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Franklin C. Brown PhD , Walter C. Buboltz Jr PhD & Barlow Soper PhD
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Relationship of Sleep Hygiene Awareness, Sleep Hygiene Practices, and Sleep Quality in University Students

Franklin C. Brown, PhD; Walter C. Buboltz, Jr, PhD; Barlow Soper, PhD

College students are known for their variable sleep schedules. Such schedules, along with other common student practices (eg, alcohol and caffeine consumption), are associated with poor sleep hygiene. Researchers have demonstrated in clinical populations that improving sleep hygiene knowledge and practices is an effective treatment for insomnia. However, researchers who have examined relationships between sleep hygiene and practices in nonclinical samples and overall sleep quality have produced inconsistent findings, perhaps because of questionable measures. In this study, the authors used psychometrically sound instruments to examine these variables and to counter the shortcomings in previous investigations. Their findings suggest that knowledge of sleep hygiene is related to sleep practices, which, in turn, is related to overall sleep quality. The data from their regression modeling indicated that variable sleep schedules, going to bed thirsty, environmental noise, and worrying while falling asleep contribute to poor sleep quality.

Index Terms: *habits, hygiene, quality, sleep, students*

College students are noted for obtaining insufficient sleep during the week and for sleeping long hours during the weekend. In fact, students' sleep schedules are so variable that twice as many students as people in the general population report symptoms consistent with delayed sleep phase syndrome.[1,2] This syndrome is marked by progressively later wake-up times on nonwork or nonschool days, leading to poor job and academic performance and excessive sleepiness during the week.

Many students' sleep difficulties extend beyond voluntary schedule variations to frequent, involuntary sleep complaints. At least two thirds of college students report occasional sleep disturbances, and about one third of those report regular, severe sleep difficulties.[1-3] The problem is even more evident in a recent study that found that only 11% of the students surveyed met the criteria for good sleep quality. The rest of the sample had moderate-to-severe sleep complaints.[4] Students' poor sleep habits may, in fact, be getting worse. One study found that sleep duration decreased from about 7.5 hours per night in 1969 to 6.5 hours per night in 1989.[5]

The apparent trend toward self-imposed sleep deprivation, irregular schedules, and poor sleep quality could have far-reaching implications. Poor sleep quality, indicated by subjective sleep ratings, sleep-onset times, sleep duration, sleep difficulties, and daytime functioning, can lead to significantly greater psychosocial distress.[6] Examples include depression, anxiety, reduced physical health,[7] general cognitive difficulties (eg, poor problem solving and attention difficulties[8]), and increased use of drugs and alcohol.[9] Partial sleep deprivation (less than 6 hours of sleep per night) can lead to deficits in attention, concentration, memory, and

At the time this work was completed, all of the authors were with Louisiana Tech University, Ruston, where ***Dr Brown*** *was a doctoral candidate,* ***Dr Buboltz*** *is director of training, and* ***Dr Soper*** *is a professor in the Department of Psychology.* ***Dr Brown*** *is now a postdoctoral neuropsychology fellow at Dartmouth Medical School, Lebanon, New Hampshire.*

critical thinking, along with increased depression, irritability, and anxiety.[8,10–14] Even students who regularly obtain 8 hours of sleep per night but shift their sleep schedule by more than 2 hours may experience attention, concentration, reasoning, and psychomotor difficulties,[13–17] as well as increased irritability, anxiety, and depression.[13–16,18]

Unfortunately, students are often unaware of how sleep deprivation influences their cognitive functioning. Pilcher and Walters[8] found that students who stay up all night before examinations that require critical thinking rated their performances better than those students who slept 8 hours, although the all-nighters' performance was actually much worse. The prevalence and implications of sleep difficulties warrant further exploration into underlying factors that contribute to such problems.

