEEK - SLEEP FULL MODELS

Model Summary			
R	**R^2**	**Adj. R^2**	**SEE**
.132	.017	.006	3.681

Full Regression Model					
Model	**SS**	**df**	**MS**	**F**	**Sig.**
Regression	104.133	5	20.827	1.537	.177
Residual	5853.182	432	13.549		
Total	5957.315	437			

Individual Predictors					
Predictor	**B**	**Std. Error**	**β**	**t-value**	**Sig.**
Constant	-3.793	2.424		-1.565	.118
Age	.256	.124	.105	2.061	.040*
LT Monogamous	.545	.379	.072	1.439	.151
Married	.596	1.202	.024	.496	.620
Sex	.029	.372	.004	.079	.937
Veteran	-.520	1.052	-.025	-.494	.622

*p < .05
**p<.01

APPENDIX P: LINEAR REGRESSION ANALYSIS FOR PATH ANALYSIS WITH DEPENDENT VARIABLE MOS SF-36 MENTAL SCORE - SLEEP FULL MODELS

Model Summary			
R	**R^2**	**Adj. R^2**	**SEE**
.147	.022	-.005	19.267

Full Regression Model					
Model	**SS**	**df**	**MS**	**F**	**Sig.**
Regression	3359.405	11	305.400	.823	.617
Residual	151834.669	409	371.234		
Total	155194.073	420			

Individual Predictors					
Predictor	**B**	**Std. Error**	**β**	**t-value**	**Sig.**
Constant	65.090	5.558		11.712	.000
Hours/Week Extracurricular	-.056	.145	-.020	-.387	.699
Hours/Week Volunteering	.160	.272	.030	.588	.577
Hours/Week Working	-.155	.087	-.097	-1.781	.076
LT Monogamous	.468	1.990	.012	.235	.814
Married	5.654	6.407	.045	.882	.378
Off Campus, In	3.792	2.194	.094	1.728	.085
Off Campus, Out	4.242	3.776	.063	1.123	.262
Roommates	.270	.299	.045	.904	.366
Semester Hours	.257	.378	.034	.679	.497
Student Leadership Positions	-.226	.708	-.016	-.320	.749
Veteran	.472	5.376	.004	.088	.930

*p < .05
**p<.01

APPENDIX Q: LINEAR REGRESSION ANALYSIS FOR PATH ANALYSIS WITH DEPENDENT MOS SF-36 PHYSICAL SCORE - SLEEP FULL MODELS

Model Summary			
R	**R^2**	**Adj. R^2**	**SEE**
.223	.050	.024	14.985

Full Regression Model					
Model	**SS**	**df**	**MS**	**F**	**Sig.**
Regression	4796.718	11	436.065	1.942	.033
Residual	91835.579	409	224.537		
Total	96632.297	420			

Individual Predictors					
Predictor	**B**	**Std. Error**	**β**	**t-value**	**Sig.**
Constant	71.763	4.322		16.603	.000
Hours/Week Extracurricular	-.052	.113	-.023	-.457	.648
Hours/Week Volunteering	.132	.212	.031	.622	.534
Hours/Week Working	.092	.068	.074	1.368	.172
LT Monogamous	-1.378	1.548	-.044	-.890	.374
Married	-4.714	4.983	-.047	-.946	.345
Off Campus, In	3.965	1.707	.124	2.324	.021*
Off Campus, Out	4.471	2.937	.085	1.523	.129
Roommates	.392	.232	.057	1.147	.252
Semester Hours	.337	.294	.057	1.147	.252
Student Leadership Positions	-.320	.550	-.029	-.582	.561
Veteran	-1.258	4.181	-.015	-.301	.764

*p < .05
**p<.01

APPENDIX R: LINEAR REGRESSION ANALYSIS FOR PATH ANALYSIS WITH DEPENDENT VARIABLE GRADE POINT AVERAGE - SLEEP FULL MODELS

Model Summary			
R	**R^2**	**Adj. R^2**	**SEE**
.283	.080	.062	.620

Full Regression Model					
Model	**SS**	**df**	**MS**	**F**	**Sig.**
Regression	13.484	8	1.686	4.383	.000
Residual	154.993	403	.385		
Total	168.477	411			

