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Sleep habits and patterns of college students and their relationship to selected personality characteristics

Steve M. Jenkins

SLEEP HABITS AND PATTERNS OF COLLEGE STUDENTS AND THEIR RELATIONSHIP TO SELECTED PERSONALITY CHARACTERISTICS

by

Steve M. Jenkins, B.A.

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Supervisor of Dissertation Research

Head of Department
Psychology & Behavioral Sciences
Department

Recommendation concurred in:

Advisory Committee

Approved:
Director of Graduate Studies

Approved:
Dean of the Graduate School

Dean of the College

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ABSTRACT

College is a time of adjustment when many students have a newfound responsibility for many aspects of their lives, including sleep habits and patterns. College students often have sleep schedules that vary greatly, which can result in sleep disturbances. Previous research indicates that college students report significantly more sleep disturbances than the general population. Poor sleep quality has been linked to myriad psychological, physiological, and cognitive difficulties, including mood and anxiety disorders, cardiovascular disease, and poor academic performance. Oftentimes, sleep disturbances can be corrected with basic psychological interventions. Considering the deleterious effects that poor sleep can have on college students, it behooves researchers to identify variables that are related to poor sleep. An area that has not been fully explored in the literature is the relationship between sleep and personality. The purpose of this study was to further clarify this relationship, and identify selected personality characteristics of college students that relate to poor sleep. This relationship was assessed using the Sleep Quality Index, a sleep habits questionnaire, and the Sixteen Personality Factors Questionnaire. Results indicate that a relationship exists between both sleep quality and delayed weekend wake times, and selected personality characteristics. Overall, it was found that people who have poor sleep quality are less emotionally stable, less self-assured, and less observing of rules and regulations. Additionally, they are more skeptical of the motives of others, more oriented to internal processes, have higher trait anxiety, and are less grounded and practical. The results also indicated that those who

wake significantly later on the weekends, compared to weekdays, are less emotionally stable and less obedient of rules and regulations. Additionally, they are less practical, tend to daydream, and are more impulsive and reckless. Results indicate only a very weak relationship between sleep length and personality. These findings have implications for those who work with college students that may lead to a decrease in sleep difficulties. Psychologists may be able to use this information to differentiate between sleep hygiene problems and sleep disturbances related to psychological difficulties. Furthermore, psychologists can use this information to identify problem areas related to personality that are affecting both psychological well being and sleep difficulties, and subsequently choose interventions that targets these specific problems.

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CHAPTER 1

Introduction

Psychologists have been studying sleep for over a century. Freud believed that dreams were the gateway to the unconscious (Freud, 1900). According to his theory, it is through dreams that the deepest and darkest desires are fulfilled and the inner core of personality is revealed. Although many modern theorists may dismiss Freud's theory, psychologists and other scientists continue to attempt to unveil the mystery of sleep. In recent years, the importance of sleep has become clearer. Research has shown that poor sleep can have a serious impact on mood, cognition, and a variety of other psychological and physiological aspects of human functioning (Pilcher, Ginter, & Sadowsky, 1997). The technology to study the brain's electrical activity during sleep was developed approximately 80 years ago (Hobson, 1995). Since that time, five distinct stages of sleep have been identified. Some stages, such as Rapid Eye Movement (REM) sleep (generally associated with dreaming), have proven to be more important than other stages, such as Stage 1 (a transition between drowsiness and sleep). Recent research has shown that REM sleep is vital to learning, memory, and life itself (Hobson, 1995). The exact purpose of sleep remains unclear. However, several theories have been developed on why sleep is

necessary to human and animal functioning. There is evidence that sleep aids in brain development during infancy, allows certain brain cells to replenish their supply of important chemicals, aids in learning, and allows tired muscles to rest and regenerate (Adam & Oswald, 1977; Roffwarg, 1966; Siegel & Rogawski, 1988).

Over the past twenty-five years there have been numerous studies exploring the sleep habits, patterns, and difficulties of college students. Studies on sleep deprivation, variation, and reduction have illuminated the numerous aversive effects that poor sleep quality and habits can have on students. Sleep difficulties take a variety of forms, and there are a plethora of potential contributing factors that are salient in college student populations, including stress, variation of sleep schedules, and the ingestion of certain foods and chemicals (Caldwell, 2003; Lack, 1986; McCann & Stewin, 1987).

College is a time of transition for many young people in which they are responsible for various aspects of their lives, including sleep habits and patterns. Although many young adults relish their newfound autonomy and independence, they are nevertheless subjected to substantial social and academic requirements (Kleeman & Richardson, 1985; Russell & Petire, 1992). This lifestyle adjustment is often done in the midst of living away from family for the first time. Taking these considerations into account, it is not surprising that college students tend to have more sleep difficulties than the general population (Brown, Soper, & Buboltz, 2001; Coren, 1994; Lack, 1986).

Demands of college adjustment bring the potential for high levels of stress. Stress and worry have been linked to poor sleep quality (McCann & Stewin, 1987). A common method students use to compensate for lost sleep during the week is to sleep later on the weekends in an attempt to "catch up" on sleep (Machado, Varella, & Andrade, 1998;

Pilcher & Walters, 1997). Unfortunately, this variable sleeping pattern is conducive to a circadian rhythm disorder known as Delayed Sleep Phase Syndrome (DSPS) that can result in excessive morning drowsiness and difficulty falling asleep on weeknights (Buboltz & Brown 2001; Lack, 1986).

Along with irregular sleeping schedules, there are several other factors that have been linked with poor sleep in college populations. Many college students have high rates of alcohol, nicotine, and caffeine use, which can have severe effects on sleep quality (Caldwell, 2003; Riedel, Durrence, Lichstein, Taylor, & Bush, 2004; Roehrs, 1993). To combat sleep difficulties, college students may turn to the use of sleep medication. Unfortunately, pharmacological treatments have demonstrated little, if any, effectiveness in treating long-term sleep problems, and can potentially exacerbate current sleeping difficulties (Morin & Wooten, 1996).

Previous research has indicated that the effects of sleep difficulties extend far beyond simply feeling tired during the day. Poor sleep quality and habits have been linked to increased tension and depression, decreased psychological well-being, and general lower life satisfaction in students (Pilcher, et al., 1997). There is also evidence that sleep difficulties can significantly impair student academic performance, learning and memory, and overall cognitive ability (De Konick, Lorrain, Christ, Proulx, & Coulombe, 1989; Lack, 1986; Schredl, Weber, & Heuser, 1998). Cognitive skills appear to be particularly dependent on REM sleep (Plicher & Walters, 1997). Periods of REM sleep increase in length as a person progresses through a night of sleep. Research suggests that the last half of a full night's sleep may be the most important in the learning process (Smith & Lapp, 1991). Hence, when students consistently deprive themselves of

the last two hours of sleep, they are likely inhibiting the memory consolidation process and the ability to learn new material.

Considering the potential detrimental effects of poor sleep, it behooves researchers to identify factors that are related to sleep habits and patterns. The amount of research on personality factors related to sleep is somewhat limited. Much has focused on sleep length and personality, but has not produced dramatic results. While general patterns of long and short sleep do not appear to be related to personality, research on sleep loss has produced significant results. Sleep deprivation of only one night has been shown to be related to increased anxiety, excitability, sensitivity, and impulsiveness (Sicard, Jouve, & Biln, 2001; Vein, Dallakyan, Levin, & Skakun, 1983). Ironically, short-term sleep deprivation also has been linked with decreased symptoms of depression (Kraft, 1984).

The few studies that have focused on sleep quality and sleep habits have produced more inspiring results. Sleep habits can be defined in terms of keeping a regular or irregular sleeping schedule, while sleep quantity generally refers to components related to a good night's sleep (e.g., time it takes to fall asleep, number of nocturnal awakenings, and feeling rested in the morning). Individuals with irregular sleeping schedules have been shown to have significantly different profiles on measures of personality when compared to a control group (Taub & Hawkins, 1979). Similarly, a clear relationship has been established between poor sleep quality and negative mood states (Bonnet, 1985; Gau, 2000; Gray & Watson, 2002; Lacks & Morin, 1992; Pilcher & Huffcutt, 1996).

There is also a small body of research linking sleep quality with clinical (abnormal) aspects of personality. Poor sleepers tend to have more clinical symptoms

than good sleepers, including increased symptoms of depression, anxiety, and social introversion (Aikens & Mendelson, 1999; Monroe, 1967). Similarly, poor sleep appears to be related to Type A personality. Type A behavior involves a chronic incessant struggle to achieve more and more in less time, which can result in health difficulties (Friedman & Rossman, 1974; Krantz, Arbrier, Davia, & Parker, 1988).

While poor sleep appears to be related to many undesirable personality characteristics (e.g., increased anxiety and negative mood states), there is a variety of psychological treatments that have been shown to produce dependable and lasting improvements in sleep quality in most individuals (Morin, Culbert, & Schwartz, 1994; Morin & Wootin, 1996; Murtagh & Greenwood, 1995). When personality characteristics that are related to sleep difficulties are identified, psychological professionals can aid students in combating potential maladies that are destructive to many aspects of life. The purpose of the present study is to define further the relationship between sleep and selected personality characteristics of college students, which may ultimately lead to improved sleep in a population that is known to have poor sleep habits and patterns.

Statement of the Problem

Humans spend approximately one third of their lives sleeping. However, actual length and quality of sleep, as well as sleep habits and patterns vary from individual to individual. Previous research has shown that there are identifiable factors that can affect sleep, ranging from the ingestion of caffeine or alcohol, to a job that requires shift changes (Caldwell, 2003; Carlson, 2004; Pressman & Orr, 1997; Roehrs, 1993). While such individual factors are easily measurable, personality characteristics are often more latent or intangible, and their relationship to sleep remains unclear.

Few studies have examined the relationship between sleep and personality. A considerable amount of the research that exists has focused on sleep length. The majority of these appear either to have suffered from poor methodology or found little to no relationship between sleep length and personality (e.g., Buela-Casal, Carlos Sierra, & Caballo, 1992; Hill, Diemer, & Heaton, 1997; McCann & Stewin, 1988). Additionally, recent research has indicated that sleep length may not be as important as sleep quality (Pilcher, et al., 1997).

Certain personality characteristics are related to poor sleep quality. Most notably, several studies have shown that individuals characterized by having negative mood states generally have more sleep difficulties and impaired daytime functioning (Bonnet, 1985; Gau, 2000; Gray & Watson, 2002; Lacks & Morin, 1992; Pilcher & Huffcut, 1996). Other studies suggest that sleep quality is related to clinical aspects of personality, including symptoms of depression, anxiety, and hypochondriasis. Poor sleep also is associated with a highly rushed and overly self-demanding lifestyle known as Type A personality (Koulack & Nesca, 1992). Additionally, individuals who are more likely to be motivated to regain, or attempt to regain, lost or threatened freedoms may have poor sleep quality (Jenkins & Buboltz, 2001, May).

Sleep habits also have been linked with personality. Some researchers argue that extroverts are more likely to be "evening types" (those who keep erratic sleep schedules and tend to be most cognitively adept during the evening hours) (Taub, Hawkins, & Van de Castle, 1978). However, more recent studies have not corroborated this theory and have found little or no relationship between the two constructs (Beaulieu, 1991; Gray & Watson, 2002; Vaidya, 1997). While the relationship between evening types and

extroversion remains suspect, consistent results have shown that individuals who keep morning-oriented schedules tend to be more conscientious and report more positive emotionality during the day, than evening types (Clark, Watson, & Leeka, 1989, Gray & Watson, 2002; Vaidya, 1997).

With the limited amount of research that has been conducted, there is not a clear picture of how sleep habits and patterns of college students are related to personality characteristics. Due to this restricted knowledge base, professionals who work with individuals with sleep difficulties do not have enough information to target selected thoughts, feelings, and behaviors that may be influencing sleep quality and habits. Further research in this area could help to solidify existent research; potentially create new theories related to personality characteristics that have not been researched; further clarify the relationship between sleep and personality.

Justification

A significant portion of the college student population suffers from sleep difficulties. Previous research suggests that approximately one third of college students are having frequent or chronic sleep disturbances, while only about one third are free from sleep disturbances (Coren, 1994).

While the impact of sleep disturbances on college students is not completely understood, studies have shown that poor sleep may have detrimental effects. Sleep loss of only one night has been shown to impact college students negatively in myriad ways, including general cognitive functioning, learning and memory, grade point average, and a variety of psychological difficulties (Caldwell, 2003; Dinges, 1988; Jenkins & Buboltz,

2002, March; Pilcher, et al., 1997; Pilcher & Walters, 1997; Schredl, Weber, & Heuser, 1988).

Sleep difficulties also have been linked to a variety of health issues in college students. College students who are able to fall asleep faster and have fewer sleep disturbances report fewer mental, social, and physical health difficulties (Jenkins, Buboltz, Fowler, & Rosielle, 2002, June). Poor sleep may have adverse effects on normal growth and development, as well as immune system maintenance (Irwin, McClintick, & Costlow, 1996; Parker, Rossmand, & Kirpke, 1980; Sassin et al, 1969).

The relationship between sleep and personality is not clearly defined. However, previous research has provided some encouraging results, indicating that a relationship may exist. Identifying personality factors related to sleep difficulties can be an important step in combating the negative effects of poor sleep. Once these factors are identified, counselors and educators can help decrease poor sleep in the college student population, as well as improve the prognosis for future college students thorough proper education and interventions.

Previous research has shown that psychological interventions are capable of improving poor sleep with the use of various behavioral, cognitive, and relaxation treatments (Morin, Culbert, & Schwartz, 1994; Morin & Wooten, 1996). Many interventions such as daily exercise and bright light therapy (the use of a bright light to help regulate an individual's sleep circadian rhythm) are simple and available to the vast majority of college students. There is also a variety of more intricate and extensive interventions that may require the guidance of a counselor.

Considering the prevalence of sleep difficulties among college students, and the deleterious effects that poor sleep habits and patterns can have on this population, further research in this area is warranted. The purpose of this study is to clarify further the relationship between sleep and personality, and identify selected personality characteristics of college students that are related to poor sleep. The information ascertained from this study potentially could be used to develop new psychological interventions that specifically target personality characteristics that are maladaptive to good sleep.

Literature Review

Most human beings spend approximately one third of their lifetime sleeping, yet many individuals give sleep little to no thought on a daily basis, other than the realization that sleep is needed when they become tired. Sleep is simply part of the human condition, and although it may be delayed or shortened to fit a particular lifestyle, it cannot be eliminated. To function at an optimum level, most human beings must obtain approximately 8 hours sleep every 24 hours. To the casual observer, sleep may appear to be a fairly simple process; perhaps consisting of little more than a daily routine of lying down, closing the eyes, and drifting off into a state of rest. However, sleep is an amazingly complex behavior. Though many bodily functions and muscles may decrease activity, the brain is very active during sleep.