A group of researchers[19] who were aware of these concerns investigated the relationship of college students' course schedules, sleep-wake variations, sleep quality, and health status. They found that students with early classes during the week had greater sleep-wake variations than those whose classes were later in the day. Furthermore, the students with more variations in their sleep schedules had shorter sleep duration and greater difficulties awakening during the week.[19] This finding suggested that inconsistencies between students' social and academic schedules may promote variations in sleep schedules and may be a contributing factor to their sleep difficulties.

Waking at the same time each day is a key ingredient in sleep hygiene instructions, a commonly used intervention to improve sleep quality. Other activities consistent with good sleep hygiene include getting regular exercise, reducing caffeine intake, taking late-afternoon naps, and curtailing alcohol consumption.[20] Indeed, drinking coffee to improve alertness, taking naps to make up for lost sleep, and drinking alcohol to promote sleepiness are common strategies students use to counter their varying sleep schedules.[7] In the general population, such poor sleep-hygiene practices are associated with a greater incidence of insomnia and chronic difficulties in initiating or maintaining sleep.[21]

Although poor sleep habits in some students may be the result of late-night parties and an associated lifestyle of alcohol, drug, and tobacco use,[9] one cannot assume that this is the case with all students. Blaming students for irresponsible sleep habits does not address the problem. Many students may be unaware that their inconsistent sleep habits can perpetuate chronic sleep difficulties; they mistakenly believe they can compensate for weeknight sleep deprivation by sleeping long hours on the weekend. In a survey of more than 900 students that assessed their knowledge of proper sleep hygiene, the average correct response rate was approximately 50%.[22] When the researchers compared the students' knowledge of sleep hygiene with their reported sleep-hygiene practices, the researchers found that the knowledge and hygiene were positively related.[22] On the other hand, different levels of sleep-hygiene knowledge were not found in an earlier study that compared long-term insomniacs with normal sleepers in the general population.[21]

The weak relationship between sleep-hygiene knowledge and practices[22] and the lack of difference between insomniacs and healthy sleepers[21] in sleep-hygiene knowledge appear to conflict with findings in efficacy studies that suggest that teaching sleep hygiene to people with insomnia can significantly improve the quality of their sleep.[20,23–28] In other words, it is not clear whether less knowledge about sleep hygiene contributes to students' poor sleep quality. Such ambiguous findings may suggest that there is no clear relationship. Conversely, the inconsistency may be the result of using measures with poor reliability or validity, given that there is no published psychometric information about the Sleep Hygiene Awareness and Practice Scale (SHAPS)[21] that the researchers used in both studies. One study based insomnia ratings on a clinical interview,[21] whereas the other measure of sleep quality was simply students' reports of sleep duration.[22] Neither study compared sleep-hygiene scores with a standardized sleep-quality instrument.

In view of the conflicting results of previous research, we believe that a further investigation into the relationship between sleep-hygiene knowledge and practice and overall sleep quality is warranted. Such investigations may shed light on factors that contribute to poor sleep quality and help clinicians develop treatment and preventive programs to improve students' sleep quality. Thus, our purpose in making this study is twofold: (a) to analyze and report on the psychometric properties of the SHAPS[21] and (b) to use the Pittsburgh Sleep Quality Index (PSQI),[6] a validated sleep-quality instrument, to examine the relationship between SHAPS scores and sleep quality in college students.

METHOD

Participants

Participants were from a mid-sized university in the southeastern United States. Initially, 124 (51 men and 73 women) undergraduate psychology students (age M = 19.46 years, SD = 2.70) agreed to participate. We used this sample to assess interitem reliability for the SHAPS and to explore the relationship between the SHAPS and the PSQI. Eighty-six percent of the students identified themselves as White, 11% as African American, and 3% as Hispanic. Of this original sample, 74 participants (27 men and 47 women, age M = 19.42,

SD = 2.84) completed the survey packets for 4-week test-retest reliability measures. Eighty-one percent of these participants identified themselves as White, 16% as African American, and 3% as Hispanic. The attrition rate was 42%, but the dropouts did not differ significantly in ethnicity, gender, or age from the students who completed the study. Approximately 30 students provided incorrect identification numbers that made it impossible to match the 2 data sets. The remaining attrition was the result of students' not attending class during the second round of data collection.

