Sleep Behaviors Among College Students

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On average, 32.2% of adults between the ages of 18-24 report short sleep duration, or obtaining less than 7 hours of sleep per night. The recommended number of hours of sleep per night for adults is 7-9 hours (CDC, 2017, May 02). In addition, the time at which college students actually go to bed is significantly later than the times they reported going to bed in high school. Reasons as to why students are less likely to obtain a full night's sleep include light exposure, job circumstance, medication, caffeine intake, poor sleep environment, and others (Altun, 2012).

The two stages of sleep are rapid eye movement (REM) and non-rapid eye movement (non-REM), which are determined by brain waves and activities of neurons. These stages occur in four waves, starting with non-REM sleep in which the brain shifts from active to relaxing, calm sleep. The second wave is a transition period between light sleep and deep sleep, and the final non-REM wave is a stage of deep sleep in which heart and breathing rates decrease to their minimum and it becomes difficult to wake up. Finally, the fourth stage is REM sleep, in which brain waves, heart rate, and breathing begin to speed up ("Brain Basics," 2019).

The body uses the circadian rhythm as an internal clock to regulate periods of wake and sleep. Throughout the day, cells send signals to the brain to indicate the presence of light, however, at night, these signals stop and the pineal gland releases melatonin, a hormone that helps the body fall asleep. The release of melatonin from the pineal gland, and a person's internal clock, may become inhibited as a result of continued light exposure ("Circadian Rhythms," n.d.).

A lack of sleep has both short term and long term consequences. In the short term, sleep deprivation causes stress and mood disorders, disrupts school performance, and reduces quality of life. Overnight, neurons in the brain transmit messages throughout the body in order to remember information from that day. A lack of sleep will prevent these processes from solidifying new material. During the day, those same signals are more likely to be delayed in the retrieval of the encoded information. In the long term, it can cause individuals to develop hypertension, cardiovascular disease, overweight and obesity, and various cancers (Medic, et al., 2017). At night, the immune system produces antibodies to fight against infections, and a continued lack of antibody production can increase the likelihood of developing diabetes and/or heart disease. Finally, sleep deprivation can prevent the production of the hormones leptin and ghrelin, which provide feelings of fullness and hunger, respectively. When tired, the brain

inhibits leptin and promotes the secretion of ghrelin which leads to nighttime eating and increased time spent awake (Taheri et al., 2004).

Sleep disorders in America account for detrimental consequences that range from increased disease susceptibility risk to deadly motor vehicle accidents. Approximately 30-35% of America's population has been diagnosed with insomnia, making it the most common sleep disorder (Heffron, 2014). Fatal diseases such as hypertension and heart disease result from this increased susceptibility risk. A lack of sleep impairs thought processes and impairs drivers abilities to react to situations on the road. The United States National Highway Traffic Safety Administration (NHTSA) estimates that this issue corresponds with at least 100,000 motor vehicle crashes and 1,500 deaths per year. Furthermore, around 71,000 drowsy driving crashes result in non-fatal injuries, stimulating $12.5 billion being spent in healthcare ("Drowsy driving," n.d.).

Sleep is imperative for everyone, and as such, it is recognized as one of the Healthy People 2020 objectives. Healthy People 2020 is a set of national goals set by the Office of Disease Prevention and Health Promotion (ODPHP) that aim to improve the health of America's population over the course of 10 years ("About Healthy People," n.d.). Under the category of sleep, there are eight published objectives related to improving sleep habits among every age population. Examples of these goals include increasing the number of adults who get enough sleep (SH-03) and reducing the number of motor vehicle crashes that are due to drowsy driving (SH-01). The ODPHP emphasizes the importance of sleep by issuing goals at multiple levels in an effort to create more attainable and persistent goals across various age groups ("Sleep," n.d.).

ORGANIZATIONAL, COMMUNITY, ENVIRONMENT, AND POLICY FACTORS

During the 2017-2018 school year, the average start time for public schools in the US was 8 AM, as cited in a survey conducted by the National Center for Education Statistics. In over 42 states, approximately 75%-100% of public middle and high schools started class before 8:30AM ("Schools Start Too Early," 2020). However, the American Academy of Pediatrics recommends that middle and high schools should begin no earlier than 8:30AM or later in order to give their students the ability to get sufficient sleep. In 2015, multiple studies were performed

to see how a delayed start time would affect the outcome of academic performance. The studies confirmed that delaying the start time of schools not only increased the amount of sleep for students on weeknights, but was also positively correlated with improved attendance, better grades, and less falling asleep during the school day (Wheaton et al., 2016).