Individual Predictors					
Predictor	**B**	**Std. Error**	**β**	**t-value**	**Sig.**
Constant	2.125	.180		11.810	.000
Hours/Week Extracurricular	.005	.005	.053	1.044	.297
Hours/Week Volunteering	-.014	.009	-.077	-1.545	.123
Hours/Week Working	.002	.003	.030	.561	.575
Off Campus, In	.064	.071	.048	.907	.365
Off Campus, Out	.253	.120	.115	2.117	.035*
Roommates	-.003	.010	-.016	-.339	.735
Semester Hours	.061	.012	.240	4.934	.000*
Student Leadership Positions	.002	.023	.004	.079	.937

*p < .05
**p<.01

APPENDIX S: LINEAR REGRESSION ANALYSIS FOR PATH ANALYSIS WITH DEPENDENT VARIABLE CIGARETTES SMOKED/WEEK - SLEEP FULL MODELS

Model Summary			
R	**R^2**	**Adj. R^2**	**SEE**
.132	.017	-.002	14.666

Full Regression Model					
Model	**SS**	**df**	**MS**	**F**	**Sig.**
Regression	1578.082	8	197.260	.917	.502
Residual	88612.996	412	215.080		
Total	90191.078	420			

Individual Predictors					
Predictor	**B**	**Std. Error**	**β**	**t-value**	**Sig.**
Constant	8.724	4.182		2.086	.038
Hours/Week Extracurricular	-.018	.110	-.008	-.0159	.873
Hours/Week Volunteering	-.394	.207	-.097	-1.906	.057
Hours/Week Working	-.018	.065	-.015	-.281	.779
Off Campus, In	2.285	1.652	.074	1.384	.167
Off Campus, Out	-.476	2.818	-.009	-.169	.866
Roommates	-.046	.227	-.010	-.201	.841
Semester Hours	-.276	.287	-.048	-.962	.337
Student Leadership Positions	-.205	.538	-.019	-.381	.703

*p < .05
**p<.01

APPENDIX T: LINEAR REGRESSION ANALYSIS FOR PATH ANALYSIS WITH DEPENDENT VARIABLE DRINKS/WEEK - SLEEP FULL MODELS

Model Summary			
R	**R^2**	**Adj. R^2**	**SEE**
.204	.042	.023	13.628

Full Regression Model					
Model	**SS**	**df**	**MS**	**F**	**Sig.**
Regression	3316.332	8	414.542	2.232	.024
Residual	76527.059	412	185.745		
Total	79843.392	420			

Individual Predictors					
Predictor	**B**	**Std. Error**	**β**	**t-value**	**Sig.**
Constant	1.570	3.887		.404	.687
Hours/Week Extracurricular	-.075	.103	-.037	-.728	.467
Hours/Week Volunteering	-.157	.192	-.041	-.818	.414
Hours/Week Working	-.038	.061	-.033	-.625	.533
Off Campus, In	3.969	1.535	.137	2.586	.010*
Off Campus, Out	-2.072	2.619	-.043	-.791	.429
Roommates	.354	.211	.082	1.678	.094
Semester Hours	.456	.267	.084	1.709	.088
Student Leadership Positions	.287	.500	.028	.575	.566

*p < .05
**p<.01

APPENDIX U: LINEAR REGRESSION ANALYSIS FOR PATH ANALYSIS WITH DEPENDENT VARIABLE WEEKDAY SLEEP LENGTH - WEEKDAY SLEEP LENGTH FULL MODEL

Model Summary			
R	**R^2**	**Adj. R^2**	**SEE**
.348	.121	.080	60.468

Full Regression Model					
Model	**SS**	**df**	**MS**	**F**	**Sig.**
Regression	196427.772	18	10912.654	2.985	.000
Residual	1429665.626	391	3656.434		
Total	1626093.398	409			