Instruments

Pittsburgh Sleep Quality Index (PSQI)

The PSQI[6] is a 19-item self-report questionnaire designed to measure sleep quality and disturbances over a 1-month period. The first 4 items (fill-in-the-blank format) ask respondents about their usual bedtimes, wake times, sleep latency, and sleep duration. The remaining 14 items ask how often participants experienced certain symptoms within the past month (*not during the past month, less than once a week, once or twice a week, 3 or more times a week*). These symptoms included *cannot get to sleep in less than 30 minutes* or *have to get up to use the bathroom*. The 19 primary items yield a global sleep quality score, ranging from 0 (*no difficulties*) to 21 (*severe sleep difficulties*). The PSQI global score has good internal constancy (Cronbach's $\alpha = .83$) and equally good test-retest reliability ($r = .85$). The 7 component scores (subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medications, and daytime dysfunction) have more moderate internal consistency. Cronbach's α ranges from .76, considered good for subjective sleep quality and habitual sleep efficiency, to a rather poor internal reliability ($\alpha = .35$) for sleep disturbances. Test-retest reliability for most of the component scores was acceptable, ranging from Pearson's $r = .84$ for sleep latency to $r = .65$ for medication use. All of the component scores showed significant correlations with the global PSQI score. Buysse and associates[6] reported that an overall sleep quality index cutoff score of 5 or greater correctly identified 88.5% of all patients and controls ($\kappa = .75$, $p < .001$), indicating a sensitivity of 89.6% and specificity of 86.5%. This same cutoff correctly identified 84.4% of patients with disorders in initiating and maintaining sleep, 88% of disorders of excessive sleepiness, and 97% of depressives in the standardization sample.[6]

Since the time that the original standardization research was completed, the PSQI has been used in a number of medically oriented sleep studies[29–33] and it has become increasingly popular in research involving university students.[7,11,34,35] Widespread use of the PSQI facilitates comparability of the findings in our present study with previous findings. Thus, it appears that the PSQI is a well-established sleep quality measure with demonstrated reliability and validity.

Sleep Hygiene Awareness and Practice Scale

Lacks and Rotert[21] developed the SHAPS for a 1986 study that compared sleep-hygiene knowledge of established insomniacs with that of good sleepers. At that time, they reported no significant between-group differences. Although the SHAPS was also used in later studies[22] and was recommended as part of clinical practice,[22] we have not found any published psychometric data for it.

The awareness section of the instrument is divided into 2 subsections. The first subsection includes 13 items that measure the respondents' knowledge of whether specific activities (such as taking a nap or having a regularly scheduled bedtime) are helpful, disruptive, or have no effect on sleep. It also asks respondents to rate the behavior on a scale from *behavior is very beneficial to sleep* (1) to *behavior is very harmful to sleep* (7). A rating of 4 indicates the respondent believes the behavior has no effect on sleep. Scores can range from 13 to 39, with higher scores indicating less hygiene awareness.

The second subsection of the awareness segment measures respondents' awareness of whether 18 common foods, beverages, and nonprescription drugs contain caffeine. Respondents are asked to write *y* if the substance contains caffeine, *n* if it does not, and *x* if they have never heard of it. This score can range from 0 to 100 and is based on the percentage of items the respondent answered correctly.[21]

The practice section of the scale contains 19 items that ask how many nights per week the respondent engages in certain activities known to promote or inhibit sleep. Because the responses range from 0 to 7, the total hygiene practice scores can range from 0 to 133; higher scores indicate behaviors more indicative of bad sleep hygiene.[21]

Procedure

Before we began collecting data, we asked the university's institutional review board to evaluate it, and the board approved of the study. We told students orally and in writing that their participation was voluntary and that informed consent data would be stored separately from the surveys to ensure anonymity. When we collected the first set of surveys, we asked participants to create an identification number that they could easily remember and use for the second set of surveys that would be collected 4 weeks later. After the students agreed to participate in the study, we asked them to complete a survey packet that contained demo-

graphic questions, the SHAPS,[21] and the PSQI.[6] Four weeks later, the same group of participants completed another set of survey packets containing the same instruments.