Stages of Sleep

Since the inception of the electroencephalogram (EEG) in 1928, scientists have been able to study electrical activity in the brain by recording impulses from the scalp, and have consequently been able to identify five distinct stages of sleep (Hobson, 1995).

Higher frequencies (less space between EEG waves) reflect a high level of brain activity, or the electrical discharge of numerous neurons. When a person is awake, brain waves consist almost entirely of alpha and beta activity (Carlson, 2004). Alpha waves are regular, medium frequency waves (8-12 Hz), that the brain produces when a person is resting quietly. Beta waves are irregular, mostly low amplitude waves (13-30 Hz), that occur when a person is engaged in mental processing, or is physiologically aroused.

When a person becomes drowsy and the eyes close, Stage 1 of sleep usually begins, and some theta waves (3.5 -7.5 Hz) become visible on the EEG (Carlson, 2004). Stage 1 is actually a transition between sleep and wakefulness. If individuals are aroused during Stage 1 they may deny being asleep (Hobson, 1995). Sleep studies have shown that individuals with insomnia often spend more time in Stage 1 sleep than those without insomnia, and frequently obtain more sleep than they confess (Carskadon & Dement, 2000).

Usually after spending about 10 minutes in Stage 1 sleep, an individual will enter Stage 2 sleep, which is distinguishable by the presence of sleep spindles and K complexes (Carlson, 2004). Sleep spindles are short EEG wave bursts that occur between two and five times a minute during the first four stages of sleep, while K complexes are sudden sharp waves that are generally only found in Stage 2. Research suggests that these two types of wave bursts are involved in keeping a person asleep (Bowersox, Kaitin, & Dement 1985; Steriade, 1992).

Although the amount of time people spend in each sleep stage changes at certain developmental periods in life, a healthy adult will spend approximately 10-25 minutes in Stage 2, before entering Stage 3 (Carskadon & Dement, 2000). During Stage 3, slow,

high amplitude waves (less than 3.5 Hz) called delta waves emerge. Stage 3 usually lasts for several minutes, and then the individual enters Stage 4, which is marked by the presence of more that 50% delta waves. Stages 3 and 4 are generally known as slow wave sleep; the sleeper is now in the deepest levels of sleep. When individuals are awakened during Stage 4, the sleeper will usually be confused and easily fall back to sleep without remembering the occurrence (Bonnet, 2000).

The final stage of sleep is characterized by rapid eye movement (REM). REM sleep does not generally follow Stage 4, but rather the individual first will usually cycle back through Stages 3 and then 2, before entering REM (Carskadon & Dement, 2000). REM sleep is also commonly referred to as paradoxical sleep because the brain paralyzes muscles by inhibiting neural activity in the brain stem, yet beta activity is present, which is usually only seen during wakefulness or Stage 1 sleep (Carlson, 2004). The vast majority of dreams occur during REM sleep, and if a person is aroused during REM he or she will almost always report they were dreaming. It is believed that muscle paralysis occurs to protect the individual from acting out dreams that could result in injury (Carskadon & Dement, 2000). REM sleep is also characterized by fast, irregular, low-voltage brain waves that indicate substantial brain activity. The person is completely asleep, yet the pattern of brain activity is similar to wakefulness (Carlson, 2004).

Throughout a night of sleep, adults generally alternate between periods of REM and non-REM sleep, with the total cycle taking about 90 minutes to complete (Carlson, 2004). Each cycle contains approximately 20-30 minutes of REM sleep, with periods of REM progressively increasing with each cycle as the night goes on. Stages 1 and 2

become less frequent. Hence, during a typical eight-hour night an individual will have four to five periods of REM sleep (Carlson, 2004).

Reasons for Sleep

Sleep is a behavior, but it is one that is unavoidable. No matter how hard one tries to do away with it, sleep will eventually come. Although counterintuitive because the body may feel physically tired, it appears that the primary function of sleep is not to allow the body to rest or regenerate from the physical exertion of the day. If this were so, individuals who use more energy during the day would require more sleep, and research has shown that changes in exercise do not significantly impact the amount of sleep a person needs (Horne, 1988). Though resting the body may not be the primary function of sleep, some restorative properties appear to occur during sleep. A person's metabolic rate is about 9% lower during sleep than it is during quiet wakefulness (Reich, Geyer, & Karnovsky, 1972). Also, it is believed that during sleep accumulated tissue restitution occurs and neurotoxins are neutralized (Adam & Oswald, 1977; Hartman, 1973).

Over the years, researchers have attempted to understand other reasons why sleep is important. While it remains unclear as to the exact purpose of sleep, theories have emerged that help explain this problem. Such theories include neurotransmitter replenishment (Hobson, 1995; Siegel & Rogawski, 1988), nervous system development (Hobson, 1995; Roffwarg, Muzio, & Dement, 1966), and memory reinforcement and consolidation (Antrobus, 1986; Hobson, 1995; Steriade & McCarley, 1990; Wood, Bootzin, Kihlstrom, & Schacter, 1992)

The neurotransmitter replenishment theory purports that sleep allows certain nerve cells a resting period so they can regenerate their supply of neurotransmitters

(Hobson, 1995). In general, neural activity slows down during sleep, with most neurons showing a slight decrease in activity. Some cease to fire altogether, especially during REM sleep. The specific neurons that stop firing are aminnergic neurons that release norepinepherine and serotonin, which are believed to play a significant roll in attentive learning and memory (Siegel & Rogawski, 1988). Neurons are continuously firing throughout waking hours, and it is possible that neurons have a limited quantity of neurotransmitters that can be depleted. According to replenishment theories, aminergic neurons continue to produce new neurotransmitters while inactive (Hobson, 1995). After enough time in REM sleep, these neurons create enough reserve neurotransmitters to help us remain cognitively adept for another day.

Developmental theories have emerged suggesting that one of the primary functions of sleep (specifically REM sleep) is to aid in the development of the nervous system (Hobson, 1995). During the first few weeks of life, infants spend up to 80% of their sleep in REM, which is more than three times the amount of adults. Because REM is so prominent in infancy, as well as in utero, developmental theorists believe that REM sleep allows the brain to rehearse future behaviors, and increase the strength of neural pathways for future use. Roffwarg, et al. (1966) found that when fetal lambs were observed thorough Plexiglas windows in the uterine wall, breathing chest movements were present during REM sleep, yet not present at any other time. Developmental theories are further supported by the fact that consistently across species, the amount of REM sleep at birth is greater than at any other time in life, and that the amount of REM sleep decreases and levels off in adulthood (Roffwarg, et al., 1966). In general, developmental theories suggest that brain stimulation during REM sleep aids in brain

development. However, this theory is incomplete in that it fails to explain the function of REM sleep in adults.

Learning theories suggest that the primary function of sleep is to consolidate and reinforce memory. While research has shown that learning cannot occur during sleep (Wood, et al., 1992), lack of sleep appears to hinder daytime learning (Hobson, 1995). It remains unknown exactly how memory is organized. Yet it is believed that memory is distributed throughout the brain and that new neural pathways are created to account for new memories. When new information or experience is procured, the neurons involved increase their synaptic strength, and the end result is that fewer impulses are needed for the post-synaptic neuron to fire (Hobson, 1995). Learning theorists suggest that as neural pathways strengthen, a new protein structure is created, allowing new information to be permanently stored in the brain (Steriade & McCarley, 1990). However, it is believed that these proteins are unstable and must be refreshed in order to remain strong. During REM sleep, neural pathways that have been altered by learning appear to be activated, which could account for why REM sleep has been found to be crucial to learning and memory (Hobson, 1995). Additionally, during REM sleep the learning and memory centers of the brain (the cortex and neo-cortex) are active, and thus could reinforce both new and older memories. Antrobus (1986) suggested that during REM sleep, the brain is aroused and ready to process information, though the environment provides little or no stimuli to be processed during this time. The brain therefore begins to process information that is stored in memory, and treats the stream of thought and imagery as if the person were awake.

Circadian Rhythms

The earth's natural environment provides living organisms with a variety of external stimuli. Many of these stimuli follow a rhythmic pattern (e.g., the lunar-tidal, solar-daily, and seasonal-yearly patterns of light). Such patterns are quite predictable, and it is believed that animals have adapted their physiology to contend with these environmental changes (Strubbe & Woods, 2001). Similar to most other animals, human beings have a number of biological rhythms that serve as internal clocks. These rhythms vary in length, including annual rhythms (e.g., the secretion of testosterone in males) and monthly rhythms (e.g., the menstrual cycle in women). However, many biological rhythms are circadian rhythms that follow approximately 24-hour cycles. Sleep follows a circadian rhythm, but one to which human beings continue to adapt. The natural sleep-wake cycle follows a rhythm that is closer to a 25-hour cycle, and thus must be reset on a daily basis. The normal period of inactivity starts several hours after dark and persists for some time into the daylight portion of the day (Boivin, Duffy, Kronauer, & Czeisler, 1994). Our internal clock is re-synchronized to a 24-hour cycle by external cues such as light. These external cues are commonly referred to as zeitgebers (German for "time givers") (Aschoff, 1979). It has been shown with several species of animals (including humans) that a brief period of bright light will reset circadian rhythms after a maintained period of constant darkness (Aschoff, 1979). With the help of sunlight as a natural zeitgeber, human beings have adapted to a 24-hour sleep-wake cycle.

The portion of the brain that appears primarily to be responsible for regulation of circadian rhythms is the suprachiasmatic nucleus (SN), which is located in the hypothalamus (Refinetti & Menaker, 1992). The SN controls patterns of sleeping and

waking primarily by regulation of the secretion of the hormone melatonin from the pineal gland. The SN becomes less active a few hours before a person's regular bedtime, while the pineal gland begins to release melatonin into the blood stream, causing the person to become sleepy within about an hour (Cajochen, Kraeuchi, & Wirz-Justice, 1997). Near a person's normal waking time, production of melatonin decreases and the person becomes more alert. The SN follows a seasonal rhythm as well, secreting larger amounts of melatonin during the winter to account for the longer periods of darkness (Ralph & Lehman, 1991). If the SN is damaged, the flow of melatonin goes largely unregulated. Subsequently, people with such damage have difficulties maintaining alertness during the day (Cohen & Albers, 1991).

The SN receives messages from a bundle of nerves called the retinohypothalamic tract, which extends from the non-visual photoreceptors in the retina of the eye. Studies have shown that when this bundle of nerves is damaged, circadian rhythms become free running, and resistant to zeitgebers (Refinetti & Menaker, 1992). However, the retniohypothalamic track appears to be able to receive input from non-visual photoreceptors in the skin as well as the retina. Campbell and Murphy (1988), found that when a bright light was focused behind the knees (without contact with the eyes) of human subjects that were kept in dim light for several days, circadian rhythms of the participants were reset. Circadian rhythms did not reset in the control group, which did not receive the light treatment.

Another circadian rhythm in humans that has been closely linked with sleep is body temperature rhythm. It is easiest to fall asleep when the body temperature rhythm is near the bottom of its curve (Campbell & Zulley, 1989). During sleep, muscular activity

is almost non-existent. Thus, a major source of body heat is basically turned off, and body heat production is reduced. While heat production is down, cooling production continues. The shivering response to cooler temperatures is not active during sleep, yet the sweating response remains, and can promote cooling. These processes result in a general decline in body temperature during sleep (Hobson, 1995). During REM sleep, central temperature control is essentially lost and reliant upon the environment or arousal to maintain stable body temperature. It is believed that heat control neurons in the hypothalamus are rested during REM sleep to enable them to control temperature more effectively during wakefulness (Parmeggiani, 1977). This theory is further supported by sleep deprivation studies that have shown that prolonged sleep deprivation generally results in a significant drop in body temperature (Horne, 1978). Studies of extreme sleep deprivation in rats indicate that if an animal is deprived of sleep for long enough, the animal apparently will die from complications resulting from the loss of ability to conserve body heat (Rechtshaffen, Gilliand, Bergmann, & Winter, 1983). The precise relationship between thermoregulation and sleep remains unclear, but it is evident that body temperature relates to the sleep-wake cycle, and that sleep may be crucial for thermoregular maintenance.

Circadian rhythms are of varying importance for human being and animal functioning. However, circadian rhythms can become desynchronized with those in the external environment when people change their daily routines, which can result in sleep disturbances (Carlson, 2004). Modern society often has demands that do not match natural circadian rhythms. This is evident in people who perform shift work and must change from working during the day to night. Night shift workers often drive home

during the morning daylight. Since daylight is a natural zeitgeber, this may cause sleep difficulties. Additionally, night workers often attempt to shift back into a daytime schedule during days off, causing further circadian rhythm disruptions, and making it utterly impossible to adjust fully to one schedule of sleep and wakefulness (Akerstedt, 1988). Poor daytime sleep and circadian rhythm disruption have been linked to poor job performance, higher rates of traffic accidents, and health complications (Monk, Folkard, & Wedderburn, 1996). Studies also have shown a significant relationship between shift work and health complications, including headaches, gastric problems, and chronic cardiovascular difficulties (Parkes, 1999; Smith, et al, 1997). Additionally, studies have shown that engineering and industrial disasters happen most frequently between the hours of midnight and 6:00 a.m. (Mitler, Carskadon, Czeisler, Dement, Dinges, & Graeber, 1988).

Natural disruptions in circadian rhythms, such as the change in seasons, also have been shown to have adverse affects on some individuals. Research suggests that individuals who are particularly sensitive to light may be more susceptible to Seasonal Affective Disorder (SAD), (Rosenthal & Wehr, 1992). People who suffer from SAD tend to become depressed during months of the year when days are shorter. During winter, people often have to wake before sunrise, which can result in a delay of the resetting of the sleep/wake circadian rhythm. The prevalence of SAD is considerably greater in higher latitudes, where changes in daylight are more extreme than in lower latitudes (Avery, Dahl, Savage, & Brengelmann, 1997; Mersh, Middendorp, Bouhuys, Beersma, & van den Hoofdakker, 1999).

Factors That Affect Sleep in College Students

Over the past 25 years, there have been numerous studies exploring the sleep habits, patterns, and difficulties of college students. Studies on sleep deprivation, variation, and reduction have illuminated the numerous aversive effects that poor sleep quality and habits can have on students (Dinges, 1988; Karni, Tanne, Rubenstein, Askenasy, & Sagi, 1994; Kelly, Kelly, & Clanton, 2001; Lack, 1986; Pilcher & Huffcutt, 1996; Pilcher & Walters, 1997;). Sleep difficulties take a variety of forms. There is a plethora of potential contributing factors that are salient in a college student population.

