Development and evaluation of the Sleep Treatment and Education Program for Students (STEPS)

Franklin Christian Brown
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Development And Evaluation of the Sleep Treatment and Education Program for Students (STEPS)

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A Dissertation Presented in Partial Fulfillment
of the Requirements for the Degree
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We hereby recommend that the dissertation prepared under our supervision by Franklin C. Brown
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be accepted in partial fulfillment of the requirements for the Degree of Doctor of Philosophy

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ABSTRACT

Sleep difficulties are becoming progressively more common among university students and may be related to increased academic and emotional difficulties. Psychoeducational interventions are among the most effective methods for reducing sleep difficulties and are significantly better than pharmacological treatments. Attempts to demonstrate the effectiveness of such treatments among university students are not present in the literature.

The purpose of this study was to develop the Sleep Treatment Education Program for Students (STEPS) and evaluate its effectiveness to improve sleep habits and reduce sleep complaints. The study used a double blind, experimental design. Participants in the treatment condition received Sleep Hygiene Guidelines, Stimulus Control Instructions, information about caffeine content, and a brief lecture describing the impact of poor sleep quality on university students. The control group students were informed about the scientific methods of behavioral sciences.

Students in the treatment group reported significant improvements in their overall sleep quality and habits. Bedtime worries about sleep difficulties, inconsistent sleep times, nighttime thirst, and caffeine use accounted for the most variance in poor sleep quality. These results suggest that inception of an inexpensive student sleep awareness program such as STEPS may significantly reduce or prevent sleep difficulties in university students.
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CHAPTER 1

INTRODUCTION

Young adults entering college often face newfound autonomy and adult responsibility. While many find this independence enjoyable, it also is a transitional period that brings with it greater intellectual and social demands (Kleeman & Richardson, 1985; Russell & Petrie, 1992). Many students appear to compensate for these demands by late-night study sessions before examinations during the week. Then on the weekend, these students often go to bed later due to social events and sleep noticeably longer to compensate for their missed sleep during the week and later weekend bedtimes (Machado, Varella, & Andrade, 1998; Pilcher & Walters, 1997).

Early Monday morning classes after delayed weekend bedtimes may further contribute to variable sleep-wake schedules. Machado et al. (1998) found that students with morning classes delayed their sleep phase by more than 3 hours during the weekend. On the other hand, those with afternoon and evening classes maintained a more balanced sleep schedule.

The variability between week and weekend sleep-wake times is so great that about twice (11 - 17%) as many students report symptoms consistent with Delayed Sleep Phase Syndrome (DSPS) than the general population (Brown, Buboltz, & Soper, 2001; Lack, 1986). This disorder is marked by progressively later sleep-wake times on non-work/school days resulting in poor job/academic performance during the week due to excessive sleepiness.

Unfortunately, many student sleep difficulties extend beyond voluntary schedule variations to frequent involuntary sleep complaints. At least two-thirds of college
students report occasional sleep disturbances with about one-third reporting regular, severe sleep difficulties (Brown et al., 2001; Coren, 1994; Lack, 1986). In a recent study (Buboltz, Brown, & Soper, 2001) only 11% of students met the criteria for good sleep quality while the rest of the sample reported moderate to severe sleep complaints. Other researchers found that average sleep duration among students decreased from about 7.5 hours in 1969 to approximately 6.5 hours each night in 1989 (Hicks & Pellegrini, 1991). These results not only suggest that students have more sleep problems than the general population, but that such difficulties are increasing.

The prevalence of sleep difficulties is alarming when considering the wide-reaching consequences. Poor sleep quality in college students is related to emotional imbalance, feelings of tension, anger, depression, fatigue, confusion, concentration and memory difficulties, and generally lower life satisfaction (Pilcher, Ginter, & Sadowsky, 1997). Habitually tired students tend to report greater frequencies of negative mood and more incidences of marijuana and alcohol use (Jean-Louis, Von Gizycki, Zizi, & Nunes, 1998). Students who vary their sleep schedules by as little as two hours while still sleeping eight hours, may report greater depressive symptoms, lower sociability scores, and more frequent concentration and attention difficulties (Taub & Berger, 1974). Those with chronic irregular sleep-wake cycles do not adjust to this, but continue to have low levels of energy, emotional distress, slower psychomotor speed, and general decline in alertness (Taub, 1978).

Unfortunately, many students who experience academic difficulties do not realize that poor sleep habits may contribute to their problems. Pilcher and Walters (1997) found that students who stayed up all night before taking a critical thinking test performed
worse than others who had a normal night of sleep, but rated their performance better than non-deprived students. These results do not bode well for all-night study binges since students who do so may impair their functioning; while believing they will perform well. Unfortunately, they may not connect their poor performance to all-night cramming. As a result, students may blame “unfair” tests or professors and may even doubt their own abilities rather than suspect their performance is related to inadequate sleep.

There is a growing body of evidence suggesting that the Rapid Eye Movement (REM) stage of sleep, which is when most dreaming occurs, plays a key role in consolidating newly learned information (DeKoninck, Lorrain, Christ, Proulx, & Coulombe, 1989; DeKoninck, Christ, Hebert, & Rinfret, 1990; Karni, Tanne, Rubenstein, Askenasy, & Sagi, 1994). Students who experience more REM sleep following intensive learning periods tend to perform better on examinations (DeKoninck et al., 1989). Research indicates that depriving students of REM sleep likely will interfere with their ability to perform newly learned tasks, but not previously learned tasks (Karni et al., 1994). Interruption of other sleep stages does not seem to impact recently learned tasks (Karni et al., 1994). Further, the longest REM sleep periods take place during the last two hours of an eight hour sleep period (Smith & Lapp, 1991). Thus, students who reduce their sleep by as little as two hours may miss vital REM time and impair their ability to learn information.

While poor sleep habits in some students may correlate with a lifestyle of alcohol, drug, and tobacco use (Jean-Louis et al., 1998), one cannot assume that this is the case with all students. Many may not fully understand the impact of poor sleep quality and what constitutes good sleep habits. Some may have the mistaken belief that sleep missed
during the week can be recovered on the weekend or that eight hours of sleep is equally healthy regardless of when the eight hours are obtained. Such misconceptions clearly run counter to sleep research (Machado et al., 1998; Taub, 1978; Taub, 1979; Taub, 1980; Taub & Berger, 1973; Taub & Berger, 1974; Taub & Berger, 1976; Taub, Tanguay, & Clarkson, 1976; Wolfson & Carskadon, 1998). The fact that some well-known sleep specialists promote the idea of sleep debt (e.g., Dement & Vaughan, 1999; Hargreaves, 2000), implying that lost sleep can recovered by sleeping longer on weekends, does not help. Thus, lack of knowledge and misinformation about proper sleep habits may contribute to poor sleep habits among students.

Research supports the idea that poor sleep quality in university students is related to lack of knowledge about good sleep habits. In a sample of 963 college students, Hicks, Lucero-Gorman, & Bautista (1999) observed that students averaged a score of 50% correct on a questionnaire that measured knowledge of daily habits that contribute to sleep quality, also known as sleep hygiene. There was a correlation between length of sleep and sleep hygiene knowledge; those with worse sleep hygiene knowledge slept less than those with better sleep knowledge. These results suggest that increasing sleep hygiene knowledge may promote healthier sleep habits.

Considering that lack of knowledge may play a role in poor sleep habits, it is promising that sleep hygiene is easy to learn and rather effective in reducing sleep complaints (Morin, Culbert, & Schwartz, 1994; Morin & Wooten, 1996). Psychoeducational interventions are amenable to the university lifestyle; they can be implemented on a large scale that does not single out individual students, are less
intimidating than psychotherapy, and are more effective without the negative side effects of pharmacological interventions (Morin et al., 1994; Morin & Wooten, 1996).

Meta-analytic studies indicate that behavioral interventions, ranging from simple instructional procedures to multiple cognitive-behavioral therapy sessions, produce similar results (Bootzin & Perlis, 1992; Lichstein & Riedel, 1994; Morin et al., 1994; Morin & Wooten, 1996; Murtagh & Greenwood, 1995). The comparability of interventions, the need for brief non-invasive treatments, and the belief that many students have poor sleep habits due to lack of knowledge suggest that sleep hygiene guidelines and stimulus control instructions may be particularly effective psychoeducational interventions among university students.

Sleep hygiene instructions refer to educating poor sleepers about activities that can improve or interfere with sleep. Instructions often include recommendations to completely eliminate caffeine intake (with a list of substances that contain caffeine) or reduce it within 6 hours of bedtime, reduce or eliminate alcohol content close to bedtime, maintain a consistent sleep-wake schedule, eliminate late afternoon and evening naps, and restrict early afternoon naps to less than an hour. Sleep hygiene instructions frequently recommend consistent sleep-wake schedules and daily exercise. Some sleep hygiene recommendations also include morning exposure to bright light by sunlight or exposure to an artificial bright light, at least 250 lumens, with brighter light producing quicker results (Harvey, 2000; Riedel, 2000).

Stimulus control instructions refer to the context of sleep and the bedroom. People with insomnia are instructed to only use the bed for sleep and sex, only lie down when sleepy, if unable to sleep after 10 minutes go to another room and do something else (not
work or school related) until feeling tired, awake at the same time regardless of the amount of sleep experienced, and not to nap during the day (Bootzin & Epstein, 2000). These instructions are based on observations that people with insomnia associate the bedroom with anxiety due to difficulties falling asleep which further inhibits sleep. Non-sleep activities in the bedroom may also interfere with sleep. People who conduct multiple activities in the bedroom may associate it with reading, studying, bills, sewing, watching television, or other activities rather than the process of falling asleep (Bootzin & Nicassio, 1991).

Despite the relative ease of implementing psychoeducational interventions, published research that examines the use of such interventions with university students was unavailable at the inception of this study. Thus, the purposes of this study were to: a) develop a manageable psychoeducational intervention program aimed at improving sleep habits and quality in university students; b) evaluate the impact this program had on students knowledge about healthy sleep habits and the importance of such habits; and c) examine the extent to which sleep quality and habits changed after taking part in the psychoeducational program.

Statement of the Problem

At least 30% of students report frequent sleep difficulties (Brown et al., 2001; Coren, 1994; Lack, 1986), some of which may severely impact academic performance (Lack, 1986). A recent study found that only 11% of students surveyed reported good sleep quality according to a standardized sleep quality measure (Buboltz et al., 2001). From 1969 to 1989, the average sleep length among students decreased from about 7.5 hours to 6.5 hours each night (Hicks & Pellegrini, 1991). This is a notable reduction since
eight hours of sleep is considered adequate for most people and students who obtain six hours of sleep or less have greater incidence of cognitive and emotional difficulties (Hicks & Gilliland, 1981; Taub & Berger, 1973).

Poor sleep quality and habits can interfere with many aspects of university life, especially academic performance and mood (Jean-Louis et al., 1998; Ohayon, Caulet, Philip, Guilleminault, & Priest., 1997; Pilcher & Huffcutt, 1996; Pilcher & Ott, 1998; Pilcher & Walters, 1997; Pires de Souza, 1996). Poor sleep quality in college students is related to emotional imbalance, feelings of tension, anger, depression, (Pilcher et al., 1997), drug and alcohol use (Jean-Louis et al., 1998), and the ability to recall newly learned information (DeKoninck et al., 1989; Lack, 1986; Pilcher & Walters, 1997; Ralph, Foster, Davis, & Menaker, 1990). Students are often unaware of the impact that sleep deprivation may have on their behaviors and may be more confident after a night of insufficient sleep than after a good night sleep (DeKoninck et al., 1989; Lack, 1986; Pilcher & Walters, 1997; Ralph et al., 1990). Irregular sleep habits (Taub & Berger, 1974) and sleep-wake schedule variations by as little as two hours, even after obtaining eight hours of sleep, may result in greater incidence of depression, lower sociability, and attention and concentration difficulties (Taub & Berger, 1974).

Hicks et al. (1999) noted that many students may lack knowledge about behaviors that promote or impair sleep quality. A sample of 963 students were administered a questionnaire measuring the accuracy of their sleep hygiene knowledge. They only answered about 50% of the questions correctly. Students with better sleep hygiene knowledge reported longer sleep duration per night than those with poorer sleep hygiene,
lending correlational evidence to the premise that lack of knowledge may contribute to 
poor sleep habits.

Students face many external demands that can interfere with sleep, such as 
examinations, class assignments, social events, and athletic activities. It may be argued 
that such external factors may limit the effectiveness of sleep treatment interventions.
There is evidence that even those facing severe external demands can benefit from 
psychoeducational sleep interventions (Friedman et al., 2000; McCurry, Logsdon, 
Vitiello, & Teri, 1998). Elderly caregivers of dementia patients face especially strong 
external challenges. While this population may not face demands such as track practice, 
fraternity parties, or all-night cramming sessions, they do have the critical responsibility 
of taking care of people who awaken at all hours of the night and without constant 
supervision may wander away and face severe injury or even death. Despite the external 
demands these caregivers face, their sleep quality improved when compared to a control 
group after six weeks of primarily psychoeducational sleep interventions (McCurry et al., 
1998).

In summary, psychoeducational interventions are effective in populations with 
many external demands (Friedman et al., 2000; McCurry et al., 1998) and generally have 
much empirical support (Hryshko-Mullen, Broeckl, Haddock, & Peterson, 2000; 
McCurry et al., 1998; Morin et al., 1994; Murtagh & Greenwood, 1995; Riedel, 2000).
Hicks et al. (1999) argue that many students lack knowledge about behaviors that 
promote or inhibit sleep. Despite empirical support for psychoeducational interventions 
and the strong need for them in the college student population, such interventions 
apparently have not been tested in a controlled study.
Statement of Purpose

The purpose of this study was to develop and evaluate a psychoeducational sleep intervention program for college students. At the inception of this study, there did not appear to be any published studies that evaluated methods to improve sleep habits among students. However, there have been similar studies with other segments of the population such as elderly insomniacs (Friedman et al., 2000; Friedman, Bliwise, Yesavage, & Salom, 1991), elderly caregivers of dementia patients (McCurry et al., 1998), and a variety of clinical patients with primary sleep disorders (Morin et al., 1994; Murtagh & Greenwood, 1995).

Improving sleep habits can remove a self-imposed learning barrier unknown to many university students. Research supports the contention that many students who stay awake all night studying for an exam mistakenly believe their performance was much better the next day than objective evidence would indicate (Pilcher & Walters, 1997). Even students who seemingly receive adequate amounts of sleep are not reaping the full benefits due to their irregular sleep schedules (Taub, 1979; Taub, 1980; Taub & Berger, 1973; Taub & Berger, 1974; Taub et al., 1976).

In addition to examining whether the psychoeducational intervention developed in this study can help students improve their sleep habits, this study also investigated whether more systemic changes need to occur. While Machado et al. (1998) found that students who had classes later in the day reported better sleep habits, it may be difficult to convince universities to change their class and athletics schedules to allow students to sleep later. Thus, it behooves researchers to explore other possibilities for improving sleep quality among students. A psychoeducational sleep intervention program that
includes a relatively brief lecture and handout materials (as used in other studies; e.g., McCurry et al., 1998; Morin et al., 1994; Murtagh & Greenwood, 1995) takes few resources as compared to altering university schedules.

This study was designed to improve student sleep habits through the development of a psychoeducational sleep program and explore the degree to which it can help students sleep better. Even if students fail to improve their sleep habits, presenting psychoeducational sleep information makes poor habits an informed choice. However, the effectiveness of psychoeducational interventions in previous studies suggested this approach would be useful. Specifically, it was predicted that students who took part in the experimental condition that included sleep hygiene and stimulus control instructions would report better sleep habits, sleep quality, and sleep knowledge at the end of six weeks than those students in the control group who received a lecture about research methods.

Literature Review

Historical Foundations

Throughout history, sleep has been an enduring mystery and often was associated with death and the supernatural. For example, in Greek folklore Hypnos, the god of sleep, was the twin of Thanatos, the god of death. They were believed to be offspring of the night. Thus, death was related to sleep. Sleep was viewed as a short death, and death as a long sleep. A main theme was that sleep was not initiated by the brain, but imposed on it (Dement & Vaughan, 1999). Less than 200 years ago, European physicians expressed a similar view, referring to sleep as an intermediate state between wakefulness and death (MacNish, 1834).
With sleep considered death-like, it is no surprise that many cultures viewed dreams as supernatural messages from God or some source in the great beyond. The idea of interpreting dreams first was used in reference to its supernatural meaning. In later years, dream interpretation took on greater psychological emphasis. It was believed that one could grasp a better idea of oneself and perhaps change some maladaptive tendencies through the interpretation of dreams (Thorpy, 1991).

One of the most influential views of dream interpretation came from Sigmund Freud (1900/1953). In his classic work, *Interpretation of Dreams*, Freud stated that dreams are an acceptable way to release sexual and aggressive energy. The id, part of the unconscious, is the source of these instinctual energies. However, the ego, the part that moderates instinctual drives (id) and learned inhibition (superego), find it difficult to fulfill drives that go against what the conscious, based on societal norms, finds acceptable. Thus, the purpose of dreams is to fulfill these drives while protecting the ego. As a result, the dream content (manifest content) symbolizes the unconscious wishes or desires (latent content) that the ego would have difficulty accepting (Freud, 1953).

The turning point of sleep research occurred in 1928 when Berger began his work using the electroencephalograph (EEG). Electrodes are attached on different areas of the scalp with tape or other adhesive. They record the average electrical activity in the area of the brain under each electrode. As sleep research progressed, researchers (Dement, 2000; Kleitman, 1963) started using electrooculographs (EOG) that measure eye movement and electromyographs (EMG) that measure muscle tension in the chin and other parts of the body. Most recently, sleep clinicians started measuring patient oxygen levels, cardiac rhythms, and other muscle activity to differentiate among sleep disorders (Hirshkowitz,
Moore, & Minhoto, 1997). Together these measures constitute polysomnography and play an integral role in better understanding sleep and the underlying physiological processes.

Prior sleep theories were either discarded or modified when scientists realized that even non-dream sleep is an active process. While there are many differing views of non-dream sleep, most current theories fit into two main schools of thought with some overlap, the restorative and evolutionary perspectives.

With the exception of the recently discarded passive view of non-dream sleep, the restorative function of sleep probably is the earliest known western-scientific perspective. While it has undergone many changes since Aristotle proposed it, the general theory that the purpose of sleep is to restore the physical, neurological, and psychological state remains a credible position that fits empirical evidence and intuitive thought (Hirshkowitz et al., 1997).

In the early 1900's a restorative view of sleep known as the hypnotoxin theory was proposed. Like Aristotle's earlier view, it was believed that fatigue is the product of toxins and other substances accumulated during wakefulness that are expelled during sleep. This theory reached its high point in 1907, when French physiologists (Legendre & Pieron, 1910) found that injecting blood serum from sleep deprived dogs into alert dogs resulted in the alert dogs falling asleep. They felt that this sleepiness was due to toxins in the blood of the sleep-deprived dogs. While it since has been learned that such sleepiness is not produced by "toxins" per se, the immune system does produce bi-produces which accumulate during waking hours, lead to sleepiness, and are expelled during sleep (Thorpy, 1991). Further, the pineal gland releases melatonin, a hormone, into the blood.
stream that produces a sleepy sensation at normally scheduled bedtimes (Czeisler, Cajochen, & Turek, 2000; Haimov & Lavie, 1996; Nagtegaal et al., 2000; Rothenberg, 1997). In summary, there are substances that circulate in the blood, although not toxins, that accumulate during wakefulness and are expelled during sleep.

As knowledge about sleep increased, the hypnotoxin view was replaced with a more informed restorative theory that states sleep is a time for cellular rebuilding and growth. This perspective receives strong support by research demonstrating that different stages of sleep play integral roles in organism growth (Arch, Browman, Milter, & Walsh, 1988), neurological functioning (Grosvenor & Lack, 1984; Smith & Lapp, 1991), and learning at both the procedural (Buchegger, Fritsch, Meier-Koll, & Riehle, 1991; Karni et al., 1994) and declarative levels (Grosvenor & Lack, 1984; Smith & Lapp, 1991).

These findings extend well beyond psychological studies to include clear physiological findings. For example, the highest levels of growth hormone secretions, vital to both growth and cell repair, occur during slow-wave sleep (non-REM sleep) and protein synthesis is greatest in the brain during Rapid Eye Movement sleep, the time when most dreaming takes place (Arch et al., 1988). Such findings support a basic view that slow-wave sleep serves as a time to restore the physical state, whereas REM sleep plays a key role in neurophysiological restoration.

The evolutionary theory of sleep, on the other hand, states that the ecology of certain species makes non-responding an important aspect of survival. Sleep serves to maintain these periods of non-responding. Adherents of this position argue that grazing animals that have many predators may sleep for 2 - 4 hours at a time, whereas predator species such as cats and armadillos sleep more (Webb, 1979). Similarly, predatory
animals find food quickly and tend to sleep longer than animals that are at risk of attack and/or take longer to find food (Campbell & Tobler, 1984; Zepelin & Rechtshaffen, 1974). Supporters also take the stance that sleep helps animals conserve energy, much like hibernation.

In summary, there appears to be empirical support for both the restoration and evolution theories of sleep. It is likely that regardless of the timing and length of sleep, it serves a restorative function rather than simply a way to store energy. On the other hand, there is considerable correlational support for the view that the length and timing of sleep relates to the role of an organism in the environment.

**Description of Sleep**

To observers, sleep appears to begin when people close their eyes, settle into a relaxed posture, and breathe at a steady rate. However, this does not differentiate among people who are relaxed, in a coma, or sleeping. In the search for clearer definitions of sleep, researchers explored behaviors that are concomitant with sleep onset. They found automatic behaviors cease several seconds after people fall asleep and (Carskadon & Dement, 1979) visual (Guilleminault, Phillips, & Dement, 1975) and most auditory evoked (Ogilvie & Wilkinson, 1984) responses cease. At the same time, most sleepers are still able to respond to meaningful stimuli such as their own name and abnormally loud or unusual sounds (Williams, Hammock, & Daly, 1964). Thus, a key aspect to sleep onset is a perceptual screening of all but meaningful and/or potentially dangerous stimuli. This is different than people in comas who are unable to respond or during a time of relaxation when individuals respond to even irrelevant stimuli. However, researchers generally do not define sleep with the above mentioned behavioral changes. Rather, they often use
polysomnographic equipment that measures brain waves (EEG), eye movements (EOG), and muscle tension (EMG).

EEG activity is characterized by electrical wave frequency, which is the number of waves per second, and amplitude, or the height of the wave, which indicates the level of microvolts of electrical brain activity. The activity levels are divided into four categories based on frequencies. Delta waves are the slowest and range from 0.5 - 3.0 cycles per second. Theta waves are slightly faster and range from 4 – 7 cycles per second. Next, alpha waves extend from 8 – 13 cycles per second. The fastest waves are called beta waves and range from 14 – 25 cycles per second. Sleep onset is characterized by reduction and eventual cessation of alpha waves and theta spikes of activity detected by electrodes on the top of the scalp.

EOG activity is measured with electrodes that gauge eye muscle activity. During the four stages of non-REM sleep, eye movements are characterized by very slow, rolling actions and disappearance of rapid eye movement and blinking. Eye movement during REM sleep, as the name implies, is rapid and seems to emulate the type of movements seen during activities while awake.

Electromyographs (EMG) measure general muscle tension. During non-REM sleep most voluntary muscles are relaxed, but little more than while relaxing when awake. However, during REM sleep, EMG activity is so low that most voluntary muscles are essentially paralyzed.

In summary, polysomniography equipment demonstrates distinct patterns of activity at the point of sleep onset. There is a cessation of alpha waves and onset of theta wave spikes, eye movement is reduced to a slow, gentle rolling of the eyes, eyelids are
relaxed, and most voluntary muscles are in a state of relaxation (Rechtschaffen & Kales, 1968). The use of such equipment has resulted in researchers labeling four non-rapid eye movement sleep stages and one stage of Rapid Eye Movement sleep (REM).

**Sleep Stages**

Initially upon falling asleep, people enter stage one sleep which normally persists only a few minutes after sleep onset. During this stage, muscles begin to relax which is followed by loss of alertness and light sleep. The EEG pattern mainly consists of small irregular waves (characteristic of the awake state) intermixed with some alpha waves (Carskadon & Dement, 2000). Sleepers tend to be easily awakened during this stage and often deny they were asleep. A common sign of disturbed sleep is a greater percentage of stage one sleep, which is why many insomniacs may receive more sleep than they acknowledge (Carskadon & Dement, 2000).

In stage two, sleep deepens and the body temperature lowers slightly. EEG readings now include sleep spindles and K complexes. Sleep spindles are EEG wave bursts with an average frequency of 11.5 to 16.0 cycles per second and last for at least 0.5 seconds. A K-complex is a sharp high amplitude wave followed by a smaller positive wave. In healthy young adults, stage two sleep continues for 10 to 25 minutes. A more intense stimulus is required to produce arousal at this stage. As stage two progresses, high voltage (≥ 75µV) slow (< 2 cps) wave activity, known as delta waves, increase. Once delta waves accounts for 20% of electrical activity, stage three sleep begins.

Sleep becomes deeper during stage three sleep. Delta waves increase and K complexes and sleep spindles decrease. This is primarily a transitional stage that usually lasts several minutes and leads into stage four. Stages three and four often are called slow
wave sleep (SWS) due to the prevalence of delta waves. During stages three and four the EEG reading is marked by slow and steady wave activity throughout the brain and sometimes referred to as synchronous sleep (Carskadon & Dement, 2000). Once the delta waves comprise more than half of EEG activity, the person has entered stage four sleep.

Stage four often is called deep sleep because brain waves become almost pure delta and the sleeper is in a state of oblivion. If awoken during stage four, people will display confusion, most likely fall back asleep, and not remember the incident (Williams, Karacan, & Hursch, 1974). During the sleep period following a night of sleep deprivation, SWS predominates over the other stages and significantly less REM sleep takes place (Angus, Heslegrave, & Myles, 1985; Bonnet, 2000). The amount of stage four sleep increases after behaviorally active days (Horne, 1985) and unusually high amounts of exercise (Trinder, Paxton, Montgomery, & Fraser, 1985). Additionally, the greatest amounts of growth hormone are released during SWS (Sassin, Parker, & Johnson, 1969). Together, these findings suggest that the preference given SWS is related to its role in maintaining physical health.