Individual Predictors					
Predictor	**B**	**Std. Error**	**β**	**t-value**	**Sig.**
Constant	608.065	56.153		10.829	.000
Age	-8.163	2.630	-.195	-3.103	.002**
Ave # of Cigarettes/Week	.069	.216	.016	.321	.748
Ave # of Drinks/Week	.076	.239	.017	.317	.751
Grade Point Average	-2.992	4.921	-.030	-.608	.544
Hours/Week Extracurricular	-.701	.468	-.077	-1.498	.135
Hours/Week Volunteering	.092	.866	.005	.106	.916
Hours/Week Working	-.601	.287	-.115	-2.099	.037*
LT Monogamous	.041	6.536	.000	.006	.995
Married	-6.827	21.453	-.016	-.318	.750
MOS SF-36 Mental Score	.396	.193	.113	1.907	.057
MOS SF-36 Physical Score	.197	.253	.047	.779	.437
Off Campus, In	12.078	12.318	.056	.981	.327
Off Campus, Out	12.078	12.318	.056	.981	.327
Roommates	-1.883	.958	-.097	-1.966	.050*
Semester Hours	-1.921	1.250	-.077	-1.537	.125
Sex	-6.911	6.876	-.055	-1/005	.316
Student Leadership Positions	.631	2.235	.014	.282	.778
Veteran	23.000	18.070	.064	1.273	.204

*p < .05
**p<.01

APPENDIX V: LINEAR REGRESSION ANALYSIS FOR PATH ANALYSIS WITH DEPENDENT VARIABLE WEEKEND SLEEP LENGTH – WEEKEND SLEEP LENGTH FULL MODEL

Model Summary			
R	**R^2**	**Adj. R^2**	**SEE**
.242	.058	.015	96.293

Full Regression Model					
Model	**SS**	**df**	**MS**	**F**	**Sig.**
Regression	224144.079	18	12452.499	1.343	.157
Residual	3616236.539	390	9272.401		
Total	3840380.618	408			

Individual Predictors					
Predictor	**B**	**Std. Error**	**β**	**t-value**	**Sig.**
Constant	582.283	89.850		6.481	.000
Age	-3.718	4.199	-.058	-.886	.376
Ave # of Cigarettes/Week	-.260	.344	-.039	-.755	.451
Ave # of Drinks/Week	.184	.385	.026	.477	.634
Grade Point Average	7.646	7.896	.050	.968	.333
Hours/Week Extracurricular	-.218	.745	-.016	-.292	.771
Hours/Week Volunteering	-1.360	1.379	-.051	-.987	.324
Hours/Week Working	-.860	.456	-.107	-1.885	.060
LT Monogamous	11.737	10.411	.059	1.127	.260
Married	-29.706	34.164	-.045	-.870	.385
MOS SF-36 Mental Score	.137	.309	.027	.443	.658
MOS SF-36 Physical Score	-.488	.403	-.076	-1.210	.227
Off Campus, In	4.375	12.970	.021	.337	.736
Off Campus, Out	1.404	19.618	.004	.072	.943
Roommates	-1.879	1.526	-.063	-1.231	.219
Semester Hours	-.463	1.991	-.012	-.233	.816
Sex	-18.187	11.011	-.094	-1.652	.099
Student Leadership Positions	4.994	3.559	.071	1.403	.161
Veteran	45.549	28.780	.082	1.583	.114

*p < .05
**p<.01

APPENDIX W: LINEAR REGRESSION ANALYSIS FOR PATH ANALYSIS WITH DEPENDENT VARIABLE SLEEP QUALITY – SLEEP QUALITY FULL MODEL

Model Summary

R	R^2	Adj. R^2	SEE
.569	.324	.292	2.52475

Full Regression Model

Model	SS	df	MS	F	Sig.
Regression	1184.065	18	65.781	10.320	.000
Residual	2473.247	338	6.374		
Total	3657.312	406			