For many late adolescents, beginning college is a major life transition. Oftentimes this involves living away from family and friends for the first time. Depending upon the intensity, level of emotional preparation, and the relationship between the student and parent, separation from home can be a particularly difficult transition for many students (Hoffman & Weiss, 1987; Lopez, Campbell, & Watkins, 1988; Rice, Cole, & Lapsley, 1990). A host of other factors have been identified that can affect social life and adjustment to college, including level of self-esteem (Bettencourt, Charlton, Eubanks, Kernahan, & Fuller, 1999), perfectionistic tendencies (Chang & Rand, 2000), and masculinity and femininity traits (Sharpe & Heppner, 1991). Although there are many individual factors that can affect adjustment, the research ultimately suggests that for many the transition to college life can be a very difficult period.

College is also a time of other transitions. Students are given responsibility for various aspects of their lives, including sleep habits and patterns. Although many young adults relish their autonomy and independence, they nevertheless are subjected to substantial social and academic demands (Kleeman & Richardson, 1985; Russell &

Petire, 1992). Many college freshmen live away from their families for the first time and may be involved with a barrage of social activities, such as fraternities and sororities, and academic and athletic clubs. This is often in the midst of adjusting to new surroundings, making new acquaintances, choosing a class schedule, and meeting the challenge of college academic requirements. Given the varying schedules to which college students are often subjected, it is not surprising that this population encounters a great deal of sleep difficulties. The few studies that have been conducted indicate that college students tend to have more sleep problems than the general population (Buboltz, Brown, & Soper, 2001; Coren, 1994; Lack 1986).

Studies exploring the prevalence of sleep difficulties in college students have yielded disturbing results. Coren (1994) noted that in a sample of college students only 36% reported being completely free of any sleep disturbance, while over 30% reported some type of sleep difficulty occurring "frequently" or "always." Buboltz, et al. (2001) found similar results in a college student sample, with over 70% of the students reporting some type of sleep difficulty on a regular basis. One of the most frequent was difficulty falling asleep. Lack (1986), in a survey of Australian college students, found that two of the most common sleep complaints were difficulty falling asleep (18%), and difficulty staying asleep (9%). Sleep problems are common for college students and the impact of these difficulties is not fully understood. However, emerging research is indicating that sleep difficulties may have profound effects on the lives of college students.

The demands of college adjustment bring potential for high levels of stress. Stress and worry have been linked to poor sleep quality (McCann & Stewin, 1987). Sleep and stress among college students appears to bring potential for a spiraling effect as changes

in sleep patterns, in and of themselves, are often identified as stressful. A study by Ross, Neibling, and Hechert (1999) investigated 40 potential stressful situations that are commonly faced by college students, including interpersonal, intrapersonal, academic, and environmental sources of stress. Of the 40 potential stressors, change in sleeping habits was identified as one of the top five sources of stress for college students.

While many students may stay up late on weekends to engage in social events, they also frequently engage in late night study sessions to meet academic responsibilities, with some students reporting depriving themselves of sleep for 24-48 hours around examination periods (Hawkins & Shaw, 1992). Since many students may be able to identify changes in sleep habits as a source of stress, they may seek ways to combat this potential stressor. A common method used to compensate for lost sleep during the week is to sleep later on the weekends in an attempt to "catch up on sleep" (Machado, Varella, & Andrade, 1998; Pilcher & Walters, 1997). Unfortunately, this type of variable sleep pattern is conducive to a condition known as Delayed Sleep Phase Syndrome (DSPS), (Brown, et al., 2001; Lack, 1986). DSPS is a circadian rhythm disorder resulting in excessive morning drowsiness and difficulty falling asleep on weeknights. In a study by Lack (1986), 17% of college students reported symptoms severe enough to meet the criteria of DSPS. This is more than twice the reported occurrence among the general population (APA, 1994; Lack, 1986). The study also showed that students who met the DSPS criteria generally had poorer academic performance, than those who did not.

Another factor related to sleep difficulties among college students is the use of alcohol and sleep medication. Research indicates that the overall prevalence of binge drinking (five or more drinks in a row) among college students is approximately 40%

(Wechsler, Dowdall, Davenport, & Castillo, 1995). Alcohol can expedite sleep onset and, depending on the quantity, can increase the amount of slow wave sleep a person obtains. However, the effects are paradoxical in that they actually decrease the amount of REM sleep, and can be associated with insomnia (Roehrs & Roth, 1993). While students who binge drink may believe they are benefiting from alcohol induced sleep because they fall asleep faster and may sleep longer, alcohol can inhibit the most important stage of sleep. Furthermore, Jean-Louis, von Gizycki, Zizi, and Nunez (1998) found that students who reported drinking more alcoholic beverages fell asleep in class more often than those who drank less. Sleep medications also can have paradoxical effects. Students who choose to use sleep medications for sleep difficulties are in danger of exacerbating the problem. While sleep medications often leave individuals feeling less than alert due to the residual effects of the drug, most over the counter sleep medications can also inhibit REM sleep. Even short-term use of sleep medications can result in rebound insomnia (insomnia symptoms that are more severe than the originals) upon discontinuation of the medication (Roehrs et al., 1990). Pharmacological treatments have demonstrated little, if any, effectiveness in treating long-term sleep problems (Morin & Wooten, 1996).

While some college students use medication to induce sleep at night, others use stimulants to stay awake during the day. The most common stimulant among college students is undoubtedly caffeine. One study found that 42% of college students drank coffee and 29% drank tea on a regular basis (Mathieson, Faris, Stam, & Egger, 1992). Even in fairly mild doses (100-150 mg., about one cup of brewed coffee) caffeine has been shown to cause sleep disturbances, including delayed sleep onset, reduced sleep time, increased number of spontaneous awakenings, and increased amounts of light sleep

(Caldwell, 2003; Pressman & Orr, 1997). The duration of caffeine activity in adults is 3-5 hours, but people can experience effects for up to 10 hours. Thus, even one cup of coffee in the afternoon can disrupt sleep, but this may depend on the individual's sensitivity to caffeine (Nehlig, Daval, & Debry, 1992). People who use caffeine on a regular basis may develop a tolerance to the drug, and be less likely to have sleep difficulties than people that use caffeine occasionally. However, frequent caffeine users tend to have more sleep disruptions than non-users (Roehrs & Roth, 1997).

The use of illicit stimulants is also not uncommon among college students. Low and Gendaszek (2002) found that 35% of students from a small liberal arts college reported using prescription amphetamines at least once in the past year without a prescription. Similarly, 34% of the sample reported using cocaine or methylenedioxymethamphetamie (MDMA) in the past year, and 8% reported using at least once a week. While the full effects of illicit stimulants are unknown, oftentimes these substances have much longer lasting effects than milder stimulants such as caffeine, and thus have potential to cause even greater sleep difficulties.

Cigarette smoking may be related to sleep difficulties. A total of 28% percent of college smokers report they began smoking regularly after reaching college age (Wechsler, Rigotti, Glendhill-Hoyt, & Lee, 1998). Considering the massive amounts of negative exposure in the media and warning labels directly on packages, it is probably safe to assume that college students are aware of the potential detrimental health effects of smoking (i.e., cardiovascular disease, emphysema, lung cancer, etc.). However, students may not be cognizant of the fact that nicotine is a stimulant. While, ironically, heavy smoking (more than 15 cigarettes a day) does not appear to affect sleep, light

smoking has recently been linked with insomnia (Riedel, Durrence, Lichstein, Taylor, & Bush, 2004). Perhaps light smokers have not built up a tolerance to the drug, resulting in a stronger reaction to the stimulatory effect. Thus, students who have recently begun smoking and students who only smoke occasionally may be suffering from symptoms of insomnia and be completely unaware of this potential source of the problem.

The Negative Impact of Poor Sleep

Previous research has indicated that the effects of sleep difficulties extend far beyond simply feelings of tiredness during the day. Poor sleep has been linked to myriad psychological, physiological, and cognitive difficulties in various populations. Children with sleep disorders, such as sleep apnea and narcolepsy, tend to have significantly lower scores than the relevant population on tests of visual attention, auditory attention, and general memory (Hansen & Vandenberg, 2001). When children are successfully treated for such disorders, overall cognitive performance was found to improve significantly. Similarly, children and adolescents who are deprived of sleep, or have sleep difficulties often show reduced cognitive efficiency (Mitru, Millrood, & Mateika, 2002).

In adults, sleep deprivation studies suggest that the loss of only one night of sleep can have dramatic effects on cognitive functioning. A night of sleep loss has been shown to impact logical reasoning and decision making negatively in adults (Harrison & Horne, 2000; Blagrove & Akehurst, 2001). Sleep deprivation appears to affect working memory negatively (short-term memory used for thinking and problem solving), psychomotor reactivity, and increase suggestibility (Blagrove, 2000; Sagaspe, Charles, Taillard, Bioulac, & Phillip, 2003). This phenomenon may be universal, because a sleep deprivation study of adults in Korea found similar results (Kim, Lee, Kim, Park, Go,

Kim, Lee, Chae, & Lee, 2001). Sleep loss due to poor quality of sleep has also been linked to poor cognitive functioning, false recall of recently learned words, and decreased visuomotor skill (Maquet, Schwartz, Passingham, & Frith, 2003; Roediger & McDermott, 1995). In addition to cognitive functioning, recent studies have linked sleep loss to changes in mood, personality, and cardiovascular disease (Blagrove, 2001; Boland, Shahar, Iber, Knopman, Kuo, & Nieto, 2003; Taylor & McFatter, 2003). Sleep loss, whether due to sleep disorders, deprivation, or poor quality, appears to have a negative impact on the total functioning of humans.

When it comes to college students, the research clearly indicates that poor sleep habits and patterns are associated with a variety of difficulties. Among these are increased tension, depression, decreased psychological well-being, and generally lower life satisfaction (Pilcher, et al., 1997). Perhaps the most consequential to college students is the negative impact that poor sleep can have on cognitive performance, as well as the ability to learn and consolidate new material. Although college may be a time for many young adults to grow developmentally and form new relationships, their primary task probably remains to succeed academically, and there is evidence that sleep difficulties can significantly impair academic performance (Lack, 1986). Recent research by Trockel, Barnes, and Egget (2000) assessed several health behaviors and health-related variables on grade point average of first-year college students. Of the twelve variables, sleep habits accounted for the largest amount of variance in grade point averages. Jenkins, Buboltz, and Wilkinson (2003, March) corroborated that academic performance is related to sleep habits in a study that assessed the relationship between sleep quality and grade point average among college students. Students who were identified as having poor sleep

quality reported significantly lower overall grade-point averages when compared to students who reported good or even moderate sleep quality.

Studies have demonstrated that sleep deprivation of 24 hours or more leads to significant declines in cognitive performance (Dinges, 1988; Pilcher & Huffcutt, 1996; Pilcher & Walters, 1997). To make matters worse, sleep deprivation also appears to affect student metacognition. Pilcher and Walters (1997) found that students deprived of one night of sleep reported significantly higher levels of estimated performance and self-rated concentration on cognitive tasks than non-deprived students, even though they performed significantly worse. Hence, when students deprive themselves of sleep in order to study for an examination, they may believe that the loss of sleep does not hinder their performance because they believe that they remain cognitively adept. Their actual performance suggests otherwise.

More than just grade point averages and test performance, there appears to be a clear link between poor sleep habits and patterns (particularly ones that inhibit or limit REM sleep) and learning and memory in general. Although there are a few studies that refute that REM sleep is important to learning and memory consolodation (Siegel, 2001; Vertes & Eastman, 2000), evidence to the contrary is overwhelming.

In a study by de Konick, Lorrain, Christ, Proulx, and Coulombe (1989), students who demonstrated a significant increase in REM sleep during and immediately following a six-week intensive language learning course, learned significantly more than those with lower or no increase in REM sleep. A similar study involving a six-week French language immersion program for English speaking students found that students who made significant progress in French learning also incorporated French language into their

dreams earlier (deKoninck, Christ, Hebert, & Rinfret, 1990). Additionally, the students who learned more efficiently had more verbal communication in their dreams during the language training, than those who made little progress. Both studies showed significant correlations between increases in REM sleep percentages and language learning efficiency.

Schredl, Weber, and Heuser (1998) found that retest performance of memory tasks was impaired after a night without REM sleep. Several sleep researchers have suggested that the active neurophysiological processes that take place during REM sleep are important to the maintenance and reinforcement of memories (Davis, 1985; Hennevin, Hars, Maho, & Bloch, 1995; Schredl, et al., 1998). A study by Maquet, et al. (2000) produced evidence that waking experience may influence regional brain activity during sleep that follows. Using positron emission tomography and regional cerebral blood flow measurements, the authors found that specific brain areas (occipital and premotor cotices) that were active during wakeful learning of a serial reaction time task, showed significantly increased activity in these specific areas on the subsequent night of sleep. The results suggest that it is possible for memory traces to be produced and reinforced during REM sleep. In addition to memory traces, theorists believe that information in long-term memory can also be activated during REM sleep (Atienza & Cantero, 2001). Empirical research supports this theory, in that poor sleep habits and patterns, as well as sleep difficulties, have been shown to impair performance on memory tasks (Grosvenor & Lack, 1984; Karni et al., 1994; Polzella, 1975; Taub, 1980; Webb & Agnew, 1974).

Although the research on slow wave sleep (SWS) and learning is scarce, there is some evidence that SWS also plays an important role in memory consolidation. A study by Stickgold, Whidbee, Schirmer, Patel, and Hobson (2000) found that overnight improvement of a visual discrimination task was proportional to the amount of SWS in the first quarter of the night, as well as the amount of REM sleep in the last quarter. Additionally, it has been found that the consolidation of perceptual skills is supported by mechanisms that are active during normal sleep patterns. Karni, et al. (1994) found that performance of a visual discrimination task improved after a normal night of sleep in individuals of college age, but there was little to no improvement if REM sleep was disrupted.

Research also suggests that REM sleep several days after learning new material plays a role in memory maintenance. A study by Smith and Lapp (1991) found that REM sleep increased from baseline levels for up to five days after learning new material, and that the greatest increase in REM activity was found in the fourth and fifth REM period of each night. As individuals sleep throughout the night, REM sleep takes up a greater portion of sleep time as the night goes on. Not surprisingly, research suggests that the last half of a full night's sleep may be the most important in the learning process (Smith & Lapp, 1991). Hence, when students consistently deprive themselves of the last two hours of sleep, they are likely inhibiting the memory consolidation process and the learning of new material.