Some of the suggestions to improve sleeping conditions include sleeping in a room that is painted in a neutral tone, is clean, quiet, has fresh air in addition to a calming scent, and is within 60-70 degrees Fahrenheit (Suni, 2020). Not only does the ambience of the room affect how much sleep one gets, but the extrinsic environment also plays a vital role in the amount and quality of sleep. Factors such as light and air pollution, as well as noises from nearby railways, airplanes, or streets can all decrease the likelihood of quality sleep. In a study comparing the rate of sleep between an urban population and a rural population, those in rural areas were able to fall asleep quicker. Streetlights and vehicular commuters are less common in rural areas, so the removal of those two factors decreased the time it took those in rural areas to fall asleep over those in urban areas by 15% (Carvalho et al., 2014).

The aesthetic of one's neighborhood, such as the presence of litter, graffiti, or abandoned vehicles can further limit sleep. In low-income areas, the prevalence of crime and the population size play a role in sleep behaviors. Those who live in a neighborhood of high stress can lose up to 20 minutes of sleep each night compared to residents in less stress-inducing neighborhoods (Hunter & Hayden, 2018). Children in impoverished areas who lack access to grocery stores, restaurants, parks, or even just sidewalks, are at a higher disadvantage than those in wealthier neighborhoods. Going to bed hungry increases the time it takes to fall asleep and influences how long one may actually stay asleep. Children who do not have an outlet to burn off energy, through playing at the park or walking around the neighborhood, also take more time to fall asleep, as they are reportedly not as exhausted at night (Sheehan et al., 2018).

Certain high risk jobs have policies in place that budget time for their employees to sleep in order to be fully awake on the job, as they may be responsible for large groups of people. For example, the Federal Aviation Administration requires an uninterrupted rest period of 10 hours for pilots, with 8 of that accounted towards actual sleep, preceding a flight (Duquette, 2020). Shift work jobs, like pilots, are jobs that require employees to work outside of normal work hours. Other examples include food service, retail workers, healthcare personnel, and

transportation workers. Shift work also disturbs the circadian rhythm, where the biological clock does not adapt quickly to constant changes which causes the body to become confused and potentially produce melatonin in times when one may need to be awake (Touitou & Touitou, 2017).

There are suggested sleep regulations put forth by the National Institute for Occupational Safety and Health (NIOSH), however, they have not been formally published. Policies such as pushing back the start time of middle and high schools in America, stronger regulation of work hours, especially for those who work in shifts, and increasing awareness on electronic use before sleep have all been proposed in order to take action against this sleep disorder epidemic (Barnes & Drake, 2015).

THEORY

Theory, or a set of ideas, knowledge, or concepts that are used to explain something, serves as the basis for many disciplines of study. Within the subset of health, theory not only helps to identify risk factors and health problems, but also to develop a structured plan moving forward to eliminate those troubles. Risk factors and beliefs allow for a greater understanding as to why one may act in the way they do, and what should be done to combat those barriers to change. Additionally, theories encourage intervention efforts and provide advice for certain target populations (Green, 2000). In order to grasp a greater understanding of poor sleep habits in college students, theories such as the Health Belief Model and the Theory of Planned Behavior have been utilized to investigate why this specific population continually lacks adequate sleep.

Health Belief Model

The Health Belief Model (HBM) is a theory explaining why people change and how they become motivated to actually participate in and sustain healthy behaviors. The HBM takes into account barriers and cues to action that may prevent or encourage one to change a regularly performed behavior. The basic principles of this theory include perceived benefits, barriers, susceptibility, severity, cues to action, and self-efficacy. These factors address the actions and thoughts of a person before, during, and after they begin to change their behavior (LaMorte, 2019). This theory is widely applicable and has been used to improve sleep behaviors in adolescents.

In one study published in 2014 by The Journal of Health Promotion and Maintenance, 188 college students from March 26th through June 1st took an electronic survey of 52 items that required them to think about their beliefs and behaviors relating to sleep. Perceived susceptibility and perceived severity examined the short and long term effects of inadequate sleep such as poor health, motor vehicle operation, performance at work, and weight gain. Perceived benefits addressed the short and long term advantages of health, energy, and work productivity performed as a result of increasing sleep behavior. Perceived barriers asked about factors preventing adequate sleep, relating to academic and employment commitments. Cues to action were discovered as biological, psychological, and physical factors that influence sleep. Examples have included fatigue, stress levels, and personal responsibilities. The final construct, self-efficacy, was generalized as the confidence or ability for these students to perform and maintain better sleep habits in the future on their own (Knowlden & Sharma, 2014).