Individual Predictors

Predictor	B	Std. Error	β	t-value	Sig.
Constant	11.717	2.360		4.965	.000
Age	.144	.110	.072	1.302	.194
Ave # of Cigarettes/Week	.004	.009	.021	.481	.631
Ave # of Drinks/Week	.020	.010	.094	2.033	.043*
Grade Point Average	-.309	.206	-.066	-1.500	.134
Hours/Week Extracurricular	-.007	.020	-.017	-.375	.708
Hours/Week Volunteering	.055	.036	.067	1.508	.132
Hours/Week Working	.000	.012	.000	.009	.992
LT Monogamous	.264	.274	.043	.965	.335
Married	-.232	.896	-.011	-.259	.796
MOS SF-36 Mental Score	-.048	.008	-.308	-5.875	.000**
MOS SF-36 Physical Score	-.054	.011	-.271	-5.058	.000**
Off Campus, In	-.635	.342	-.100	-1.858	.064
Off Campus, Out	.821	.515	.080	1.595	.112
Roommates	-.013	.040	-.014	-.332	.740
Semester Hours	.020	.052	.016	.373	.709
Sex	.194	.289	.032	.672	.502
Student Leadership Positions	.048	.093	.022	.515	.607
Veteran	-1.641	.755	-.096	-2.174	.030*

*p < .05
**p<.01

APPENDIX X: LINEAR REGRESSION ANALYSIS FOR PATH ANALYSIS WITH DEPENDENT VARIABLE OFF-CAMPUS, IN - SLEEP TRIMMED MODELS

Model Summary			
R	**R^2**	**Adj. R^2**	**SEE**
.505	.255	.253	.409

Full Regression Model					
Model	**SS**	**df**	**MS**	**F**	**Sig.**
Regression	24.941	1	24.941	148.859	.000
Residual	73.050	436	.168		
Total	97.991	437			

Individual Predictors					
Predictor	**B**	**Std. Error**	**β**	**t-value**	**Sig.**
Constant	-2.813	.259		-10.861	.000
Age	.159	.013	.505	12.201	.000*

*p < .05
**p<.01

APPENDIX Y: LINEAR REGRESSION ANALYSIS FOR PATH ANALYSIS WITH DEPENDENT VARIABLE OFF CAMPUS, OUTSIDE OF CARBONDALE - SLEEP TRIMMED MODELS

Model Summary			
R	**R^2**	**Adj. R^2**	**SEE**
.178	.032	.029	.278

Full Regression Model					
Model	**SS**	**df**	**MS**	**F**	**Sig.**
Regression	1.095	1	1.095	14.200	.000
Residual	33.609	436	.077		
Total	34.703	437			

Individual Predictors					
Predictor	**B**	**Std. Error**	**β**	**t-value**	**Sig.**
Constant	-.573	.176		-3.264	.001
Age	.033	.009	.178	3.768	.000*

*p < .05
**p<.01

APPENDIX Z: LINEAR REGRESSION ANALYSIS FOR PATH ANALYSIS WITH DEPENDENT VARIABLE NUMBER OF ROOMMATES - SLEEP TRIMMED MODELS

Model Summary			
R	**R^2**	**Adj. R^2**	**SEE**
.058	.003	.001	3.158

Full Regression Model					
Model	**SS**	**df**	**MS**	**F**	**Sig.**
Regression	14.848	1	14.848	1.489	.223
Residual	4338.374	435	9.973		
Total	4353.222	436			

Individual Predictors					
Predictor	**B**	**Std. Error**	**β**	**t-value**	**Sig.**
Constant	-.767	1.999		-.383	.702
Age	.122	.100	.058	1.220	.223
*p < .05					
**p<.01					

APPENDIX AA: LINEAR REGRESSION ANALYSIS FOR PATH ANALYSIS WITH DEPENDENT VARIABLE SEMESTER HOURS ENROLLED - SLEEP TRIMMED MODELS