Sleep and Health

Sleep difficulties have been linked to a variety of physiological ailments in different populations. A condition that often causes sleep difficulty is sleep-disordered-

breathing. Although sleep disordered breathing can be caused by respiratory disease, it is generally associated with sleep apnea; a condition in which an individual's airway is obstructed during sleep, and the individual is awakened several times a night due to lack of oxygen (Thorpy & Yager, 2001). One study found that children as young as five years old with mild-sleep-disordered-breathing (MSDB) reported significantly more bodily pain complaints (Rosen, Palermo, Larkin, Emma, & Redline, 2002). MSDB was also related to lower scores on a measure of health-related quality of life for children ages 5-17, and increased effects were apparent with more severe sleep disordered breathing. A study involving adults 30-60 years of age reported similar results, with even mild cases of sleep disordered breathing resulting in decrements on a general health survey (Finn, Young, Palta, Fryback, & Dennis, 1998). The severity of health problems related to poor sleep resulting from sleep disordered breathing is noted in the fact that the magnitude of decrements on the health survey were comparable to other chronic conditions, such as arthritis, angina, hypertension, diabetes, and back problems. Also among the most common sleep disorders is insomnia, with prevalence estimates that range between 15% to 20% for chronic insomnia, and 30% to 40% for transient or occasional insomnia (Mellinger, Balter, & Uhlenhuth, 1985). In addition to affecting physiological health adversely, insomnia can also affect mood, relationships, and overall psychological well-being (Lacks, 1987; Sloan & Shapiro, 1993).

Sleep difficulties appear to have an impact on physiological health in people of all ages. In a study involving junior high school students, a link was found between general quality of sleep and physiological health, with adolescents who reported poor sleep also reporting a higher number of illnesses and lower scores on a measure of general health

(Tanaka, et al, 2002). Poor sleep has been linked with poor health in the geriatric population, as well. Two studies, each consisting of over 5,000 participants over the age of 65, linked poor sleep to reduced physical health, including limitations in activities of daily living, and increased reports of cardiovascular disease (Asplund, 2000; Newman, Enright, Manolio, & Haponik, 1997). Research by Appels and Mulder (1984) found that sleep difficulties in adults were related to cardiovascular disease, while Elashoff, et al. (1983) found an association between sleep and gastrointestinal disorders.

The literature also suggests a relationship between sleep habits and social and psychological health. As early as in pre-adolescence, poor sleep quality has been linked with poor mental health (Meijer, Habekothe, VanDen, & Wittenboer, 2001). One study involving college students found that individuals considered to be psychologically healthy reported increased somatic complaints, greater tendency toward obsessive-compulsive activities, higher levels of interpersonal reactivity, more symptoms of depression and anxiety, and higher social discomfort, after only a single night of poor sleep (Zammit, 1988). Poor sleep may exacerbate health difficulties in individuals who are afflicted with psychological disorders. The relationship between traumatic stress symptoms and health functioning was fully mediated by sleep in a study comprised of urban police officers with posttraumatic stress symptoms; only those who reported poor sleep also reported somatic health problems (Mohr, Vedantham, Neylan, Metzler, Best, & Marmar, 2003).

In a study by Taub and Hawkins (1979), young adults who reported irregular sleeping schedules had fewer tendencies toward achievement potential, intellectual efficiency, self-control, and sociability. More recently, Carpenter (2001, October) noted

that psychopathologies such as attention deficit hyperactivity disorder and depression are often associated with sleep difficulties. College students who are able to fall asleep faster and have fewer sleep disturbances also have been found to report fewer mental and social health difficulties (Jenkins, Buboltz, Fowler, & Rosielle, 2002, June).

In addition to the manifestations of health difficulties that appear to be related to poor sleep, sleep loss may have adverse affects on normal growth and development, as well as maintaining a healthy immune system. Both protein synthesis and growth hormones play a substantial role in physical growth, and are at their highest levels during REM sleep (Parker, Rossman, & Kirpke, 1980; Sassin, Parker, & Johnson, 1969). The number of natural killer T-cells that are crucial to the body's immune system in fighting infection have been shown to be reduced up to 50% in individuals who obtain less than six hours of sleep (Irwin, McClintick, & Costlow, 1996). Ultimately, poor sleep habits and patterns, as well as sleep difficulties, appear to have significant adverse affects across college students' physical, mental and social health.

Sleep and Personality

Considering the various potential impacts that sleep difficulties may have on college students, it behooves researchers to identify factors that contribute to sleep difficulties in this population. An area that has not been explored thoroughly is the relationship between personality factors and sleep habits and patterns of college students. Personality can be generally defined as "the distinctive and relatively enduring ways of thinking, feeling, and acting that characterize a person's responses to life situations" (Passer & Smith, 2001, p. 420). Personality traits refer to lasting qualities within a person (Coon, 1992). Examples of personality traits would include such descriptors as sociable,

orderly, shy, sensitive, creative, jolly, frugal, and impulsive. In sum, personality is the essence of what makes each individual unique. Additionally, because personality traits are relatively enduring, patterns of thinking, feeling, and behavior are somewhat predictable (Rowe, 1987).

Personality is generally assessed on two broad dimensions, with one being in terms of general personality traits, or "normal" personality components, and the other in terms of psychopathology, or "abnormal" components. Assessing for abnormal personality traits involves using instruments such as the Minnesota Multiphasic Personality Inventory (MMPI) and the Millon Clinical Multiaxial Inventory (MCMI). These instruments help psychologists identify specific personality characteristics that are associated with primary psychological disorders (e.g., mood disorders and anxiety disorders), as well as personality disorders (e.g., borderline personality disorder and histrionic personality disorder).

Although potentially there is an infinite number of personality traits, several factor analyses have suggested that there are five broad bipolar factors of personality (Digman, 1990; McCrae & Costa, 1999; Tupes & Christal, 1961). The "Big Five," as they are commonly labeled, consist of Extraversion, Agreeableness, Conscientiousness, Neuroticism, and Openness. Extraversion is simply how introverted or extroverted an individual is, while Agreeableness refers to how friendly, nurturing, and caring someone is, as opposed to cold, indifferent, self-centered, or spiteful. Adjectives that describe the two poles of Conscientiousness are self-disciplined, responsible, and achieving on one end, and irresponsible, careless, and undependable on the other. Neuroticism refers to the

presence (or lack of) negative and upsetting emotions. Finally, the factor Openness indicates a person's openness to new experiences and ideas (Digman, 1990).

Research relating personality to sleep has often focused on the relationship between sleep length and personality. Results in this area have been inconclusive and generally have found only weak associations between the two constructs. In a 1971 study by Webb and Friel, undergraduates who were classified as "natural" long sleepers (those who typically slept 9.5 hours or more) and short sleepers (those who typically slept 5.5 hours or less) were given a battery of personality tests (the MMPI, CPI, and Zung Measurement of Depression Scale), and a medical test (Cornell Medical Index). The results indicated that long and short sleepers did not differ significantly on any of the measures. Another study found that long sleepers are characterized by worrying more than short sleepers (McCann & Stewin, 1987). However, upon further inspection, the evidence appeared to be inconsequential, as the authors concede that the correlation was quite small, and that worry only accounted for 2.63% of the variance in preferred length of sleep.

One study by Domino, Blair, and Bridges (1984), concluded that "short sleepers" score higher on seven of the eighteen variables on the California Psychological Inventory, than "long-sleepers". Upon closer examination, length of sleep appears to have been poorly defined. Length of sleep was derived from subject answers on three yes or no questions, including "I need more than 8 hours of sleep," "I love to sleep," and "Five or six hours of sleep is sufficient for me." Nowhere in the study did the authors include objective measures of how many hours subjects actually slept. Other studies have found that sleep length is a weak predictor of mood and functioning (Pilcher, et al., 1997;

Verlander, Benedict, & Hanson, 1999). Two other studies found no significant correlations between all of the Big Five dimensions of personality, and self-reported sleep length (Buela-Casal, Carlos Sierra, & Caballo, 1992; Hill, Diemer, & Heaton, 1997).

While general patterns of long and short sleep do not appear to be correlated with personality, research on sleep loss has produced significant results. Blagrove and Akehurst (2001) found that college age individuals who were deprived of 29-35 hours of sleep showed deficits in mood and significantly higher scores on neuroticism on the Profile of Mood States. Research by Vein, Dallakyan, Levin, and Skakun (1983), found that sleep deprivation of one night of sleep led to increased anxiety, sensitivity, and excitability in college-age individuals. Similarly, another study found that military pilots showed increased impulsiveness when sleep deprived (Sicard, Jouve, & Blin, 2001).

Conversely, there appears to be a link between sleep deprivation and decreased symptoms of depression. Studies have shown that short-term sleep deprivation is correlated with positive changes in both thought content, as well as improvement on clinical assessments of depression (Kraft, 1984; Vein, & Airapetov, 1984). Although it is not clear why symptoms of depression often decrease following sleep deprivation, researchers suggest that neurophysical and biochemical processes that occur during sleep, are responsible for one's emotional state (Vein & Airapetov, 1984). Not surprisingly, research on REM sleep deprivation (rather than total sleep) appears to have an affect on depressive symptoms. The negative emotion connected with emotionally important memories appears to decrease following sleep deprivation (Greenberg, Pearlman, Schwartz, & Grossman, 1983). Hence, the most conclusive research linking sleep length

to personality and mood appears to be in terms of sleep deprivation, rather than general sleeping patterns. However, positive changes in mood due to short-term sleep deprivation appear to be ephemeral, as individuals in these studies tend to return to baseline levels of depression after a regular night of sleep (Kraft, 1984; Vein & Airapetov, 1984).

The few studies that have focused on sleep quality and sleep habits have produced more dramatic results. Although sleep quality and quantity overlap to some degree, there appears to be a quantifiable difference between them. Sleep length can simply be defined as the number of hours that an individual spends in a sleeping state. Similarly, sleep habits can be defined in terms of keeping a regular or irregular sleeping schedule (i.e., going to bed and waking up at the same times on a regular basis) (Taub, 1971). Sleep quality is more complicated, and generally consists of both objective and subjective measures of sleep, including number of awakenings during the night (and length of time to fall back asleep), sleep latency (the time it takes to fall asleep), a feeling of fatigue/restfulness upon awakening in the morning, and general satisfaction of sleep (Pilcher, et al., 1997).

An early study by Taub and Hawkins (1979) found several significant relationships between aspects of personality and irregular sleep habits. Although the results of their study are not conclusive, as it consisted of only two groups of 18 individuals, it produced some interesting findings. Irregular sleepers reported that their retiring times, awakening times, and sleep duration varied at least four days a week by 2-4 hours or more, for at least the previous two years. Irregular sleepers were compared to a control group of individuals with regular sleeping habits on the California Psychological Inventory (CPI). The CPI is an instrument designed to measure various "normal" (rather

than clinical) aspects of personality (McAllister, 1996). Control subjects scored significantly higher than the irregular sleep group on scales that measure leadership ability, persistence, initiative, a participative disposition, and self-confidence within the domain of interpersonal relationships. They also scored higher on scales that measure the extent of personal esteem, capacity for independent action and deliberation, degree of autonomous influence over behavior, absence from impulsiveness, and egocentricity. Finally, they scored higher on levels of interest, motivation directed to group activities, level of alertness, clear thinking, and degree of cognitive activity. The only scale that irregular sleepers scored significantly higher on than the control group was flexibility, which measures the extent of adaptability in cognitive processes and social behavior. In sum, the study suggests that regularity of sleep habits appears significantly to reflect specific aspects of personality.

In terms of the Big Five personality factors, the most conclusive research has linked poor sleep quality to Neuroticism. High scores on Neuroticism are associated with negative mood states. Studies using college students, junior high students, clinical populations, and healthy adults have all produced similar findings; most notably that Neuroticism is associated with sleep difficulties and impaired daytime functioning (Bonnet, 1985; Gau, 2000; Gray & Watson, 2002; Lacks & Morin, 1992; Pilcher & Huffcutt, 1996). The direction of the sleep/Neuroticism relationship (whether negative mood causes sleep difficulties, sleep difficulties cause negative mood, or they interact) remains unclear. However, since sleep difficulties are one of the hallmark symptoms of depression (APA, 1994), it is certainly possible that the relationship is cyclical, in that

depressed mood can lead to poor sleep quality, and in return poor sleep quality can exacerbate negative mood states.

Extraversion is another broad personality factor that appears to have a relationship with sleep quality, particularly subjective sleep inefficiency (Gray & Watson, 2002). However, Extraversion has largely been studied in terms of its relationship with peak activation time, which is also known as morningness vs. eveningness. Morningness refers to individuals who have a circadian rhythm cycle such that they are more alert and "at their best" during the early hours of the day, rather than during the evening (Guthrie, Ash, & Bendapudi, 1995). Not surprisingly, level of morningness is directly related to habitual times of going to sleep and awakening, as well as disturbed nocturnal sleep and chronic irregularity in sleeping routine (Taub, Hawkins, & Van de Castle, 1978). Some early studies suggested that individuals who are more extroverted are "evening types" (Blake, 1967; Larsen, 1985). This relationship is consistent with the stereotype that extroverts are more likely to engage in late-night parties and social activities, while introverts are more likely to be quiet, stay-at-home types. However, recent research has found only a weak or no relationship between eveningness and extroversion (Beaulieu, 1991; Gray & Watson, 2002; Vaidya, 1997). Additionally, the relationship between morningness and personality appears to be more complicated than a simple relationship to Extraversion, because morning types have reported higher positive affect throughout the day, higher optimism, greater satisfaction with life, and more positive emotionality, than evening people (Clark, Watson, & Leeka, 1989; Vaidya, 1997).

A Big Five variable that has been linked with morningness is Conscientiousness. Gray and Watson (2002) found that individuals who maintain a later, more evening-

oriented schedule tend to score lower on Conscientiousness. Students who score higher on Conscientiousness also have been found to be more successful in academic endeavors (Barrick & Mount, 1991; Gray & Watson, 2002; Organ, 1975), to which sleep may be a moderator in this relationship. Finally, some studies have linked higher scores on Psychoticism of the Eysenck Personality Questionnaire (EPQ, Eysenck & Eysenck, 1975) with a more evening-oriented sleep schedule (Mitchell & Redman, 1993; Wilson, 1990). The Psychoticism scale purports to measure a dimension of personality characterized as cold, impersonal, hostile, lacking in sympathy, unfriendly, untrustful, odd, unemotional, unhelpful, lacking insight, strange, and paranoid (Eysenck & Eysenck, 1975).

Research suggests a relationship between clinical aspects of personality and sleep, as well. In a study by Monroe (1967), poor sleepers produced significantly higher scores on seven of the ten clinical scales of the MMPI. The most significant increases were on Depression, Psychasthenia, Hypomania, and Social Introversion. The Depression scale measures some of the classic depressive symptoms, including feelings of hopelessness, slowing of thought or action, and sometimes preoccupations with death and suicide, while high scores on Psychasthenia are indicative of individuals who are tense, anxious, and evaluate themselves very negatively (Friedman, Lewak, Nichols, & Webb, 2001). Individuals who score high on Hypomania are generally energetic, expansive, and emotionally excitable. High Social Introversion scores reflect a preference for being alone, rather than with others (Friedman, et al., 2001). Additionally, Monroe (1967) noticed that poor sleepers appeared to be less well adjusted. He found that poor sleepers asked more questions about possible dangers of recording techniques in the sleep laboratory, and had a higher incidence of peculiar behaviors. One individual in the poor

sleeper group accused the experimenter of putting thoughts into his head, and two other poor sleepers complained of being awakened by "electrical stimulation." Such odd behaviors were not noted in any individuals in the good sleepers group.