After stage four, people cycle back through stages three and then two. They then enter REM sleep instead of stage one. REM is characterized by vivid dreaming, rapid eye movement, irregular heartbeats, blood pressure changes, and heightened sexual arousal. At the same time, the brain stem paralyzes muscles by inhibiting neural activity, apparently to protect the sleeper from acting out dreams that may result in injury. During this time, the EEG shows irregular, low-voltage fast waves that suggest considerable brain activity, similar to the awake state. However, such individuals clearly are asleep and unable to move (Carskadon & Dement, 2000).
When awakened during REM sleep, volunteers report vivid dream activity. While
dream activity is sometimes reported during other sleep stages, it is most consistent with
REM sleep (Arch et al., 1988). One way to understand the function of REM sleep is to
deprive participants of this stage and examine the impact upon daytime functioning.
Selective sleep deprivation of REM sleep is accomplished by waking sleepers each time
they begin REM sleep.

Selective sleep deprivation suggests that REM sleep is important for consolidating
newly learned information (DeKoninck et al., 1989; Dewan, 1970; Ellman, Spielman, &
Studies also show that students deprived of REM sleep perform worse on examinations
than those who were not deprived (Karni et al., 1994; Pilcher & Huffcutt, 1996; Pilcher &
Ott, 1998; Pilcher & Walters, 1997; Smith & Lapp, 1991). The relationship between
memory storage and REM sleep receives further support by studies indicating that
cholinergic receptors play a key role in both memory storage and REM sleep (Mesulam,
1995; Sitaram, Moore, & Gillin, 1978).

Research demonstrates complex relationships between REM sleep and areas of
the brain related to motivation and emotion such as the locus coeruleus and neighboring
sub-cortical pleasure centers (Ellman et al., 1991). Additionally, the limbic structures of
the brain that participate in learning and memory, motivation, and emotional behavior in
the waking state are activated during REM sleep. Researchers currently are developing
physiological methods to evaluate the relationships among REM dream images, waking
goals, and motivations of the dreamer (Braun, Balkin, & Wesensten, 1998).
Normal sleep processes suggest that precedence is given to SWS. SWS predominates the first half of sleep, whereas REM sleep predominates the second half (Carskadon & Dement, 2000). The effects of sleep deprivation on sleep stages support the hypotheses that the body places precedence on physical health and secondarily on neurological health. Following total sleep deprivation, the first night of sleep is marked by considerably more SWS, while REM sleep does not rebound until the second night following deprivation (Carskadon & Dement, 2000). While this predisposition toward SWS increases the chances people with chronic sleep deprivation remain physically healthy, the consequences of REM sleep deprivation are much more subtle (e.g., attention, memory, and mood difficulties) and may not be readily attributed to sleep difficulties.

The amount of time spent in each sleep stage is influenced by age. Infants experience more REM sleep, very short transitional stages, and do not experience deep sleep. In fact, during the first 2 - 6 months of life infants do not exhibit defined non-REM sleep. This is most likely due to the developing central nervous system and the inability of the brain to initially produce high-voltage SWS (Carskadon & Dement, 2000).

The sleep of young children is characterized by a large percentage of SWS and REM sleep. During this time, there is very little transitional sleep (stages one and two) and children are difficult to awaken. Even a very loud tone (123dB) was unable to awake a group of children whose average age was ten years (Busby & Pivik, 1983).

From early adolescence to age twenty there is a 40% reduction in REM sleep, with the same amount of overall sleep (Carskadon & Dement, 1987). By age 80, very little SWS is exhibited in most humans with greater amounts of stage one and two. REM
sleep has not been shown to change significantly in healthy adults. The amount of REM sleep at night correlates with intellectual functioning (Prinz, 1977). Older adults with conditions of dementia have a marked decline of REM sleep (Prinz, Peskind, & Vitaliano, 1982). Generally, nocturnal awakenings increase with age, some of which are remembered, others that are not (Carskadon, Brown, & Dement, 1982).

In summary for the past 80 years, research has had a significant impact on the scientific view of sleep. Sleep once was viewed as a passive state with occasional dream periods that were supernaturally invoked. As a result of both technological and scientific advances, researchers have learned that sleep is an extremely active time during which complex neurological, physiological, and hormonal changes transpire (Dement, 2000).

**Physiological Processes of the Sleep-Wake Cycle**

While some psychological factors (e.g., personality, depression, and stress) may play roles in sleep difficulties (Monroe, 1967; Taub, 1978; Taub, 1979; Verlander, Benedict, & Hanson, 1999); there are three main physiological processes that directly affect the sleep-wake cycle: the autonomic nervous system, homeostatic drive for sleep, and circadian rhythm (Health, 1998; Refinetti, 2000). These are important to understand because sleep difficulties usually arise from interference with any of these processes.

**Autonomic Nervous System**

The autonomic nervous system is a subcomponent of the peripheral nervous system that controls individual levels of arousal in reaction to both environmental and internal stimuli. The autonomic system is further broken down into the sympathetic system, which activates the human body in response to a stressor or anticipated danger and the parasympathetic system, which calms the body. Sleep is associated with
increased parasympathetic and decreased sympathetic functioning (Parmaggiani, 1994). Electrical stimulation of parasympathetic activating systems in the brain results in behavioral signs of sleep in mammals. Specifically, stimulation of the anterior hypothalamic and preoptic areas of the brain produce parasympathetic signs such as a slower heart rate, lower blood pressure, and constriction of the pupils (Parmaggiani, 1994).

The response of the sympathetic nervous system can be extremely disruptive to sleep. This reaction can occur just as readily to imagined stressors as real environmental stressors. Thus, frustrations associated with transient difficulties falling asleep or worries that develop as people are trying to fall asleep may significantly impair the ability to fall asleep or stay asleep (Parmaggiani, 1994). While most people occasionally have difficulty sleeping, it is when such difficulties become behaviorally associated with the bedroom that chronic sleep problems may develop. As a result, transient sleep difficulties can turn into chronic insomnia (Hauri, 1991).

In summary, the autonomic nervous system plays an important role in the ability to fall and stay asleep. This system is organized to react immediately and can rapidly impair sleep (Parmaggiani, 1994). However, autonomic relaxation is not the only factor that can influence sleep readiness. This is important since most people do not want to fall asleep anytime they begin to feel relaxed. People who have not slept for several days may fall asleep relatively quickly even if under stress. Thus, the homeostatic drive also plays a key role in sleep propensity.
Homeostatic Drive

The longer people remain awake the sleepier they become (Carskadon & Dement, 1981). Periods of sleep deprivation result in shorter sleep onset and even more rapid entry into deep sleep (Roehrs, Carskadon, Dement, & Roth, 2000). In people without sleep disorders, the need for sleep can often be inferred by the length of time it takes to fall asleep or sleep latency. In addition to experimental evidence, this makes intuitive sense and is most likely what contributed to Aristotle's hypnotoxin theory of sleep (Thorpy, 1991). While the term "toxic" may be too strong, it does appear that certain substances accumulate in the body while awake and are reduced during sleep. Such substances promote sleepiness and are partially responsible for the decreased sleep latency after sleep deprivation.

When the body and brain are in the awakened state, ongoing metabolic activity breaks down adenosine monophosphate (AMP) into adenosine. Adenosine is accumulated during wakefulness. This build up of adenosine leads to inhibition of the basal forebrain, part of the brain responsible for maintaining alertness. As adenosine levels increase, the propensity to maintain alertness decreases, resulting in increased drowsiness and sleep (Porkka-Heiskanen, 1999). While asleep, the metabolic activity responsible for the buildup of adenosine decreases, allowing the body to return to lower adenosine levels and increased alertness.

Additionally, prostaglandins, type d2, are endogenous hormones that promote sleep. Prostaglandins (d2) stimulate neurons that inhibit the arousal response of certain hypothalamic cells (Scamel et al., 1998). These chemicals are present throughout most of the body. Prostaglandins are natural by-products of immune system activity. While
healthy people produce prostaglandins, they are produced at a faster rate when the immune system is fighting infection. This is why people often feel sleepier when ill. Thus, prostaglandins also play a key role in promoting sleep in people who have been awake for extended periods of time (Ram et al., 1997; Scamel et al., 1998).

While the autonomic nervous system can influence ability to fall asleep by affecting (Parmaggiani, 1994) levels of arousal, the homeostatic processes plays an important role in the tendency to fall asleep. Entering a state of relaxation after a night of sleep deprivation, however, does not ensure eight hours of restful sleep outside the normal sleep-wake schedule (Parmaggiani, 1994). Timing that is consistent with the circadian rhythm or sleep-wake cycle, is the third factor required for good sleep (Cohen & Albers, 1991; Czeisler et al., 2000; Gillette & McArthur, 1996).

**Circadian Rhythm**

Human beings have a variety of biological rhythms. The duration of such rhythms may vary from a matter of minutes to more than a year. There is approximately a 90 minute cycle of alertness and drowsiness in human beings that influences both their day and night activity level (Coleman, 1986). Another longer cycle is the 28-day menstrual cycle in human females and the comparable, although not as obvious, sex hormone secretion cycle in men (Parlee, 1982). In other instances, year long cycles may appreciably impact individuals' moods based on certain seasonal changes, as in the case of seasonal affect disorder. In this disorder, people become depressed in the winter months associated with lower levels of light and return to a non-depressed state during the rest of the year (Nelson, Badura, & Goldman, 1990). However, of all biological
rhythms, the daily sleep-wake cycle or circadian rhythm is one of the most readily observable.

While sleep researchers were hypothesizing about daily sleep rhythms for years, Richter (1967) conducted the first well-recognized, systematic study to localize the circadian pacemaker in a series of lesion and dissection experiments using rats. Circadian activity rhythms were found to persist after the removal of various endocrine organs or focal destruction of many brain areas but were abolished by large lesions placed ventromedially in the hypothalamus, a part of the brain associated with hormone, temperature, and appetite regulation. However, a specific location was not identified (Richter, 1967). Then in 1972, researchers observed that the destruction of the bilaterally paired suprachiasmatic nuclei in the anterior portion of the hypothalamus in rats lead to the loss of daily biological rhythms, such as the circadian rhythm and related hormone release cycles (Stephan & Zucker, 1972).

The role that the suprachiasmatic nucleus has in the daily sleep-wake cycle continues to receive support in numerous studies. After the suprachiasmatic nuclei from hamsters that had a 20-hour cycle were transplanted into hamsters that had a 24-hour circadian rhythm, the donors demonstrated a 20-hour circadian rhythm. Further, the opposite happened when the suprachiasmatic nuclei of hamsters with a 24-hour circadian rhythm were transplanted into hamsters with a 20-hour cycle (Ralph et al., 1990). This supports the idea that there is an endogenous, possibly genetic component to the length of circadian rhythms.

In mammals (including humans) there is a tendency for the circadian rhythm to extend to 25-hours when environmental input is removed. After researchers isolated the
suprachiasmatic nuclei in rodents via lesions, the circadian rhythm continued but increased from a 24-hour to a 25-hour day (Groos & Hendricks, 1982; Inouye & Kawamura, 1979). In another study, human volunteers lived in an environment that lacked all external cues of time. Most of the participants shifted from a 24-hour cycle to a 25-hour cycle (Moore-Ede, Sulzman, & Fuller, 1982). The 25-hour or longer sleep-wake cycle that occurs due to the suprachiasmatic nuclei isolation from environmental cues either through lesions or voluntary isolation is referred to as a free-running rhythm. While the circadian rhythm generally may be endogenous in nature, it requires external cues for accuracy. These external cues are commonly known to sleep researchers as zeitgebers, which in German means "time-givers."

Although research suggests that exercise (Youngstedt, Kripke, & Elliott., 1999), noise, meals, and temperature (Refinetti, 2000) may serve as zeitgebers, it is not clear whether they influence circadian rhythm or general level of arousal. For example, the body is coldest during the middle of the normal sleep cycle. However, this is not a zeitgeber since changing body temperature does not change the circadian rhythm (Turek, 1985). Bright light on the other hand is a zeitgeber that plays a key role in maintaining the circadian rhythm (Ando, Kripke, Cole, & Elliott, 1999; Boivin, Duffy, Kronauer, & Czeisler, 1994; Daurat et al., 1993; Duffy, Kronauer, & Czeisler, 1996; Lack & Wright, 1993; Trinder, Armstrong, O'Brien, Luke, & Martin, 1996).

The suprachiasmatic nucleus receives information about bright light via the retinohypothalamic tract, a bundle of nerves extending from nonvisual photoreceptors in the retina of the eye to the suprachiasmatic nuclei. Damage to the retinohypothalamic
track results in free-running circadian rhythms that are not influenced by environmental patterns of light and dark (Refinetti & Menaker, 1992).

However, there is evidence that the retinohypothalamic track receives input from sources other than the retina. Blind mole rats have folds of skin and fur covering their eyes but light still resets their circadian rhythm (DeJong, Hendriks, Sanyal, & Nevo, 1990). In a study with human beings, volunteers were kept in dim light for four days, with the experimental group being exposed to bright light for three hours a day. This light was focused behind their knees and did not contact their eyes. Even this light reset their circadian rhythms, suggesting that there may be nonvisual photoreceptors in the skin (Campbell & Murphy, 1998).

Physiological studies suggest that both the rhythm of the daily wake-cycle and the time-setting influence of light are controlled within the suprachiasmatic nucleus. Specifically, cells in the ventral (lower) part of the suprachiasmatic nuclei synthesize neurochemicals that are light sensitive, whereas the cells in the dorsal (upper) section produce neurochemicals that are strictly used for keeping time. When the retinohypothalamic track communicates to the suprachiasmatic nuclei that the body is being exposed to light, neurochemicals in the suprachiasmatic nuclei adjust its activity to account for the presence of light (Inouye, 1996).

The suprachiasmatic nuclei primarily controls waking and sleeping through the regulation of melatonin. Melatonin is a hormone that causes sleepiness when released into the blood stream via the pineal gland and possibly other routes. Approximately two to three hours before regular bedtime, the suprachiasmatic nuclei becomes less active and the pineal gland begins releasing melatonin into the blood stream (Dijk & Cajochen,
Sleepiness ensues after melatonin has been in the bloodstream for about an hour. The suprachiasmatic nuclei activity level increases in the morning and informs the pineal gland to stop releasing melatonin. This cessation of melatonin usually is associated with increased alertness (Haimov & Lavie, 1996). People with damage to the suprachiasmatic nucleus have great difficulty maintaining alertness due to the inability to cease the flow of melatonin (Cohen & Albers, 1991).

Regular sleep-wake cycles are dependent on the circadian rhythm set by the suprachiasmatic nuclei and moderated by exposure to light. The circadian rhythm is so important that even people who are sleep deprived have difficulty sleeping outside of their normal sleep-wake schedule. This is why people who fly to different time zones have sleep difficulties. At the same time, people must feel sleepy and relaxed in order to fall asleep. Thus, people who take late afternoon naps will have difficulty falling asleep at their normal bedtime. In summary, the autonomic nervous system, homeostatic sleep drive, and circadian rhythm work together to maintain a normal sleep-wake schedule and ensure 8 - 9 hours of sleep each night. Sleep disorders usually stem from a difficulty in one or more of these systems.

Sleep Disorders

The frequent co-occurrence of sleep difficulties with mental illness makes the diagnosis of sleep disorders difficult. This may be due to the impact of emotional distress on sleep, the impact of sleep difficulties on mental health, or underlying physiological processes that influence both. As a result, diagnosing sleep disorders may be a complex task that should only be done by with a clinical interview and polysomnography (Rothenberg, 1997). While the Diagnostic and Statistical Manual (4th edition): DSM-IV
(American Psychiatric Association, 1994), the International Classification of Diagnosis (9th Edition) (ICD-9: U.S. Government, 1989) and the International Classification of Sleep Disorders (ICSD: American Sleep Disorders Association, 1997) have slightly different categories with the ICSD having the most categories. Rothenberg (1997) pointed out that they agree in most instances. Since this study is based in psychology, the description of sleep disorders will follow the DSM-IV categorization of sleep difficulties.

In order for a sleep difficulty to be a diagnosable disorder it must cause clinically significant distress in social, occupational, or other important areas of life. The DSM-IV (American Psychiatric Association, 1994) broadly separates sleep disorders into three main groups. The first group contains Primary Sleep Disorders that principally are the result of difficulties in sleeping rather than other mental or medical problems. This category is divided into Dyssomnias, which refer to disturbances in the amount, quality, and timing of sleep; and Parasomnias, which refer to abnormal physiological or behavioral events that occur during sleep. The second diagnostic group is Sleep Disorders related to another Mental Disorder. In this group, sleep difficulties are severe enough to warrant attention, but are not the main cause of mental difficulties. The third group of Other Sleep Disorders include either sleep difficulties due to a medical disorder or a substance-induced sleep disorders. While this study focused on Primary Sleep Disorders, these latter two groups are important to note because if sleep difficulties are secondary to a substance abuse, mental, or medical disorder different treatments are required (American Psychiatric Association, 1994).

While survey research typically is a source for prevalence estimates of sleep disorders, it is important to realize that clinical interviews and objective sleep measures
are required for proper diagnoses of sleep disorders. Further, different sleep disorders have similar symptoms. One should not use the results of survey data alone to diagnose people without accompanying interviews. On the other hand, there is empirical support for using self-report measures because such measures tend to be more indicative of subjective life difficulties than more objective measures (Pilcher et al., 1997; Spinweber, Johnson, & Chin, 1985). While not providing a clear diagnosis, survey studies can suggest useful estimates of the prevalence of sleep difficulties within a given population. Regardless of the measures used, it is important to have a general understanding of different types of sleep disorders. The following section reviews general aspects of each disorder including a description and prevalence information when available.

Dyssomnias

Dyssomnias are sleep disorders related to disturbances in the quantity, quality, or timing of sleep. As a result people complain of insufficient sleep or excessive sleepiness. It is important to note that Dyssomnias must be the primary complaint. If the sleep difficulty is secondary to substance abuse or another mental or medical disorder, it is not considered a Dyssomnia. The following section will briefly describe aspects of each type of Dyssomnia.

Primary Insomnia. Within Dyssomnias, Primary Insomnia refers to difficulty initiating or maintaining sleep, or non-restorative sleep. These difficulties must last for at least one month (American Psychiatric Association, 1994). People with this disorder often feel exhausted and/or irritable the next day, worry about not sleeping, dread going to bed, and may unexpectedly doze at inappropriate times. Many people have occasional difficulty falling asleep upon retiring or awakening during the night and have difficulty or
are unable to return to sleep (Rothenberg, 1997). A diagnosis of Primary Insomnia is warranted when these difficulties become a regular occurrence and interfere with important aspects of life (American Psychiatric Association, 1994).

The overall prevalence of insomnia ranges between 15 - 30% in the general population. However this is not restricted to Primary Insomnia and may include mental and medical difficulties. Research suggests that only 15 - 25% of people with chronic insomnia have Primary Insomnia (American Psychiatric Association, 1994). There may be numerous causes of Primary Insomnia. It often begins as a temporary difficulty associated with a life situation or physiological illness, the problem is that it often persists long after the initial causes are resolved. Thus, when going to bed during non-stressful times, people often maintain these negative associations and retain behavioral reactions that are incongruent with sleep. Primary Insomnia usually begins during young adulthood or middle age but seldom occurs in childhood or adolescence (American Psychiatric Association, 1994; Rothenberg, 1997).

*Primary Hypersomnia.* People with Primary Hypersomnia have had excessive sleepiness for at least one month that is not the result of an inadequate amount of sleep (American Psychiatric Association, 1994). If sleepiness is due to Primary Insomnia, other Dyssomnias, or Parasomnias then it cannot be Primary Hypersomnia. Many people with this disorder fall asleep quickly, sleep soundly from 8 – 12 hours and have extreme difficulty waking in the morning. The commonly occurring low levels of alertness contribute to poor cognitive efficiency, concentration, and memory difficulties throughout the day. In addition to occupational and school impairment, social difficulties
are also common since others may misattribute their sleepiness to boredom or aloofness (American Psychiatric Association, 1994).

In the general population, the prevalence of Primary Hypersomnia is unknown. However, its prevalence ranges between 5 - 10% of patients in sleep disorder clinics. Hypersomnia usually begins between the ages of 15 and 30. Once people develop this disorder, their symptoms are usually chronic and stable. It is important that individuals diagnosed with Hypersomnia undergo an overnight sleep test in a laboratory with polysomnographic equipment because this disorder can be secondary to sleep apnea, during which the sleepers breathing momentarily stops many times throughout the evening (Johns, 1992; Newman et al., 2000).

Breathing Related Sleep Disorder. Breathing-Related Sleep Disorder is a sleep disruption due to breathing difficulties that leads to excessive sleepiness or insomnia. (American Psychiatric Association, 1994). This can be separated into three different types subtypes. Obstructive Sleep Apnea is the most common type during which muscles and soft tissue of the throat collapse and result in reduce or obstructed airflow. People with this disorder complain of excessive sleepiness and often have a history of loud snoring. Obesity can contribute to this difficulty (Moran, Thompson, & Nies, 1988). In addition, alcohol and hypnoanxiolytic drugs may convert snoring into Apnea (American Psychiatric Association, 1994). Bed partners often will hear loud snoring mingled with moments of silence when breathing stops and then gasping as breathing returns.

Central Sleep Apnea is characterized by a cessation of airflow but not due to obstruction. These patients do not necessarily snore and it is not usually related to obesity. This problem often is associated with cardiac or neurological conditions that
influence breathing regulation. People with this difficulty most often present with complaints of insomnia due to repeated awakenings but are unaware of breathing difficulties.

Central Alveolar Hyperventilation Syndrome is characterized by impairment in breathing control that results in decreased arterial oxygen levels that are worsened during sleep. This form of breathing difficulty usually occurs in extremely overweight individuals. Individuals with this difficulty may complain of either sleepiness or insomnia. In addition to the main features of this disorder, individuals may also complain of nocturnal chest pains, choking sensations, or intense anxiety. People with this disorder often are described as restless since they may awake violently after being unable to breathe. People with this problem may have extremely dry mouths while sleeping and often drink water during moments of wakefulness. They have a great deal of difficulty waking and complain of dull morning headaches that last for 1 - 2 hours after waking. Further, breathing difficulties may lead to memory, concentration and other cognitive disturbances.

The excessive sleepiness that accompanies these difficulties often may lead to social, occupational, and educational impairments. Obstructive Sleep Apnea occurs in approximately 1 - 10% of the adult population, but tends to be slightly higher in older individuals. Most individuals demonstrate sleep apnea between the ages of 40 - 60 years old. The prevalence of the other breathing related sleep disorders varies considerably. Central Sleep Apnea is more common in the elderly with central nervous system disorders or cardiac disease. On the other hand, Central Alveolar Hypoventilation syndrome may develop at any age (American Psychiatric Association, 1994).
Narcolepsy. Individuals with Narcolepsy have irresistible attacks of sleep on a daily basis for at least 3 months. People with this difficulty describe their sleep episodes as irresistible. These attacks of sleep can occur in situations where it is inappropriate and even dangerous, such as during class or while driving an automobile.

Approximately 70% of people with Narcolepsy develop cataplexy, an inhibited muscle tone in which individuals report symptoms that range from feeling weak to actually falling down in a paralytic state. Narcolepsy is similar to the paralyzed state that people enter while in REM sleep. Episodes of paralysis occur while people are awake and are often triggered by strong emotional reactions including laughing, crying, anger, and surprise. These are more common when individuals do not receive enough sleep (American Psychiatric Association, 1994).

The close association with Narcolepsy and REM sleep does not limit itself to cataplectic episodes. About 20 - 40% also experience intense, dreamlike hallucinations as they are falling asleep or upon awakening. They may feel extremely real and as a result can be very frightening (Rothenberg, 1997). In addition, 30 - 50% of people with Narcolepsy experience sleep paralysis immediately before or after awakening. These paralysis and hallucinations may occur simultaneously and may be terrifying (American Psychiatric Association, 1994; Rothenberg, 1997).

People with Narcolepsy often develop problems that reduce their quality of life. They may engage in daily activities with reduced awareness resulting from excessive sleepiness. Their fear of falling asleep and/or having episodes of catalepsy may result in avoiding social situations and an over-controlled tendency that impairs social relationships. The danger of falling asleep while driving also may impair their
independence. Keeping these difficulties in mind, it is no surprise that approximately 40% of people with Narcolepsy have other disorders. Mood disorders are most common, followed by substance-related disorders and anxiety disorders (American Psychiatric Association, 1994).

Considering all the difficulties associated with this disorder, it is fortunate that Narcolepsy is rare. Epidemiological studies indicate that approximately 0.02 - 0.16% of adults have Narcolepsy. Genetic factors play a role in the development of Narcolepsy with 5 - 15% of first-degree relatives having the disorder. In addition, 25 - 50% of first-degree relatives have other disorders marked by excessive sleepiness. Most people with this disorder begin to experience excessive daytime sleepiness during adolescence. The literature does not list many treatments for this Narcolepsy, although the DSM-IV (American Psychiatric Association, 1994) recommends the use of stimulants.

Circadian Rhythm Disorders. Circadian Rhythm Disorders are the result of a mismatch between the sleep-wake cycle required by the environment (school, occupation) and endogenous sleep-wake patterns. People with Circadian Rhythm Disorders may have histories of alcohol and drug abuse from attempts to control their sleep habits. Unfortunately, this may exasperate their symptoms. In addition, people with these disorders may have greater cardiovascular and gastrointestinal disturbances (American Psychiatric Association, 1994).

People who habitually move their bedtime later, have difficulty falling asleep during their normal scheduled wake time, sleep progressively later on non-work/school days, and experience great difficulty waking for work may be suffering with a Circadian Rhythm Disorder of the Delayed Sleep Phase type more commonly referred to in the
literature as Delayed Sleep Phase Syndrome (DSPS). People with DSPS have great difficulty maintaining socially acceptable sleep-wake schedules. Such people often experience chronic sleep deprivation from being unable to get enough sleep during the week and as a result may feel excessive sleepiness during the day. Unfortunately, their tendency to sleep late on weekends exacerbates DSPS by further delaying their circadian rhythm (American Psychiatric Association, 1994).