Model Summary			
R	**R^2**	**Adj. R^2**	**SEE**
.059	.003	.001	2.542

Full Regression Model					
Model	**SS**	**df**	**MS**	**F**	**Sig.**
Regression	9.465	1	9.465	1.465	.227
Residual	2726.941	422	6.462		
Total	2736.406	423			

Individual Predictors					
Predictor	**B**	**Std. Error**	**β**	**t-value**	**Sig.**
Constant	14.585	.125		116.738	.000
Married	-.985	.814	-.059	-1.210	.227
*p < .05					
**p<.01					

APPENDIX AB: LINEAR REGRESSION ANALYSIS FOR PATH ANALYSIS WITH DEPENDENT VARIABLE NUMBER OF HOURS WORKED/WEEK - SLEEP TRIMMED MODELS

Model Summary			
R	**R^2**	**Adj. R^2**	**SEE**
.397	.157	.152	11.022

Full Regression Model					
Model	**SS**	**df**	**MS**	**F**	**Sig.**
Regression	9833.976	3	3277.992	26.981	.000
Residual	52606.102	433	121.492		
Total	62440.078	436			

Individual Predictors					
Predictor	**B**	**Std. Error**	**β**	**t-value**	**Sig.**
Constant	-52.138	7.210		-7.231	.000
Age	3.027	.365	.381	8.291	.000**
LT Monogamous	2.723	1.095	.111	2.487	.013*
Veteran	-6.453	3.099	-.095	-2.082	.038*
*p < .05					
**p<.01					

APPENDIX AC: LINEAR REGRESSION ANALYSIS FOR PATH ANALYSIS WITH DEPENDENT VARIABLE EXTRA-CURRICULAR INVOLVEMENT/WEEK - SLEEP TRIMMED MODELS

Model Summary			
R	**R^2**	**Adj. R^2**	**SEE**
.170	.029	.024	6.920

Full Regression Model					
Model	**SS**	**df**	**MS**	**F**	**Sig.**
Regression	616.425	2	308.212	6.436	.002
Residual	20784.538	434	47.891		
Total	21400.963	436			

Individual Predictors					
Predictor	**B**	**Std. Error**	**β**	**t-value**	**Sig.**
Constant	17.581	4.420		3.977	.000
Age	-.694	.225	-.149	-3.087	.002**
Sex	1.637	.677	.117	2.419	.016*
*p < .05					
**p<.01					

APPENDIX AD: LINEAR REGRESSION ANALYSIS FOR PATH ANALYSIS WITH DEPENDENT VARIABLE NUMBER OF LEADERSHIP POSITIONS - SLEEP TRIMMED MODELS

Model Summary			
R	**R^2**	**Adj. R^2**	**SEE**
.087	.008	.005	1.329

Full Regression Model					
Model	**SS**	**df**	**MS**	**F**	**Sig.**
Regression	5.837	1	5.837	3.305	.070
Residual	770.126	436	1.766		
Total	775.963	437			

Individual Predictors					
Predictor	**B**	**Std. Error**	**β**	**t-value**	**Sig.**
Constant	.212	.088		2.402	.017
Sex	.231	.127	.087	1.818	.070
*p < .05					
**p<.01					

APPENDIX AE: LINEAR REGRESSION ANALYSIS FOR PATH ANALYSIS WITH DEPENDENT VARIABLE NUMBER OF HOURS VOLUNTEERED/WEEK - SLEEP TRIMMED MODELS

Model Summary			
R	**R^2**	**Adj. R^2**	**SEE**
.128	.016	.012	3.67

Full Regression Model					
Model	**SS**	**df**	**MS**	**F**	**Sig.**
Regression	98.293	2	49.147	3.649	.027
Residual	5859.022	435	13.469		
Total	5957.315	437			

Individual Predictors					
Predictor	**B**	**Std. Error**	**β**	**t-value**	**Sig.**
Constant	-3.611	2.327		-1.552	.121
Age	.248	.117	.101	2.116	.035*
LT Monogamous	.512	.364	.067	1.405	.161
*p < .05					
**p<.01					