Some studies have found a relationship between increased MMPI profiles and obstructive sleep apnea, which results in poor sleep quality (Aikens, Caruana-Montaldo, Vanable, Tadimeti, & Mendelson, 1999; Aikens & Mendelson, 1999; Ramos Platon & Sierra, 1992). These studies found that most MMPI scales were elevated in individuals with sleep apnea, with particularly elevated scores on the Depression and Hypochondriasis. Additionally, Klonoff, Fleetham, Tayor, & Clark (1987) found that individuals with obstructive sleep apnea obtained significantly lower scores on the Depression and Anxiety scales after corrective surgery.

Research also has established a link between sleep quality and Type A personalities, a more basic measure. Type A behavior refers to a pattern of behavior in which an individual is aggressively involved in a chronic, incessant struggle to achieve more and more in less time (Friedman & Rossman, 1974). Not surprisingly, individuals with Type A personalities tend to perceive themselves as living under great pressure, and are demanding of themselves and others (Shaw & Dimsdale, 2000). Conversely, Type B personalities are more relaxed, more agreeable, and have far less of a sense of urgency than Type A Personalities (Strube, 1989). Several studies have linked Type A behavior with decreased habitual sleep duration in college students (Hicks, Allen, Armogida, Gilliland, & Pelligrini, 1980; Hicks, Pellegrini, Martin, Garbesi, Elliott, & Hawkins, 1979; McKelvie, 1992). Research has also shown that students who have high scores on a measure of Type A personality have more sleep disturbances, including more difficulties

falling asleep, and increased reports of nightmares (Koulack & Nesca, 1992). Koulack, Nesca, and Stroud (1993) suggest that individuals who view and approach their lives as a succession of unsuccessful and stressful events may also view their sleep time in a similar manner. Aggressive behavior associated with waking Type A personality appears also to affect dream content. Sleep studies have found that individuals with Type A personalities tend to have dreams with more aggressive content, greater general activity, higher self-activity, and a greater incidence of misfortunes in their dreams than individuals with Type B personalities (Madigan, Dale, & Cross, 1997; Nesca & Koulack, 1991).

A construct that may be related to Type A personality is stress. As individuals with a Type A personality are characterized by striving to achieve more in less time, it is likely that these individuals place themselves under higher levels of subjective stress. The body's physiological reaction to stress is an increase in the functioning of the sympathetic nervous system. Research has shown that individuals with Type A behavior patterns react to laboratory stressors with higher increases in heart rate and systolic blood pressure than subjects classified as Type B (Krantz, Arabrier, Davia, & Parker, 1982). Stress has been linked to sleep disturbances in a number of studies (Hicks & Garcia, 1987; Paulsen & Shaver, 1991; Weller & Avinir, 1993). Specifically, a study by Verlander, et al. (1999) suggests that a person's emotional response to stressors has the most significant impact on sleep difficulties. Their study found that a high emotional response to stress was the best predictor of sleep patterns. The intensity of anxiety, hostility, and depression significantly predicted scores on five of the seven scales of the Domino Sleep Questionnaire, including depth of sleep, difficulties in waking up, quality and latency of sleep, negative affect in dreams, and sleep irregularity. Hence, poor sleep patterns and

sleep difficulties, may be linked to an individual's coping style, rather than just his or her level of stress.

Related to emotional response is the concept of psychological reactance. Psychological reactance refers to individuals' motivational force which impels them to regain, or attempt to regain, lost or threatened freedoms (Brehm, 1966). In other words, psychological reactance is the tendency to respond behaviorally or verbally to protect personal freedoms from real or perceived threats. Jenkins and Buboltz (2001, May) found that college students that scored high on a measure of psychological reactance were more likely to report a variety of sleep difficulties, than students who scored lower. Similarly, the researchers found that students who have a desire to avoid dependence reported increased sleeping difficulties. Brissette and Cohen (2002) also found that individuals who had more interpersonal conflicts during the day, or who report higher negative affect, had higher incidences of sleep difficulties than those who did not.

In terms of projective personality tests (e.g., the Thematic Apperception Test and the Rorschach) related to sleep, there is a dearth of research. However, the few studies that have been done indicate that there is a relationship between personality factors and sleep difficulties (Mattlar, Carlsson, Kronholm, & Rytohonka, 1991; Mattlar & Kronholm, 1990). One study using the Rorschach found that individuals who consistently obtain poor sleep have a tendency toward passive and possibly dependent behavior (Mattlar, et al., 1991). Poor sleepers were also characterized by a tendency to use flight into passive forms of fantasy as a defense mechanism, and were less likely to initiate decisions or behaviors if others could be expected to do so, when compared to good

sleepers. Finally, poor sleepers were more prone than good sleepers to make impulse decisions.

Sleep Interventions

Poor sleep appears to be related to many personality characteristics, most of which are largely undesirable (e.g., increased symptoms of anxiety and depression). Pharmacological treatment options for poor sleepers are well known by the general population via television and other media, while psychological treatments do not generally receive this type of exposure, and are much less well known. Unfortunately, pharmacological treatments have demonstrated little, if any, effectiveness in treating long-term sleep difficulties (Morin & Wooten, 1996). Conversely, psychological interventions have been shown to produce dependable and lasting improvements in sleep quality in about 60% to 80% of individuals (Morin, Culbert, & Schwartz, 1994; Morin & Wooten, 1996; Murtagh & Greenwood, 1995). Hence, when personality characteristics that are related to sleep difficulties are identified, psychological professionals can aid students in combating potential maladies that are destructive to many aspects of life.

There are several non-clinical treatments available to students that may help improve sleep quality. Sleep hygiene, which refers to basic information about practices that promote good sleep and inhibit poor sleep is generally considered an essential component in the treatment of sleep disorders (American Sleep Disorders Association, 1990). Such education may include information about the effects of poor sleep, maintaining a consistent sleep/wake schedule, foods to avoid at night (e.g. caffeine), increased exercise (except for three hours prior to bedtime), and information about a good sleep environment (e.g., bed is only for sleeping, minimal noise and light in room). Most

individuals suffering from mild to moderate non-chronic sleep difficulties show improvement through the use of sleep hygiene education (Buboltz, Soper, Brown, & Jenkins, 2002). In fact, Hauri (1993) found that people who reported sleep difficulties showed improved sleep at one, three, and twelve-month follow-ups, after only one session of sleep hygiene instructions. Similarly, one study found sleep hygiene education to be equally effective when compared to relaxation or stimulus control therapy (Schoicket, Bertelson, & Lacks, 1988). Research has indicated that individuals overestimate their knowledge about proper sleep habits and how they actually apply that knowledge to themselves (Hicks, Lucero-Gorman, & Bautista, 1999). Thus, one way to help students improve sleep quality is to provide them with proper information on good sleep hygiene.

Another non-clinical treatment for sleep difficulties is regular exercise. Exercise has been shown to decrease the reporting of sleep difficulties and the amount of time that it takes individuals to fall asleep, as well as increase the time spent in stages 3 and 4 sleep (Dement, 1999; Duncan, Bomar, Nicholson, & Wilson, 1995; Matsumoto, Saito, Abe, & Furumi, 1984; Youngstedt, Kripke, & Elliot, 1999). Exercises that involve a large cardiovascular component have a greater effect than exercises that do not (Trinder, Paxton, Montgomery, & Fraser, 1985). However, it should be noted that all exercise appears effective in reducing sleep difficulties and time to fall asleep, at least to some extent.

Bright light therapy has also been demonstrated to be an effective treatment for disturbed sleep schedules, especially for individuals who have shifted their sleep and wake times out of phase with the norm (Campbell & Murphy, 1998; Rosenthal, Joseph-

Vanderpool, & Levandosky, 1990). The application of bright light therapy is actually easy and very affordable, and is helpful for the treatment of early morning insomnia or late night insomnia. The individual simply places a broad spectrum light in a position where they can get full exposure to the light while they are doing their normal activities of the day for 30-60 minutes. The timing during the day will depend on the particular phase syndrome for which the individual is suffering. Exposure to bright light will enable the circadian rhythm to begin to shift into a more normal mode.

Among individuals who are informed about proper sleep habits and treatment options such as exercise and bright light therapy, some individuals continue to experience sleep difficulties for possible biological or psychological reasons. However, clinical interventions have proven to be quite effective. Examples of such treatments include stimulus control therapy, sleep restriction, relaxation, cognitive therapy, and paradoxical intent (Bootzin & Perlis, 1992; Buboltz, et al., 2002; Morin & Wooten, 1996).

Stimulus control therapy consists of a set of instructional procedures that involve the context of sleep and the bedroom, including going to bed only when sleepy, using the bedroom solely for sleep and sex, moving into another room if unable to fall asleep after 15-20 minutes, and returning to bed only when sleepy. Stimulus control therapy also generally involves maintaining a regular rising time in the morning regardless of sleep onset time and duration, and avoiding daytime napping. The purpose of this approach is to associate bedtime, the bed, and bedroom with rapid sleep onset and encourage a more consistent circadian sleep-wake cycle (Morin & Wooten, 1996).

Sleep restriction therapy focuses on limiting the amount of time in bed to actual sleep time, or increase the proportion of time in bed as sleep time. For example, if a

person complains of acquiring only 4 hours of sleep a night, the amount of time in bed is limited to 4 hours. When sleep efficiency (the amount of actual time spent sleeping while in bed) exceeds 85-90%, the amount of time allowed in bed is increased by 15-20 minutes. If efficiency falls below 80%, one reduces the amount of time in bed by 15-20 minutes. Adjustments in sleep are made until the person can sleep soundly through the night. This approach tends to be the opposite of that of many individuals with insomnia, which is to increase the amount of time in bed in an attempt to get more sleep (Morin & Wooten, 1996). A key component in both interventions is to help individuals learn they can control their sleeping habits, an important consideration since a common complaint of many is that they have no control over sleep.

Relaxation therapies focus on decreasing arousal level to ease sleep onset. Specifics include behavioral relaxation therapy such as progressive muscle relaxation and deep breathing, as well as cognitive imagery. The latter may entail imagining oneself on a beach or other pleasant place that would be considered a positive situation for the client. Imagining feelings of warmth also are often helpful. Behavioral approaches tend to work well with simple physical restlessness, while imagery is effective for people who have both mental and physical restlessness, such as ruminating about the day's events (Morin & Wooten, 1996). To facilitate this process and make it easier for the client, counselors can help clients create their own relaxation tapes to use when attempting to fall asleep. Without consistent applications, the effectiveness of relaxation techniques to reduce sleep difficulties diminishes.

Cognitive therapy, which often focuses on patients' expectations, has also been found to help those with sleep difficulties (Bootzin & Perlis, 1992). Frequently, small

successes experiencing control facilitate further expectations of success. For example, if the client can learn to control bedtime and related circumstances with the help of the therapist, two expectations are encouraged. The therapist is validated as a legitimate source of help and, once small successes are experienced with the help of the therapist, larger ones become a logical progression and are anticipated.

Finally, another method of changing the way in which clients view their sleep difficulties is paradoxical intent (Bootzin & Perlis, 1992). Paradoxical intent consists of instructing clients to do the opposite of what they have been doing. Many individuals try very hard to fall asleep and can become anxious about it, especially those for whom sleep concerns are sufficient to seek professional help. As a result, client sleep becomes more difficult and quality worsens. While this treatment may sound counter-intuitive, a meta-analysis of over 100 sleep treatment studies found that paradoxical intent is slightly more effective than most psychological interventions for reducing unwanted night time awakenings, but less effective in reducing sleep-onset time (Murtagh & Greenwood, 1995).

Hypotheses

The literature suggests that there is a relationship between college student sleep habits and patterns and certain personality characteristics. However, an exhaustive review of the literature was unable to produce a single study that examined the relationship between sleep and personality measured by the Sixteen Personality Factors Questionnaire (16PF). Thus, the study is somewhat exploratory, and many outcomes are possible. Because certain personality factors in both the primary and global factors of the 16PF

share similarities with instruments used in previous research, some specific hypotheses can be made.

Hypothesis One

Overall sleep quality will be related to selected primary scales of the 16PF. Specifically, poor sleep quality will be related to lower scores on Factor C (Emotional Stability), and higher scores on Factor L (Vigilance), Factor O (Apprehension), and Factor Q4 (Tension) of the 16PF.

Hypothesis Two

Overall sleep quality will be related to higher scores on the Anxiety global scale of the 16PF.

Hypothesis Three

Delayed weekend wake times (DWW, for those who wake up significantly later on weekend days compared to weekdays) will be related to selected primary scales of the 16PF. Specifically, DWW will be related to higher scores on Factor Q1 (Openness to Change) and Factor F (Liveliness), and lower scores on Factor Q3 (Perfectionism) and Factor G (Rule Consciousness).

Hypothesis Four

DWW will be related to lower scores on the Tough-Minded and Self Control global scales of the 16PF.

Hypothesis Five

Sleep length will not be related to any of the primary scales of the 16PF.

Hypothesis Six

Sleep length will not be related to any of the global scales of the 16PF.

CHAPTER 2

Methods

The purpose of this study was to explore the relationship between sleep habits and patterns of college students and their relationship to selected personality characteristics. Statistical analyses were used to determine this relationship. This study employed a demographic questionnaire, the Sleep Quality Index (Urponen, Partinen, Vuori, & Hasan, 1991), and a sleep habits questionnaire based on an instrument designed by Lack (1986) to measure sleep habits and patterns, and the fifth edition of the16-PF (Cattell, Eber, & Tatsuoka, 1970) to measure personality characteristics.

Participants

A total of 410 participants were recruited from introductory psychology courses at a mid-sized university in the southern United States. The University Human Use Committee approved the study (Appendix A) and all participants were treated in accordance with the ethical guidelines established in the American Psychological Association's *Ethical Principles of Psychologists and Code of Conduct* (2002). Participation was voluntary and no compensation was awarded for participating. A consent form explaining the nature of the study was signed by all participants prior to receiving a survey packet. All information was held strictly confidential and only viewed

by the researcher. Data were used to gather group information and no data was analyzed or reported individually.

Instrumentation

Demographic Questionnaire

The demographic questionnaire consists of six items that inquired about participants age, gender, current year in school, ethnicity, current major, and number of siblings (Appendix B).

Sleep Quality Index

The Sleep Quality Index (SQI) is an eight item self-report inventory of general sleep difficulties (Appendix C). The SQI is composed of one scale labeled *sleep quality*. For each item, participants choose one of three possible responses: "no," "< 3 days per week," and "3-7 days per week." Each response is weighted as 0, 1, or 2, with 2 representing the most common or severe symptom. To determine sleep quality of individuals the items are summed to derive a total sleep quality score. Scores of 0 or 1 indicate good sleep quality, scores from 2 to 8 indicate occasional sleep difficulties, and scores ranging from 9 to 16 indicate poor sleep quality. Initial support for the validity of the SQI is provided by a significant relationship between quality of sleep and subjective health (Urponen, Partinen, Vuori, & Hasan, 1991).