While adolescents and young adults may voluntarily delay their sleep phase, those without Delay Sleep Phase Syndrome (DSPS) will be able to resume their earlier bedtime (Rothenberg, 1997). People with this disorder represent approximately 1.2% of patients at sleep treatment centers and 39.1% of people with Circadian Rhythm Disorders (Coleman et al., 1982). Studies indicate that DSPS affects approximately 7.3% of adolescents (Pelayo, Thorpy, & Glovinsky, 1988). Prevalence studies indicate even higher rates of DSPS in college students, ranging from 11 to 17% (Brown et al., 2001; Lack, 1986).

The Jet Lag type of Circadian Rhythm Disorder arises from an abrupt shift in sleep-wake schedules that occurs from flying across time zones (American Psychiatric Association, 1994). Many people experience malaise, fatigue, and disrupted sleep following transoceanic or transcontinental flights as well as a decrease in such symptoms once the body starts to adjust to the new time zone. In addition to sleep difficulties, Jet Lag is often accompanied by headaches and indigestion due to travel conditions, caffeine use, and the internal desynchronization that accompanies a constantly changing schedule (Graeber, 1994).

The Shift-Work type often is the result of workers who are asked to change their sleep-wake schedules with many variations. This is worsened by alterations in sleep-
wake schedules on days off that complicate adjustment to changing work shifts. This type of disorder is marked by difficulty sleeping during the day and problems maintaining alertness at night. Rotating shift schedules tend to be the most disruptive Circadian Rhythm Disorder because they do not allow consistent adjustment. In addition, fluctuating schedules can detrimentally impact social and family life. Symptoms usually persist as long as the troubling schedule exists and usually subside after about a two week regular sleep-wake schedule (American Psychiatric Association, 1994).

*Dyssomnias Not Otherwise Specified.* Dyssomnias Not Otherwise Specified refers to symptoms that result in sleep difficulties that do not meet the criteria for any specific disorder (American Psychiatric Association, 1994). For example, Periodic Limb Movement Disorder is the result of muscle contractions of a limb, usually the lower leg, that occur at 20 - 40 second intervals episodically or continually throughout the night. The chief result is disruption of sleep by brief arousals that may or may not follow each limb movement. Large numbers of arousal may lead to increased daytime sleepiness (Rothenberg, 1997).

*Parasomnias*

Parasomnia Disorders are indicated by abnormal behavioral or physiological occurrences that are associated with sleep, specific sleep stages, or sleep-wake transitions. These events take place at inappropriate times during the sleep wake cycle. People with Parasomnias often complain of unusual behavior during sleep (American Psychiatric Association, 1994). As with the Dyssomnias, it is important to realize that substance abuse, mental, or medical disorders need to be ruled out before diagnosing a Parasomnia.
**Nightmare Disorder.** People with a Nightmare Disorder have repeated awakenings from major sleep periods or naps marked by detailed recall of extended and very frightening dreams that involve threats to survival, security, and/or self-esteem (Rothenberg, 1997). Awakenings usually occur during the second half of an eight-hour sleep period. Upon awakening, individuals with these nightmares rapidly become oriented and alert but lingering fear makes it difficult to return to sleep (American Psychiatric Association, 1994). While many people experience occasional nightmares, those with a Nightmare Disorder have difficulty functioning during the day and often fear going to sleep.

The prevalence of this disorder is currently unknown. While almost 50% of adults and children complain of nightmares, it is difficult to determine whether the symptoms are of enough severity to meet the criteria of a Nightmare Disorder without clinical interviews. Nightmares are rather common for children between three and six years old. Most outgrow their problems with nightmares. However, if they persist into adulthood, nightmares are likely to be a significant life-long problem (American Psychiatric Association, 1994).

**Sleep Terror Disorder.** A Parasomnia that may be confused with a Nightmare Disorder is Sleep Terror Disorder. However, with this disorder people do not retain the ability to recall a detailed dream. Individuals awake with a panicky scream, experience intense anxiety, signs of autonomic arousal, and are relatively unresponsive to the comforting of others (American Psychiatric Association, 1994). If awakened during an episode, sufferers are confused and disoriented for several minutes and recount vague feelings of terror even though they are unable to recall the reason.
Children with this disorder usually do not have higher incidence of mental disorders than the general population. Adults often have accompanying difficulties such as Posttraumatic Stress Disorder, Anxiety Disorders, Dependent, Schizoid, and Borderline Personality disorders. There is limited information regarding the prevalence of Sleep Terror Disorder, about 1 - 6% of children and less than 1% of adults complain of sleep terror episodes. It is unclear how many experience impairment in the daily functioning (American Psychiatric Association, 1994).

Sleepwalking Disorder. People with Sleepwalking Disorder have repeated episodes of arising from bed while asleep and walking about. This usually happens during SWS in the first third of an eight-hour sleep period. They often walk about with a blank expression on their faces and can only be awakened with great difficulty. People with this disorder are usually amnesiac about their walking episodes the next morning (American Psychiatric Association, 1994).

A variety of behaviors may occur during these episodes. In mild sleepwalking episodes, people may sit-up in bed and look around. However, it is more common for them to get out of bed, walk around the house, and even leave their home, which can be dangerous. In some instances individuals may talk with others and not remember any aspect of the events. These people may wake in places other than their bedrooms and feel rather confused. Due to the amnesiac quality of this disorder, individuals do not usually experience personal distress from sleepwalking. However, their sleep walking behavior may be distressful to others and result in social and occupational impairments.

Psychological or physiological stressors may increase the likelihood of sleepwalking. Approximately 10 - 30% of children have at least one incident of
sleepwalking. Repeated episodes are much more unusual (1 - 5%). Sleep walking usually begins between 4 - 8 years of age and then peaks at about age 12. Epidemiological surveys suggest that the prevalence of sleepwalking ranges from 1 - 7% in adults. A family history has been reported in up to 80% of people with a Sleepwalking Disorder.

*Parasomnias Not Otherwise Specified.* Individuals with Parasomnia Not Otherwise Specified have abnormal behavioral or physiological events during sleep or sleep-wake transitions that do not meet the criteria for a specific Parasomnia. For example, individuals may suffer temporary paralysis while waking or falling asleep, lash out violently while sleeping, or have some symptoms associated with the other disorders, but not enough to meet the full criteria.

In summary, sleep disorders are divided into two different groups: Dyssomnias, which refer to difficulties regarding the amount and timing of sleep, whereas Parasomnias refer to unusual conditions that take place during sleep. Considering the nature of this study, the primary focus will be on Primary Insomnia and Circadian Rhythm Disorders. Such sleep difficulties are more readily identified by surveys, tend to be the most common types of sleep complaints in university students, and are usually related to lifestyle and daily behaviors present in the university setting (Lack, 1986). Further, these disorders are most commonly treated with psychoeducational interventions. Disorders that represent physical or neurological difficulties often require more invasive treatments such as drugs in the case of narcolepsy or surgery in the case of sleep apnea. Symptoms related to different disorders are helpful for understanding the sleep habits and difficulties often faced by university students.
**Sleep Habits and Difficulties in University Students**

Most studies exploring the sleep habits and difficulties of university students focus on describing general sleep difficulties rather than supplying information about the prevalence of diagnoses. Considering that these are primarily self-report studies, describing rather than diagnosing is more appropriate since clinical interviews were not conducted. However there are occasional references to diagnosable disorders for the sake of simplicity.

From 1969 through 1989, there was a notable decline in the average length of sleep. One study found that the median amount of sleep students received in 1969 was 7.8 hours, 7.1 hours in 1979, and 6.8 hours in 1989 (Hicks & Pellegrini, 1991). While these results are presented in a brief article, the authors provide a table from which further inferences may be drawn. In 1969, 9% reported average sleep durations of less than 6.5 hours. Then in 1979, 26.9% of students reported receiving less than 6.5 hours sleep. The amount of sleep continued to decline in 1989, during which 41.5% of students reported consistently receiving less than 6.5 hours. In 1989, about half the number of students surveyed reported less than 6.5 hours of sleep. While these findings do not include sleep quality indexes, they certainly present an alarming trend in college student sleep habits. Further, this trend discounts the idea that poor sleep is simply part of student life — it was not for the majority of students in 1969.

Hicks and Pellegrini’s (1991) study was not the first to demonstrate that sleep difficulties are becoming an increasingly severe problem for university students. Twenty years ago, Domino and Fogl (1980) noted their surprise at the lack of normative sleep studies and proceeded to explore sleep patterns of college students. They developed and
administered a sleep scale they called the SQ 51, which was administered to a random sample of undergraduate students that consisted of 60 males and 71 females. The results indicated that 7% used medication for sleep difficulties, 13% reported their sleep was usually restless, and 39% reported that they often had highly irregular sleep schedules (Domino & Fogl, 1980).

Several years later in a sample of Australian college students, Lack (1986) found that the most commonly reported symptoms were difficulties falling asleep (18%), early morning awakenings (13.2%), general sleep difficulties (12.8%), and difficulties staying asleep (9%). Only 8% reported never having had sleep difficulties. Notably, when sleep complaints were examined for each student, 17% of the students had symptoms consistent with Delayed Sleep Phase Syndrome. This is more than twice the estimated prevalence for the general population, which is about 6 - 7% (American Psychological Association, 1994; Lack, 1986). Students who met the criteria for Delayed Sleep Phase Syndrome had lower grades, greater feelings of drowsiness, and irritability when compared to the rest of the sample.

Older subjects reported less sleep during the week, reduced perceived need of sleep, and greater drowsiness during the day. Younger subjects reported more variability in their sleep habits, longer sleep onset latencies, and greater difficulty falling asleep. Females reported a greater perceived need for sleep, but less total sleep time and received less adequate sleep on weekends. Females also took more frequent naps, were more irritable, and were more likely to describe themselves as insomniacs than males. There were no significant gender differences for sleep onset latencies, difficulties falling asleep, or difficulties staying asleep (Lack, 1986).
A sample of United States college students also reported a higher prevalence of Delayed Sleep Phase Syndrome than the general population (Brown et al., 2001). These results indicate a lower prevalence rate of Delayed Sleep Phase Syndrome (11.5%) than the Australian sample but higher rates of some specific sleep complaints. Sleep difficulties most commonly reported "frequently" or "almost always" were early morning awakenings (25.5%), general sleep difficulties (21.9%), difficulty falling asleep (19.5%), daytime napping (15.1%), and difficulty staying asleep (10.9%). Students in the United States sample went to bed later during the weekend than the week and received less sleep during the week. Additionally, females reported more frequent difficulties falling asleep and staying asleep than males. The types of complaints were similar to the Australian sample with a greater prevalence for specific complaints. Despite some minor differences, these findings support a consistent pattern of poor sleep habits in university students from two geographically diverse samples.

Buboltz et al. (2001) found that only 11% of college students reported symptoms consistent with good sleep quality, 73% of the sample reported moderate sleep problems, and 15% of the sample had symptoms consistent with poor sleep quality according to a standardized sleep quality measure. Compared to the general adult population, these students reported 60% greater incidence of poor sleep quality than the original standardization sample of working adults (Buboltz et al., 2001).

Another study (Hawkins & Shaw, 1992) examined sleep logs at three different week periods during the academic semester. Sleep logs were comprised of a seven-item questionnaire that included items asking about the amount of time in bed, level of satisfaction with sleep, and questions related to sleep quality and quantity. The amount of
time in bed declined as the semester progressed and the demands placed on respondents increased. Their nocturnal awakenings decreased with reductions in their sleep length. Ratings of sleep quality did not change throughout the quarter. It should be noted that the definition of sleep quality was based on one item that asked, "How good was your sleep?" Thus, these sleep quality findings are difficult to compare with other studies (Buysse, Reynolds, Monk, Berman, & Kupfer, 1989; Pilcher et al., 1997; Urponen, Partinen, Vuori, & Hasan, 1991) that included the length of time to fall asleep, number of nocturnal awakenings, morning status, and general sleep. Hawkins and Shaw (1992) reported no significant differences according to age. Despite some of the limitations with certain aspects of this study, it is clear that there was a noteworthy decrease in sleep length as the quarter progressed.

Citing the studies mentioned above, Brown and Buboltz (2000) recently explored the combined relationship of sleep quality, quantity, and sleepiness on student academic performance. Ratings of sleepiness became higher as the academic quarter progressed. There was also a reduction in the length of sleep from the beginning ($M = 8.26$, $SD = 1.95$) to the end ($M = 6.81$, $SD = 1.91$) of the quarter. According to the Sleep Quality Index (Urponen et al., 1991), 16.7% of the students were classified as poor sleepers, while about 12% had symptoms consistent with Delayed Sleep Phase Syndrome. Only 8.9% reported that their sleep was free from difficulties. The prevalence of symptoms in this study was similar to previous college student samples.

After reviewing the prevalence of sleep difficulties in students, especially their inconsistent sleep wake schedules, it seems likely that discrepancies between social and academic schedules may negatively impact sleep quality. There is, in fact, empirical
support for this contention. Students who were able to sleep late in the morning due to classes scheduled later in the day had more consistent sleep-wake schedules than those required to awaken for 8 a.m. classes or jobs. Further, students who had morning responsibilities showed evidence of partial sleep deprivation during the week. These results indicate that students may have healthier sleep habits if they are able to take classes and work later in the day (Machado et al., 1998).

In summary, students from different geographic locations tend to report variable sleep schedules, poor sleep quality, and similar sleep complaints. While further studies are warranted from broader geographical regions, clearly many students have poor sleep quality (Brown et al., 2001; Coren, 1994; Lack, 1986). Such difficulties seem to increase during a typical academic term (Brown & Buboltz, 2000; Hawkins & Shaw, 1992) and seem to be worse now than in the 1960’s (Hicks & Pellegrini, 1991).

The high percentage of college students with poor sleep quality probably is not a surprise for most students or faculty. However, it is surprising that despite both the empirically demonstrated high prevalence of sleep difficulties and intuitive sense that students do not sleep well, there do not seem to be any studies that focus on developing interventions to reduce student sleep difficulties nor do there appear to be many studies suggesting that universities are concerned about student sleep habits. Unfortunately, this lack of concern is not warranted by research. The following section reviews the impact of inadequate sleep on college students.

**Importance of Sleep**

A good night of sleep is vital to normal functioning, many with excessive sleepiness report that it has resulted in automobile accidents, occupational accidents, and
job dismissals (Guilleminault & Carskadon, 1977). Several studies found that people with excessive sleepiness had automobile accident rates that were seven times higher than the general population according to records obtained through motor vehicle agencies (Findley, Unverzagt, & Guchu, 1995; Findley, Unverzagt, & Suratt, 1988).

Sleep deprivation also may negatively impact normal growth and development. Two important physiological aspects of physical growth, protein synthesis and growth hormone are at their highest levels during sleep (Parker, Rossman, & Kripke, 1980; Sassin et al., 1969). People who have less than six hours of sleep have a 50% reduction in natural killer T-cell numbers that may dramatically weaken the immune response to infection (Irwin, McClintick, & Costlow, 1996). With such consequences in mind, findings that indicate more than one third of the general population of the United States may be suffering from chronic partial sleep deprivation suggests that poor sleep habits may be one of the most common unrecognized public health problems (Bonnet, 2000; Bonnet & Arand, 1995).

Many in the United States who sleep 5 - 6 hours per night with the goal of greater productivity do not realize that such habits, in addition to increasing chances of mortality, can actually undermine their ability to function. This is especially true in college students for whom attention and memory functioning are vital to learning new information, two aspects of intellectual functioning that may be especially susceptible to partial sleep deprivation (Grosvenor & Lack, 1984; Karni et al., 1994; Webb & Agnew, 1974) The following section discusses the wide-ranging impact that poor sleep habits and difficulties can have on university students.
Poor Sleep Quality and Subjective Complaints

It is easy to imagine two students talking about how tired they feel after a night of poor sleep. However, how much worse do people really feel after a night of diminished sleep and what is meant by not sleeping well? In order to explore these questions, Zammit (1988) compared the symptoms that participants associated with a night of poor quality sleep with those after a night of good quality sleep. While this study did not take place in a controlled environment, it had the advantage of generalizing to everyday life since most people gauge their nights sleep by the way they feel about it, not by polysomnographic measures (i.e. EEG, EMG, and other devices not commonly used by people on a regular basis). Self-report data were collected from 40 traditionally aged university students. They were screened prior to the study for medical, psychological, or sleep difficulties. Participants completed a self-administered post sleep questionnaire developed for this study. The items were designed to measure sleep quality and various psychological factors (Zammit, 1988).

Students considered their sleep quality to be poor after a night of difficulty falling asleep, staying asleep, less time in bed, and less total sleep time. The day after these sleep difficulties, they reported more somatic complaints, greater tendencies toward obsessive-compulsive activities, higher levels of interpersonal reactivity, greater endorsement of depressive symptoms, more anxiety, higher social discomfort, and greater subjective feelings of motor impairment. Thus, people who were considered psychologically healthy according to the pre-participation screening had more psychological complaints after one night of poor sleep quality (Zammit, 1988). If such a drastic change took place after one night, consider the impact of having chronically poor sleep.
Inadequate Sleep Length

Contrary to the assertions of some who habitually sleep less than normal, people do not become accustomed to shortened sleep length. Hicks and Gilliland (1981) explored the impact that chronic sleep deprivation had on attention and coordination of young adults using the Digit Symbol Copy test from the WAIS intelligence test. This test is sensitive to attention and visual-motor coordination difficulties. A group of 11 habitually long sleepers (≥ 9 hours) and 17 habitually short sleepers (< 6 hours) were sampled from a group of 400 first-year college students. The long sleepers scored better on the performance test than the short sleepers. Further, long sleepers scored in the average range for 20 year-olds, whereas short sleepers scored in the average range for 40 year-olds (Hicks & Gilliland, 1981). While the authors may be over-generalizing by focusing on the age-equivalence scores, the results suggest that habitually short sleepers tend to have more attention and coordination difficulties than people who sleep longer.

The aforementioned study referred to two distinct groups. However, research generally indicates that all levels of sleep quality are correlated with health and well-being. Pilcher and associates, (1997) explored the relationships between student health, well-being, sleepiness, sleep quantity, and sleep quality in a two-study research project. Their first study included 30 volunteers from an upper-division psychology class. Participants completed sleep logs to measure their sleep quality and habits for each of the seven days prior to their final exam. The day before their final exam they completed a battery of instruments to measure their sleep quality, health, and well-being during a stressful period of time (Pilcher et al., 1997). In the second study, 87 students from an introductory psychology class participated. The key difference in the second study was...
that the data collection took place during a less stressful time of the semester (the third week). According to these results, poor sleep quality was correlated with increased physical health complaints, irritability, depression, anxiety, fatigue, lower life satisfaction, and subjective impressions of confusion. The data collected during the stressful or the non-stressful time of the academic semester did not differ significantly (Pilcher et al., 1997).

In another study Pilcher and Walters (1997) explored the influence of sleep deprivation on psychological variables related to cognitive performance. A total of 44 college students were randomly assigned to either the 24-hour sleep deprivation condition or the 8-hour sleep condition. Cognitive performance was measured with the Watson-Glaser Critical Thinking Appraisal (WG: The Psychological Corporation, San Antonio, TX), which is a mental effort linguistic task that contains inference, recognition of assumptions, and deduction tasks. Self-report scales were used to measure participant mood, off task cognitions (non-relevant thinking), and estimated performances. The assessment procedures took place at 10 a.m. after the experimental night (Pilcher & Walters, 1997).

Sleep-deprived students made more errors on the Watson-Glaser Critical Thinking Appraisal than non-deprived students. Counter to expectations, sleep deprived participants did not feel that they had more difficulty concentrating or focusing on the relevant task after their night of sleep deprivation. However, objective measures of performance demonstrated that sleep deprived students had more difficulty with critical thinking, concentrating, and attending to relevant stimuli after sleep deprivation (Pilcher & Walters, 1997). These findings imply that students may have reduced critical thinking
ability following an all-night study session, yet have higher estimates of their performance. As a result of their over confidence, students may not blame their poor test performance on poor sleep or study habits since they do not receive their grades until well after their examinations. This may lead to a tendency to blame factors such as the test, professor, or even believe that they lack the ability to learn.

**Regular Sleep Habits**

It is not only the amount, but also the regularity of sleep that can impact daily functioning. Taub (1980) examined the impact of extending sleep on sensorimotor performance, memory, and subjective sleepiness. Sixteen students were randomly selected from a pool of 300 volunteers and were screened to ensure they were free of medical, psychological, and sleep difficulties. During the control night, students slept from 12 midnight until 8 a.m. On experimental nights, students were instructed to pick their sleep-wake times and sleep length. Polysomnographic sleep recordings were collected during both sleep conditions. Short-term memory was assessed with an immediate recall task of unrelated, high frequency nouns. Visual motor reaction times were measured with a serial reaction task that required participants to press a button that matched a randomly illuminated light. Participants also took part in an auditory vigilance task. The Stanford Sleepiness Scale was used to measures students subjective ratings of sleepiness (Taub, 1980).

Students went to sleep at their regular bedtimes. However, they slept approximately two hours longer than normal. They reported more frequent nocturnal awakenings, declines in efficiency on auditory vigilance tasks, and slower serial reaction times. Participants performed worse on the first two-thirds of the words presented but did
not differ on the last third. This may indicate that residual sleepiness after a longer than normal night of sleep can initially impair reaction times (Taub, 1980). In summary, these results indicate that sleeping late on the weekend can impair students functioning on that particular day and may explain the "sleep-drunk" feeling people may experience when sleeping later than normal on the weekend.

Taub and Berger (1973) studied the impact of sleep length and schedule upon performance on timed addition problems, vigilance tasks, and mood. Ten students who met the criteria of "regular sleepers" (usual sleep schedule that extended from 12 midnight to 8 a.m.) were exposed to normal sleep conditions (12 - 8 a.m.), deprived sleep conditions (3 - 8 a.m.), extended sleep conditions (9 p.m.- 8 a.m.), advanced shift conditions (9 p.m.- 5 a.m.), and delayed shift conditions (3 - 11 a.m.) in a well controlled laboratory environment.

Participants performed worse on vigilance tasks and reported more dysphoria, anger, and hostility in the afternoon following any of the non-normal sleep conditions. When comparing the effects of sleep deprivation to sleep extension, participants reported more depressive symptoms following sleep deprivation, whereas their reaction times were slower following sleep extension. The conditions of irregular and shortened sleep were equally detrimental on vigilance tasks. Anger-Hostility mood scores were greater when sleep length was either shorter or longer than normal. Participants made more addition errors following an advanced shift (earlier bed and wake times) than a delayed shift (later bed and wake times). In summary, these findings suggest that shifts in the sleep-wake cycle or sleep duration by at least two hours are comparably detrimental.
Taub and Berger (1974) examined the effects of shifting the sleep times of regular sleepers upon their attention, concentration and mood. Participants were randomly selected from a group of students who were screened for medical, psychological, and sleep difficulties. Attention and concentration were measured with an experimenter paced addition task and an auditory vigilance task. Mood was measured according to a 57-item adjective checklist. There were five sleep conditions. The regular sleep condition took place at 12 - 8 a.m. There were two different advanced sleep times during which students moved their sleep and wake times; these were two or four hours earlier than normal. There were two delayed sleep times that were two or four hours later than normal. Participants took part in all five conditions and order was randomly assigned (Taub & Berger, 1974).

Students produced lower scores on vigilance and addition tasks following any shift from their normal sleep routine. They also had lower scores on alertness and cheerfulness following any shift from their normal sleep schedule. When comparing the delayed and advanced conditions, participants reported more depression, lowered affability, and made more addition mistakes after the advanced condition (Taub & Berger, 1974). These findings suggest that students whose preferred wake up time is after 10:00 a.m. or sleep four hours later than normal on the weekend, but have 8 a.m. classes may have more academic and interpersonal difficulties than students whose classes are later or have an earlier regular wake time.

Taub and Berger (1976) also explored the influence that changing sleep habits of habitually long sleepers (9.5 - 10.5 hours per day) had on their daily functioning. Ten participants were randomly selected from a pool of 17 habitually long sleepers who did
not evidence any medical, psychological, or sleep disorders according to sleep charts, medical, and psychological surveys. Participants took part in each of five conditions in randomly assigned order, including the control (usual sleep habits), extended (three hours longer), reduced (3 hours shorter), advanced (3 hours earlier), and delayed (3 hours later) sleep conditions. All conditions took place in the laboratory and participants refrained from caffeine and naps. Performance measurements were obtained from a 45-minute auditory vigilance task and a 5 minute experimenter-paced addition task. Participant mood was measured with an adjective checklist. Measurements were taken 30 minutes after awakening, midday, and in the evening following each experimental condition (Taub & Berger, 1976).

At the morning and noon assessment times all the experimental groups demonstrated slower reaction times on vigilance tasks and more difficulties initiating activities. At the morning and evening assessment times all the experimental groups made more errors and demonstrated less energy (Taub & Berger, 1976). There were also noteworthy differences between experimental conditions. Morning ratings of sleepiness were greater and energy levels lower following the reduced as compared with the extended condition. Students in the extended condition demonstrated faster reaction times at noon when compared to the advanced condition. These results suggest that habitually long sleepers suffer similar deficits to normal sleepers when their sleep schedule and timing receives interference (Taub & Berger, 1976).

In summary, inadequate amounts of sleep may result in greater health complaints, anxiety, depression, irritability (Pilcher et al., 1997; Zammit, 1988), visual-motor coordination difficulties (Hicks & Gilliland, 1981; Zammit, 1988), and critical thinking
errors (Pilcher & Walters, 1997). Many students may realize they are getting inadequate sleep but mistakenly believe they can “catch-up” on insufficient sleep by sleeping longer on the weekend. However, sleeping longer than normal or having irregular sleep schedules may result in similar deficits experienced by students with insufficient sleep (Taub, 1978; Taub, 1979; Taub, 1980; Taub & Berger, 1974; Taub & Berger, 1976; Taub et al., 1976). The following section discusses the relationships between specific sleep stages, cognitive processes, and emotional functioning.

REM Sleep and Learning

Students who habitually receive inadequate sleep may be missing most of their REM sleep since this stage predominates the last four hours in an eight hours sleep period. The problem with missing REM sleep is that research clearly suggests this stage plays a vital role in storing information learned during the day into long-term memory (Karni et al., 1994; Ohayon et al., 1997; Smith & Lapp, 1991).