APPENDIX AF: LINEAR REGRESSION ANALYSIS FOR PATH ANALYSIS WITH DEPENDENT VARIABLE MOS SF-36 MENTAL SCORE - SLEEP TRIMMED MODELS

Model Summary			
R	**R^2**	**Adj. R^2**	**SEE**
.131	.017	.010	19.184

Full Regression Model					
Model	**SS**	**df**	**MS**	**F**	**Sig.**
Regression	2764.056	3	921.352	2.504	.059
Residual	159350.706	433	368.015		
Total	162114.762	436			

Individual Predictors					
Predictor	**B**	**Std. Error**	**β**	**t-value**	**Sig.**
Constant	68.909	1.283		53.725	.000
Hours/Week Working	-.166	.084	-.103	-1.965	.050*
Off Campus, In	4.780	2.075	.117	2.303	.022*
Off Campus, Out	5.847	3.600	.086	1.624	.105
*p < .05					
**p<.01					

APPENDIX AG: LINEAR REGRESSION ANALYSIS FOR PATH ANALYSIS WITH DEPENDENT MOS SF-36 PHYSICAL SCORE - SLEEP TRIMMED MODELS

Model Summary			
R	**R^2**	**Adj. R^2**	**SEE**
.209	.044	.032	14.906

Full Regression Model					
Model	**SS**	**df**	**MS**	**F**	**Sig.**
Regression	4205.892	5	841.178	3.786	.002
Residual	92428.912	416	222.185		
Total	96634.805	421			

Individual Predictors					
Predictor	**B**	**Std. Error**	**β**	**t-value**	**Sig.**
Constant	70.985	4.226		16.797	.000
Hours/Week Working	.087	.066	.069	1.315	.189
Off Campus, In	4.020	1.648	.126	2.439	.015*
Off Campus, Out	4.094	2.815	.077	1.454	.147
Roommates	.392	.229	.083	1.711	.088
Semester Hours	.338	.288	.057	1.174	.241
*p < .05					
**p<.01					

APPENDIX AH: LINEAR REGRESSION ANALYSIS FOR PATH ANALYSIS WITH DEPENDENT VARIABLE GRADE POINT AVERAGE - SLEEP TRIMMED MODELS

Model Summary			
R	**R^2**	**Adj. R^2**	**SEE**
.275	.076	.067	.620

Full Regression Model					
Model	**SS**	**df**	**MS**	**F**	**Sig.**
Regression	12.872	4	3.218	8.376	.000
Residual	156.741	408	.384		
Total	169.613	412			

Individual Predictors					
Predictor	**B**	**Std. Error**	**β**	**t-value**	**Sig.**
Constant	2.140	.179		11.940	.000
Hours/Week Extracurricular	.005	.005	.051	1.033	.302
Hours/Week Volunteering	-.011	.009	-.065	-1.319	.188
Off Campus, Out	.252	.107	.114	2.363	.019*
Semester Hours	.061	.012	.242	5.030	.000**

*p < .05
**p<.01

APPENDIX AI: LINEAR REGRESSION ANALYSIS FOR PATH ANALYSIS WITH DEPENDENT VARIABLE CIGARETTES SMOKED/WEEK - SLEEP TRIMMED MODELS

Model Summary			
R	**R^2**	**Adj. R^2**	**SEE**
.117	.014	.009	14.336

Full Regression Model					
Model	**SS**	**df**	**MS**	**F**	**Sig.**
Regression	1232.267	2	616.134	2.998	.051
Residual	89401.881	435	205.522		
Total	90634.148	437			

Individual Predictors					
Predictor	**B**	**Std. Error**	**β**	**t-value**	**Sig.**
Constant	4.258	.866		4.920	.000
Hours/Week Volunteering	-.413	.189	-.106	-2.189	.029*
Off Campus, In	2.140	1.470	.070	1.456	.146