No previous reliability information was available for the SQI. Thus, to assess for test-retest reliability Pearson Product-Moment Correlations were calculated for a two-week interval. The sample consisted of 18 male and 21 female university undergraduate students. Mean age for the sample was 19.4 years. The SQI was found to be a reliable

indicator of general sleep difficulties, with reliability coefficients ranging from .74 to .96, with a mean of .84.

Sleep Habits Questionnaire

The sleep habits questionnaire is based on an instrument designed by Lack (1986). The habits section consists of open-ended items on which participants report their usual amount of sleep, wake-up times, bedtimes, and other sleep-wake habits for the week and weekend (Appendix D).

No previous reliability information was available for the sleep habits questionnaire. Thus, to assess for test-retest reliability Pearson Product-Moment Correlations were calculated for a two-week interval. The sample consisted of 18 male and 21 female university undergraduate students. Mean age for the sample was 19.4 years. The sleep habits questionnaire was found to be a reliable indicator of usual amount of sleep, wake-up times, bedtimes, and other sleep-wake habits for the week and weekend, with reliability coefficients ranging from .68 to .89, with a mean of .80.

The Sixteen Personality Factor Questionnaire (16PF)

The Sixteen Personality Factor Questionnaire (16PF) was originally developed by Ramond Cattell in 1949 and has since gone though four revisions (Cattell, Eber, & Tatsuoka, 1970). The 16PF measures sixteen personality or temperament traits that were developed though factor analyses. All five editions of the 16PF contain the same sixteen factors, and Cattell claims to have factor analyzed all English-language adjectives describing human behavior (Cattell, Cattell, & Cattell, 1994). This list of adjectives was derived from a study by Allport and Odbert (1936) that consisted of over 18,000 adjectives that describe people. The 16PF also contains a set of five global factors that are

produced by combining related primary scales or second-order factors. The test was designed for use with a "normal" population. In other words, it is a measure of universal personality traits, rather than a measure of psychopathology.

The 16PF consists of 185 items (10-15 items for each scale) that make up the 16 primary personality factor scales. An Impression Management index that assesses social desirability is also derived from these items. The test is self-report, intended for individuals 16 years of age and above, and is written at a fifth-grade reading level. As such, it can easily be administered individually or in a group setting. The hand-scored version generally takes 35-50 minutes to complete.

All factor scales on the 16PF are bipolar in nature in that both high and low scores have meaning. In general, high scores are not necessarily better than low scores on any scale. For example, factor 'L' corresponds to the personality trait of vigilance. Individuals who score low on this scale are generally trusting, unsuspecting, and accepting, while those who score high are more apt to be vigilant, suspicious, skeptical, and wary. Depending upon the circumstance, or occupational environment, either set of traits may be desirable.

While all 16 factors have remained constant, the newest edition has revised item content to reflect modern language and remove gender or racially biased language for a more contemporary version. Additionally, normative data have been updated to reflect the 1990 U.S. census. Combined-gender norms are available as a scoring option. Administrative indices have also been added to assess response bias. The Impression Management Index, which replaced the "Faking Good" and "Faking Bad" scales of the last edition, is comprised of items that are not a part of the sixteen primary personality

factor scales. Acquiescence and Infrequency scales also were added to help assess validity of profiles. Finally, psychometric properties for the latest version have improved.

Overall, the 16PF has been shown to be a psychometrically sound instrument. To assess for test-retest reliability Pearson Product-Moment Correlations were calculated for two-week and two-month intervals (Cattell, et al., 1994). The two-week sample consisted of 77 male and 127 female university undergraduate and graduate students. Mean age for the sample was 20.5 years, and mean education level was 13.8 years. The reliability coefficients for the primary factors ranged from .69 to .86, with a mean of .80. Higher test-retest coefficients were found for the global factors, which ranged from .84 to .91, with a mean of .87. The two-month interval sample consisted of similar demographics. The primary factors were found to have reliability coefficients ranging from .56 to .79, with a mean of .70. The global factors for this sample ranged from .70 to .82, with a mean of .78. To assess for internal consistency Chronbach alpha coefficients were calculated on the general population norm sample of 2,500 adults. Values ranged from .64 to .85, with an average of .74.

Further evidence for the temporal stability of the 16PF is shown in a study by Schuerger, Zarella, and Hotz (1989). The authors evaluated 19 studies that assessed the test-retest reliability of the 16PF. Of the studies assessed, twelve were test-retest intervals of less than one year, four were from 1-5 years, and three were from 5-20 years. The average stability coefficient was .63, which is comparable with the other personality tests in the study, including the Myers-Briggs Type Indicator, the Edwards Personal Preference Schedule, and the California Psychological Survey.

Construct validity for the 16PF was assessed both though factor analyses and by correlating the scales with other psychometrically valid tests. Factor analyses indicates that the 16PF measures sixteen distinct personality factors. However, these factors are not purely orthogonal. Before conducting the factor analyses, Cattell anticipated that distinct personality factors may still be related to one another (Cattell, et al., 1994). Subsequently, he found that the sixteen primary factors cluster along the five global scales of Extraversion, Anxiety, Tough-Mindedness, Independence, and Self-Control. The latest version of the 16PF was correlated with similar personality instruments currently used by psychologists, including the revised edition of the NEO Personality Inventory (NEO). The NEO is a 240-item test that is designed to measure five major dimensions of normal personality, including Neuroticism, Extraversion, Openness, Conscientiousness, and Agreeableness. Each of the five major dimensions is composed of scales that tap related personality attributes. The five global factors of the16PF were found to have significant correlations with each of the five major dimensions of the NEO, and nearly all of the individual related facets.

Not only has the 16PF been used in a variety of settings, but with a multitude of populations in various countries and ethnicities. In fact, the Fifth Edition of the 16PF is currently available in 12 languages (including alternate English versions for Australia, Canada, the United Kingdom, and South Africa), with six more translations in production. A study by Bai and Meng (2000) found that the 16PF had predictive validity for differentiating between outstanding Chinese acrobats and the Chinese norm. The authors assessed 309 Chinese acrobats that had won international, national, or regional awards in various cities throughout China. The profiles of the winning acrobats included

the characteristics of extraversion, cooperation, love of art, excitation, self-regulation, modesty, obedience, and high intelligence. In South Africa, a study found that psychological attributes of Underwater Sabotage Device Disposal (USDD) operators in the South African Navy differed from profiles of clearance divers (Waters, 2001). The USDD operators were found to be more adventurous and more assertive, which was theorized to be appropriate in terms of environmental demands of the job. In sum, the 16PF has been shown to be both a reliable and a valid instrument that is useful across a variety of populations and settings.

Procedure

Participants read and signed a consent form that explained the purpose of the study. This form also noted that participation is voluntary, that all information would remain confidential, and information would be disseminated only as group data. The survey packet was then given to consenting participants to be taken home, completed, and returned. All packets included the same questionnaires, but the order of the surveys was varied to control for order effects.

Data Analysis

For the first four hypotheses, four separate multivariate analyses of variance (MANOVA) tests were conducted. A MANOVA is the appropriate statistical analysis for these hypotheses because, in each case, the relationship between a categorical independent variable and multiple continuous dependent variables is being assessed. Alpha levels were adjusted to a family-wise level of .05 using a Bonferroni correction. This correction was conducted to compensate for performing multiple statistical analyses on the same data, and thus control for Type I errors (Hays, 1994).

Hypotheses One through Six

In the first two MANOVAs, sleep quality served as the independent variable. Scores were separated into poor sleep quality, occasional sleep difficulties, and good sleep quality. In the first MANOVA, scores on each of the sixteen primary personality factors served as the dependent variables. In the second MANOVA, scores on each of the five global personality factors served as the dependent variables. Tukey's post-hoc tests were performed on all significant findings.

In the third and fourth MANOVAs, Delayed Weekend Waketimes (DWW) served as the independent variable. Scores were separated into less than two hours, two to four hours, and more than four hours. In the third MANOVA, scores on each of the sixteen primary personality factors served as the dependent variables. In the fourth MANOVA, scores on each of the five global personality factors served as the dependent variables. Tukey's post-hoc tests were performed on all significant findings.

For the fifth and sixth hypotheses multiple regression analyses were used. Multiple regression is the appropriate statistical analysis to use because in both cases, the relationship between a continuous independent variable and a continuous dependent variable is being assessed.

For the fifth hypothesis, the sixteen primary personality factors were regressed onto sleep length. The five global personality factors were regressed onto sleep length for the sixth hypothesis.

CHAPTER 3

Results

The results of the current study are presented in this chapter. First, sample characteristics are displayed. Reliability for the scales used in the current study are then discussed. Next, means, standard deviations, and correlations among the variables are provided. Finally, the results of the current study are presented by hypothesis.

Participants

Of the 410 volunteers, ages ranged from 17 to 57 ($M = 23.16$, $SD = 7.25$). Female participants comprised 61% of the population. In terms of ethnicity, 71.8% of participants were Caucasian, 19.4% were African American, 1.9% were Hispanic/Latino, 1.2% were Asian American, 0.7% were Native American, and 1.2% identified themselves as "other." Education level varied, with 34.2% being freshmen, 13.6% being sophomores, 10.2% being juniors, 19.4% being seniors, 18.0% being graduate students, and 1.2% reporting "other" as their education level. Participants were from diverse academic majors.

Reliabilities and Correlations

Table 1 contains the means and standard deviations of the 16PF, the Sleep Quality Index and the Sleep Habits Questionnaire. The means and standard deviations for the

16PF were similar to those found by Cattell, Cattell, and Cattell (1994). Similarly, the means and standard deviations for the SQI and the sleep habits questionnaire were similar to the test-retest reliability sample. Table 2 shows the intercorrelations between all of the primary and global variables of the 16PF, the Sleep Quality Index, and the Sleep Habits Questionnaire.

Results by Hypotheses

In this section the results of the six hypotheses are presented. The first two hypotheses suggest that sleep quality will be related to selected primary scales and selected global scales of the 16PF. Hypotheses three and four indicate DWW will be related to selected primary scales and selected global scales of the 16PF. Hypotheses five and six suggest that sleep length will not be related to any of the primary or global scales of the 16PF. A Bonferroni correction was made, and the alpha level for each individual analysis was appropriately changed to .0085. This correction sets the family-wise alpha level for all statistical tests at .05.

Table 1

Means and Standard Deviations of All Variables

Variables	M	SD
Factor A (Warmth)	5.67	1.90
Factor B (Reasoning)	5.68	2.00
Factor C (Emotional Stability)	5.25	1.68
Factor E (Dominance)	5.35	2.03
Factor F (Liveliness)	6.25	1.69
Factor G (Rule-Consciousness)	5.52	1.70
Factor H (Social Boldness)	5.62	1.87
Factor I (Sensitivity)	5.76	1.94
Factor L (Vigilance)	6.43	1.81
Factor M (Abstractness)	5.88	1.97
Factor N (Privateness)	5.39	1.76
Factor O (Apprehension)	5.82	1.85
Factor Q1 (Openness to Change)	5.32	1.88
Factor Q2 (Self Reliance)	5.35	1.76
Factor Q3 (Perfectionism)	5.13	1.75
Factor Q4 (Tension)	5.59	1.75
Extraversion	58.82	16.97
Anxiety	59.88	17.83
Tough-Mindednesss	53.62	18.13
Independence	55.77	18.71
Self-Control	50.47	16.19
Sleep Quality	2.05	.60
Delayed Weekend Wake Times	1.73	.66
Average Sleep Length in Hours	7.77	1.40

Table 2

Correlation Matrix of All Variables

Variable	1	2	3	4	5	6	7	8	9	10
Factor A	1.00	-.08	.00	.08	.23*	.13*	.21*	.41*	-.08	-.11*
Factor B		1.00	.09	-.03	-.08	.08	-.08	.04	-.17*	-.02
Factor C			1.00	.02	.09	.12*	.19*	-.13*	-.25*	-.34*
Factor E				1.00	.19*	-.17*	.44*	-.05	.17*	.09
Factor F					1.00	-.22*	.43*	.03	.06	.19*
Factor G						1.00	-.10*	.04	-.19*	-.37*
Factor H							1.00	-.03	-.01	.00
Factor I								1.00	-.01	.14*
Factor L									1.00	.25*
Factor M										1.00
Factor N										
Factor O										
Factor Q1										
Factor Q2										
Factor Q3										
Factor Q4										
Extraversion										
Anxiety										
Tough-Mindedness										
Independence										
Self-Control										
Sleep Quality										
Delayed Weekend Wake Times										
Average Sleep Length										

Note: * = $p < .05$ two-tailed

Table 2 Cont.

Correlation Matrix of All Variables

Variable	11	12	13	14	15	16	17	18	19	20
Factor A	-.31*	.21*	.03	-.33	.65*	.07	.65*	.07	-.41*	.01*
Factor B	.04	.09	.17*	.10	.03	.02	-.11*	-.04	-.08	-.02
Factor C	-.06	-.45*	-.02	-.17	.03	-.36	.15*	-.77*	.19*	.02
Factor E	-.06	-.20*	.32*	-.15*	.03	.22*	.24*	.05	-.18*	.90*
Factor F	-.23	-.01	.13*	-.50*	-.23*	.08	.70*	.01	-.19*	.30*
Factor G	-.03	.14*	-.11	.00	.41*	-.16	-.04	-.10*	.12*	-.21*
Factor H	-.30*	-.26*	.24*	-.34*	.00	-.07	.62*	-.20*	-.15*	.65*
Factor I	-.01	.27*	.09	.06	.02	.09	.12*	.19*	-.71*	-.01
Factor L	.26*	.10*	.04	.14*	-.07	.26	-.13*	.54*	-.08	.31*
Factor M	.02	.17*	.38*	.09	-.31*	.10*	-.01	.31*	-.57*	.22*
Factor N		1.00	-.06	.36*	.03	.03	-.66*	.10	.09	-.09
Factor O			-.08	.01	.16*	.20*	.02	.69*	-.20*	-.21*
Factor Q1			1.00	-.01	-.06	-.07	.12*	-.04	.69*	.58
Factor Q2				1.00	.10	.05	-.75*	.13*	.01	-.18*
Factor Q3					1.00	-.02	-.08*	.03	.10*	-.02
Factor Q4						1.00	-.01	.68*	-.05	.15*
Extraversion							1.00	-.09	-.25*	.35*
Anxiety								1.00	-.19*	.06
Tough-Mindedness									1.00	-.38*
Independence										1.00
Self-Control										
Sleep Quality										
Delayed Weekend Wake Times										
Average Sleep Length										

Note: * = $p < .05$ two-tailed

Table 2 Cont.