Researchers found that students who received more REM sleep demonstrated better learning efficiency (DeKoninck et al., 1989). The study consisted of 10 participants enrolled in a 6-week French immersion course. Baseline polysomnographic readings were recorded for the participants two week prior to the start of the course, a second set of recordings were taken mid-way through the course, and a third set within one month after ending the course.

Students who demonstrated increased REM sleep during and immediately following intensive learning periods were able to recall more recently learned information with fewer errors than students who did not have comparable increases in REM sleep. Similar analysis of other stages of sleep found no significant trends. In other
words, of all the sleep stages, increased language efficiency was associated only with REM sleep (DeKoninck et al., 1989).

Studies show the relationship between learning new information and REM sleep extends beyond the night after which the information has been learned. Smith and Lapp (1991) examined the relationship between important learning events and sleep. They hypothesized that the amount of REM sleep and number of REMs would be higher following a major learning event and that this increase would persist for many days after the end of the learning situation.

A total of 17 senior psychology college students participated, of whom 11 were in the experimental condition and five were in the control condition. Students in the experimental condition took their final examinations, whereas the control group participants were recent graduates who did not take examinations during the experimental time period. All potential participants were screened with the Trent University Sleep Questionnaire and an interview to ensure they were free of major personal problems. During the summer prior to the fall session, participant sleep was recorded on four consecutive nights with baseline polysomnographic recordings that included EEG to measure brain waves, EMG to measure muscle tension, and EOG to measure eye movements during sleep. Polysomnographic recordings were repeated one to three days after their final examinations. The recordings were not taken the night immediately following their examinations because researchers wanted to ensure that sleep deprivation due to cramming did not confound the results. Participants were asked to return two months after their Spring term final examinations for another polysomnograph recording session.
Following the exam period, students in the experimental condition demonstrated more total number of REMs (rapid eye movements) and greater density of REMs (movements within a given time period) than their baseline measures and the control participants. However, there was no significant increase in the length of REM sleep time nor were there any changes in other sleep parameters or stages. When looking at specific REM periods, participants had more REMs during the fifth (and usually final) REM stage of the night, whereas they demonstrated greater REM density during the fourth REM period than their baseline or the control group measurements. In summary, experimental participants had more REMs and greater REM density three to five days following their examinations, especially during the later part of the evening (Smith & Lapp, 1991).

The practical implications of these findings are that students who do not get a full night of sleep tend to miss the last two stages of REM sleep that are also the most vital for memory consolidation. Students who cram the night before a test may miss potential learning benefits of several nights of increased REM sleep.

In addition to academic knowledge, college occasionally requires students to improve their visual-perceptual skills (e.g., sports, performing arts, visual arts). Karni et al. (1994) investigated the influence of sleep on attaining new skills in young adults. The initial night was spent in the sleep laboratory to acclimate to the environment. In the second and third night, baseline measures were recorded to determine normal sleep stage patterns. The fourth and fifth nights consisted of either REM or slow-wave sleep deprivation, depending on which condition participants were assigned. Deprivation was accomplished by ringing a bell each time participants entered either REM or SWS. The sixth and seventh evenings consisted of uninterrupted recovery sleep. A week after the
first set of experiments, the procedures were repeated and participants took part in the experimental conditional in which they did not participate during the first set of conditions. Throughout both experimental conditions, participants took part in learning a novel visual stimulus detection skill, which consisted of identifying three shapes whose orientation was different from the rest of the shapes in the visual field (Kami et al., 1994).

During experimental nights, polysomnographic equipment indicated that deprivation of either SWS or REM sleep was complete. After nights of normal sleep or only SWS deprivation, participants demonstrated improvement in their ability to detect the target stimulus. Participants demonstrated no improvement the day following REM sleep deprivation. Performance on a previously learned visual stimulus task was unaffected by REM sleep deprivation or normal sleep, whereas those deprived of SWS performed worse than expected (Kami et al., 1994). These results suggest that some neurophysiological activity during REM sleep facilitates newly learned skills, whereas a different neurophysiological activity during SWS ensures effective performance on previously learned tasks.

In summary of the relationship between sleep and learning, it is clear that students who do not sleep well the night before an exam will most likely perform worse (DeKoninck et al., 1989; Pilcher & Walters, 1997). Further, the last half of a full night of sleep may play a neurophysiological role in consolidating newly learned information (Smith & Lapp, 1991). Students who are constantly depriving themselves of the last two hours of sleep may be needlessly impairing their ability to learn new information. Unfortunately, many may erroneously believe they can catch up on lost sleep during the
weekend. However, this will probably not help them consolidate information they studied immediately prior to their exam. There also is evidence that sleep irregularity may be as detrimental to cognitive and emotional functioning as sleep reduction (Taub, 1978; Taub, 1979; Taub, 1980; Taub & Berger, 1974; Taub & Berger, 1976; Taub et al., 1976).

Sleeping late on weekends simply makes it more difficult to awaken Monday mornings rather than restore lost sleep. The following section reviews sleep treatments for people with Primary Insomnia, Hypersomnia, and Circadian Rhythm difficulties as well as those with less severe, but detrimental irregular sleep patterns.

Sleep Treatments

Psychological interventions produce reliable, durable improvements in sleep patterns for 60 - 80% of patients with sleep disorders. Pharmacological treatments demonstrate little, if any, effectiveness in treating long-term sleep problems (Lichstein & Riedel, 1994; Morin et al., 1994; Morin & Wooten, 1996; Murtagh & Greenwood, 1995). There is further evidence that pharmacotherapy may even undermine the effectiveness of cognitive-behavioral interventions (Morin, Colecchi, Stone, Sood, & Brink, 1999) Even in the short-term, the expense and side effects of drugs tend to counter the potential benefits (Morin & Wooten, 1996 #120; Bootzin & Perlis, 1992). With the exception of sleep difficulties that require medical interventions, such as narcolepsy or apnea, psychologists are ideally suited to study and provide the treatment of sleep difficulties.

Psychoeducational Interventions

Considering the number of people suffering from sleep difficulties and the rarity of health professionals who are sleep specialists, it is noteworthy that some of the most effective treatments require very little intervention and are primarily psychoeducational
in nature. In fact, psychoeducational interventions consistently produce results at least as
effective as long term psychotherapeutically-oriented interventions and are almost always
more effective than drug therapies (Morin et al., 1994; Murtagh & Greenwood, 1995).

Sleep Hygiene. Basic information about practices that promote and inhibit sleep,
also known as sleep hygiene, is usually provided as a core aspect to all treatments of
insomnia (American Sleep Disorders Association, 1990). Sleep hygiene instructions
usually include a list of behaviors that promote or inhibit sleep. These instructions
typically recommend the cessation or reduction of caffeine, alcohol, and nicotine
consumption, discontinuance of naps in the late afternoon, regular exercise regimes more
than two hours before bedtime, regular sleep-wake times, a comfortable bedroom
environment, and avoidance of stressful or exciting activities close to bedtime (Riedel,
2000). In more recent years, instructions often include the use of bright light therapy to
promote consistent sleep-wake cycles (Bootzin & Rider, 1997).

Sleep hygiene instructions typically accompany several sleep interventions.
However, the results of studies that examined the efficacy of sleep hygiene in isolation
were generally positive. A study of 62 patients who received one session of sleep hygiene
instructions reported improved sleep at one, three, and twelve-month follow-ups (Hauri,
1993). In another study, sleep hygiene produced equivalent results when compared to
relaxation or stimulus control therapies (Schoicket, Bertelson, & Lacks, 1988).

The empirical efficacy of sleep hygiene is important since the instructions tend to
be a combination of logic, clinical experience, and empirical evidence. It is possible that
some sleep hygiene instructions may fit particular individuals better than others, which
may influence views of its effectiveness. Thus, it is important to further address sleep hygiene instructions and accompanying empirical support.

Many are unaware that numerous medications, foods, and beverages contain caffeine. An important part of sleep hygiene includes informing people about products with caffeine and the influence caffeine may have on sleep (Hauri, 1991). Caffeine consumption can produce significant changes in sleep. As little as one cup of coffee can increase sleep onset time, reduce the total amount of sleep, increase awakenings during sleep, and produce lighter sleep through increasing stage one and decreasing stages three and four (Bonnet & Arand, 1992; Roehrs & Roth, 1997). Regular caffeine users may habituate to caffeine and experience less sleep disruptions than occasional users. However, they may continue to demonstrate frequent sleep difficulties (Bonnet & Arand, 1992; Roehrs & Roth, 1997).

It is important to acknowledge individual variability in sensitivity to caffeine (Nehlig, Daval, & Debry, 1992). Caffeine may negatively affect sensitive individuals up to 10 hours after consumption, whereas others may experience little disruption due to caffeine (Roehrs & Roth, 1997). Not surprisingly, poor sleepers tend to be more sensitive to caffeine than good sleepers. Saliva tests indicate that poor sleepers take longer to eliminate caffeine from their blood and experience inconsistent consequences of caffeine than good sleepers (Tiffin, Ashton, Marsh, & Kamali, 1995). Those who do not experience consistent sleep difficulties after caffeine consumption will be especially difficult to convince to eliminate or reduce its use. However, caffeine consumption needs to be eliminated or limited to morning hours for people complaining of sleep difficulties.
In a survey of over 3,500 adults, ranging from 20 – 69 years old, smoking was associated with difficulty falling asleep and greater prevalence of nightmares. Ex-smokers reported comparable sleep quality with non-smokers and had better sleep quality than current smokers (Wetter & Young, 1994). In another study, smokers reported greater difficulty falling asleep and less overall sleep time (Soldatos, Kales, Scharf, Bixler, & Kales, 1980). While these correlative studies support the benefits of smoking cessation, experimental studies indicate sleep difficulties may worsen for up to six weeks after smoking cessation due to the effects of withdrawal. In one study, smokers were assigned to continue smoking, placebo, or transdermal nicotine replacement (Wetter, Fiore, Baker, & Young, 1995). According to both objective and subjective measures, those who continued smoking did not show any changes in sleep, while the placebo group demonstrated sleep deterioration during withdrawal periods. On the other hand, smokers who received transdermal nicotine replacement reported increased sleep difficulties while their polysomnography readings reported improved sleep. Wetter et al. (1995) hypothesized that improvements while using transdermal nicotine replacement may be due to lower, more consistent amount of nicotine (Wetter et al., 1995).

In one study at six weeks post-treatment, ex-smokers continued to report sleep difficulties (Wolter et al., 1996). Smokers were randomly assigned to either one of three experimental conditions with different levels of transdermal nicotine therapy or a control condition with a placebo. Objective measures of movement during sleep demonstrated no significant changes from baseline to one-week follow-up. All groups were then supplied with transdermal nicotine replacement for seven more weeks. Six weeks after the beginning of therapy, there was no significant differences in body movements during
sleep from baseline (Wolter et al., 1996). These findings were counter-intuitive and questionable since their measure of sleep quality was based on wrist movement rather than polysomnographic measures.

In summary, smoking cessation studies produced conflicting results. Correlational evidence supported long-term smoking cessation, whereas shorter-term experimental studies did not. Poor sleepers need to be informed that smoking may worsen sleep. However, they also should be aware that smoking cessation also might initially worsen sleep quality before improving it. While previous studies focused on cigarette smoking, other forms of nicotine such as chewing tobacco should also be discouraged. If a smoker is willing to quit, it should certainly be encouraged. On the other hand, greater compliance may be achieved if other habits are initially altered, especially for those who are not interested in quitting or who have been smoking for many years.

While many people commonly use alcohol as a sleep aid (Johnson, 1997), it actually reduces sleep quality. Occasional alcohol users experience shorter sleep latency but suppressed REM sleep. As the liver processes alcohol, the sedating effects decrease and they experience lighter sleep with more nocturnal awakenings (Roehrs & Roth, 1997). In alcoholics, sleep disruptions worsen over time. Even after cessation of alcohol use, sleep quality may continue to remain poor for weeks or months (LeBon et al., 1997; Roehrs & Roth, 1997).

Breathing suppression and increased limb movements associated with alcohol use can further reduce sleep quality. People who drink more than two servings of alcohol per day are more likely to experience periodic limb movements during sleep (Aldrich & Shipley, 1993). Alcohol consumption increases the frequency of sleep apneas and
hypoapneas during sleep (Guilleminault, Silvestri, Mondini, & Coburn, 1984; Mitler, Dawson, Henriksen, Sobers, & Bloom, 1988). In summary, it is important to emphasis that alcohol may seem to help sleep but in reality it lowers sleep quality and may result in a less rested feeling.

Another common sleep hygiene instruction is to avoid naps. In three separate studies with young adults, researchers found that a two-hour nap in the late afternoon or early evening resulted in longer sleep onset times and reduced stage four sleep during their normal sleeping hours (Feinberg et al., 1985; Karacan, Williams, Finley, & Hursch, 1970; Werth, Dijk, Acherman, & Borberly, 1996). Research demonstrated that early afternoon naps may increase alertness for afternoon or evening classes (Bonnet & Arand, 1994; Taub et al., 1976).

While late afternoon or evening naps can reduce sleep quality, students may continue to take naps. When students insist on naps or the culture encourages siestas, scheduling naps late in the morning or early in the afternoon may minimize sleep-related interference (Czeisler et al., 2000). To minimize sleep disruptions, sleep hygiene instructions should include warnings against naps that last more than an hour and later than 2 or 3 in the afternoon for people who normally go to bed prior to midnight.

Maintaining regular sleep-wake schedules is a sleep hygiene instruction especially relevant to university students. Students need to realize that sleeping 12 hours on weekend nights will not replace the sleep lost from sleeping only 5 hours on weeknights. Such habits will simply result in grogginess, depressed mood, attention and concentration difficulties, poor test performance, and long-term sleep difficulties (Lack, 1986; Machado et al., 1998; Taub, 1979; Taub, 1980; Taub & Berger, 1973; Taub & Berger, 1974; Taub
et al., 1976; Zammit, 1997). Similarly, people need to know that the idea that eight hours of sleep is the most important thing and that sleep debt can be repaid are myths not supported by empirical evidence. Unfortunately some sleep specialists (e.g., Dement, 1999) inadvertently perpetuate such myths by suggesting people can, "repay sleep debt," implying that lost sleep can be paid back.

Since many students will continue to have variable sleep schedules, it is important to include recommendations that will minimize the influence of such variability on their academic performance. Keeping in mind empirical findings (Lack, 1986; Machado et al., 1998; Taub, 1979; Taub, 1980; Taub & Berger, 1973; Taub & Berger, 1974; Taub et al., 1976; Zammit, 1997), it is important that students try to keep schedule variations to less than two hours. For example, students who keep daily sleep wake schedules of 11:30 p.m. - 1:30 a.m. during the week should go to bed by 1:00 a.m. and wake by 9:00 a.m. on weekends. If students like to awake until 3:00 a.m. one night, it should be Friday night. They should then go back to their regular schedules on Saturday and Sunday to get ready for Monday morning. Finally, students should awaken around the same time each day even if occasionally they only receive 4 hours of sleep. Evidence suggests that large variations in sleep schedules produce almost the same difficulties as receiving less than a normal amount of sleep (Taub, 1978; Taub & Berger, 1974). Since these suggestions will be difficult to implement, exercise and bright light therapy may be especially useful in countering the ill effects of poor sleep schedules.

People who regularly exercise report fewer sleep difficulties and have shorter sleep onset than those who do not (Duncan, Bomar, Nicholson, & Wilson, 1995; Matsumoto, Saito, Abe, & Furumi, 1984; Van Someren, Lijzenga, Mirmiran, & Swaab,
Even people who find it impossible to completely stabilize their schedules, such as airline pilots, can reduce the ill effects of jet lag and variable sleep schedules through regular exercise (Shiota, Sudou, & Ohshima, 1996).

As for type of exercise, one study found that cardiovascular exercise resulted in shorter sleep onset time than anaerobic exercise, such as weightlifting. However, both types of exercise reduced sleep onset times when compared to the non-exercise condition (Trinder et al., 1985). Even simple hand squeezing exercises two hours before bedtime can reduce sleep onset time (Browman, 1980). Regardless of the type, it is apparent that some exercise is certainly better than no exercise.

Sleep hygiene instructions usually advise against evening exercise. This idea has not received empirical support (O'Connor, Breus, & Youngstedt, 1998; Urponen, Vuori, Hasan, & Partinen, 1988; Youngstedt et al., 1999). In fact, there are indications that evening exercise may enhance sleep and reduce sleep onset time (Browman, 1980; Urponen et al., 1988). However, exercise should probably not take place within an hour of bedtime to allow for physiological relaxation.

Bright light exposure is a particularly good treatment for people with irregular sleep patterns, jet lag, and other circadian rhythm disorders (Ando et al., 1999; Bootzin & Perlis, 1992; Daurat et al., 1993; Duffy et al., 1996; Leproult, Van Reeth, Byrne, Sturis, & Van Cauter, 1997; Rosenthal, Joseph-Vanderpool, & Levandosky, 1990). People with Delayed Sleep Phase Syndrome who received bright light therapy had greater improvements in their sleep patterns than those without bright light exposure (Rosenthal et al., 1990). Researchers even found that that shining bright lights on the back of knees...
of participants after awakening, advanced their sleep cycle (Campbell & Murphy, 1998). This suggests that people do not have to look at bright light to reap benefits. In a study that sought to normalize light exposure, participants wore dark glasses in the evening and were exposed to bright light in the morning. This intervention resulted in shorter sleep onset times and better adaptation to the desired sleep schedule (Eastman, Stewart, Mahoney, Liu, & Fogg, 1994). College students should be informed about the beneficial effects that bright light may have on their sleep-wake schedules; especially since many students experience symptoms consistent with Delayed Sleep Phase Syndrome (Brown et al., 2001; Buboltz et al., 2001; Lack, 1986).

Morning walks in the sunlight can serve to integrate the benefits of both exercise and bright light. When natural sunlight is unavailable, artificial light may be used. To demonstrate the ease and affordability of bright light therapy for university students, it costs less than thirty dollars to buy a 500-Watt Halogen "shop light" and an appliance timer in many hardware stores. Using appliance timers allow students to set the amount of time they would like to be exposed to bright light prior to the alarm sounding. This imitates bright light shining through a window and can reduce melatonin levels to improve alertness. Students should use a lamp that gives off more than 250 lumens and remain exposed to it for at least 30 minutes upon awakening (Trinder et al., 1996).

In summary, research supports using sleep hygiene instructions to improve sleep habits and quality (Guilleminault et al., 1995; Hauri, 1991; Riedel, 2000). Empirical investigations suggest that people with sleep difficulties should eliminate caffeine intake six hours before bedtime, reduce alcohol consumption, and preferably quit smoking, although this last recommendation needs to be made with caution since the first several
weeks of withdrawal may temporarily worsen sleep (Wetter et al., 1995). Instructions should recommend either eliminating afternoon and evening naps, or restricting them to an hour or less in the early afternoon to minimize the effects of evening sleep latency. People with sleep difficulties should also be informed of the importance of regular sleep wake-schedules, a consistent exercise regime, and daily morning exposure to bright light.

**Stimulus Control.** Stimulus control instructions are recommendations to increase the association of the bedroom with sleep. People with insomnia are instructed to only use the bed for sleep and sex, lie down only when sleepy, if unable to sleep after 10 minutes go in another room and do something else until sleepiness increases, get up at the same time regardless of the amount of sleep acquired, and eliminate naps (Bootzin & Epstein, 2000). These instructions work because people with insomnia associate the bedroom with anxiety associated with difficulties sleeping. Non-sleeping activities in the bedroom results in associating the bedroom with reading, studying, bills, sewing, or other activities rather than the process of falling asleep (Bootzin & Nicassio, 1991).

Reviews and meta-analyses of treatment methods suggest stimulus control instructions are among the most effective for both sleep onset insomnia and sleep maintenance insomnia (Engle-Friedman, Bootzin, Hazelwood, & Tsao, 1992; Lacks, 1987; Morin et al., 1994; Morin & Wooten, 1996; Murtagh & Greenwood, 1995). While some drug therapies may have immediate short-term effects on sleep, one-month follow-up studies suggest that stimulus control and relaxation therapies produce superior results (McClusky, Milby, Switzer, Williams, & Wooten, 1991).

In summary, the purpose of stimulus control instructions is to strengthen the association between the bedroom with falling asleep rather than lying in bed anxiously...
awaiting for sleep to begin. This focus of improving sleep efficiency and associating bedtime with feeling tired is similar to sleep restriction therapy, another psychoeducational intervention.

Sleep Restriction Therapy. Sleep restriction therapy arose from observations that many people with insomnia, especially older adults, spend excess amount of time in bed trying to recover lost sleep. The less they sleep, the more some people try to sleep, and the greater amounts of time in bed with less efficiency.

Sleep restriction therapy seeks to increase the proportion of time in bed as sleep time. To demonstrate, if a person complains of acquiring only 4 hours of sleep, the amount of time in bed is limited by 4 hours. When the sleep efficiency exceeds 85 - 90%, the amount of time allowed in bed is increased by 15 - 20 minutes. If efficiency falls below 80% the amount of time in bed is reduced by 15 - 20 minutes. Adjustments in sleep are made until the person achieves optimal sleep (Morin & Wooten, 1996).

In a meta-analysis of research examining the efficacy of different sleep treatments, both sleep restriction and stimulus control instructions were the two most effective treatments (Morin et al., 1994). When these therapies were combined in sleep treatment programs, patients with sleep maintenance insomnia consistently demonstrated reductions in unwanted nocturnal awakenings, less time in bed awake, and generally increased sleep efficiency (Bootzin & Perlis, 1992; Edinger, Hoelscher, Marsh, Lipper, & Ionescu-Pioggia, 1992; Friedman et al., 1991).

Psychotherapeutic Interventions

While many psychoeducational interventions include aspects of behavior therapy, the cognitive-behavioral therapies discussed in this section require a greater degree of
intervention on the part of a therapist. Psychoeducational therapies can be taught in one or two sittings and the same information can be provided on a printed handout. The following therapies, on the other hand, require practice and multiple sessions for improvement.

**Relaxation Training.** Relaxation therapies focus on decreasing physiological arousal to ease sleep onset. These include behavioral relaxation therapies, such as progressive muscle relaxation and deep breathing as well as cognitive imagery techniques, such as imagining oneself on a beach and lying in the sun. Behavioral techniques work for physical restlessness, whereas imagery approaches are better for worry or rumination (Morin & Wooten, 1996).

Efficacy studies generally support the use of relaxation therapies to decrease sleep latency (Bootzin & Perlis, 1992; Friedman et al., 1991; Hryshko-Mullen et al., 2000; Morin et al., 1994; Morin & Wooten, 1996). However, not all patients with insomnia are physiologically hyper-aroused. Some studies demonstrated relationships between poor sleep quality and physiological arousal (Bonnet & Arand, 1995; Monroe, 1967) and others no relationship (Good, 1975; Haynes, Follingstad, & McGowan, 1974). Relaxation therapy is likely to work for physiologically aroused insomniacs. Some people are not physiological aroused, but cognitively aroused. For such people, cognitive therapeutic interventions may be more appropriate.

**Cognitive Therapy.** Many cognitive symptoms contribute to sleep difficulties such as worrying, cognitive intrusions, and dysfunctional beliefs about sleep. The most consistently used interventions for these difficulties are cognitive restructuring, thought stopping, and paradoxical intention.
Cognitive restructuring works well for people with irrational thoughts that result in exaggerating the need for sleep or panicking when something interferes with sleep. Generally, there are five underlying areas of functional cognitions that cognitive restructuring strives to change regarding sleep: mistaken beliefs about the causes of insomnia, over-exaggeration about the consequences of poor sleep, unrealistic sleep expectations, feeling out of control about the sleep, and faulty beliefs about practices that promote sleep. Treatments that focus on changing such beliefs can increase sleep efficiency, reduce sleep latency, and decrease unwanted nocturnal awakenings (Morin, Kowatch, Berry, & Walton, 1993).

During times of stress, it is common for people to have trouble falling asleep while they ruminate about past or future activities. To some extent this is normal. However, people who consistently have trouble falling asleep due to intrusive or unwanted thoughts may require cognitive-behavioral interventions. One form of intervention known as thought stopping may be as simple as training people to silently yell, "stop!" to themselves each time intrusive thoughts occur (Wolpe, 1973). A similar approach is articulatory suppression where patients repeat a word to themselves several times a second until sleep onset occurs (Levey, Aldaz, Watts, & Coyle, 1991). This technique emerged from observations that repeating the same word rapidly interferes with other thoughts in short-term memory and can effectively reduce intrusive thoughts (Levey et al., 1991).

Paradoxical intention is another approach useful for reducing anxiety about the need to fall asleep, especially for those people resistive to therapeutic suggestions. Clients are instructed to go to bed and stay awake as long as possible rather than fall asleep. The
premise is that this suggestion will reduce the anxiety and failure associated with trying to fall asleep. They then will become more relaxed and fall asleep easier. While generally more effective than no treatment (Shoham-Salomon & Rosenthal, 1987), it is usually less effective than most other treatments except for reducing unwanted nocturnal awakenings where it is comparable to other psychological interventions (Murtagh & Greenwood, 1995).

In summary, meta-analytic studies strongly support the superiority of psychological interventions over medication in the treatment of insomnia (Bootzin & Perlis, 1992; Morin et al., 1994; Murtagh & Greenwood, 1995; Pilcher & Huffcutt, 1996). Psychoeducational interventions are as effective as more time intensive treatments (McCurry et al., 1998; Morin et al., 1994; Morin & Wooten, 1996; Murtagh & Greenwood, 1995). Considering the comparable efficacy, psychoeducational treatments have the advantage of reaching a large group of students without becoming invasive, are less costly than individual sessions, and tend to be perceived as educational and less aversive than individual therapies that are more likely to be avoided by students.

Psychoeducational Treatments for Students

The prevalence and implications of poor sleep habits among college students strongly suggests the need for action. Yet, literature that discusses practical ways of doing so is limited. While there are indications that starting classes later in the day may reduce discrepancies between student sleep habits during the week and weekend (Machado et al., 1998), this would require extensive restructuring of university class times, athletic practices, and other major schedule changes. Therefore before such
suggestions are even considered, researchers might do well to examine other ways to reduce poor sleep habits among university students.