*p < .05
**p<.01

APPENDIX AJ: LINEAR REGRESSION ANALYSIS FOR PATH ANALYSIS WITH DEPENDENT VARIABLE DRINKS/WEEK - SLEEP TRIMMED MODELS

Model Summary			
R	**R^2**	**Adj. R^2**	**SEE**
.185	.034	.027	13.578

Full Regression Model					
Model	**SS**	**df**	**MS**	**F**	**Sig.**
Regression	2749.158	3	916.386	4.970	.002
Residual	77249.829	419	184.367		
Total	79998.987	422			

Individual Predictors					
Predictor	**B**	**Std. Error**	**β**	**t-value**	**Sig.**
Constant	1.297	3.839		.338	.736
Off Campus, In	3.863	1.398	.134	2.763	.006*
Roommates	.341	.208	.079	1.640	.102
Semester Hours	.409	.262	.076	1.563	.119

*p < .05
**p<.01

APPENDIX AK: LINEAR REGRESSION ANALYSIS FOR PATH ANALYSIS WITH DEPENDENT VARIABLE WEEKDAY SLEEP LENGTH - WEEKDAY SLEEP LENGTH TRIMMED MODEL

Model Summary

R	R^2	Adj. R^2	SEE
.313	.098	.076	61.859

Full Regression Model

Model	SS	df	MS	F	Sig.
Regression	169847.110	10	16984.711	4.439	.000
Residual	1561221.010	408	3826.522		
Total	1731068.120	418			

Individual Predictors

Predictor	B	Std. Error	β	t-value	Sig.
Constant	597.048	55.060		10.844	.000
Age	-7.490	2.642	-.176	-2.834	.005**
Hours/Week Extracurricular	-.643	.458	-.069	-1.406	.161
Hours/Week Working	-.486	.286	-.091	-1.700	.090
MOS SF-36 Mental Score	.447	.160	.134	2.794	.005**
Off Campus, In	35.321	8.103	.260	4.359	.000**
Off Campus, Out	9.501	12.309	.042	.772	.441
Roommates	-1.671	.963	-.083	-1.734	.084
Semester Hours	-2.001	1.210	-.079	-1.654	.099
Sex	-6.285	6.347	-.049	-.990	.323
Veteran	5.480	17.651	.015	.310	.756

*p < .05
**p<.01

APPENDIX AL: LINEAR REGRESSION ANALYSIS FOR PATH ANALYSIS WITH DEPENDENT VARIABLE WEEKENDSLEEP LENGTH - WEEKEND SLEEP LENGTH TRIMMED MODEL

Model Summary			
R	**R^2**	**Adj. R^2**	**SEE**
.228	.052	.029	95.04607

Full Regression Model					
Model	**SS**	**df**	**MS**	**F**	**Sig.**
Regression	204114.982	10	20411.498	2.259	.014
Residual	3730941.110	413	9033.756		
Total		3935056.092	423		

Individual Predictors					
Predictor	**B**	**Std. Error**	**β**	**t-value**	**Sig.**
Constant	561.631	72.980		7.696	.000
Age	-2.964	3.523	-.046	-.841	.401
GPA	6.576	7.434	.043	.885	.337
Hours/Week Volunteering	-.927	1.255	-.036	-.739	.461
Hours/Week Working	-.893	.421	-.111	-2.122	.034*
LT Monogamous	15.027	9.925	.076	1.514	.131
MOS SF-36 Physical Score	-.375	.311	-.059	-1.206	.228
Roommates	-1.528	1.464	-.051	-1.043	.298
Sex	-16.599	9.872	-.086	-1.681	.093
Leadership Positions	5.171	3.449	.073	1.499	.135
Veteran	42.659	27.909	.076	1.528	.127

*p < .05
**p<.01

APPENDIX AM: LINEAR REGRESSION ANALYSIS FOR PATH ANALYSIS WITH DEPENDENT VARIABLE SLEEP QUALITY - SLEEP QUALITY TRIMMED MODEL