In this study, 34% of the variability of sleep behavior within a sample of college students was identified as a result of the HBM. The results of this study showed that perceived susceptibility and sleep behavior did not present a clear relationship. There was a positive relationship between perceived severity and sleep behavior, as students were more likely to change their sleep behaviors if they could see immediate or legitimate short-term consequences. Both cues to action and sleep behavior and self-efficacy and sleep behavior also had a positive relationship as determined by the data. On the contrary, a negative relationship was determined between perceived barriers and sleep behaviors, and this can be justified by the fact that the more distractions one has throughout the day, the less likely they would be to obtain healthy sleep (Knowlden & Sharma, 2014).

Theory of Planned Behavior

The Theory of Planned Behavior (TPB) evolved from the Theory of Reasoned Action that originated in the 1980s to encompass external factors that may be present and may be preventing one from initiating behavioral changes. The TPB emphasizes both one's actual ability or control over a behavior and also the societal constructs of it as well. It is made up of six constructs, with two generalized into attitude towards the behavior, two to subjective norms, and two to perceived behavioral control. The constructs relating to attitude evaluate one's behavioral beliefs and the value they place on those outcomes. Opinions and thoughts from closeby peers or

family and one's desire to go along with those opinions fall under subjective norms. Perceived behavioral control, such as whether the environment around a person makes it easy or difficult to quit or adopt a behavior, and perceived power, of which one behavior is emphasized over the other, ultimately deciding whether one will change or not (Clinkscales, 2019).

A study was conducted at a university asking randomized sets of students who entered the cafeteria (and would comply) a series of questions regarding their beliefs and attitudes towards sleep behaviors. To specify the behavior targeted, sleep was categorized into a specific target, action, context and time. Adequate sleep was defined for undergraduate students as achieving between 7 and 8 hours each night. Questions such as "what do you believe are the advantages of sleeping 7-8 hours a night" and "what factors or circumstances would enable you to sleep 7-8 hours a night" were asked in order to understand further what situations are inhibiting healthy sleep. Depending on the participant's response determined which generalized category, perceived behavioral control, subjective norm, and attitude toward the behavior, the response would go into (Knowlden et al., 2012).

The intent of the second part of the study, in which 29 items were asked to the participants, was to come up with a predictive model of sleep behavior for college students. The first part was addressed directly, where attitude toward a sleep behavior was measured to be either favorable or unfavorable. The second part was addressed indirectly, in which participants were asked about specific beliefs they held. These specific beliefs would be integrated and developed using theoretical principles and then could further be used to draw conclusions based on each individual participant's attitude toward sleep patterns (Knowlden et al., 2012).

To assess perceived behavioral control, questions directed toward participants' self-efficacy and ability to actively engage in a healthy sleep behavior were developed as part of the survey. For example, the question "if I wanted to, I am confident that I could sleep for 7-8 hours every night" was asked, with participants having to determine their response on a scale from completely disagree to completely agree. Subjective norm was asked through questions incorporating the opinions of those closest to the participant and how they feel about obtaining quality sleep. For example, descriptions like "most people who are important to me think…" and "my friends want me…" started off the question, and encouraged participants to think about social norms regarding sleep. Attitude toward the behavior was asked from both a positive and negative standpoint. Questions in a more optimistic viewpoint focused on how the participant

would feel after obtaining the desired 7-8 hours of sleep. Questions in a more pessimistic viewpoint asked the detrimental impact on their social life. Finally, behavioral intention was addressed through futuristic phrases such as "I will…" or "I plan to…" within the next 24 hours. This section was included to measure the motivation participants would be willing to change moving forward. Additionally, this section stimulated the participant to think about behaviors they can adopt and implement into their life going forward. Those with higher ratings were hypothesized to be more likely to adopt a new behavior (Knowlden et al., 2012).

This method of questioning was repeated many times to different college students, and was then used to generalize a greater population. After reviewing the statistical analyses from the different sections of the test, all three concepts were significant in predicting behavior intention. Perceived behavioral control had the highest significance, followed by attitude toward the behavior, and then subjective norm. The TPB is focused around the idea that behavioral intention is the antecedent for behavior. In this study, a person's perception of whether or not they could actually change their behavior was the strongest correlated factor showing that the higher the perceived behavioral control, the more likely one would be to change their sleep habits and stick to those healthy habits later on (Knowlden et al., 2012).