Not all students with sleep difficulties go to university counseling centers for assistance. Many may not attribute their daily difficulties to sleep loss. With this in mind, psychoeducational interventions have clear advantages over more psychotherapeutic approaches. Psychoeducational approaches can be developed to reach many students through first year student orientation seminars or as part of psychology classes. Such interventions have the advantage of brief administration and fit into the classroom model of learning, to which many students are accustomed.

In addition to conduciveness to the university environment, psychoeducational interventions can provide information students lack. In an attempt to understand variables contributing to poor sleep habits, Hicks et al. (1999) explored the sleep hygiene knowledge and practices of 963 undergraduate psychology students. Their knowledge of sleep hygiene was rather poor as demonstrated by an average correct response rate of 50% on a test of sleep hygiene knowledge. Further, student sleep practices were positively correlated with sleep hygiene knowledge. These results lend support to the idea that psychoeducational sleep treatments may improve student sleep habits.

Hypotheses

College students have a high prevalence of poor sleep quality and inconsistent sleep habits (e.g., Brown et al., 2001; Lack, 1986, Pilcher et al., 1997). Students in 1989 reported approximately one hour less sleep than their counterparts in 1969 (Hicks & Pelligrini, 1991). Poor sleep quality may increase emotional imbalance, feelings of tension, anger, depression, (Pilcher et al., 1997), drug and alcohol use (Jean-Louis et al.,
1998), and difficulties recalling newly learned information (DeKoninck et al., 1989; Lack, 1986; Pilcher & Walters, 1997; Ralph et al., 1990). Even students who receive eight hours of sleep may experience academic and emotional difficulties due to inconsistent sleep habits and patterns. Sleep-wake schedule variations by as little as two hours may result in greater incidence of depression, lower sociability, and significant attention and concentration difficulties, even after obtaining eight hours of sleep (Taub & Berger, 1974).

Despite the potential difficulties of poor sleep quality and inconsistent sleep habits; there is little, if any, empirical research exploring interventions for improving student sleep quality and habits. However, meta-analytic studies with various non-student populations strongly supports the efficacy of psychoeducational interventions to improve overall sleep quality, which includes sleep latency, subjective sleep satisfaction, sleep efficiency, and sleep duration (Morin et al., 1994; Murtagh & Greenwood, 1995; Pilcher & Huffcutt, 1996). Psychoeducational interventions, such as stimulus control and sleep hygiene instructions are as effective as more time intensive, in-depth psychological interventions and clearly more effective than sleep medication in long term studies (Morin et al., 1994; Murtagh & Greenwood, 1995; Pilcher & Huffcutt, 1996). Even groups that have many external demands, such as caregivers of dementia patients, experience better sleep quality following psychoeducational sleep interventions (McCurry et al., 1998).

In addition to support by efficacy studies, psychoeducational interventions may provide knowledge students lack. Hicks et al. (1999) found that many students are unaware of behaviors related to sleep quality. On a questionnaire measuring sleep
hygiene knowledge, the average student only answered 50% of the questions correctly. Further, there was a positive correlation between student sleep hygiene knowledge and healthy sleep practices.

With this research in mind, the Sleep Treatment and Education Program for Students (STEPS) was developed for this study to determine whether teaching students about the importance of sleep, sleep hygiene knowledge, and stimulus control instructions would result in better sleep hygiene practices, more consistent sleep habits, and improved sleep quality. Based on the above research, the following hypotheses were examined.

**Hypothesis One**

Students in the treatment condition will report significantly better overall sleep quality when compared to the control group at six-weeks post-treatment.

**Hypothesis Two**

Students in the treatment group will report significantly better subjective sleep satisfaction when compared to the control group at six-weeks post-treatment.

**Hypothesis Three**

Students in the treatment condition will report significantly less time to fall asleep at six weeks post-treatment than the control group.

**Hypothesis Four**

The average sleep duration of students will be significantly longer for the treatment group than the control group at six weeks post-treatment.
**Hypothesis Five**

Students in the treatment group will report significantly better sleep efficiency than the control group at six-weeks post-treatment.

**Hypothesis Six**

Students in the treatment group will report significantly fewer sleep disturbances at six weeks post-treatment when compared to the control group.

**Hypothesis Seven**

Students in the treatment group will report significantly better daytime functioning than the control group at six weeks post-treatment.

**Hypothesis Eight**

Students in the treatment group will use significantly fewer prescribed or nonprescribed sleep medications at six weeks post-treatment.

**Hypothesis Nine**

Students in the treatment group will have significantly more accurate sleep hygiene knowledge than the control group at six weeks post-treatment.

**Hypothesis Ten**

Students in the treatment group will report significantly better sleep hygiene practices than the control group at six weeks post-treatment.

**Hypothesis Eleven**

Students in the treatment group will report significantly fewer differences between their week and weekend wake-up times than the control group at six weeks post-treatment.
Hypothesis Twelve

Students in the treatment condition will report significantly fewer differences between their weekend and week sleep times than the control group at six weeks post-treatment.

Hypothesis Thirteen

Students in the treatment condition will report significantly fewer differences between their weekend and week sleep latencies than the control group at six weeks post-treatment.
CHAPTER 2
METHODS
Participants

Participants were recruited from two large introductory psychology classes at a mid-sized university in the southern United States. Prior to recruitment, the university human subjects committee approved this study (Appendix A). The two classes, which started within 30 minutes of each other but on different days, were randomly assigned to the treatment and control conditions. Participants were informed, orally and in writing (Appendix B), that participation was voluntary. Both groups completed packets containing a demographics questionnaire, the Pittsburgh Sleep Quality Index (Buysse et al., 1989), Sleep Hygiene Awareness and Practices Survey (Lacks & Rotert, 1986), and the Sleep Habits Survey (Brown et al., 2001) prior to the treatment condition and at six weeks post-treatment.

Control Group

The control condition initially consisted of 95 participants. At six weeks post-treatment, 66 (69%) of the original participants (22 males, 44 females) remained. Most of the attrition was due primarily to students forgetting their chosen identification numbers. Five students were absent and six incorrectly completed the survey. The mean age was 19.5 (SD = 3.0) years. A total of 78% were freshmen, 10% sophomores, 7% juniors, and 5% seniors. The ethnicity makeup was 82% Caucasian, 14% African American, and 3% Hispanic. This sample was representative of the university's academic majors with 13% engineering, 13% biology, 12% undecided, 9% computer science, 6% nursing, 6%
fine arts, 4.5% psychology, 4.5% physics, 4.5% education, 3% aviation, and 3% sociology.

Treatment Group

The treatment condition initially consisted of 82 participants. At six weeks post-treatment, 56 (71%) of the original participants (28 males, 28 females) remained. Like the control group, most of the students who failed to complete the study did not provide a correct identification number. Seven students were absent and three incorrectly completed the survey. The mean age was 19.4 (SD = 2.5) years. A total of 84% were freshmen, 11% sophomores, 5% juniors, and 5% seniors. The ethnicity makeup was 91% Caucasian, 6% African American, 2% Hispanic, and 2% Native American. This sample was representative of the university's majors with 18% undecided, 13% art, 11% engineering, 9% biology, 9% architecture, 7% computer science, 7% nursing, 4% aviation, 4% sociology, 2% psychology, 2% history, 2% physics, and 2% physical education.

Materials

Pittsburgh Sleep Quality Index

The Pittsburgh Sleep Quality Index (PSQI: Buysse et al., 1989) is a 19-item self-report questionnaire designed to measure sleep quality and disturbances over a one month period (See Appendix C). The first four items are fill-in-the-blank format and ask respondents about their usual bedtime, wake time, sleep latency, and sleep duration. One item asks about level of enthusiasm for completing tasks during the past month and is rated on a 4-point scale ranging from “no problem at all” to “a very big problem.” The remaining 14 items ask how often (i.e., not during the past month, less than once a week,
once or twice a week, or three or more times a week) certain symptoms occurred in the past month.

The primary 19 items yield a Global Sleep quality score, ranging from 0, indicating no difficulty, to 21, indicating severe sleep difficulties. The Global Score is derived by summing each of the seven component scores: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medications, and daytime dysfunction. Some of the component scores are the result of several items, such as the sleep disturbances or sleep latency scores, whereas others are the result of one item, such as the subjective sleep quality or use of sleep medication. Subtest raw scores are converted into component scores ranging from 0, indicating no problem, to 3, indicating severe difficulties (see Appendix D for component and global score details).

The PSQI has good internal consistency (Cronbach's \( \alpha = .83 \)) and equally acceptable global test-retest reliability \( (r = .85) \). The subtest or component scores have more moderate internal consistency with Cronbach's \( \alpha \)s ranging from .76 for subjective sleep quality and habitual sleep efficiency, to a rather low .35 for sleep disturbances. Test-retest reliabilities for most of the component scores are acceptable, ranging from a Pearson's \( r = .84 \) for sleep latency to \( r = .65 \) for medication use. All of the component scores are significantly correlated (habitual sleep efficiency, \( r = .85 \); sleep quality, \( r = .83 \); sleep duration \( r = .80 \); sleep latency, \( r = .72 \); daytime dysfunction, \( r = .63 \); and sleep medication, \( r = .62 \); sleep disturbance, \( r = .46 \)) with the global PSQI score. The authors did not report the correlations between component scores. However, the component scores were rationally derived from prior empirical research and considered to be part of
the overall global score rather than discrete factors. Component scores give clinicians or researchers information regarding the type of symptoms respondents are experiencing (Buysse et al., 1989). The use of these as component scores of the overall Sleep Quality Index receives support from the higher total inter-item reliability as compared to the component score item inter-item reliability.

In addition, the PSQI global score demonstrates fairly good ability to discriminate between those with sleep complaints and controls. Buysse et al. (1989) reported that a cutoff score of 5 correctly identified 88.5% of all patients and controls (kappa = .75, p < .001), indicating a sensitivity of 89.6% and specificity of 86.5%. This same cutoff score correctly identified 84.4% of patients with disorders of initiating and maintaining sleep, 88% of disorders of excessive sleepiness, and 97% of depressives in the standardization sample (Buysse et al., 1989). See Appendix D for scoring details.

Since the original standardization research, the PSQI has been used in numerous medically oriented sleep studies (Lockley et al., 1997; Nokes & Kendrew, 2001; Phillips & Skelton, 2001; Royuela Rico, Macias Fernandez, & Conde Lopez, 2000; Smith, Perlis, Smith, Giles, & Carmody, 2000) and has become increasingly popular in sleep quality studies involving university students (Liu, Tang, Hu, Wang, & et al., 1995; Pilcher et al., 1997; Pilcher & Ott, 1998; Pilcher, Schoeling, & Prosansky, 2000). Widespread use of the PSQI facilitates comparison of results from the present study with previous ones. In summary, the PSQI is a well-established sleep quality measure with demonstrated reliability and validity.
Sleep Hygiene Awareness and Practice Scale

Lacks and Rotert (1986) developed the Sleep Hygiene Awareness and Practice Scale (see Appendix E) in a study comparing sleep hygiene of established insomniacs and good sleepers. As the name implies, it measures awareness and practice of sleep hygiene. The scoring key is located in Appendix F.

The Awareness section has two subsections. The Sleep Hygiene Awareness section consists of 13 items and measures knowledge of whether specific activities (such as taking a nap or having a regularly scheduled bedtime) are helpful, disruptive, or neutral to sleep. Respondents rate behaviors on a scale from one, indicating the behavior is very beneficial to sleep, to seven, indicating the behavior is very harmful to sleep. A rating of four indicates they believe the behavior has no effect on sleep. Responses are given one point if correct, two points if not answered, and three points if incorrect. For example, if the correct answer is that the behavior is disruptive to sleep, respondents rating from one through four are incorrect and receive three points, whereas ratings of five or higher are correct and receive one point. Items with behaviors beneficial to sleep use the opposite scoring method. Scores can range from 13 - 39, with higher scores indicating lower sleep hygiene awareness. The Caffeine Awareness section measures respondent knowledge of whether or not 18 common foods, beverages, and nonprescription drugs contain caffeine. Respondents write "y" if the substance contains caffeine, "n" if it does not, and "x" if they never heard of the substance. Scores range from 0 to 100, which correspond to the percentage of correct answers (Lacks & Rotert, 1986). Converting items where correct answers receive 5.5 points results in the same
score range while using whole numbers rather than percentiles to ease data entry and analysis.

The Practice section contains 19 items asking how many nights per week respondents engage in activities known to promote or inhibit sleep (e.g., napping, evening exercise, regular afternoon exercise). Responses can range from 0 indicating never to 7 indicating every day or night. Items are given one point for each day of the activity (0 to 7 points each item). Total Hygiene Practice scores range from 0 to 133 with higher scores indicating behaviors less indicative of good sleep hygiene (Lacks & Rotert, 1986).

While Lacks & Rotert (1986) did not supply reliability information for the SHAPS, internal and test-retest reliability was determined in recent study (Brown, Buboltz, & Soper, in press). Since each section of the SHAPS has different scoring methods, internal reliability was measured for each section using the Cronbach’s $\alpha$ statistic. The Sleep Hygiene Awareness section had good internal reliability (Cronbach’s $\alpha = .78$), the Caffeine Knowledge section had poor internal reliability (Cronbach’s $\alpha = .47$), and the Sleep Hygiene Practices section had poor internal reliability (Cronbach’s $\alpha = .55$). Test-retest reliabilities were measured with Pearson’s product-moment correlation coefficients. The Sleep Hygiene Awareness section had good test-retest reliability ($r = .76, p < .001$), the Caffeine Knowledge section had poor test-retest reliability ($r = .50, p < .001$), and the Sleep Hygiene Practices section had good test-retest reliability ($r = .74, p < .001$) (Brown et al., in press).

While the Sleep Hygiene Practices section had weak internal reliability, this is not necessarily a reflection of the psychometric quality. It may be simply that students with some good sleep habits also have some poor sleep habits. This receives support by the
good test-retest reliability. Such stability over time supports the use of this instrument section in the current study. The generally poor psychometric quality of the Caffeine Knowledge Survey calls into question its utility. Part of the problem may be that these items clearly have different levels of difficulty. For example, the caffeine content of coffee and tea is more common than knowledge about the caffeine content of Aqua Ban or Sudafed. Clearly, these variable difficulty levels need to be examined in future study of this instrument. Considering the psychometric weakness of this scale, it was not included in this study.

Sleep Habits Survey

The Sleep Habits Survey (SHS) is part of the Sleep Habits and Patterns Inventory developed by Brown et al. (2001). The SHS consists of 10 items that ask respondents for estimates of their sleep habits such as their sleep time during the week, sleep time during the weekend, and other similar questions (see Appendix G). The SHS is descriptive in nature and does not have internal reliability statistics since each the items are answered with different metrics (e.g., wake time, bedtime, time to fall asleep) and do not lend themselves to split half or internal consistency evaluation.

Demographic Survey

The demographics survey instrument consists of nine items that inquire about respondent age, gender, ethnicity, year in school, major, employment status and hours of work, housing status, whether or not the person has sleep difficulties, and if he or she would like to have better sleep quality (see Appendix H).
Sleep Treatment and Education Program for Students

The Sleep Treatment and Education Program for Students (STEPS) was developed for this study. It includes a 15-minute oral presentation (see Appendix I) and handouts with Sleep Hygiene Guidelines (see Appendix J), Stimulus Control Instructions (see Appendix K), and Substances with Caffeine (see Appendix L).

The oral presentation is a script read verbatim to college students in a group. It begins with an introductory paragraph explaining the purpose of STEPS. The next paragraph briefly describes the prevalence of sleep difficulties in college students. The following paragraphs focus on consequences that college students may experience due to inadequate amounts of sleep, inconsistent sleep habits, and poor sleep quality. These include brief summaries of empirical studies that lend credence to the importance of sleep. The script then proceeds to review the Sleep Hygiene Guidelines, Substances with Caffeine, and Stimulus Control Instructions handouts with additional emphasis on the reasons for the instructions.

Sleep Hygiene Guidelines are ten behaviors that either promote or inhibit sleep. They are commonly part of clinical practices (Lacks, 1987) and receive substantial clinical support (e.g., Morin et al., 1994; Murtagh & Greenwood, 1995). These guidelines include traditional sleep hygiene instructions (Lacks, 1987; Bootzin et al., 1991) as well as instruction for regular morning exposure to sunlight or bright (more than 250 lumens) artificial light.

The Substances with Caffeine handout informs students about the presence of caffeine in commonly used products. It includes beverages such as coffee and colas, foods such as chocolate cake, and medications such as diet pills. The handout includes
the amount of caffeine that each substance contains (Nehlig et al., 1992; Roehrs & Roth, 1997; Tiffin et al., 1995).

The Stimulus Control Instructions handout is a list of four recommendations to reduce sleep difficulties. These recommendations are common in clinical practice (Lacks, 1987) and empirical evidence indicates they can significantly improve sleep quality (e.g., Morin et al., 1994; Morin & Wooten, 1996; Murtagh & Greenwood, 1995). Clinical observations that people with transient difficulties falling asleep or staying asleep begin to feel anxious about bedtime are the basis for stimulus control instructions. The more they try to sleep, the more anxious they become. This turns transient sleep difficulties into more permanent problems. Non-sleeping activities in the bedroom also may interfere with sleep. As a result, people associate the bedroom with reading, studying, bills, sewing, or other activities rather than the process of falling asleep. The goal of Stimulus Control is to break the habit of trying too hard to fall asleep and end the association of anxiety and non-sleep activities with the bed and bedroom (Bootzin & Nicassio, 1991). Since students who live in a dormitory or similar setting use their bedroom for multiple purposes, these instructions were modified for the university lifestyle. For example, rather than limit bed activity to sex or sleep, as in traditional stimulus control, students were encouraged to limit bed behavior to relaxing non-coursework related activities, sleep, and sex.

Procedures

Prior to the collection of data, the Human Use Committee approved this study (Appendix A). Participants were recruited from two large introductory psychology classes at a university located in the Southern United States. The classes were randomly
assigned to the treatment or control condition by flipping a coin. The treatment group was heads and the control condition tails. Two weeks into the academic quarter, a graduate student volunteer (not the researcher) asked students to participate in the study. Students were informed orally and in writing that participation was completely voluntary, they would not be compensated, and all data would be stored separately from consent forms to ensure anonymity. After agreeing to participate in this study, participants signed the Human Participant Consent form (Appendix B).

The graduate student volunteer distributed survey packets containing the Demographic Survey, PSQI, SHAPS and SHS and read the directions to ensure students completed the forms correctly. Participants were asked to write an easily remembered, personally relevant, four-digit number in the ID blank that they would remember for the pre and post-test data collection. They were asked to write their best estimates and use one answer rather than a range of answers (use 8 rather than 8 - 10) for fill-in-the-blank items, such as the time they fall asleep and if unsure to give an educated guess rather than leave an item blank. They were then instructed to turn the survey over when complete and quietly work on other material until all the survey packets were collected.

Participants concerned with their sleep difficulties were informed they could discuss these at the end of the study in six weeks with the primary researcher and if necessary be referred to an appropriate professional.

Once the surveys were completed and collected for the control condition, the data collecting graduate student left the room and another graduate student volunteer, the presenter, provided the control condition lecture (See Appendix L). This was a lecture designed to last approximately 15 minutes and reviewed the importance of the scientific
method in psychology and some of its key aspects. The purpose of this 15-minute lecture was to control for the presenter effects of the 15-minute sleep lecture that took place in the treatment group.

After the surveys were completed and collected for the experimental condition, the data collecting graduate student (the same person who collected the data for the control conditions) left the classroom and the graduate student who volunteered as presenter (same person as in the control condition) entered the room and distributed the Sleep Hygiene Guidelines, Stimulus Control Instructions, and Substances with Caffeine handouts. Participants were informed that the presentation was designed to improve their sleep habits and that time would be allowed after the presentation for them to ask questions. Next, the presenter read the oral script for the Sleep Treatment and Education Program for Students (STEPS), which took about 15 minutes to read. It begins with a discussion of the prevalence of sleep difficulties and poor sleep habits in college students, continues by summarizing research that details the negative consequences of poor sleep habits, and concludes with a review of the Stimulus Control Instructions and Sleep Hygiene Guidelines. At the end of the STEPS presentation, participants were told they could keep the handouts and refer to them as needed. Time was allocated for any questions directly related to the STEPS program. Information not included in the STEPS was not provided in order to limit the information to the STEPS program.

The data collecting graduate student returned to the class six weeks later, reviewed the directions for filling out the surveys, and redistributed the survey packets containing the Demographics Survey, PSQI, SHAPS, and SHS. Participants were asked to place an X next to their ID number if they had watched on television, read, or
otherwise sought additional sleep information. This was to increase the likelihood that
changes were due to the STEPS treatment. Those who placed an X next to their ID were
excluded from data analysis. After these surveys were collected, participants were given
several minutes during class to ask brief questions. Those who were concerned with their
sleep difficulties were given the opportunity to meet with the primary researcher and if
necessary, were referred to an appropriate professional.

Data Analysis

Several levels of statistical analysis were conducted. Frequency and percentages
were calculated for year in college, ethnicity, gender, and major area of study. Means,
standard deviations, and ranges were calculated for ages. Data were inspected for skew,
kurtosis, outliers, and other potential problems.

The hypotheses were tested using a repeated measures MANOVA. The within
subjects factor was time and had two levels: pre-test and 6-weeks post-test. The between
subjects factor was treatment condition and had two levels: the control condition and
experimental condition. The dependent variables were the PSQI Total Sleep Quality
Score and related Component Scores; the differences between week and weekend sleep
latency, wake, and sleep times; and the SHAPS sleep hygiene awareness and sleep
hygiene practices scores. Post-hoc tests were not conducted since there were only two
levels of between and within subject factors. The effect sizes of the results were
calculated using the multivariate eta square (η²). Since the sample size was greater than
15 participants per condition (Green, Salkind, & Akey, 1999), the normality assumptions
were not examined. The assumption of sphericity (equal population variances) did not
need to be met since there were only two levels of within and between subject factors

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(Green et al., 1999). Difference scores for the participants were examined using a scatter plot to ensure they were independent. Alpha levels of significance for all analyses were set at .05.

Stepwise multiple regression analysis was used to explore the relationship between sleep hygiene practices and sleep quality. The predictor variables were the items from the pretest sleep hygiene practice scale from the SHAPS. The criterion variable was overall sleep quality as measured by the PSQI total score. This analysis was independent of the treatment effects since it took place before the intervention. Therefore, both groups were consolidated into one group. This analysis used the random-effects model underlying the multiple correlation coefficient. There are two assumptions inherent in this model. The first is that the variables are multivariately normally distributed in the population, ensuring the relationship is linear. The second assumption is that the cases represent a random sample from the population and the scores are from variables that are independent of other scores. To check these assumptions and the associated linearity, scatterplots between each predictor and the criterion variables were examined.
CHAPTER 3
RESULTS

Independent samples t-tests were used to compare demographic compositions and baseline sleep measures of the two groups. Groups did not differ significantly according to age, ethnicity, or housing status (off versus on campus). They also did not differ on baseline measures of the overall or subtest PSQI scores, the sleep hygiene awareness subtest of the SHAPS, or the SHS items. There were significantly ($t = 1.94$, $df = 121$, $p = .008$) more females in the control group ($n = 44$) than the treatment condition ($n = 28$). Students in the treatment group ($M = 29.04$, $SD = 8.99$) had significantly lower ($t = 3.65$, $df = 121$, $p < .001$) baseline scores of poor sleep hygiene practices than the control group ($M = 35.72$, $SD = 10.02$).

A repeated measures ANOVA was used to compare treatment and control conditions. The within subjects factor was time and had two levels: pre-test and 6-weeks post-test. The between subjects factor was treatment condition and had two levels: the control condition and experimental condition. The dependent variables were the PSQI Total Sleep Quality Score and subscale scores; the SHAPS sleep hygiene awareness and sleep hygiene practices scores; and SHS variables, as well as the difference between week and weekend sleep latency, sleep times, and wake times.

From baseline to six-weeks post-treatment, participants in the treatment condition demonstrated significantly improved overall sleep quality on the PSQI ($F(1,120) = 5.83$, $p = .017$, $\eta^2 = .05$, $1 - \beta = 67$) when compared to the control group. Among PSQI subtest scores, the treatment group had significantly lower sleep disturbance scores ($F(1,120) = 11.59$, $p = .001$, $\eta^2 = .09$, $1 - \beta = 92$), sleep latency ($F(1,120) = 13.63$, $p > .0001$, $\eta^2 =$
.10, 1 - β = .96), and sleep medication use ($F(1,120) = 4.81, p = .030, \eta^2 = .04), 1 - \beta = .59). See table 1 for means and standard errors of PSQI scores. Table 2 contains the overall and group frequencies of good and poor sleep quality according to the established cutoff score of ≤ 5 being good sleep quality and ≥ 6 labeled poor sleep quality.