Model Summary			
R	**R^2**	**Adj. R^2**	**SEE**
.565	.319	.304	2.509

Full Regression Model					
Model	**SS**	**df**	**MS**	**F**	**Sig.**
Regression	1217.201	9	135.245	21.479	.000
Residual	2600.477	413	6.297		
Total	3817.678	422			

Individual Predictors					
Predictor	**B**	**Std. Error**	**β**	**t-value**	**Sig.**
Constant	11.577	2.159		5.361	.000
Age	.172	.103	.086	1.669	.096
Drinks/Week	.022	.009	.101	2.441	.015*
GPA	-.274	.196	-.058	-1.401	.162
Hours/Week Volunteering	.051	.033	.064	1.544	.123
MOS SF-36 Mental Score	-.046	.008	-.295	-5.870	.000**
MOS SF-36 Physical Score	-.058	.010	-.291	-5.717	.000**
Off Campus, In	-.492	.330	-.077	-1.490	.137
Off Campus, Out	.923	.473	.088	1.953	.052
Veteran	-1.665	.731	-.096	-2.276	.023*

*p < .05
**p<.01

APPENDIX AN: HUMAN SUBJECTS COMMITTEE APPROVAL FORM A

SIUC HSC FORM A

REQUEST FOR APPROVAL TO CONDUCT RESEARCH ACTIVITIES INVOLVING HUMAN SUBJECTS

CERTIFICATION STATEMENT

By making this application, I certify that I have read and understand the University's policies and procedures governing research activities involving human subjects. I agree to comply with the letter and spirit of those policies. I acknowledge my obligation to:

1. Accept responsibility for the research described, including work by students under my direction.
2. Obtain written approval from the Human Subjects Committee of any changes from the originally approved protocol **BEFORE** implementing those changes.
3. Retain signed consent forms in a secure location separate from the data for at least **three** years after the completion of the research.
4. Immediately report any adverse effects of the study on the subjects to the Chairperson of the Human Subjects Committee, SIUC, Carbondale, Illinois - 618-453-4533 and to the Director of the Office of Research Development and Administration, SIUC. Phone 618-453-4531. E-mail: **siuhsc@siu.edu**

Project Title
Predictors of Sleep Quantity and Quality in College Students Pilot Study

RESEARCH ADVISOR'S ASSURANCE: My signature on this application certifies that the student is knowledgeable about the regulations and policies governing research with human subjects. I am aware of my obligations stated on Form A and will be available to supervise the research. When on sabbatical leave or vacation, I will arrange for an alternate faculty sponsor to assume responsibility during my absence. I will advise the Human Subjects Committee by letter of such arrangements.

Researcher(s) or Project Director(s) Eric S. Davidson 11/15/2010 Date
Please print or type name below signature.

Researcher's Advisor (required for all student projects) Roberta Ogletree, HSD, MEd, CHES 11/16/2010 Date
Please print or type name below signature.

The request submitted by the above-named researcher(s) was approved by the SIUC Human Subjects Committee.

This approval is valid for one year from the review date. Researchers must request an extension to continue the research after that date. This approval form must be included in all Master's theses/research papers and Doctoral dissertations involving human subjects that are submitted to the Graduate School.

Chairperson, Southern Illinois University Human Subjects Committee 11-23-10 Date

VITA

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Southern Illinois University

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Bachelors of Arts, Psychology with Human Services Option, December 1994
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Dissertation/Thesis/Research Paper Title:
Predictors of Sleep Quantity and Quality in College Students

Major Professor: Roberta Ogletree, PhD

Publications:

Davidson, E.S. (2008). Influenza prevention and vaccination: Knowledge, attitudes and beliefs of college students. *The Health Education Monograph Series: Student Monographs*, *25*(3), 14-19.

Davidson, E.S. (2008). Perceived continuing education needs and job relevance of health education competencies among health education/promotion practitioners in college health. *Journal of American College Health*, 57(2), 197-210.