This study concluded that sleep habits within college students need to be prioritized higher at most universities. The results discussed above show that intervention should be focused on increasing student's perceived behavioral control. This would take into account modifiable and nonmodifiable physical, environmental, mental, and any other factors that prevent students from obtaining sleep.

Intrapersonal Factors

Intrapersonal factors affecting one's behavior include values, knowledge, attitude, or any personal beliefs, in addition to socioeconomic status, race, gender, and other specific characteristics related to an individual. Learning more about one's beliefs, values, or background may provide insight as to why they feel inclined to act, or fail to act, a certain way ("Ecological Models," n.d.).

College students are the least likely group to report having satisfactory sleep. In a study evaluating sleep behaviors in college students, 50% reported having daytime sleepiness and 70% reported obtaining insufficient sleep. The students in the survey reported reasons such as pulling

an all nighter before an exam in hopes of achieving a higher grade and going to bed late and waking up early as reasons that cause excessive sleepiness. Other factors that are prioritized over sleep include alcohol, caffeine and energy drinks, stimulants, and technology. These factors all negatively impact the amount of sleep students acquire each night, however, they are still utilized regardless. The justification for these harmful behaviors are attributed to the student's GPA, in that they value a higher GPA over feeling restful. Many students were also found to have the mindset that cramming before an exam will positively impact their result. However, as published in the same study as listed above, GPA and school performance both decrease when rates of sleep deprivation increase (Hershner & Chervin, 2014).

Sleep deprivation may have resulted from poor voluntary behaviors, however, gender may also influence the amount of sleep one gets. Even though women may sleep longer than men, their quality of deep sleep is not as good as what a man experiences. Women are more likely than men to take off work when they have a baby, which gives them more opportunities to sleep during the day. Women also spend more time doing household chores and caring for their children than their male partner, creating more tasks and work during the day for them and less for the men. Finally, this study found that the value of obtaining sleep differed among men and women. Men found that sleep was a necessity, but something they did not enjoy, as it took away from time they could be spending doing other tasks. Women were found to have higher knowledge about healthy behaviors, specifically about sleep, than men, so they participate in behaviors like napping and/or going to bed earlier in order to increase the amount of sleep they get (Burgard & Ailshire, 2013).

One's socioeconomic status (SES) is an influential factor in determining sleep quality. Coming from a low SES presents additional challenges in obtaining full sleep such as outside noise, temperature, and other health issues may not be adequately addressed. Most low SES neighborhoods have higher rates of crime, which make the area noisy and violent, preventing uninterrupted sleep. Higher crime rates can also increase anxiety. Finally, low SES may mean working additional hours after work in order to survive, which cuts into time that could have been spent sleeping (Jehan et al., 2018).

Race can also play a role in sleep behavior. African Americans are 50% more likely to experience short sleep, and sleep about 35-60 minutes less each night than whites. In addition, rates of sleep deprivation are more common in low-income and minority groups. People of color

are more likely to experience workplace discrimination, or obtain a job with unsafe working conditions, and thus have higher rates of anxiety (Williams et al., 2015).

Psychological distress, in forms of anxiety, depression, and other mental illnesses, all impact the amount of sleep obtained per night as well. People with depression often suffer from insufficient sleep, with 80% having been diagnosed with insomnia as well. They also suffer from a shortened rapid eye movement, REM, stage, which increases deprivation, and higher sleep latency, which is how long it takes for someone to fall into deep sleep (Steiger & Pawlowski, 2019).

Personality characteristics such as extraversion or introversion also play a role in regulating sleep. Frequently waking up throughout the night and feeling less rested were both associated with high neuroticism, low extraversion, and low conscientiousness. Reasons for this may include that neurotic people have higher rates of anxiety. Extroverted individuals are more likely to live active lifestyles and are less likely to be diagnosed with depression, which both contribute to better sleep. Those who present higher rates of conscientiousness are more organized, and are predicted to have scheduled and routinely bedtime rituals. Additionally, those found to be more conscientious reported consistently earlier bedtimes (Sutin et al., 2020).

Interpersonal Factors

Interpersonal factors are related to a person's social support, or relationships with those closest to them. Depending on the strength of the relationship, those closest to a person can have the greatest influence on a behavior one partakes in. When looking at how relationships impact the amount of sleep a person gets, there are notable differences between those with strong support groups and those who are more lonely ("Ecological Models," n.d.).