Table 1

*PSQI Scores at the Initial Assessment and Six-week Follow-up*

<table>
<thead>
<tr>
<th>Measure</th>
<th>Condition</th>
<th>Initial M</th>
<th>SD</th>
<th>6 weeks M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSQI: Overall*</td>
<td>Control</td>
<td>7.28</td>
<td>3.20</td>
<td>7.25</td>
<td>2.97</td>
</tr>
<tr>
<td></td>
<td>Treatment</td>
<td>6.60</td>
<td>3.10</td>
<td>5.50</td>
<td>2.23</td>
</tr>
<tr>
<td>Subjective SQ</td>
<td>Control</td>
<td>1.28</td>
<td>.75</td>
<td>1.13</td>
<td>.60</td>
</tr>
<tr>
<td></td>
<td>Treatment</td>
<td>1.21</td>
<td>.56</td>
<td>1.13</td>
<td>.60</td>
</tr>
<tr>
<td>Duration</td>
<td>Control</td>
<td>.87</td>
<td>.90</td>
<td>.99</td>
<td>.99</td>
</tr>
<tr>
<td></td>
<td>Treatment</td>
<td>1.00</td>
<td>1.10</td>
<td>.70</td>
<td>.81</td>
</tr>
<tr>
<td>Day Dys.</td>
<td>Control</td>
<td>1.05</td>
<td>.64</td>
<td>1.10</td>
<td>.74</td>
</tr>
<tr>
<td></td>
<td>Treatment</td>
<td>1.11</td>
<td>.68</td>
<td>1.20</td>
<td>.70</td>
</tr>
<tr>
<td>Sleep Meds*</td>
<td>Control</td>
<td>.52</td>
<td>.88</td>
<td>.39</td>
<td>.70</td>
</tr>
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<td></td>
<td>Treatment</td>
<td>.27</td>
<td>.67</td>
<td>.13</td>
<td>.38</td>
</tr>
<tr>
<td>Sleep Latency***</td>
<td>Control</td>
<td>1.72</td>
<td>.98</td>
<td>1.58</td>
<td>.94</td>
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<td></td>
<td>Treatment</td>
<td>1.21</td>
<td>.91</td>
<td>.96</td>
<td>.81</td>
</tr>
<tr>
<td>Efficiency</td>
<td>Control</td>
<td>.46</td>
<td>.80</td>
<td>.69</td>
<td>1.02</td>
</tr>
<tr>
<td></td>
<td>Treatment</td>
<td>.64</td>
<td>1.03</td>
<td>.38</td>
<td>.75</td>
</tr>
<tr>
<td>Disturbance***</td>
<td>Control</td>
<td>1.39</td>
<td>.58</td>
<td>1.37</td>
<td>.55</td>
</tr>
<tr>
<td></td>
<td>Treatment</td>
<td>1.14</td>
<td>.48</td>
<td>1.02</td>
<td>.49</td>
</tr>
</tbody>
</table>

* $p \leq .05, **p \leq .01, ***p \leq .001$ changes over time, between conditions.
Table 2

*Frequency for PSQI Ratings*

<table>
<thead>
<tr>
<th>Measure</th>
<th>Cond</th>
<th>Initial Good</th>
<th>Poor</th>
<th>6 weeks Good</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sleep Quality</td>
<td>Control</td>
<td>29.9%</td>
<td>70.1%</td>
<td>17.9%</td>
<td>82.1%</td>
</tr>
<tr>
<td></td>
<td>Treatment</td>
<td>46.4%</td>
<td>53.6%</td>
<td>39.3%</td>
<td>60.7%</td>
</tr>
<tr>
<td></td>
<td>Overall</td>
<td>37.4%</td>
<td>62.6%</td>
<td>27.6%</td>
<td>72.4%</td>
</tr>
</tbody>
</table>

Students in the treatment group had significantly better Sleep Hygiene Practices $(F (1,120) = 21.51, p = .0001, \eta^2 = .15, 1 - \beta = .99)$ over the six-week period than the control group. As for specific sleep practice changes over time, those in the treatment group had significant decreases in the number of naps $(F (1, 120) = 6.60, p = .01, \eta^2 = .05, 1 - \beta = .72)$, hunger before bedtime $(F (1, 120) = 6.43, p = .01, \eta^2 = .05, 1 - \beta = .71)$, beverages with caffeine $(F (1, 120) = 8.81, p = .004, \eta^2 = .07, 1 - \beta = .84)$, and medications with caffeine $(F (1, 120) = 3.87, p = .05, \eta^2 = .03, 1 - \beta = .50)$. Both groups demonstrated reductions in relaxation time before bed but the control group displayed a significantly less decrease $(F (1, 120) = 5.35, p = .02, \eta^2 = .04, 1 - \beta = .63)$. The control group had significant reductions $(F (1, 120) = 6.0, p = .02, \eta^2 = .05, 1 - \beta = .68)$ in the amount of disturbance caused by noise during sleep. There were no significant differences between the treatment conditions on the Sleep Hygiene Knowledge measures. Descriptive statistics for the SHAPS are found in Table 3. The treatment group had significant $(F (1,120) = 4.43, p = .037, \eta^2 = .04, 1 - \beta = .55)$ improvements in their sleep latency over the six-week period. There were no other significant differences on pre-test or post-test items on the SHS (See Table 4 for means and standard deviations).
Table 3

**SHAPS Scores at the Initial Assessment and Six-week Follow-up**

<table>
<thead>
<tr>
<th>Measure</th>
<th>Condition</th>
<th>Initial M</th>
<th>SD</th>
<th>6 weeks M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Awareness</td>
<td>Control</td>
<td>22.57</td>
<td>4.72</td>
<td>22.66</td>
<td>5.45</td>
</tr>
<tr>
<td></td>
<td>Treatment</td>
<td>24.04</td>
<td>5.41</td>
<td>20.55</td>
<td>6.51</td>
</tr>
<tr>
<td>Total Practices**</td>
<td>Control</td>
<td>35.72</td>
<td>10.02</td>
<td>35.70</td>
<td>10.13</td>
</tr>
<tr>
<td></td>
<td>Treatment</td>
<td>29.04</td>
<td>8.99</td>
<td>27.09</td>
<td>8.99</td>
</tr>
<tr>
<td>Naps**</td>
<td>Control</td>
<td>2.52</td>
<td>1.96</td>
<td>2.73</td>
<td>1.86</td>
</tr>
<tr>
<td></td>
<td>Treatment</td>
<td>1.91</td>
<td>1.78</td>
<td>1.75</td>
<td>1.72</td>
</tr>
<tr>
<td>Hunger**</td>
<td>Control</td>
<td>1.96</td>
<td>1.70</td>
<td>1.72</td>
<td>1.62</td>
</tr>
<tr>
<td></td>
<td>Treatment</td>
<td>1.20</td>
<td>1.47</td>
<td>1.14</td>
<td>1.20</td>
</tr>
<tr>
<td>Thirsty</td>
<td>Control</td>
<td>1.12</td>
<td>1.44</td>
<td>1.15</td>
<td>1.71</td>
</tr>
<tr>
<td></td>
<td>Treatment</td>
<td>.82</td>
<td>1.60</td>
<td>.64</td>
<td>1.12</td>
</tr>
<tr>
<td>Smoke</td>
<td>Control</td>
<td>.33</td>
<td>1.12</td>
<td>.49</td>
<td>1.41</td>
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<tr>
<td></td>
<td>Treatment</td>
<td>.29</td>
<td>1.32</td>
<td>.29</td>
<td>1.32</td>
</tr>
<tr>
<td>Sleep Meds</td>
<td>Control</td>
<td>.48</td>
<td>1.16</td>
<td>.46</td>
<td>1.08</td>
</tr>
<tr>
<td></td>
<td>Treatment</td>
<td>.37</td>
<td>1.20</td>
<td>.27</td>
<td>1.02</td>
</tr>
<tr>
<td>Caff. Drinks*</td>
<td>Control</td>
<td>4.22</td>
<td>2.23</td>
<td>3.91</td>
<td>2.23</td>
</tr>
<tr>
<td></td>
<td>Treatment</td>
<td>2.96</td>
<td>2.47</td>
<td>2.84</td>
<td>2.35</td>
</tr>
<tr>
<td>Alcohol Use</td>
<td>Control</td>
<td>1.21</td>
<td>1.53</td>
<td>1.18</td>
<td>1.49</td>
</tr>
<tr>
<td></td>
<td>Treatment</td>
<td>.82</td>
<td>1.27</td>
<td>.64</td>
<td>1.02</td>
</tr>
<tr>
<td>Meds w/Caff.*</td>
<td>Control</td>
<td>.46</td>
<td>.86</td>
<td>.67</td>
<td>1.34</td>
</tr>
<tr>
<td></td>
<td>Treatment</td>
<td>2.96</td>
<td>2.37</td>
<td>.34</td>
<td>.79</td>
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<tr>
<td>Night Worries</td>
<td>Control</td>
<td>1.22</td>
<td>1.91</td>
<td>.94</td>
<td>1.68</td>
</tr>
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<td>Treatment</td>
<td>1.07</td>
<td>1.85</td>
<td>.64</td>
<td>1.45</td>
</tr>
<tr>
<td>Day Worries</td>
<td>Control</td>
<td>.73</td>
<td>1.53</td>
<td>.73</td>
<td>1.25</td>
</tr>
<tr>
<td></td>
<td>Treatment</td>
<td>.63</td>
<td>1.43</td>
<td>.39</td>
<td>1.02</td>
</tr>
<tr>
<td>Alcohol for Sleep</td>
<td>Control</td>
<td>.25</td>
<td>.88</td>
<td>.25</td>
<td>.70</td>
</tr>
<tr>
<td></td>
<td>Treatment</td>
<td>.20</td>
<td>.52</td>
<td>.13</td>
<td>.43</td>
</tr>
<tr>
<td>Exercise at Bed</td>
<td>Control</td>
<td>.25</td>
<td>.88</td>
<td>1.00</td>
<td>1.52</td>
</tr>
<tr>
<td></td>
<td>Treatment</td>
<td>.91</td>
<td>1.64</td>
<td>.95</td>
<td>1.55</td>
</tr>
<tr>
<td>Relax at BedR*</td>
<td>Control</td>
<td>2.55</td>
<td>2.16</td>
<td>4.91</td>
<td>2.10</td>
</tr>
<tr>
<td></td>
<td>Treatment</td>
<td>2.77</td>
<td>2.72</td>
<td>3.89</td>
<td>2.59</td>
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<tr>
<td>Exercise inR</td>
<td>Control</td>
<td>2.52</td>
<td>2.16</td>
<td>4.81</td>
<td>1.93</td>
</tr>
<tr>
<td></td>
<td>Treatment</td>
<td>2.52</td>
<td>2.19</td>
<td>4.41</td>
<td>2.22</td>
</tr>
<tr>
<td>Comfortable RoomR</td>
<td>Control</td>
<td>4.03</td>
<td>2.32</td>
<td>2.57</td>
<td>1.93</td>
</tr>
<tr>
<td></td>
<td>Treatment</td>
<td>4.84</td>
<td>2.10</td>
<td>1.82</td>
<td>1.96</td>
</tr>
</tbody>
</table>

* p < .05, ** p < .01, *** p < .001 changes over time, between conditions. R = reversed

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Table 4

Descriptive Statistics for Sleep Habits Survey

<table>
<thead>
<tr>
<th>Habit</th>
<th>Cond</th>
<th>M</th>
<th>SD</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bed</td>
<td>Week</td>
<td>Cont 12:28 a.m.  1 hr 13 min</td>
<td>12:19 a.m.  1 hr 19 min</td>
<td>Treat 12:41 a.m.  1 hr 40 min</td>
<td>12:11 a.m.  1 hr 12 min</td>
</tr>
<tr>
<td></td>
<td>Week</td>
<td>Cont 2:14 a.m.  1 hr 40 min</td>
<td>2:21 a.m.  1 hr 42 min</td>
<td>Treat 2:03 a.m.  1 hr 46 min</td>
<td>1:43 a.m.  1 hr 24 min</td>
</tr>
<tr>
<td></td>
<td>Week</td>
<td>W - We Dif* Cont 1 hr 50 min  1 hr 18 min</td>
<td>2 hr 08 min  1 hr 55 min</td>
<td>Treat 1 hr 30 min  1 hr 06 min</td>
<td>1 hr 39 min  1 hr 11 min</td>
</tr>
<tr>
<td></td>
<td>Wake</td>
<td>Cont 7:40 a.m.  1 hr 20 min</td>
<td>7:44 a.m.  1 hr 20 min</td>
<td>Treat 7:36 a.m.  1 hr 26 min</td>
<td>7:44 a.m.  1 hr 13 min</td>
</tr>
<tr>
<td></td>
<td>Week</td>
<td>Cont 10:15 a.m.  2 hr 45 min</td>
<td>12:23 a.m.  2 hr 29 min</td>
<td>Treat 9:30 a.m.  2 hr 33 min</td>
<td>10:00 a.m.  1 hr 50 min</td>
</tr>
<tr>
<td></td>
<td>Week</td>
<td>W - We Dif Cont 3 hr 13 min  1 hr 46 min</td>
<td>2 hr 59 min  1 hr 46 min</td>
<td>Treat 3 hr 11 min  1 hr 52 min</td>
<td>2 hr 38 min  1 hr 41 min</td>
</tr>
<tr>
<td></td>
<td>Latency</td>
<td>Cont 31.78 min  24.78 min</td>
<td>22.91 min  22.35 min</td>
<td>Treat 26.09 min  28.88 min</td>
<td>18.45 min  19.53 min</td>
</tr>
<tr>
<td></td>
<td>Week</td>
<td>Cont 20.25 min  14.94 min</td>
<td>18.84 min  16.14 min</td>
<td>Treat 17.50 min  20.03 min</td>
<td>15.64 min  13.57 min</td>
</tr>
<tr>
<td></td>
<td>W-We Dif</td>
<td>Cont 14.21 min  19.24 min</td>
<td>12.54 min  15.85 min</td>
<td>Treat 9.13 min  19.41 min</td>
<td>6.02 min  13.75 min</td>
</tr>
<tr>
<td></td>
<td>Amount</td>
<td>Cont 6 hr 43 min  1 hr 14 min</td>
<td>6 hr 47 min  1 hr 13 min</td>
<td>Treat 6 hr 39 min  1 hr 14 min</td>
<td>6 hr 59 min  1 hr 10 min</td>
</tr>
<tr>
<td></td>
<td>Week</td>
<td>Cont 8 hr 27 min  1 hr 52 min</td>
<td>8 hr 13 min  1 hr 52 min</td>
<td>Treat 8 hr 08 min  1 hr 33 min</td>
<td>8 hr 23 min  1 hr 32 min</td>
</tr>
<tr>
<td></td>
<td>W - We Dif</td>
<td>Cont 1 hr 34 min  1 hr 26 min</td>
<td>1 hr 26 min  1 hr 55 min</td>
<td>Treat 1 hr 29 min  1 hr 47 min</td>
<td>1 hr 24 min  1 hr 36 min</td>
</tr>
</tbody>
</table>

* p ≤ .05 changes over time, between conditions

W - We Dif = Difference between the week and weekend on each measure.

To explore those behaviors that contribute to overall sleep quality, stepwise regression modeling was used to determine which pretest practices significantly (p ≤ .05) contributed to pretest overall sleep quality. Prior to this analysis, sleep hygiene practice variables that were considered to be out of the control of the participant (i.e., disturbance by noise, light, and roommate) were removed. The final model (F(5, 116) = 18.12, p =
.0001, $R^2 = .44$) indicated that nighttime worry about sleep, sleep medications, and daytime worry about sleep were related to worse sleep quality. Having a comfortable bedroom and sleeping the same length each night were positively associated with better sleep quality (see table 5 for statistics).

Table 5

*Pre-treatment: Contribution of Sleep Practices to Overall Sleep Quality*

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE</th>
<th>$\beta$</th>
<th>$t$</th>
<th>$r$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>8.46</td>
<td>.70</td>
<td></td>
<td>12.06</td>
<td>.0001</td>
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The predictor variables (sleep hygiene practices) were compared to the criterion variable (overall sleep quality) on scatterplot graphs. Most of these graphs confirmed linear relationships between predictors and criteria. The primary exception was the frequency of smoking and sleep habits. As can be seen in figure 1, students who smoked on a regular basis experienced roughly the same level of sleep quality as those who did not smoke. However, students who smoked occasionally experienced noticeably worse sleep quality than either the regular or nonsmokers.
Figure 1. Scatterplot Graph Comparing PSQI Overall Scores with Smoking

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CHAPTER 4

DISCUSSION

General Findings

The purpose of this study was to develop and evaluate the efficacy of the Sleep Treatment Education Program for Students (STEPS). The results supported the first hypothesis that students in the sleep treatment condition would demonstrate significantly better overall sleep quality when compared to the control group at six weeks post-treatment. When viewing the component scores of overall sleep quality, it appears that some aspects of sleep quality changed more than others in response to STEPS. Students in the treatment group demonstrated lower sleep disturbance scores (Hy5), shorter sleep onset times (Hy3), and used less sleep medication (Hy8) following the STEPS program. However, they did not report better subjective sleep satisfaction (Hy2), longer sleep duration (Hy4), greater sleep efficiency (Hy6), or better daytime functioning (Hy7) at six weeks post-treatment.

The deficit of improvement in subjective sleep satisfaction compared to the overall sleep quality is not surprising since the former is based on one item and has rather low test-retest reliability. Overall sleep quality, on the other hand, takes many aspects of sleep into account and has much greater stability over time and internal consistency. Thus, while some students may not have perceived any noticeable sleep improvement, collaborating evidence from other component scores suggests that others have.

The lack of significant differences in sleep efficiency, sleep length, and daytime dysfunctions were surprising since researchers found that as the academic term progressed, sleep length decreased while efficiency increased (Pilcher & Ott, 1998). It is
possible that there was a tendency for sleep to decrease in length and the STEPS program might have slowed this decrease in one group, but not enough for statistical significance. Another possibility may be due to the lack of comparability among the populations. Pilcher and Ott’s (1998) study took place at a different university with different coursework and social demands. Students in the current study may not have had the same demands on their social and academic lives and therefore, may have not experienced the same deterioration seen in student sleep length in prior studies (Pilcher & Ott, 1998). However, the prevalence of sleep complaints in this population make this second possibility less probable. A third possibility is that students in the STEPS program made changes in their behaviors, but six weeks was not enough time for their change in habits to impact sleep length. The last may be the most likely of the three possibilities.

The results of the SHAPS similarly produced some of the expected findings, but also some unexpected results. As hypothesized (Hy10) participants in the treatment group reported significantly better sleep hygiene practices over time when compared to the control group. The effect size ($\eta^2$) for changes in sleep hygiene practices was much stronger than the effect size for changes in overall sleep quality, suggesting that the treatment condition had a more immediate impact on sleep hygiene practices than overall sleep quality. These results support the idea that sleep hygiene practices will change as a result of education, which in turn should improve sleep quality. The lower effect size for overall sleep quality suggests that it was not as quickly changed as sleep practices. One would expect that given this relationship, students might have had a greater improvement in sleep quality if tested again at a later date, such as six months instead of six weeks.
Given the probable influence of sleep hygiene practices upon overall sleep quality, one might expect similar findings for sleep hygiene knowledge. This was not the case. Counter to hypothesis nine, students in the treatment demonstrated no improvements in sleep hygiene knowledge when compared to the control group. The reason for this lack of significant improvement may be logical. Specifically, the amount of knowledge may not have changed, but the importance students placed on this knowledge may have. For example, when asked whether it was better to go to sleep at the same time each day or different times each day, most students can probably surmise that similar times are better. Prior to the intervention, they may not have realized how important regular bedtimes were. The discussion about the importance of sleep during the sleep treatment program may be a key factor that drives home the value of good sleep hygiene. While the sleep hygiene knowledge portion of the SHAPS is answered in a Likert scale, the score places the answer as either correct or incorrect. Thus, in the future, researchers may want to reformat the scoring method of the SHAPS to include weights for the level of importance respondents place upon sleep hygiene knowledge and practice.

Specific improvements in sleep hygiene practices were consistent with some of the sleep hygiene instructions. Specifically, students in the control group reported significantly less naps at six weeks post-treatment. This alone can be considered a success, since taking afternoon naps in order to “catch-up” on lost sleep can be detrimental to sleep onset time and reinforce their misperception that they can counter lost evening sleep by taking afternoon naps. Similarly, students in the treatment group reported significant reductions in caffeine intake for beverages and medications. This is
another specific behavior addressed in STEPS and supports it as an intervention. Students in the sleep treatment group also made more effort to be comfortable when falling asleep as indicated by their significant reduction in hunger at bedtime. While both groups had a decline in the amount of relaxation before bedtime, the treatment group maintained a greater amount of relaxation time, suggesting they placed greater importance on relaxing than the control group. The decline in relaxation is not surprising considering that students likely have a greater workload as the term progresses, especially when they procrastinate. Thus, STEPS not only improves some area of sleep habits, but may be able to prevent deterioration in sleep practices during times of academic stress.

In terms of sleep habits on the SHS, only differences between week and weekend sleep latencies demonstrated significant improvement in the treatment group (Hy13). There was no significant improvement among week and weekend wake-up times (Hy11) or sleep onset (Hy12). While greater regularity in sleep and wake times would be ideal, the improvement in sleep latency is representative of significant improvements in sleep quality. These improvements were likely related to the reduction of naps in the treatment group. Such reductions are important considering difficulties falling asleep may rapidly move from voluntary to involuntary difficulties. Such difficulties are associated with anxiety about wake time and long term sleep onset insomnia (Bootzin, Epstein, & Wood, 1991). Therefore, the improved consistency in this area is a very promising result of STEPS.

Stepwise regression modeling was conducted to explore the relationship between sleep hygiene practices and overall sleep quality. The final model included some factors addressed by STEPS, whereas others were not included. Creating a comfortable bedroom
and going to sleep the same length were positively related to overall sleep quality, but use of sleep medication was negatively related. While STEPS specifically addressed these behaviors, they were not among those that significantly improved. Additionally, both evening and daytime worries about falling asleep contributed to poor sleep quality. Evening worries about falling asleep contributed the most variance to overall sleep quality. While stimulus control instructions address physiologically associated anxiety with difficulty falling asleep and some cognitive factors, neither sleep hygiene nor stimulus control instructions address the cognitive ruminations and misperceptions that contribute to evening sleep worry to the same extent of more direct cognitive-behavioral interventions. Thus, these findings strongly support the need for college counseling center staff to be well versed in cognitive behavioral interventions for sleep difficulties.

Limitations and Future Directions

This study was designed to examine the efficacy of STEPS as both a treatment and preventative measure in reducing sleep difficulties in university students. Therefore, it was not limited to students with sleep difficulties. Additionally, it was administered to an entire class of students without attempting to ensure equal numbers of males and females. Females typically report more sleep complaints than males (Brown et al., 2001; Buboltz et al., 2001). While there were no significant differences among initial indicators of sleep quality, the control group had significantly worse sleep practices at the onset of the study. Fortunately, the repeated measures design reduced the need for comparable groups, since the analysis measured the degree of change within groups over time, according to their treatment condition. Nonetheless, the control group decline in sleep quality may have been worsened by gender influences.
The nonlinear relationship between smoking and sleep quality is certainly noteworthy. Students who smoked occasionally reported worse sleep quality than those who smoked regularly or not at all. This suggests there may be some aspects to smoking and/or irregular smokers that impact sleep. It is possible that irregular smokers in this group smoked at parties, bars, and/or during stress. It is possible that irregular smokers are more sensitive to the stimulant aspects of nicotine. The non-linear relationship may explain why some studies found that quitting smoking initially hurts but then helps sleep (Wetter et al., 1995), whereas other studies found no improvement in the sleep quality of people who quit smoking (Wolter et al., 1996). The complex nature of the relationship between sleep and smoking is likely related to the complicated nature of the central nervous system which can react differentially to addictive substances. Regardless of the reason, this nonlinear relationship deserves additional empirical exploration.

Another possible limitation is the relatively small effect size of STEPS on overall sleep quality on the PSQI. This along with the moderate level of significance is likely related to low power (1 - \( \beta \)). Typically, increasing sample size increases power. However, part of the problem may not be sample size, but the variability of the sample. In many treatment efficacy studies, participants have significant complaints for which they are seeking treatment. In this study, 37% of the participants initially did not fall into the range of poor sleep quality. Thus, the relatively small effect size does not necessarily decrease the significance of this study since the effect size would most likely have been much greater had the study been limited to those with significant sleep complaints. Comprising a study of only those in need of treatment would reduce the relevance of STEPS as a preventative measure. Researchers interested in testing the efficacy of
STEPS primarily as a treatment without looking at its preventative aspects may want to limit their samples to those with significant sleep complaints, which is likely to result in larger effect sizes.

Outcome measures limited to six weeks post-treatment is another concern. As mentioned above, it appears that sleep hygiene practices are first to change, followed by overall sleep quality. It is possible that larger changes in overall sleep quality may occur over longer periods of time. Post data collected 6 months after the treatment may be a better indicator of efficacy than data collected at 6 weeks. Additionally, such delayed outcome measures may also demonstrate whether the intervention has a long-term impact on student sleep habits and related sleep quality or whether improvements are short lived. Therefore, future research over a longer time frame is strongly recommended.

Implications for Practice

Students who took part in STEPS demonstrated significantly improved sleep hygiene practices at six-weeks post-treatment. They took fewer naps, reduced caffeine intake, and ensured greater physical comfort and relaxation at bedtime. These improvements in sleep hygiene practices, in turn, apparently influenced overall sleep quality. Specific sleep quality component score improvements included greater sleep efficiency, shorter sleep latency, and less medication use. Additionally, students reported less discrepancies between week and weekend sleep latency times. These results support the use of STEPS to prevent and reduce the disproportionately large number of sleep complaints among university students.
Suggestions for Implementation

The use of graduate student volunteers who have not otherwise been trained in behavioral sleep interventions is an important aspect of this study. In addition to reducing experimenter bias, the use of these volunteers suggests that non-professionals who are otherwise untrained in sleep treatment interventions can administer STEPS effectively. Thus, any college staff members that interacts with students can administer STEPS, including resident hall advisors, first year orientation leaders, coaches, and professors, in addition to college counseling center personnel.

While there are many ways that universities can implement programs such as STEPS, the following are based on the results of this study and previous studies suggesting that student sleep difficulties become worse as the academic term progresses (Hawkins & Shaw, 1992; Pilcher & Ott, 1998). The ideal time for the administration of the STEPS may be during first year student orientation. Rather than attempt to treat already entrenched poor sleep habits, this may prevent students from developing such habits. At the same time, the problem with first year orientation is that students are inundated with information about adjusting to college life. The large amount of information presented may decrease the effectiveness of STEPS or a similar program. Students may perceive STEPS as one of many orientation classes and tune out much of the information.

One way to counter the tendency of students to discount STEPS as simply another orientation program is to include it in a course that students are required to take their first year. Some universities have such courses that include examinations and college credit. Inclusion of STEPS in such programs may be an ideal way to ensure that students learn
the importance of sleep early in their first year while increasing the chance they will pay attention and learn STEPS. For schools without formalized orientation classes, inclusion of STEPS into general studies classes that all students are required to take, such as introductory psychology, can be an opportunity to teach STEPS and include it on examinations. In such classes instructors can expand the presentation of STEPS to include in-depth coverage of associated research and findings, along with class discussion.

Providing follow-up meetings may increase student sleep quality. Such an approach has worked well with elderly caregivers of dementia patients. Researchers provided sleep hygiene instructions and similar psychoeducational sleep interventions. However, they went beyond simply providing instructions to include group discussions and support to increasing the chances of implementing the suggestions (McCurry, Logsdon, & Teri, 1996). If resident hall advisors present STEPS, they can review progress and concerns during mandatory floor meetings that are common in university resident halls. Additionally, if part of formal classes, instructors can review the information and recommendations during lectures and/or can have students divide into small groups and discuss their thoughts and impressions to better integrate the material into their lives. These are just some of the ways in which universities might implement STEPS. Regardless of their method of implementation, it is an inexpensive intervention that can be incorporated into first year student orientation programs with little effort on the part of the university.