Correlation Matrix of All Variables

Variable	21	22	23	24
Factor A	.07	.00	-.01	.09
Factor B	.08	.04	-.06	-.05
Factor C	.17*	.-.34	-.18*	.17*
Factor E	-.13*	.03	.08	.02
Factor F	-.47*	.01	.09	.06
Factor G	.77*	-.14*	-.20*	-.07
Factor H	-.14*	-.06	.03	.04
Factor I	-.03	.14*	.09	-.02
Factor L	-.21*	.18*	.05	.00
Factor M	-.69*	.25	.20*	.00
Factor N	.05	-.04	.00	.01
Factor O	.06	.25*	.04	-.16
Factor Q1	-.23*	.12*	.08	-.06
Factor Q2	.11*	.10	-.02	.04
Factor Q3	.76*	-.12*	-.05	-.08
Factor Q4	-.13*	.19	.04	-.04
Extraversion	-.19	-.03	.04	.04
Anxiety	-.15*	.35*	.11*	-.14*
Tough-Mindedness	.34*	-.22*	-.15*	.02
Independence	-.24*	.07	.01	.01
Self-Control	1.00	-.21*	-.20*	-.07
Sleep Quality		1.00	.13*	-.10*
Delayed Weekend Wake Times			1.00	.06
Average Sleep Length				1.00

Note: * = $p < .05$ two-tailed

Hypothesis One

The first hypothesis stated that overall sleep quality would be related to selected primary factors of the 16PF. Specifically, it was hypothesized that poor sleep quality would be related to lower scores on Factor C (Emotional Stability), and higher scores on Factor L (Vigilance), Factor O (Apprehension), and Factor Q4 (Tension) of the 16PF. The results of the MANOVA indicated a significant relationship between Sleep Quality and Emotional Stability, $F(2, 376) = 26.47, p < .0085$, and Rule Consciousness, $F(2, 376) = 5.01, p < .0085$, Vigilance, $F(2, 376) = 6.28, p < .0085$, Abstractness, $F(2, 376) = 12.84, p < .0085$, Apprehension, $F(2, 376) = 12.16, p < .0085$, and Tension $F(2, 376) = 7.05, p < .0085$. No other significant relationships were found.

Tukey's post hoc tests were performed on all significant findings. All alpha levels for the following were less than .05. On Emotional Stability, post hoc tests revealed that good sleepers scored higher than those with occasional sleep difficulties and poor sleepers, and that those with occasional sleep difficulties scored higher than poor sleepers. Both good sleepers and those with occasional sleep difficulties scored higher than poor sleepers on Rule Consciousness. Good sleepers scored lower on Vigilance than poor sleepers. On both Abstractness and Apprehension, good sleepers scored lower than those with occasional sleep difficulties and poor sleepers, and those with occasional sleep difficulties scored lower than poor sleepers. Good sleepers scored lower on Tension than those with occasional sleep difficulties and poor sleepers. There were no other significant findings.

Hypothesis Two

The second hypothesis stated that overall sleep quality would be related to higher scores on the Anxiety global scale of the 16PF. Results of the MANOVA found a significant relationship between Sleep Quality and Anxiety, $F(2, 376) = 26.71$, $p < .0085$, Tough-Minded, $F(2, 376) = 9.58$, $p < .0085$, and Self-Control, $F(2, 376) = 8.59$. No other significant relationships were found.

Tukey's post hoc tests were performed on all significant findings. All alpha levels for the following were less than .05. On Anxiety, post hoc tests revealed that good sleepers scored lower than those with occasional sleep difficulties and poor sleepers, and that those with occasional sleep difficulties scored lower than poor sleepers. The opposite was found on Tough-Minded; good sleepers scored higher than those with occasional sleep difficulties and poor sleepers, and that those with occasional sleep difficulties scored higher than poor sleepers. On Self-Control, both good sleepers and those with occasional sleep difficulties scored higher than poor sleepers. There were no other significant findings.

Hypothesis Three

Hypothesis three stated that DWW would be related to selected primary scales of the 16PF. Specifically, DWW would be related to higher scores on Factor Q1 (Openness to Change) and Factor F (Liveliness), and lower scores on Factor Q3 (Perfectionism) and Factor G (Rule Consciousness). The results of the MANOVA indicated a significant relationship between DWW and Emotional Stability, $F(2, 376) = 6.28$, $p < .0085$, Rule Consciousness, $F(2, 376) = 8.30$, $p < .0085$, and Abstractness, $F(2, 376) = 8.14$, $p < .0085$. No other significant relationships were found.

Tukey's post hoc tests were performed on all significant findings. All alpha levels for the following were less than .05. Post hoc tests revealed that those who had DWWs of less than 2 hours scored higher on Emotional Stability than those who had DWWs of more than 4 hours. On Rule Consciousness, those who had DWWs of less than 2 hours scored higher than those who had DWWs of 2-4 hours and more than 4 hours, and those who had DWWs of 2-4 hours scored higher than those who had DWWs of more than 4 hours. On Abstractness, those who had DWWs of less than two hours scored lower than both those who had DWWs of 2-4 hours and more than 4 hours. There were no other significant findings.

Hypothesis Four

The fourth hypothesis stated that DWW would be related to lower scores on the Tough-Minded and Self Control global scales of the 16PF. The results of the MANOVA indicated a significant relationship between DWW and Self Control, $F(2, 375) = 7.77$, $p < .0085$. No other significant relationships were found.

Tukey's post hoc tests were performed on all significant findings. All alpha levels for the following were less than .05. Post hoc tests revealed that those who had DWWs of less than 2 hours scored higher on Self Control than those who had DWWs of 2-4 hours and more than 4 hours. No other significant relationships were found.

Hypothesis Five and Six

Hypothesis five stated that sleep length would not be related to any of the primary factors of the 16PF. Hypothesis six stated that sleep length would not be related to any of the global factors of the 16PF. To assess the unique effects of each primary factor and each global factor on sleep length, multiple regression analyses were utilized. In the first

regression, the sixteen primary factors were regressed on sleep length. For the second regression, the five global factors were regressed on sleep length.

The first regression analysis showed a significant relationship between the sixteen primary factors and sleep length, $R^2 = .089$, $F(16, 378) = 2.21$, $p < .0085$. Consequently, the sixteen primary factors account for approximately 9% of the variance in sleep length. Specifically, Warmth significantly predicted sleep length with a Beta weight of .199. None of the other primary factors were significant predictors of sleep length.

The second regression analysis did not show a significant relationship between any of the five global factors and sleep length.

CHAPTER 4

Discussion

The focus of the current study was to examine the relationship between sleep habits and patterns of college students and their relationship to selected personality characteristics. The specific hypotheses were narrowed to specify the relationships between the primary and global factors of the 16PF, and sleep quality, delayed weekend wake times (DWW, those who wake up significantly later on weekend days compared to weekdays), and sleep length.

Discussion of the results will begin with a broad overview. The six formal hypotheses will then be discussed individually. A general discussion of these results will follow, highlighting significant findings and implications. The limitations of the study will be discussed next. Finally, suggestions for future research will be posited.

General Overview

Overall, the results indicate that there is a significant relationship between sleep quality and all the predicted primary and global factors of the 16PF. Additionally, sleep quality was found to have a significant relationship with two primary factors and two global factors of the 16PF that were not predicted. In general, it was found that people who have poor sleep quality are less emotionally stable, less self-assured, and less

observing of rules and regulations. Additionally, those who have poor sleep quality are more skeptical of the motives of others, more oriented to internal processes, and have higher trait anxiety. Finally, individuals who have poor sleep quality tend to be more anxious and reactive, more reckless, and less grounded and practical.

The results also indicate that there is a significant relationship between DWW and some of the primary and global factors of the 16PF. In general, those who wake up significantly later on the weekends, compared to weekdays, have less emotional stability and are less obedient of rules and regulations. These individuals are also less practical and tend to daydream. Additionally, people who delay their weekend wake times are more impulsive and reckless.

Although the results indicate that a relationship between sleep length and the primary factors of the 16PF does exist, this relationship is fairly weak, and only one of the 16 primary factors was found to be significant. The relationship between sleep length and the global factors was not found to be significant. These results support previous findings that there is there is little to no relationship between these two constructs.

Hypothesis One

The first hypothesis stated that overall sleep quality would be related to selected primary scales of the 16PF. Specifically, poor sleep quality would be related to lower scores on Factor C (Emotional Stability), and higher scores on Factor L (Vigilance), Factor O (Apprehension), and Factor Q4 (Tension) of the 16PF.

The results show that the less emotionally stable people are, the more sleep difficulties they may incur. This relationship was true for each sleep category, as good sleepers reported more emotional stability than those with occasional sleep difficulties

(OSD) and poor sleepers, and those with OSD reported more emotional stability than poor sleepers. Low scores on Emotional Stability are indicative of someone who is reactive and emotionally changeable, as well as less adaptive and mature (Cattell, et al., 1994). Individuals who score high on Emotional Stability are generally emotionally secure and shows few signs of becoming easily upset (Craig, 1999). The current findings are consistent with research on psychological reactance by Jenkins and Buboltz (2001, May) that found that highly reactant college students were more likely to report sleep difficulties. The current results also are consistent with a study by Verlander, et al. (1999) that found that emotional response to stress may affect sleep.

The relationship between sleep quality and Vigilance was limited to a difference between good sleepers and poor sleepers, with poor sleepers being more vigilant. High scores on Vigilance are indicative of someone who is suspicious, skeptical, and wary of others (Cattell, et al., 1994). This suggests that people who are able to get a good night's sleep are less likely to be suspicious and skeptical of others than those who have frequent or severe sleep difficulties. The fact that individuals with OSD are not more or less vigilant than those who generally sleep soundly, or people that suffer from consistent sleep difficulties, may indicate that a moderate level of suspiciousness may occasionally disrupt sleep.

The results indicate that apprehension level is directly related to increased incidences of sleep difficulties. For each sleep category, as apprehension increased, sleep quality decreased. High scores on Apprehension reflect self-doubt and worry (Cattell, et al., 1994). Those who suffer from a high level of self-doubt may stay up at night worrying over their performance in the events of the day, as well as their ability to be

competent in future events. Consistent with the literature (McCann & Stewin, 1987) the results of the current study show that the more people worry, the worse sleep quality becomes.

Individuals who scored higher on Tension also indicated a greater occurrence of sleep difficulties. The current study found that good sleepers had lower scores on Tension than those with OSD and poor sleepers. However, there was not a significant difference between those with OSD and poor sleepers. The fact that high levels of tension are related to moderate sleep difficulties in some students, and severe difficulties in others, may reflect differences in how individuals cope with and adapt to external life stressors. People who score high on Tension are impatient, driven, and have high energy. These personality characteristics are very similar to individuals with Type A personality. Koulack and Nesca (1992) also found that students who score high on a measure of Type A personality have more sleep disturbances.

There were also two primary factors from the 16PF (Rule Consciousness and Abstractedness) that were not in the original hypothesis, yet were found to be related to sleep quality. Hypothesis one was drawn from information based on previous research and the results support the assertion that there is a relationship between sleep quality and particular personality characteristics. However, the fact that other personality characteristics not in the original hypothesis were also were found to be related to sleep quality suggests that the relationship between these two constructs may be more complicated than previously thought.

High scores on Rule Consciousness were related to better sleep quality. Specifically, good sleepers and those with OSD were more rule conscious than poor

sleepers. Individuals who score high on Rule Consciousness both accept and follow rules. They also may be described as responsible, determined, and orderly (Craig, 1999). The relationship between Rule Consciousness and sleep quality may be related to proper sleep habits that result in better sleep quality. People who follow rules and are concerned with being orderly are probably more likely to keep a consistent sleep schedule than those who are less conventional, or non-conforming. Previous research has shown that individuals who keep a consistent sleep schedule are less likely to have sleep difficulties (Lack, 1986).

The results of the current study also indicate that higher scores on Abstractedness are associated with poor sleep quality. This difference was found between each of the pairs of sleep difficulties, indicating that the more abstracted a person is, the greater the likelihood of sleep difficulties. People who score high on Abstractedness tend to be imaginative, creative, and unconventional, while low scorers are guided by objective and practical realities (Craig, 1999). This relationship may also be directly related to sleep habits. Those who are less abstract may have a tendency to approach all aspects of their lives more practically and objectively, including sleep schedules. Unconventional types may not be as concerned with keeping a consistent sleep schedule, and thus, have more sleep difficulties.

Overall, each of the four primary factors of the 16PF that were hypothesized to have a relationship with sleep quality turned out as expected. All four of these personality characteristics (lower Emotional Stability, and higher Vigilance, Apprehension, and Tension) can be associated with the negative mood states. High scores on Neuroticism also reflect the presence of negative and upsetting emotions (Digman, 1990). The current

results support earlier research that suggests a relationship exists between Neuroticism and poor sleep quality (Bonnet, 1985; Gau, 2000; Gray & Watson, 2002; Lacks & Morin, 1992; Pilcher & Huffcutt, 1996). However, the primary factors of the 16PF relate to more specific aspects of negative mood states than the general concept of Neuroticism. The current findings may allow professionals who work with sleep disorders to better operationalize, and subsequently more efficiently treat sleep difficulties. For example, relaxation techniques may work well with an individual who has high levels of tension, but not as well for someone who is emotionally unstable. Individual or group psychotherapy may be more appropriate to assist someone with unstable emotions.

Hypothesis Two

Hypothesis two stated that overall sleep quality would be related to higher scores on the Anxiety global scale of the 16PF. Results indicate that the relationship between sleep and anxiety is consistent for each sleep category, as good sleepers reported less anxiety than those with OSD and poor sleepers, and those with OSD reported less anxiety than poor sleepers. This suggests that the more trait anxiety a person has, the greater the probability of sleep difficulties. These findings are consistent with previous research that poor sleep quality is related to anxiety (Klonoff et al, 1987; Monroe, 1967).

Sleep quality was found to be related to two other global factors (Tough-Mindedness and Self-Control) of the 16PF that were not in the original hypothesis. Individuals who are tough minded approach tasks and problems with an emphasis on rationality and on getting things done; they pay less attention to emotional aspects of relationships (Craig, 1999). This suggests that individuals who are able to view life more rationally have fewer sleep difficulties. Although it was not originally hypothesized, this

relationship makes sense. Sleep difficulties are one of the hallmark symptoms of depression (APA, 1994). Cognitive behavioral therapy for depression focuses on challenging irrational beliefs (Freeman, Pretzer, Fleming, & Simon, 1990). As irrational beliefs are eradicated, depressive symptoms (including sleep difficulties) are often alleviated. Perhaps individuals who are more tough-minded also suffer from less symptoms of depression. Similar to the relationship between poor sleep and Anxiety, the results indicate that the relationship between sleep and Tough-Mindedness is consistent for each sleep category. Hence, the less tough-minded a person is, the greater chance of sleep difficulties.