Those with more social support are more likely to experience better sleep quality. Social supports also decrease the effects of stress, which in turn, increases sleep as well. One study looking at social support found that support from a mother-figure also helped reduce stressors (van Schalkwijk et al., 2015). In contrast, during 2020 when lockdown measures were in place, rates of depression and loneliness were astronomically high. During a time when in-person interaction was low, perceived social support decreased, which made rates of poor sleep quality increase (Grey et al., 2020).

Family sleep habits play a significant role in an individual's sleep habits. Physical interactions and emotional feelings from family members may increase or decrease sleep quality. Having a poor family dynamic is associated with poor sleep health, and can carry on with a person throughout their life (Gunn & Eberhardt, 2019). For children, family dynamics play a pivotal role in whether they sleep through the night or not. High reports of familial stress, such as yelling or fighting, can increase the likelihood of nightmares for children. Being in environments with tension and loud, scary noises to children can prevent them from falling asleep, or can wake them up due to anxiety (Lebowitz et al., 2019).

Both positive and negative relationships with friends can influence sleep health. Friends can provide a safe environment and reduce the amount of stressors one may feel in relation to their living environment. Living with friends, or even just spending time with friends, provides comfort and safety, and less feelings of worry. On the contrary, tension or negative relationships may negatively affect sleep habits. Additionally, having little or no friendly relationships has a higher association with depression (Kent et al., 2015).

SUGGESTIONS FOR INTERVENTION

When addressing the issue of sleep deprivation in college students, there are many factors that need to be taken into account in order to develop the most effective solution. Issues like time management, consequences of daytime sleepiness, and daily priorities all influence whether one gets a full night's sleep or not, and need to be utilized when coming up with a solution. Since college students are very busy I believe the most successful approach to improving sleep is something that would not take too much time out of their already busy schedules.

Since college students already spend so much time on their electronics, incorporating an approach through technology would be the most effective way, in my opinion. One way to improve sleeping habits is to go to bed and wake up at a regular time every day. Having an iPhone app track, and also encourage, one's sleep routines could help remove some of the stress of not actually going to bed. If a student has an app that reminds them to go to bed at the same time they went to bed the previous night, they would be more inclined to wrap up their work and maintain a consistent sleep schedule. Without that reminder, it would be much easier to stay up later and use work or any other distraction to justify not sleeping. Previous sleep studies tracking the effectiveness of phone apps on sleep habits have shown that technological interventions have

reduced sleep disorders and further improved sleep quality. These methods have also had equal or better outcomes than other therapies (Shin et al., 2017).

Institutionally, colleges have a pivotal role in bettering sleep health. Interventions done by a college would show students how important sleep is, and how their school is committed to helping their students. One intervention would include creating a mandatory, for credit class, in addition to other health topics that are typically covered before or during freshman year, that discusses not only the biology and importance of sleep, but also methods students can adopt in order to improve their sleep quality. Showing how easy it is to make sleep a priority would motivate students to make time for healthy sleep. Studies incorporating sleep seminars or "classes," have shown that over time, length of sleep per night goes up during both weekdays and weeknights (Colt & Reilly, 2019). College students are sleep deprived and as much as they are aware of this, they may not understand how to change it. Although an additional class may not be desirable, this would explicitly state how to change behaviors, and in the long run, would be beneficial to those who participate.

On a societal level, there are many environmental factors that negatively influence sleep. One of the greatest influences is caffeine. Caffeine presents its strongest effects on the receptors in the brain dealing with sleep. Cafés, restaurants, and any other place that may sell caffeinated beverages should advertise that after 3pm, caffeine reduces the amount of sleep one gets each night. Reminding customers of caffeine's influence can help them evaluate their choice and how it may affect their sleep later that day. The lack of caffeine consumption would protect the brain's production of melatonin, and thus reduce barriers to unobstructive sleep (O'Callaghan et al., 2018).

Personally, after researching and understanding sleep behaviors and patterns of college students, I believe that this behavior is not as difficult to adopt as many students believe it may be. If college students and people in general are educated about the importance of sleep and learn of its vital importance for good health and longevity, then they will be more likely to adopt better sleep habits. College students often complain of having no time in the day to complete all of their tasks, failing to recognize that about 2 hours is spent per day on social media (Perrin & Kumar, 2020). Our current values align with detrimental practices like working extreme hours in order to survive, or staying up all night to study in order to achieve a higher grade, and if those norms are addressed and discouraged, then people will be less likely to partake in them.

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