**Psychotherapeutic Interventions**

In addition to STEPS, the regression analysis indicated that the greatest predictor of poor sleep quality was evening worrying about falling asleep. While stimulus control
instructions serve to reduce some bedtime anxiety associated with attempting to fall asleep, they are geared more to conditioning related to anxiety rather than irrational belief systems, ruminations, and cognitive misperceptions. Students who worry about falling asleep during the evening and/or daytime may require more in depth cognitive behavioral interventions. Therefore, it is important that people who present STEPS inform students that college counseling center personnel may help them reduce worrying about falling asleep or other matters. However, before such suggestions can be useful, college counseling center staff members need to learn cognitive-behavioral interventions that can reduce sleep difficulties. It is of interest to note, that in a review of all the APA accredited university counseling training centers, the author of this study did not find any that listed sleep disorders as one of their areas of treatment. The following is a brief summary of some cognitive behavioral treatments that can be used at university counseling centers. Those interested in more in depth sleep treatments may review some selected literature in this area (Bootzin & Nicassio, 1991; Bootzin & Perlis, 1992; Bootzin & Rider, 1997; Buboltz, Soper, Brown, & Jenkins, in press; Murtagh & Greenwood, 1995).

Sleep Restriction Therapy

Sleep restriction therapy focuses on limiting the amount of time in bed to actual sleep time or increasing the proportion time in bed as sleep time. For example, people complaining of acquiring only 4 hours of sleep, should reduce their amount of time in bed to 3 hours and 50 minutes. When sleep efficiency exceeds 85 - 90%, the amount of time in bed increases by 15 - 20 minutes. If efficiency falls below 80% the amount of time in bed decreases by 15 - 20 minutes. Adjustments in sleep are made until the person
achieves optimal sleep. This approach tends to be the opposite of the intuitive response, which is to increase the amount of time in bed to get more sleep (Morin & Wooten, 1996).

Both stimulus control and sleep restriction therapies have psychoeducational components. It is important that sleep restriction therapy includes ongoing monitoring and support by a helping professional. Therapists who use these interventions need to monitor client behaviors. Students should be encouraged to keep a log of their sleep changes. One of the key components in both these interventions is to help students learn they can have control over their sleeping habits. This is extremely important because a common complaint of many clients with sleep problems is that they have no control over their sleep.

Relaxation Therapy

Relaxation therapies focus on decreasing patient arousal level to ease sleep onset. This includes behavioral relaxation therapy such as progressive muscle relaxation and deep breathing, as well as cognitive imagery techniques such as imagining oneself on a beach and lying in the sun. Behavioral approaches work well with simple physical restlessness, while the imagery approaches are better for people who have mental restlessness, such as ruminating about past or future events (Morin & Wooten, 1996).

College counselors should help students create their own relaxation tapes. Making tapes encourages students to import their interests and ideas into treatment. Listening to tapes when attempting to fall asleep takes less effort than trying to remember the steps to relaxation taught by therapists. Further, expecting students to spend hours in therapy
learning relaxation techniques is simply creating a situation for non-compliance, whereas creating relaxation tapes enable them to continue treatment with fewer counseling interventions.

_Cognitive Therapy_

Cognitive therapy focuses on patient expectations. A key component is to change their view from feeling like they are out of control to feeling as though they are capable of coping with the situation. Refuting irrational beliefs and thought stopping procedures are effective in treating sleep difficulties (Bootzin & Perlis, 1992). For example, as people become more worried about their sleep difficulties, they may commonly begin catastrophizing about their sleep problems with such self talk as, “I will NEVER be able to fall asleep” or “I SHOULD have been able to fall asleep by now.” Cognitive therapy can improve adherence to stimulus control, sleep restriction, and sleep hygiene instructions. Some sufferers may believe they need to sleep late if they have trouble falling asleep at night or that taking naps can make up for lost sleep. While different psychoeducational and behavioral interventions specifically mention such beliefs as inconsistent with reality, changing these beliefs may require more thorough psychotherapeutic interventions.

Paradoxical intent is another method of changing insomniacs view of their sleep difficulties (Bootzin & Perlis, 1992). Paradoxical intent consists of instructing clients to do the opposite of what they have been doing. Many clients try very hard to fall asleep and may become anxious about it. As a result, their sleep becomes worse. For example, a paradoxical prescription may instruct students to try and wake up at least 3 times throughout the night for the next 7 nights. Success indicates they have control over their
sleep, while "failure" would mean they woke less than 3 times during the night — a significant improvement for some. While this treatment may sound counter-intuitive, a meta-analysis of over 100 sleep treatment studies found paradoxical intent tends to be slightly more effective than most psychological interventions for reducing unwanted night time awakenings, but less effective in reducing sleep-onset time (Murtagh & Greenwood, 1995).

University Schedules

Beyond psychological interventions for students, universities may want to consider environmental changes to improve sleep habits. In this and previous studies (Brown et al., 2001; Buboltz et al., 2001; Lack, 1986), the average discrepancy between sleep and wake time varied by at least two hours and in some cases more than three. Many universities offer significantly more morning classes than afternoon classes. Shifting class times by as little as an hour may significantly reduce the variability in sleep schedules. However, there are several immediately obvious reasons why this might prove difficult and surely many that are not so obvious.

The first problem involves athletics. Many athletes have practices and competitions in the afternoon that require them to take morning classes. However, switching practices to mornings rather than afternoons have some distinct advantages. Morning exercise is a great way to shift the circadian rhythm to earlier wake times (Shiota et al., 1996). This can be especially useful on Monday mornings. Similarly, practices that take place outdoors expose students to natural sunlight that can also reduce the ill effects of returning to Monday morning schedules. As for athletic events, many are often in the late afternoon and early evening. In most cases, a one to two hour shift in
class schedules should not interfere with these events. Later class times would allow students to go to evening sporting events and give their bodies time to relax prior to bedtime since they would not have to awaken quite so early.

Another problem involves staff, faculty, and traditional work hours. There seems to be a culture-wide belief in the United States that work starts around 8 a.m., give or take an hour. There is no reason to believe that university professors are that much different, many likely want to finish their work day as early as possible. However, there may be just as many who would actually prefer to wake an hour or two later. Indeed, the traditional 8 a.m. wake time is rapidly becoming a thing of the past, especially in the case of shift work and retail stores. With the advent of computers and computer programming, many can set their own work schedules and work late rather than awake at more traditional times. The argument by some that the “real” world works on 8 a.m. through 5 p.m. schedules may actually not be the case. In fact, 9 - 5, 10 - 6 and other shift times seem to be more common when observing retail and computer-related occupations. Many retail stores do not open until 10, suggesting that this consumer driven market has already realized that most people do not naturally awaken early in the morning. Furthermore, moving back staff and faculty start times may be more beneficial since employees may feel more alert during their first hour of work, work more efficiently, and spend less time waking themselves with coffee.

Another difficulty involves the cognitive belief systems among university administrators and personnel. Hopefully, they believe one of the goals of college is to prepare students for the world of work. Consistent with this, they may believe that students need to learn how to take responsibility for their actions and as such are
responsible for ensuring proper amounts of sleep. Certainly, it is important for students to take responsibilities for their actions. However, environmental forces play a large role in student decision making processes. Do universities want to encourage students to be less social? When observing the many programs designed by universities to ensure student social opportunities, the obvious answer is "no:" universities want students to grow socially as well as academically. Indeed, there are many social events, some university promoted, others obviously not (such as late night parties). The point is that while students have early morning classes they also have late night social events. Though such choices are inherently part of college life, they do not have to be mutually exclusive. Moving classes an hour or two later can narrow the gap between academic and social events.

These are just a few suggestions of how universities can alter class schedules while remaining true to other important aspects of university life. While some may view such moves as drastic, it is clearly supported by the evidence provided in this study. Many of the current study participants made efforts to improve their sleep quality. They took fewer naps, used less caffeine, placed importance of relaxing before bedtime, and made a greater effort at going to bed in a comfortable state. The reduction of naps and caffeine is especially important since these are quick fixes to fatigue that many use and are hesitant to give up. The result is that many in the treatment group reported shorter sleep onset times and less evening disturbances, which are two important indicators of sleep quality. This study demonstrated that students listened and cared about improving their sleep quality. On the other hand, there were few improvements in consistency between sleep and wake times. Students continued to have sleep complaints and more
met the criteria for poor sleep quality on the PSQI at the end of the study. This suggests that despite the sleep treatment, which did elicit improvements in the treatment group, the university lifestyle clearly detracts from good sleep habits. It is rather clear that the most obvious factors and the areas of least improvement were related to the inconsistency between students and universities schedules. In summary, while supporting the use of psychoeducational sleep interventions and greater training in behavioral sleep medicine for university therapists, this study also strongly suggests that universities need to consider changing their course schedules to reduce complaints related to variable sleep schedules.

Conclusions

The purpose of this study was to develop and evaluate the Sleep Treatment and Education Program for Students (STEPS). The need for such a program is clearly indicated by the high prevalence of sleep difficulties that students report (Brown et al., 2001; Buboltz et al., 2001). Poor sleep quality is related to emotional balance, feelings of tension, anger, depression, fatigue, confusion, concentration and memory difficulties, reduced life satisfaction (Pilcher et al., 1997), alcohol and tobacco use (Jean-Louis et al., 1998), and lowered sociability (Taub & Berger, 1974; Zammit, 1988; Zammit, 1997). Research demonstrates that psychoeducational interventions are among the most effective treatments for sleep difficulties (Bootzin & Perlis, 1992; McCurry et al., 1998; Morin et al., 1999; Morin & Wooten, 1996; Murtagh & Greenwood, 1995). It was predicted that students who participated in STEPS would demonstrate significantly improved overall sleep quality, sleep hygiene knowledge and practices, and decrease habits that interfere with sleep.
The results of this study are promising. The greatest impact, when looking at
effect sizes ($\eta^2$), was on sleep hygiene practices. Students in the treatment group took
fewer naps, less frequently went to bed hungry, drank fewer beverages with caffeine, and
took fewer medications with caffeine six weeks after the intervention. While both groups
reported decreased pre-sleep relaxation, those in the treatment group had less of a
reduction. This suggests students relax less as the academic semester progresses, but that
those in the treatment condition continued to provide more time for relaxation. Thus,
STEPS not only helped reduce some problem behaviors, but may have prevented an
increase in poor sleep habits as the academic semester progressed. This finding is
consistent with prior research indicating that sleep length declines as the academic term
progresses (Hawkins & Shaw, 1992).

Overall sleep quality in the treatment group was significantly better over time.
Students in the treatment condition demonstrated significantly shorter sleep onset time
and fewer sleep disturbances than the control group. It is of interest to note that the effect
size of treatment on sleep quality was much lower than on sleep practices. This likely
demonstrates the relationship that sleep practices have on sleep quality. In other words,
sleep practices were apparently most directly affected by the intervention, which in turn,
impacted overall sleep quality.

Stepwise regression analysis demonstrated that worrying about falling asleep at
night and during the daytime were the greatest predictors of pre-treatment sleep quality.
Since anxiety prior to falling asleep is counterproductive to good sleep quality, this
finding was not surprising. The stimulus control instructions do, to some extent, address
bedtime sleep anxiety. However, conscious worrying about sleep goes beyond
physiological anxiety to include cognitive self-talk. Therefore, some who sleep poorly may require individually focused cognitive behavioral interventions to reduce sleep worry. A need for sleep intervention training for college counseling center personnel is indicated. However, other than worrying about falling asleep, the remaining predictors of sleep quality were addressed in the sleep hygiene and stimulus control instructions and support these as valid approaches to treatment.

The frequency of sleep difficulties and habits supported the need for universities to seriously address this problem. When combining both groups, 63% of students met the criteria for poor sleep quality on the PSQI during the first two weeks of the term. Eight weeks into the academic term, even with the STEPS treatment, 72% of the students met the criteria of poor sleep quality. The mean sleep quality of the treatment group was significantly lowered over the six week post-treatment period, even though the number of people meeting the criteria for poor sleep criteria was slightly higher in the treatment group. The prevalence of poor sleep difficulties in the control group on the other hand, rose from 70% to 82%. In the standardization sample of the PSQI, at least 84% of those in the poor sleep category met the criteria for some form of diagnosable primary sleep disorder (Buysse et al., 1989). Student week and weekend wake times differed by an average of slightly more than three hours, which is not amenable to waking at 7 a.m. for Monday morning classes.

In addition to supporting the need for a psychoeducational sleep treatment program such as STEPS and college counseling center therapist training in cognitive behavioral sleep interventions, these results supported the need for universities to change their course schedules. Monday morning classes at 8 a.m. clearly run counter to the social
demands many students face during the weekend that may last into early morning hours. Research indicates that sleep complaints are greater among students with large discrepancies between week and weekend wake times (Machado et al., 1998). With an average wake time difference of more than two hours, it would seem that moving classes back an hour or two may drastically decrease the sleep difficulties students face. While such changes may initially be difficult for universities, the impact that these changes may have on sleep schedules, health, and academic performance are worth considering.

This study demonstrated that a simple, brief, and inexpensive to administer psychoeducational sleep treatment program can produce significant improvements in student sleep habits and quality. Many universities already have health and wellness orientation seminars for first year students. Considering the global impact of sleep difficulties, the addition of a 15 - 25 minute sleep program seems well worth the effort required.
APPENDIX A

HUMANS SUBJECTS USE APPROVAL
RESEARCH & GRADUATE SCHOOL

MEMORANDUM

TO: Franklin C. Brown  
   Walter C. Buboltz  
   Barlow Soper

FROM: Deby Hamm, Graduate School

SUBJECT: HUMAN USE COMMITTEE REVIEW

DATE: March 21, 2001

In order to facilitate your project, an EXPEDITED REVIEW has been done for your proposed study entitled:

"The development and evaluation of the Sleep Treatment and Education Program for Students (STEPS)  
Proposal # I-UW"

The proposed study procedures were found to provide reasonable and adequate safeguards against possible risks involving human subjects. The information to be collected may be personal in nature or implication. Therefore, diligent care needs to be taken to protect the privacy of the participants and to assure that the data are kept confidential. Further, the subjects must be informed that their participation is voluntary.

Since your reviewed project appears to do no damage to the participants, the Human Use Committee grants approval of the involvement of human subjects as outlined.

You are requested to maintain written records of your procedures, data collected, and subjects involved. These records will need to be available upon request during the conduct of the study and retained by the university for three years after the conclusion of the study.

If you have any questions, please give me a call at 257-2924.
APPENDIX B

HUMAN SUBJECTS CONSENT FORM
HUMAN SUBJECTS CONSENT FORM

The following is a brief summary of the project in which you are asked to participate. Please read this information before signing the statement below.

TITLE: The development and evaluation of the Sleep Treatment and Education Program for Students (STEPS) (STEPS)

PURPOSE: To develop and evaluate the effectiveness of a program designed to improve student sleep habits and quality.

PROCEDURES: Completion of the survey packet and listening to the presentation.

INSTRUMENTS: A demographics questionnaire, sleep habits survey, Pittsburgh Sleep Quality Index, and the Sleep Hygiene Awareness and Practices Scale

RISKS/ALTERNATIVE TREATMENTS: None

BENEFITS/COMPENSATION: There will be no benefits or compensation for participants.

I attest with my signature ___________________________ that I have read and understood the following description of the study, "The development and evaluation of the Sleep Treatment and Education Program for Students (STEPS)", and its purposes and methods. I understand that my participation in this research is strictly voluntary and my participation or refusal to participate in this study will not affect my relationship with Louisiana Tech University or my grades in any way. Further, I understand that I may withdraw at any time or refuse to answer any questions without penalty. Upon completion of the study, I understand that the results will be freely available to me upon my request. I understand that the results of my survey will be anonymous and confidential, accessible only to the principal investigators, myself, or a legally appointed representative. I have not been requested to waive nor do I waive any of my rights related to participation in this study.

CONTACT INFORMATION: The principal experimenters listed below may be reached to answer questions about the research, subjects rights, or related matters:

Franklin C. Brown, M.A., Ph.D. Candidate (257-3413)
Dr. Walter C. Buboltz, Jr. (257-2449)
Dr. Barlow Soper (257-2449)

The Human Subjects Committee of Louisiana Tech University may also be contacted if a problem cannot be discussed with the experimenters:

Dr. Mary Margaret Livingston (257-2292)
Dr. Terry McConathy (257-2924)
APPENDIX C

PITTSBURGH SLEEP QUALITY INDEX
Instructions:

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

1. During the past month, when have you usually gone to bed at night? __________

2. During the past month, how long (in minutes) has it usually take you to fall sleep each night? ______

3. During the past month, when do you usually awake in the morning? _____

4. During the past month, how many hours of actual sleep did you get at night? (This may be different than the hours you spend in bed.) _______

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

5. During the past month, how often have you had trouble sleeping because you ....
   (a) Cannot get to sleep within 30 minutes.
      Not during the past month ____ once a week____ twice a week____ times a week ____

   (b) Wake up in the middle of the night or early morning.
      Not during the past month ____ once a week____ twice a week____ times a week ____

   (c) Have to get up to use the bathroom.
      Not during the past month ____ once a week____ twice a week____ times a week ____

   (d) Cannot breathe comfortably.
      Not during the past month ____ once a week____ twice a week____ times a week ____

   (e) Cough or snore loudly
      Not during the past month ____ once a week____ twice a week____ times a week ____

   (f) Feel too cold.
      Not during the past month ____ once a week____ twice a week____ times a week ____

   (g) Feel too hot.
      Not during the past month ____ once a week____ twice a week____ times a week ____
(h) Had bad dreams.
Not during the past month __ Once or twice a week ___ times a week ___
(i) Have pain.
Not during the past month __ Once or twice a week ___ times a week ___
(j) Other reasons for sleep difficulties, please describe _______________________

Not during the past month __ Once or twice a week ___ times a week ___

6. During the past month, how would you rate your sleep quality overall?
Very Good ___ Fairly Good___ Fairly Bad___ Very Bad ___

7. During the past month, how often have you taken medicine (prescribed or “over the counter”) to help you sleep?
Not during the past month __ Once or twice a week ___ times a week ___

8. During the past month, how often have you had trouble staying awake while driving, eating meals, or engaging in social activities?
Not during the past month __ Once or twice a week ___ times a week ___

9. During the past month, how much of a problem has it been for you to keep up enough enthusiasm to get things done?
Not during the past month __ Once or twice a week ___ times a week ___

10. Do you have a bed partner or roommate?
Not during the past month __ Once or twice a week ___ times a week ___
APPENDIX D

SCORING FOR THE PITTSBURGH SLEEP QUALITY INDEX
The Pittsburgh Sleep Quality Index (PSQI) contains 19 self-rated questions and 5 questions rated by the bed partner or roommate (if one is available). Only self-rated questions are included in the scoring. The 19 self-rated items are combined to form seven (component) scores, each of which as a range of 0 – 3 points. In all cases, a score of “0” indicates no difficulty, while a score of “3” indicates severe difficulty. The seven component scores are often then added to yield one “global” score, with a range of 0 – 21 points, “0” indicating no difficulty and “21” indicating severe difficulties in all areas.

Scoring proceeds as follows:

**Component 1: Subjective Sleep Quality**

Examine question #6 and assign scores as follows:

<table>
<thead>
<tr>
<th>Response</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Good</td>
<td>0</td>
</tr>
<tr>
<td>Fairly Good</td>
<td>1</td>
</tr>
<tr>
<td>Fairly Bad</td>
<td>2</td>
</tr>
<tr>
<td>Very Bad</td>
<td>3</td>
</tr>
</tbody>
</table>

Component 1 Score: ________

**Component 2: Sleep Latency**

Examine Question # 2 and assign scores as follows:

<table>
<thead>
<tr>
<th>Response</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 15 minutes</td>
<td>0</td>
</tr>
<tr>
<td>16 - 30 minutes</td>
<td>1</td>
</tr>
<tr>
<td>31 – 60 minutes</td>
<td>2</td>
</tr>
<tr>
<td>&gt;60 minutes</td>
<td>3</td>
</tr>
</tbody>
</table>

Question 2 Score: ________

Examine question #5a, and assign scores as follows:

<table>
<thead>
<tr>
<th>Response</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not during the past month</td>
<td>0</td>
</tr>
<tr>
<td>Less than once a week</td>
<td>1</td>
</tr>
<tr>
<td>Once or twice a week</td>
<td>2</td>
</tr>
<tr>
<td>Three or more times a week</td>
<td>3</td>
</tr>
</tbody>
</table>

Question 5a score: ________

Add #2 score and #5a score as follows:

<table>
<thead>
<tr>
<th>Sum of 2 and 5a</th>
<th>Component 2 score</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1-2</td>
<td>1</td>
</tr>
<tr>
<td>3-4</td>
<td>2</td>
</tr>
<tr>
<td>5-6</td>
<td>3</td>
</tr>
</tbody>
</table>

Component 2 score: ________
Component 3: Sleep duration
Examine question #4, and assign scores as follows:

<table>
<thead>
<tr>
<th>Response</th>
<th>Component 3 score</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 7 hours</td>
<td>0</td>
</tr>
<tr>
<td>6 - 7 hours</td>
<td>1</td>
</tr>
<tr>
<td>5 - 6 hours</td>
<td>2</td>
</tr>
<tr>
<td>&lt; 5 hours</td>
<td>3</td>
</tr>
</tbody>
</table>
Component 3 score: _______

Component 4: Habitual sleep efficiency
1) Write the number of hours slept (question #4) here: _____
2) Calculate the number of hours spent in bed:
   Getting up time (question #3): ______
   - Bedtime (question #1): ______
   Number of hours spent in bed: ______
3) Calculate habitual sleep efficiency as follows:
   (Number of hours slept/ number of hours spent in bed) x 100 = Habitual Sleep efficiency
   (_____ / _____) x 100 = _____ %
4) Assign component 4 scores as follows:
   Habitual sleep efficiency % | Component 4 score
   >85%                        | 0
   75 - 84%                    | 1
   65 - 74%                    | 2
   <65%                        | 3
Component 4 score: _______

Component 5: Sleep disturbances
1) Examine questions # 5b - 5j, and assign scores for each question as follows:
<table>
<thead>
<tr>
<th>Response</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not during the past month</td>
<td>0</td>
</tr>
<tr>
<td>Less than once a week</td>
<td>1</td>
</tr>
<tr>
<td>Once or twice a week</td>
<td>2</td>
</tr>
<tr>
<td>Three or more times a week</td>
<td>3</td>
</tr>
</tbody>
</table>

   #5b score ______
   c score ______
   d score ______
   e score ______
   f score ______
   g score ______
   h score ______
   i score ______
   j score ______
2) Add the scores for questions #5b - 5j: ______
3) Assign component 5 score as follows:
Component 5 score:

Component 6: Use of sleeping medication
Examine question #7 and assign scores as follows:

<table>
<thead>
<tr>
<th>Response</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not during last month</td>
<td>0</td>
</tr>
<tr>
<td>Less than once a week</td>
<td>1</td>
</tr>
<tr>
<td>Once or twice a week</td>
<td>2</td>
</tr>
<tr>
<td>Three or more times a week</td>
<td>3</td>
</tr>
</tbody>
</table>

Component 6 score: ______

Component 7: Daytime dysfunction
1) Examine question #8, and assign scores as follows:

<table>
<thead>
<tr>
<th>Response</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never</td>
<td>0</td>
</tr>
<tr>
<td>Once or twice</td>
<td>1</td>
</tr>
<tr>
<td>Once or twice each week</td>
<td>2</td>
</tr>
<tr>
<td>Three or more times each week</td>
<td>3</td>
</tr>
</tbody>
</table>

Question #8 score: ______

2) Examine question #9 and assign scores as follows:

<table>
<thead>
<tr>
<th>Response</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>No problem at all</td>
<td>0</td>
</tr>
<tr>
<td>Only a very slight problem</td>
<td>1</td>
</tr>
<tr>
<td>Somewhat of a problem</td>
<td>2</td>
</tr>
<tr>
<td>A very big problem</td>
<td>3</td>
</tr>
</tbody>
</table>

Question #9 score: ______

3) Add the scores for question #8 and #9: ______

4) Assign component 7 score as follows:

<table>
<thead>
<tr>
<th>Sum of #8 and #9</th>
<th>Component 7 score</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1 - 2</td>
<td>1</td>
</tr>
<tr>
<td>3 - 4</td>
<td>2</td>
</tr>
<tr>
<td>5 - 6</td>
<td>3</td>
</tr>
</tbody>
</table>

Component 7 score:______

Global PSQI Score
Add the seven component scores together

Global PSQI Score:______
APPENDIX E

SLEEP HYGIENE AWARENESS AND
PRACTICE SCALE
This is a survey of the effect of daytime behaviors upon sleep. We are interested in knowing your opinion about whether any of these daytime behaviors influence the quality and/or quantity of sleep. For the following list of behaviors, please indicate your opinion as the general effect, if any, that each behavior may have on nightly sleep. Please use the following scale and answer each item by writing the appropriate number in the space provided. Note that numbers 1, 2, and 3 indicate degrees of benefit to sleep, number 4 indicates no effect on sleep, and numbers 5, 6, and 7 indicate degrees of disruption of sleep.

<table>
<thead>
<tr>
<th>Beneficial to sleep</th>
<th>No effect</th>
<th>Disruptive to sleep</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>very</td>
<td>moderately</td>
<td>mildly</td>
</tr>
<tr>
<td>mildly</td>
<td>moderately</td>
<td>very</td>
</tr>
</tbody>
</table>

What effect does each of these behaviors have upon sleep?

1. Daytime napping ______
2. Going to bed hungry______
3. Going to bed thirsty____
4. Smoking more than one pack of cigarettes a day______
5. Using sleep medication regularly (prescription or over-the-counter) ______
6. Exercising strenuously within 2 hours of bedtime____
7. Sleeping approximately the same length of time each night______
8. Setting aside time to relax before bedtime____
9. Consuming food, beverages, or medications containing caffeine______
10. Exercising in the afternoon or early evening_____
11. Waking up at the same time each day ______
12. Going to bed at the same time each day ______
13. Drinking 3 ounces of alcohol in the evening (e.g., mixed drinks, 3 beers, 3 glasses of wine)______

Caffeine Knowledge

For each item on the following list, indicate whether you believe it contains caffeine or another stimulant by placing a Y (yes) or N (no) in the space provided. If you are not sure, make your best guess. If you have never heard of an item please place an X in the space.