The other global factor of the 16PF that was found to be related to sleep quality was Self-Control. In the present study, good sleepers and those with OSD both reported higher Self-Control than poor sleepers. However, those with OSD did not report significantly higher Self Control than good sleepers. This suggests that while higher levels of Self-Control may improve sleep, it will not necessarily alleviate sleep difficulties. Individuals with high self-control are generally fairly predictable, planful, and not very impulsive. Similar to the findings between Rule Consciousness and sleep, the relationship between Self-Control and sleep may be attributed to sleep habits that affect sleep quality. People who are predicable and planful are probably more likely to keep a consistent sleep schedule than those who are more capricious or impulsive.

Overall, the results of hypothesis two suggest that individuals who approach life more rationally and calmly, and less impulsively or reckless, have less sleep difficulties. The demands of college life often leave students with schedules that vary from day to day. The lack of a consistent schedule may lead certain students to become disorganized

and more anxious about getting things done. Some students with sleep difficulties may find relief through learning how to plan and organize their academic and social calendars in a manner that is realistic to a changing college lifestyle.

Hypothesis Three

Hypothesis three stated that DWW would be related to selected primary scales of the 16PF. Specifically, DWW would be related to higher scores on Factor Q1 (Openness to Change) and Factor F (Liveliness), and lower scores on Factor Q3 (Perfectionism) and Factor G (Rule Consciousness). Out of these four primary factors of the 16PF that were hypothesized to have a relationship with DWW, the only factor found to have this relationship was Rule Consciousness. Additionally, two primary factors that were not in the original hypothesis (Emotional Stability and Abstractedness) were shown to have a relationship with DWW. Even though the results are considerably different from the original hypothesis, they are not entirely surprising. An exhaustive review of the literature was unable to find a study linking DWW with personality. Thus, the analysis in hypothesis three was exploratory rather than research driven.

As individuals become less rule-conscious, they tend to increase their delay of weekend wake times. Level of rule-consciousness appears to be directly proportionate to length of DWW, as all pairs of DWW categories share this relationship with DWW. This suggests that students with less conventional or non-conforming personalities are less likely to keep regular sleep schedules than those who tend to follow the rules or are concerned with being orderly.

Students who reported DWW of less than 2 hours had more emotional stability than those who reported DWW of more than 4 hours. However, those who delayed their

weekend wake times by 2-4 hours did not differ between DWW of less than 2 hours or more than 4 hours. Higher scores on Emotional Stability are associated with adaptiveness and maturity, as opposed to lower scores that are indicative of reactiveness (Cattell, et al., 1994). Students who continue to wake up a few hours later on weekends may not be quite as mature or adapted to college life as those who keep consistent sleep schedules.

For Abstractedness, students who reported DWW of less than 2 hours were less abstracted than students that indicated DWW of 2-4 hours, or more than four hours. However, there was no difference between those who had DWW of 2-4 hours, and those who had DWW of more than 4 hours. Higher scores on Abstractedness reflect an internal orientation of mental processes and a proneness to daydream, while lower scores are associated with practicality and being psychologically grounded (Cattell, et al., 1994). This implies that when students generally wake up even a few hours later on the weekends, they are likely to be just as impractical and ungrounded as those who wake up drastically later on the weekend. Hence, even moderate variations in wake times may have potentially serious implications.

Overall, individuals who keep regular wake times are more adaptive, mature, practical, and grounded than those who vary their wake times. Previous research has shown that poor sleep hygiene (which includes not keeping regular bedtimes and wake times) is associated with the circadian rhythm disorder DSPS and subsequent poor sleep quality (Brown, et al, 2001; Lack, 1986). Thus, it is not surprising that the three primary personality factors related to increased DWW were also related to poor sleep quality. Improving the sleep schedules of college students through sleep hygiene education may help students adapt better to college and develop maturity.

Hypothesis Four

Hypothesis four stated that DWW would be related to lower scores on the Tough-Minded and Self-Control global scales of the 16PF. The results did not show a significant relationship between Tough Mindedness and DWW, but did confirm an inverse relationship between DWW and Self-Control. This relationship was consistent between all pairs of DWW categories. Thus, the more fairly predictable, planful, and not very impulsive people are, the more likely they are to keep regular wake times. The results confirm that keeping regular, or non-regular, sleep schedules is related to personality type. It appears that those who have a more impulsive nature are also likely to keep impulsive and unpredictable sleep schedules. Students with this type of personality may benefit from the knowledge that while having a capricious personality may not be inherently bad, it may be aversely affecting their sleep. Students will most likely be less resistant to change their sleep patterns if they understand that they are only changing a particular pattern, rather than being asked to change who they are.

Hypothesis Five

Hypothesis five stated that sleep length would not be related to any of the primary scales of the 16PF. The results did show a relationship between the primary factors and sleep length. Although significant, this relationship was fairly weak in that only 9% of the variance was accounted for. Warmth was the only primary factor related to sleep length, with higher scores indicating increased sleep length. Individuals that have higher scores on Warmth tend to be more outgoing and attentive to others, as opposed to reserved and impersonal (Cattell, et al., 1994). Although the relationship between sleep length and

personality is fairly weak, the results do suggest that warmer individuals sleep longer than those who are more reserved.

Hypothesis Six

Hypothesis six stated that sleep length would not be related to any of the global scales of the 16PF. The results indicate that there is not a significant relationship between the global scales and sleep length. This is consistent with previous research that has found either a weak or no relationship between sleep and personality (Buela-Casal, et al., 1992; Hill, et al., 1997; Pilcher, et al., 1997; Verlander, et al., 1999).

Implications

Good sleep appears to be important to almost every aspect of a college student's life, including academically, socially, physically, and psychologically. The more information that is revealed about factors that relate to good sleep, the more we can insure that students reap its benefits. While certain factors that can cause sleep difficulties are well documented (e.g., caffeine and shiftwork), little is known about psychological variables that may impact sleep. Research that focuses on factors that may contribute to sleep difficulties increases this limited knowledge base. The present study corroborated previous research on sleep and personality, and explored new potential relationships. The results of this research can be used by professionals that work with college students to help reduce sleep difficulties.

Examination of the overall results of this study shows that all of the primary and global personality factors that were related to DWW were also related to poor sleep quality. This finding adds credence to studies by Brown, et al. (2001) and Lack (1986) that have shown that varying sleep schedules of only a couple hours on a regular basis

can lead to sleep difficulties and overall poor sleep quality. The current study brings new information that may help psychologists better understand which students are likely to have varied sleep schedules based on personality characteristics.

A practical application of how this information could be used to help decrease sleep difficulties in college students would be to assess personality characteristics during orientation or a university seminar class. An extensive personality inventory like the 16PF may be impractical for such a situation, as it would be lengthy, expensive and require professional interpretation. However, a survey of simple questions related to self-control, emotional stability, rule consciousness, and abstractness could be used to identify students who are at a high risk for sleep difficulties because of varying sleep schedules. The students could then be informed that they might need to be especially careful to keep a regular sleep schedule in order to avoid the many psychological, physiological, and academic detriments associated with poor sleep. As incoming college freshmen are often completely responsible for their sleeping habits and patterns for the first time, developing proper sleep hygiene habits early in their college career can help students avoid sleep problems before they start. Similarly, counselors who work with students having sleep difficulties could use this information to help both client and counselor better understand what may be causing poor sleep, and thus assist in determining a suitable intervention.

The results of the current study also found certain personality characteristics to be related to poor sleep quality, that were not significant on the DWW and personality analyses. It is possible that factors such as Vigilance, Apprehension, and Tension may be indicative of sleep difficulties related to certain psychopathologies, rather than simply associated with sleep hygiene. Individuals who score high on both Vigilance and

Apprehension are often worrying, troubled, insecure, apprehensive, and emotionally restricted (Craig, 1999). Similarly, high scores on both Vigilance and Tension suggest someone who is frustrated, driven, and tense. Psychologists may be able to use this information to differentiate between sleep hygiene difficulties and sleep difficulties related to psychological problems. Furthermore, psychologists can use this information to identify problem areas related to personality that are affecting both psychological well being and sleep difficulties, and subsequently choose an intervention that targets these specific problems. For example, highly vigilant individuals may be having sleep difficulties because they are preoccupied with and suspicious of the intentions of others. This constant mistrust may cause them to be very "light" sleepers that awaken easily and have many nocturnal awakenings that disrupt sleep. A cognitive-behavioral or interpersonal intervention that explores irrational mistrust may alleviate interpersonal difficulties for the individual, as well as sleep difficulties.

Limitations

Although sound methodology was used in this study, there are several limitations that may have influenced the results that should be noted. Some of these limitations refer to the characteristics of the sample, while others are related to the instruments used. These limitations, and their potential implications, are discussed to help ensure that the results are not generalized inappropriately.

The sample used in this experiment may limit the generalizability of the results to other populations. First, all participants were selected from a single university in a predominantly rural southern part of the United States. Ethnic diversity in this area of the country is restricted, and the sample in this study only significantly represents Caucasians

and African Americans. It was the intent of this study to examine college students, and close to 80% of participants were between the ages of 18 and 25. Readers should be careful not to generalize these findings to other age groups or individuals with a significantly different level of education.

Some of the instruments used in this study also present limitations. First, the construct of personality was solely defined by the 16PF. The16PF is generally considered a valid and reliable instrument. However, there is no definitive measure of personality, and it is impossible to say that any operational definition of personality is completely accurate. Thus, the results of this study should be interpreted with caution and not generalized to other theories of personality.

A concern when measuring the sleep of college students is that sleep habits and patterns may vary depending upon when students are surveyed. For example, students may have fewer sleep difficulties during the beginning of the quarter, rather than towards the end because of preparations for final exams. Data for the current study were collected throughout the quarter, and variations in sleep schedules should not affect the outcome because the SQI inquires about sleeping habits and patterns over the last three months, rather than at the particular time in which students are surveyed.

Another limitation is that the results of this study are correlational in nature. Therefore, it is not possible to interpret causation. While certain aspects sleep were found to be related to selected personality characteristics, it can not be certain if sleep disturbances are caused by elevated personality characteristics, or visa-versa. Finally, the data from this study are from self-report measures. Errors are always possible when this method is used, as not all participants may have answered truthfully. In many cases, it is

impossible to determine if someone is responding randomly or dishonestly. However, efforts were made to eliminate surveys that were obviously fraudulent (e.g., responding identically for every question asked). A total of fourteen surveys were discarded due to obvious fraudulence.

Suggestions for Future Research

Sleep quality has been found to be more important to many aspects of human functioning than sleep length (Pilcher, et al., 1997). The current study found only a weak relationship between sleep length and personality, and only one of the 21 personality factors assessed was significant in this relationship. These findings corroborate previous research that suggests that there is not a strong relationship between these two constructs (Buela-Casal, et al., 1992; Hill, et al., 1997; Pilcher, et al., 1997; Verlander, et al., 1999). Although it is impossible to definitively state that there is not a connection between long or short sleepers and personality, future research efforts may be better served by studying sleep quality.

There is a paucity of research on factors related to DWW. This varying type of sleep schedule can result in the circadian rhythm disorder DSPS, causing in excessive morning drowsiness and difficulty falling asleep on weeknights (APA, 1994; Buboltz & Brown 2001; Lack, 1986). Ultimately, this could lead to cognitive, emotional, and physiological difficulties that are related to sleep problems. Further research in this area is warranted. As this is the first known study to link DWW with personality characteristics, it should be replicated to establish a reliable connection between the two constructs.

Since the study is correllational in nature, it is not possible to imply causality. Thus, it remains unclear if personality characteristics lead to poor sleep, or if sleep disturbances invoke increases or decreases in certain personality characteristics. Process outcome research may be useful in distinguishing a directional relationship. Individuals with poor sleep quality could be given a personality inventory prior to treatment. Once sleep quality is improved through psychological interventions, scores on a second personality inventory administration could be compared to the original personality inventory. This type of study could also be done with people who have DWW to assess for personality changes once a regular sleep schedule is established.

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APPENDIXES

Appendix A

Human Use Committee Approval Form

LOUISIANA TECH
UNIVERSITY

RESEARCH & GRADUATE SCHOOL

MEMORANDUM

TO: Walter Buboltz ✓
Steve Jenkins

FROM: Deby Hamm, Graduate School

SUBJECT: HUMAN USE COMMITTEE REVIEW

DATE: October 1, 2001

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

"Sleep habits and behaviors of college students"
Proposal # 1-WI

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.

A MEMBER OF THE UNIVERSITY OF LOUISIANA SYSTEM
P.O. BOX 7923 • RUSTON, LA 71272-0029 • TELEPHONE (318) 257-2924 • FAX (318) 257-4487 • email: rsearch@LaTech.edu
AN EQUAL OPPORTUNITY UNIVERSITY

APPENDIX B

Demographic Questionnaire

For the following items, please provide information by filling in the blank or circleing the most appropriate answer.

1. _____ Age in years (write in your age on answer sheet)
2. Gender (please circle) Male Female
3. Current year in school (please circle)?

   Freshman
   Sophomore
   Junior
   Senior
   Graduate Student
   Other
4. With which ethnic group do you most identify (please circle)?

   African American
   Asian American
   Caucasian American
   Hispanic/Latino
   Native American
   Other
5. Current major (if any)? _____
6. Number of siblings in your family? _____

APPENDIX C

Sleep Quality Index

Please answer the following questions to the best of your ability by circling the response that best fits you. If unsure, please give your best guess.

1. Time to fall asleep

   <10 min 11-30 min >30 min

2. Suffered from insomnia during the past 3 months

   No <3 days/week 3-7 days/week

3. Difficulties falling asleep during the past 3 months

   No <3days/week 3-7 days/week

4. Disturbed night sleep during the past 3 months

   No <3days/week 3-7 days/week

5. Nocturnal awakenings during the past 3 months

   No <3days/week 3-7 days/week

6. Tiredness in the morning

   Very or Mostly Alert Don't Know Very or Mostly Tired

7. Wake up too early in the morning during the past 3 months

   No <3days/week 3-7 days/week

8. Use of sleeping medication during the past 3 months

No Occasionally At least once per week

APPENDIX D

Sleep Habits Questionnaire

1. On the average what time during the week do you go to bed? _____
2. One the average what time during the week do you wake up? _____
3. One the average what time during the weekend do you go to bed? _____
4. One the average what time during the weekend do you wake up? _____
5. On the average how many hours of sleep do you get during the week? _____
6. On the average how many hours of sleep do you get on the weekend? _____
7. Ideally I would like to get _____ hours of sleep during the week each night.
8. Ideally I would like to get _____ hours of sleep on the weekend each night.
9. About how many minutes does it take you to fall asleep after lying down in bed? ___