- 7-Up soft drink
- Regular Tea
- Dristan Cold Remedy
- Aspirin
- Dr. Pepper
- Midol menstrual relief
- Lemonade
- Root Beer
- Chocolate Cake
- Regular Coffee
- Excedrin
- Sudafed
- Mountain Dew
- Cola soft drinks
- Dexatrim
- Tylenol
- Aqua Ban
- Sprite soft drink

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Sleep Hygiene Practice

For each of the following behaviors state the number of days per week (0 - 7) that you engage in the activity or have that experience. Base your answers on what you would consider an average week for yourself.

Indicate the number of days or nights in an average week you:

1. Take a nap ______
2. Go to bed hungry _____
3. Go to bed thirsty _____
4. Smoke more than one pack of cigarettes ______
5. Use sleeping medications (prescription or over-the-counter) ______
6. Drink beverages containing caffeine (e.g., coffee, tea, colas) within 4 hours of bedtime ______
7. Drink more than 3 ounces of alcohol (e.g., 3 mixed drinks, 3 beers, or 3 glasses of wine) within 2 hours of bedtime ______
8. Take medications/drugs with caffeine within 4 hours of bedtime ______
9. Worry as you prepare for bed about your ability to sleep at night ______
10. Worry during the day about your ability to sleep at night ______
11. Use alcohol to facilitate sleep ______
12. Exercise strenuously within 2 hours of bedtime ______
13. Have your sleep disturbed by light ______
14. Have your sleep disturbed by noise ______
15. Have your sleep disturbed by your bed partner (put NA if no partner) ______
16. Sleep approximately the same length of time each night ______
17. Set aside time to relax before bedtime ______
18. Exercise in the afternoon or early evening ______
19. Have a comfortable nighttime temperature in your bed/bedroom ______
**Sleep Hygiene Knowledge**

Correct answer = 1 point, item omitted = 2 points, incorrect answer = 3 points
Items 1 - 6, 9, and 13 are disruptive to sleep.
If responses to these questions are:
   1. 2, 3, or 4 score as incorrect
   5, 6, or 7, score as correct
Items 7, 8, 10, 11, and 12 are beneficial to sleep.
If responses to these questions are:
   1, 2, or 3 score as correct
   4, 5, 6, or 7, score as incorrect
Note the response 4 is always incorrect
Scores on this section may range from 13 – 39. Higher scores indicate less sleep hygiene knowledge.

**Caffeine Knowledge**

The following are the correct answers:

- N 7-Up soft drink
- Y Regular Tea
- Y Dristan cold remedy
- N Aspirin
- Y Dr. Pepper soft drink
- Y Midol menstrual relief
- Y Lemonade
- N Root Beer
- Y Chocolate Cake
- Y Regular Coffee
- Y Excedrin
- Y Sudafed decongestant
- Y Mountain Dew
- Y Cola soft drinks
- Y Dexatrim diet pills
- N Tylenol
- Y Aqua Ban Diuretic
- N Sprite soft drink

The score is the number correct divided by the number answered and then multiplied by 100.
Scores may range from 0 to 100, a higher score indicates better knowledge of caffeine.

**Sleep Hygiene Practice**

The total score is the sum of the answers to all the items: reverse the scores for items 16 – 19
(i.e., 0 = 7, 1 = 6, 2 = 5, 3 = 4, 4 = 3, 5 = 2, 6 = 1, 7 = 0.
Scores may range from 0 – 133; higher scores indicate less healthy sleep hygiene practices.
APPENDIX G

SLEEP HABITS SURVEY
SLEEP HABITS SURVEY

1. During the week, what time do you usually fall asleep? ______
2. During the week, what time do you usually wake up? ______
3. On the weekend, what time do you usually fall asleep? ______
4. On the weekend, what time do you usually wake up? ______
5. During the week, what is your average amount of sleep each night? ______
6. During the weekend, what is your average amount of sleep each night? ______
7. Ideally, I would like to get _____ hours of sleep each night during the week.
8. Ideally, I would like to get _____ hours of sleep each night during the weekend.
9. It usually takes me about _____ minutes to fall asleep on a weeknight.
10. It usually takes me about _____ minutes to fall asleep on a weekend night.
APPENDIX H

DEMOGRAPHIC SURVEY
1. Age __________
2. Gender: _____ Male     _____ Female
3. Year in School?
   a. Freshman
   b. Sophomore
   c. Junior
   d. Senior
4. Ethnicity
   a. African American
   b. Caucasian
   c. Hispanic/Latino
   d. Asian American
   e. Native American
   f. Other
5. Major: __________________________
6. Do you currently work? _____ Yes     _____ No
   If yes, how many hours a week?      _____ hours
7. Do you live on campus? _____ Yes     _____ No
8. Do you feel you have any sleep difficulties? _____ Yes     _____ No
9. Do you want to improve your sleep quality? _____ Yes     _____ No
APPENDIX I

ORAL PRESENTATION FOR THE SLEEP TREATMENT AND EDUCATION PROGRAM FOR STUDENTS
Directions: Please read the following information verbatim. When speaking, look at the class at least once every thirty seconds to maintain their attention.

I am here to tell you about the impact sleep has on your life, its importance for your grades, ways to make sure you are getting the right kind of sleep, and how to improve it if you are not. Many of you already know some of the things I am going to tell you. However, it is likely that you will learn some interesting new things as well. All I ask is that you listen carefully. When I am finished speaking, there will be time for you to ask questions and discuss the information presented.

About 1/3 of students surveyed in different parts of the world, including in the United States, report severe sleep difficulties. Another third have at least occasional problems and the remaining third deny sleep difficulties. Sleep problems are brushed off by many students and faculty as part of college lifestyle. But this is not true. From 1969 to 1989, college student sleep length declined by an hour per night, from 7.5 hours to 6.5 hours on average. Many students mistakenly believe that sleeping fewer hours results in more work time. However, this is not true. In fact, people who usually sleep only 5 - 6 hours a night are impairing their ability to learn and work.

Many students believe if they only sleep 6 hours every night, they will adjust to it. But this simply is not true. People who sleep less than six hours per night on a regular basis have more attention and coordination difficulties (Hicks & Gilliland, 1981). Attention is vital in learning more information and coordination is important in many athletics and many leisure pursuits, such as video games.

Sleep problems can impair your ability to think clearly. In one study, a group of students stayed up all night while another group slept eight hours before an exam that
measured their confidence and ability to think rationally. Students who were sleep deprived felt more confident about their score on the rational thinking test but actually scored much lower than those who slept eight hours. Have you ever left an exam feeling like you did well, but then were disappointed when your grade? Before blaming the professor, ask yourselves how you slept the night before.

Sleep problems can even hurt your ability to learn new things and remember them later. Why does this occur? As it turns out, your brain seems to sort out newly learned information and organize it more efficiently into your memory. Everyone who sleeps eight hours a night usually dreams about five different times – even if you can’t remember it. People who are awoken every time they enter REM sleep, in essence depriving them of dream sleep, remember less information learned the day before than those whose dream sleep was not interrupted. Even when other sleep stages were interrupted, the only time that it hurt memory was blocking dream sleep. Researchers studied people who were part of an intensive 6-week language course. People who did better in the course dreamt more; in fact they continued to dream more for up to a week following their class. A key point to take from this is that most dreams occur during the last four hours of sleep. When you miss part of this sleep time you are reducing your learning abilities and hurting your test performance.

The timing of sleep is as important as the amount. It is a myth that eight hours of sleep are vital, regardless of when you get the sleep. It is more important to sleep around the same time each night and to get your normal amount of sleep (probably between 7 - 9 hours each night). Research has found that students who sleep two hours later than normal or shift their sleep schedule by more than two hours experience the same
difficulties as those who only sleep six hours, such as irritability, poor attention and concentration, and interpersonal problems. These and similar results were supported in several other studies. Thus, if you have an option between sleeping later than normal to get eight hours or sleeping only six hours of sleep, it is better to awake at the same time and keep a consistent schedule. Attempting to make up for lost sleep is simply going to disrupt your sleep schedule and you will have trouble getting up at your normal time – THIS IS WHY MOST PEOPLE HATE MONDAY MORNINGS!

These are just a few examples of the importance of regular sleep habits and good quality sleep. Many other examples and discoveries about the impact of sleep on our daily lives are being made all the time. The point is that sleep can clearly impact your lives in many areas. Now I am going to tell you about ways you can improve your sleep quality.

I am now passing out 3 sheets of paper to each of you: a list of Sleep Hygiene Guidelines, or behaviors than can help or harm your sleep, a set of Stimulus Control Rules that can improve your sleep quality, and a list of substances that contain caffeine. If you will follow me on the lists I handed out, I will explain the rules and the reasons for them

To begin with, I am going to tell you about the Sleep Hygiene Guidelines. You probably will not be able to follow these rules everyday but following them most of the time should result in a noticeable improvement in your sleep quality.

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

   Reason: If you go to bed without being sleepy, you might toss and turn and worry about not falling asleep. As a result you get mentally and physically upset,
making sleep even more difficult. If you get into this habit, bedtime becomes stressful. Some people worry that waiting until feeling sleepy is not realistic since they have to awake at an early hour the next morning. But, by establishing a fixed time to get up each morning your body will determine how much sleep you need and soon you will begin to feel sleepy when it is time to go to bed.

2. Get up at approximately the same time each morning, including weekends. If you feel you must get up later on weekends, allow yourself a maximum of 1 hour later arising.

Reason: This establishes a regular wake time, if you sleep late every time you go to bed late, you will find your bed and wake time shifting later each day. This is why people who sleep late during the weekend find it very difficult to wake Monday mornings and go to bed at a reasonable hour during the week. Some people believe sleeping late on the weekend can make up for "lost sleep." However, this is a mistaken belief. Once you lose your sleep, you cannot make up for it. If you try, you will find yourself feeling sleepy on those days you sleep late and on those days you do not get enough sleep. It is much better to get a consistent schedule and sleep approximately the same amount at the same time each night.

3. Do not take naps or if you take naps make sure they are in the early afternoon and limit them to an hour.

Reason: If you have difficulty falling asleep or go to bed late and wake up at a predetermined wake-up time you will naturally feel sleepy during the day. If you do not take a nap this will ensure that you will be able to fall asleep at your
scheduled bedtime. If you take a long nap late in the day, you will lose your
sleepiness and then have difficulty falling asleep at your scheduled bedtime.

4. If you feel sleepy in the morning especially on Mondays, get exposure to sunlight
or some other bright light immediately after awakening in the morning for 10 - 30
minutes. If using artificial lights, make sure they very bright (at least 250 lumens,
but preferably over 1000 lumens). You can buy an inexpensive 500 Watt Halogen
"Shop" light at most stores that sell hardware. You do not need to look at the light
directly, just have it shining on or near you.

Reason: You become and stay sleepy when your biological clock releases the
hormone melatonin into your body; bright light stops the flow of melatonin. This
is also why many people feel sleepy or depressed on cloudy days. Without
exposure to bright light, many people's bodies do not completely stop the flow of
melatonin.

These first 4 rules will give you a consistent sleep cycle. Remember, if you stay up late
and only get 5 hours sleep, sleeping later than normal may be just as detrimental than
only getting five hours sleep. Further, sleeping late can mess up you sleep routine for
several days as opposed to not getting enough sleep which will only bother you the day
you feel tired.

5. Do not drink alcohol later than 2 hours prior to bedtime.

Reason: Although alcohol may help you relax and fall asleep, it leads to restless,
non-restorative sleep and you will tend to wake up during the night as it wears off.

6. Do not consume caffeine after about 4 p.m. or within 6 hours prior to bedtime. It
is important for you to learn which foods, beverages, or medicines contain
caffeine. The Substances with Caffeine Handout lists commonly used substances that contain caffeine. But, it does not include everything. So if you are having sleep difficulties, it is important that you check the ingredients of evening medications, beverages, or food that you ingest before bedtime.

Reason: Caffeine is a stimulant for all people even those who report they do not feel any different after digesting it, and can interfere with the natural sleep cycle.

7. Do not smoke within several hours before bedtime. If you are looking for a reason to quit smoking and have sleep problems, this may be a good time to think about quitting.

Reason: Like caffeine, nicotine is a powerful physical stimulant. Your mind may feel more relaxed after a cigarette but you are more physically aroused. Higher physical arousal makes it more difficult to fall asleep.

8. Exercise regularly. The best time to exercise is in the late afternoon or in the morning after awakening. Avoid strenuous exercise within two hours of bedtime.

Reason: Exercise in the afternoon may be a good way to counter feelings of sleepiness because it wakes you up through physiological arousal. Exercise in the morning may help you become more alert. This same physiological arousal will keep you from falling asleep if you do it too close to your normal bedtime.

9. Make your bedroom conducive to sleep. Turn down the lights before bedtime, make sure your bed is comfortable, and minimize noise. If you are unable to reduce the noise due to neighbors or other factors, you can try flexible earplugs to reduce the effect on your sleep.
**Reason:** Uncomfortable sleeping environments raise your physiological arousal and decrease your chances of falling asleep or staying asleep.

10. If you usually snack before bedtime, have a light carbohydrate snack with a small amount of fluid, such as milk. Do not have snack if you awaken in the middle of the night, otherwise your body will become used to this routine.

**Reason:** Going to sleep hungry is not comfortable, at the same time you do not want to eat too much because it will cause you to get up and go to the bathroom in the middle of the night.

Next, I am going to tell you about the Stimulus Control Instructions. Many of you may find it hard to follow some of these instructions simply because you live in a dormitory and use your room for many things. However, if you do have difficulty staying asleep or falling asleep, it may be a good idea to look for other places you can study and do some of your other activities.

1. Do not use your bed or bedroom for any activity other than sleep or sex. You should not watch television, read, talk on the phone, worry, argue with your spouse, or eat in bed. This may be difficult to follow if you live in a dormitory. In this case, try to at least limit your activity on your bed to relaxing activities. If you are having a heated discussion on the phone, try not to do it while lying on your bed. If you are having sleep difficulties, you may want to start looking for places other than your dorm room to study and do assignments, such as in the library or in a study room in your dorm.
Reason: This will ensure you associate the bedroom with sleeping. If you begin to associate your bedroom with other activities, it will be difficult to fall asleep and/or stay asleep.

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

Reason: If you go to bed when you are not sleepy, you will associate your bed with feeling frustrated about not being able to fall asleep.

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

Reason:
This will prepare your body for sleep and you will associate such activities with bedtime.

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

Reason: Lying in bed trying to fall asleep can lead to worrying about sleep.

Getting out of bed makes you only associated the bed with sleep.
Thank you for listening to this presentation. I hope you take it to heart and improve your sleep quality. At this point, you are welcome to ask any questions or bring up points to discuss the material presented.
APPENDIX J

SLEEP HYGIENE GUIDELINES
Sleep Hygiene Guidelines

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

2. Get up at approximately the same time each morning, including weekends. If you feel you must get up later on weekends, allow yourself a maximum of 1 hour later arising.

3. Do not take naps. Or if you take naps make sure they are in the early afternoon and limit them to an hour.

4. If you feel sleepy in the morning, get exposed to sunlight or some other bright light immediately after awakening each morning for 10 - 30 minutes. If you use an artificial light, make sure it is very bright (at least 250 lumens, but preferably over 1000 lumens). You can buy an inexpensive 500 Watt Halogen "Shop" light at most stores that sell hardware. You do not need to look at the light directly, just have it shining on you.

5. Do not drink alcohol later than 2 hours prior to bedtime. Initially, alcohol may help you fall asleep quickly, but it will negatively influence your sleep structure, and probably find yourself waking up in the middle of the night.

6. Do not consume caffeine after about 4 p.m., or within 6 hours prior to bedtime. It is important for you to learn which foods, beverages, or medicines contain caffeine. For example, Regular coffee, tea, colas, chocolate, and most types of cold medicine contain caffeine.

7. Do not smoke within several hours prior to your bedtime. If you are looking for a reason to smoke and have sleep problems, this may be a good time to think about quitting.

8. Exercise regularly. The best time to exercise is in the late afternoon. Avoid strenuous exercise within two hours of bedtime.

9. Make your sleep environment conducive to sleep. Turn down the lights before bedtime, make sure your bed is comfortable, and minimize noise. If you are unable to reduce the noise due to neighbors or other factors, you can try flexible ear plugs or a white noise machine to reduce the effect on your sleep.

10. If you are accustomed to having a snack before bedtime, have a light carbohydrate snack with a small amount of fluid, such as milk. Do not have snack if you awaken in the middle of the night, otherwise your body will become used to this routine.
APPENDIX K

STIMULUS CONTROL INSTRUCTIONS
Stimulus Control Instructions

1. Do not use your bed or bedroom for any activity other than sleep or sex. You should not watch television, read, talk on the phone, worry, argue with your spouse, or eat in bed.

   If you live in a dormitory, try to at least limit your activity on your bed to relaxing activities. If you are having a heated discussion on the phone, try not to do it while lying on your bed. If you are having sleep difficulties, you may want to start looking for places other than your dorm room to study and do assignments, such as in the library or in a study room in your dorm.

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

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

4. If you wake up in the middle of the night and can not fall asleep within 15 minutes, get out of bed and do something else that is relaxing until you feel sleepy again. Then try to fall asleep again and repeat the cycle if necessary.
APPENDIX L

SUBSTANCES WITH CAFFEINE
Substances with Caffeine

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

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

Sodas
- Coca Cola & Diet Coke: 45.6 mg/serving
- Dr. Pepper: 39.6
- Pepsi: 37.2
- Diet Pepsi: 35.4
- Generic Colas: 30 - 60 mg/serving
- Jolt: 71.2 mg/serving
- Mountain Dew: 55 mg/serving
- Mellow Yellow: 52.8 mg/serving

Food
- Chocolate: 8 mg per ounce

Non-Prescription Medicines
Some medicines such as weight loss pills (Dexatrim), certain pain relievers (Midol) and decongestants (Sudafed) contain caffeine. If you take medicine at night you may want to check the ingredients for caffeine.
APPENDIX M

CONTROL LECTURE-INTRODUCTION TO RESEARCH
Control Group Instructions

Adopted from Leary (1990)

Directions: Please read the following information verbatim. When speaking, try to look at the class at least once every thirty seconds to maintain their attention.

Scientific research is important in the field of psychology and for the whole of society. There are four main interrelated functions for behavioral research: describing behavior, understanding behavior, predicting behavior, and solving applied problems.

Some behavioral researchers are primarily interested in describing behavior. Marketing researchers study consumers' preferences and buying practices. Similarly, public opinion polls, such as those that dominate the news during election years, strive to describe people's attitudes. Other examples are research in developmental psychology that describes age-related changes in behavior, and studies from industrial psychology describe the behavior of effective managers.

Throughout history, people have asked questions about the causes of behavior. A good example of this is Aristotle who was one of the first to systematically address basic questions about the nature of humans and their behavior. For most people throughout history however, the approach to these questions was speculative. People concocted explanations of behavior based on observations, creative insights, or religious doctrines. For many centuries, people who wrote about behavior tended to be philosophers or theologians and their approach was not scientific. Even so, many of these early insights into behavior were fairly accurate.

On the other hand, many of their explanations were erroneous. However, even modern researchers can draw erroneous conclusions. The difference though is that these
early thinkers did not rely on scientific research to provide answers about behavior. As a result, they had no way to test the validity of their explanations and, thus, not way to discover whether their interpretations were accurate.

During the end of the 19th century scientific exploration into the field of psychology became more rigorous. Early researchers such as William Wundt, William James, John Watson, and others began to realize that basic questions about behavior could be addressed using many of the same approaches that were used in more established sciences, such as biology, chemistry and physics.

A great deal of behavioral research today is dedicated to providing a better understanding of behavior. One area of research, often termed basic research, is geared toward understanding behavior without regard for the immediate application of this knowledge. This is not to say that basic researchers are not interested in applying their findings; such research usually leads to more life-oriented research. As an example, basic brain research involving neurological functions led to the development of many drugs to control symptoms of mental illness. Similarly, basic research on the cognitive development of children has led to many educational innovations in schools. However, the immediate goal of basic is simply to acquire knowledge rather than solve a particular applied problem.

Many psychologists are interested in predicting behaviors. For example, personnel psychologists try to predict employees' job performance from employment tests and interviews. Similarly, educational psychologists develop ways to predict academic performance on standardized tests in order to identify students who might have
learning difficulties in school. Likewise, forensic psychologists are interested in predicting which criminals will be more dangerous if released from prison.

Developing methods to predict job performance, grades, or violent actions require much research. The tests (such as employment, personality, or achievement) must be administered, analyzed, and refined to meet certain statistical criteria. Then, data are collected and analyzed to identify the best predictors of the target behavior. Prediction equations are calculated and validated on other samples of subjects to be sure they predict the target behavior well enough to be used. In brief, the scientific prediction of behavior involves certain research methods.

The goal of applied research is to provide solutions for current problems rather than to study basic psychological processes. Many industrial-organizational psychologists are hired by businesses to study and solve problems related to employee moral, satisfaction, and productivity. Similarly community psychologists are asked to investigate social problems such as racial tension, littering, and teenage pregnancy. In such cases, researchers use behavioral research methods to understand and solve some problems of immediate concern.

The four main goals of behavioral research - description, understanding, prediction, and solving problems - overlap considerably. For example, many basic research studies are immediately applicable, and many applied research studies answer basic questions. Descriptive and basic research often provides the foundation on which predictive and applied research rests. Additionally, regardless of whether their goal is to describe, understand, predict, or improve behavior; researchers largely rely on the same
strategies. Thus, you should regard these goals as four primary reasons that behavioral scientists conduct research rather than as four distinct types of research.

Aside from the important role that research plays in psychology, a firm grasp of basic research methodology has advantages for students such as you. Even though many students have no intention of becoming researchers or even psychologists and often wonder about the benefits of studying research methods.

A solid background in research has three important outcomes. First, knowledge about research methods is important because it allows people to understand research that is relevant to their professions. Many professionals who deal with people, such as psychologists, social workers, nurses, teachers, managers, public relations specialists, advertisers, and clery must keep up with the advances in their fields. Counselors and therapists are obligated to stay in touch with current research that deals with therapy and related topics. Most such information is published in professional research journals. However, as you may have already learned from writing papers, journal articles are often difficult to understand unless you know something about research and statistics. Thus, a background in research will provide you with knowledge and skills that you may find useful in professional life.

A second outcome of research training involves the development of critical thinking. Scientists are a critical lot, always asking questions, considering alternative explanations, insisting on hard evidence, refining their methods, and critiquing their own and others’ conclusions. Many people have found a critical, scientific approach to solving problems in areas other than research. For example, the Surgeon General of the United States and the tobacco industry have long engaged in a debate regarding the dangers of
cigarette smoking. The Surgeon General maintains that cigarettes are hazardous to your health, whereas cigarette manufacturers claim no conclusive evidence exists that shows cigarette smoking to cause lung cancer and other diseases in humans. Furthermore, both sides present scientific data to support their arguments. Who is right? As you'll see later in this book, even a basic knowledge of research methods will allow you to resolve this controversy.

A third outcome of becoming involved in research activities is that it helps you become an authority, not only in procedures, but also in particular areas of psychology. In the process of reading about previous studies, wrestling with issues involving research methods, collecting data, and interpreting the results, researchers grow increasingly familiar with their topics. For this reason, the faculty at many colleges urge students to become involved in research, such as class projects, independent research projects, or assisting with faculty research. This is one reason why many universities insist that their faculty maintain ongoing research programs - it ensures they are leaders in their fields.

There are three main aspects to scientific research that separate it from intuitive, philosophical, or religious explanations: systematic empiricism, public verification, and solvable problems.

Empiricism refers to the practice of relying on observations to draw conclusions. The phenomena to be studied must be objective and observable, not the product of imagination. But, observations alone are not enough to ensure something is scientific. The observations must be systematic. Scientists structure their observations in systematic ways so they can draw conclusions about the nature of the world around them. For example, a behavioral researcher interested in the effects of exercise on stress is unlikely
to simply talk with people who exercise and ask them how much stress they feel. The researcher is more likely to design a carefully controlled study in which people are randomly assigned to different exercise programs, then measure their stress using well-validated techniques. Data obtained through systematic empiricism allows researches to draw more confident conclusions than they can draw from casual observations alone.

The second criteria, public verification, means that research must be conducted in such a way that the findings of one researcher can be observed, replicated, and verified by others. This is to ensure that the phenomena studied are real and observable, not one person's imagination. Claims without the possibility of verification are disregarded as non-scientific. This is why people who claim they were abducted by aliens who do not have physical proof usually are not taken seriously. Public verification also helps make science self-correcting. Research that is open to public scrutiny allows the correction of errors in methodology and interpretation.

The third aspect, solvable problems, directs scientists to only deal with problems that have a workable solution. Investigating questions that are unanswerable only leads to pointless argument and debate. This means that many questions should be left out of the realm of science: such as the existence of Gods, angels, or other supernatural non-examinable questions. Such questions are beyond the realm of scientific investigation.
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VITA

Franklin Brown completed this dissertation as part of the requirements for the Doctor of Philosophy degree in Counseling Psychology at Louisiana Tech University. He previously attended Kutztown University of Pennsylvania where he received his Master of Arts degree in Counseling Psychology in May of 1996, his Bachelor of Arts in Psychology in May of 1994, and Bachelor of Science in Criminal Justice in May of 1994.

His clinical and counseling experience primarily has focused on health and clinical neuropsychology. He completed an American Psychological Association accredited Clinical Psychology Internship at Utah State Hospital. He is currently a Clinical Neuropsychology Postdoctoral Fellow at Dartmouth Medical School.

While at Louisiana Tech University, he actively researched, published, and presented numerous articles on the sleep patterns of college students, psychological predictors of cardiac rehabilitation, and multicultural aspects of depression. He was also an advocate for student health and founded a radio program at the Louisiana Tech University radio station designed to improve health awareness. Currently, he is researching neuroanatomical aspects of spatial memory with functional magnetic resonance imaging as part of his postdoctoral fellowship.