Data Analysis

We used Cronbach's α coefficient to examine the internal reliability of each section of the SHAPS and Pearson's product-moment correlation coefficient to determine test-retest reliability of each section. To evaluate the extent to which sleep-hygiene knowledge was related to sleep-hygiene practices, we conducted a linear regression analysis. We also used a stepwise multiple regression analysis to evaluate the extent to which sleep-hygiene practices and sleep-hygiene awareness were related to overall ratings of sleep quality. Finally, we conducted a stepwise multiple regression analysis with all 19 sleep-hygiene practice variables as predictors of the sleep-quality rating.

RESULTS

The sleep-hygiene awareness section of the activities subsection of the SHAPS demonstrated acceptable internal reliability (Cronbach's α = .78), but the caffeine knowledge subsection and sleep-hygiene practice section had poor internal reliability (Cronbach's α = .55 and α = .47, respectively). The sleep-hygiene awareness activities subsection and sleep-hygiene practice section had acceptable test-retest reliability (r = .76, $p < .001$ and r = .74, $p < .001$, respectively), whereas the caffeine knowledge subsection had poor test-retest reliability (r = .50, $p < .001$). Because of its poor internal and test-retest reliability, we omitted the caffeine awareness subsection from further analysis.

We found that the regression equation comparing sleep-hygiene knowledge with practices was significant, R^2 = .09, adjusted R^2 = .09, $F(1, 121) = 11.84$, p = .001. The final regression equation included sleep-hygiene practices as a significant predictor of sleep quality, R^2 = .23, $F(1, 121) = 36.67$, $p < .001$, but we removed sleep-hygiene awareness because its p value was greater than .10 (see Table 1 for correlations, Table 2 for means and standard deviations). The final regression equation comparing the 19 sleep-hygiene practices with overall sleep quality included variable sleep length, noise disturbance, going to bed thirsty, and worrying about the ability to fall asleep at bedtime as significant sleep quality predictors, R^2 = .24, adjusted R^2 = .22, $F(1, 118) = 5.30$, p = .023.

TABLE 1
Correlations of Sleep Quality, Sleep Hygiene Knowledge, and Practices (N = 124)

Variable	PSQI rating	Sleep hygiene awareness
Sleep hygiene		
Awareness	.21	
Practice	.49*	.30*

Note. Controlled for type I error with the Bonferroni correction.
*$p < .012$.

TABLE 2
Means and Standard Deviations of Sleep Hygiene and Practices for Sleep Quality

	Sleep hygiene			
	Practice		Awareness	
Sleep quality	*M*	*SD*	*M*	*SD*
Good	23.53	1.58	19.68	1.01
Poor	34.74	0.98	22.47	0.63

COMMENT

Our findings support the use of the sleep-hygiene awareness activities subsection and sleep-hygiene practice sections of the SHAPS,[21] but not the use of the caffeine awareness subsection The weak internal consistency and strong test-retest reliability of the sleep-hygiene practices section suggest that it is a stable measure over time and that the internal variability is probably a result of the students' habits rather than of its psychometric properties. In other words, even students with relatively good sleep practices will continue to maintain some poor habits such as using caffeine or smoking cigarettes. The wide variety of behaviors we assessed may also increase the internal variability of this scale.

The findings suggest that having good sleep-hygiene knowledge is weakly associated with good sleep-hygiene practices but is not directly related to overall sleep quality. However, sleep practices are strongly related to overall sleep quality. These findings suggest that knowing about proper habits does not necessarily influence sleep quality, whereas practicing proper habits is strongly related to good overall sleep quality. However, the regression model that examined the relationship between specific behaviors and overall sleep quality suggests a more complicated relationship. When we considered behaviors associated with sleep quality, it was clear that some behaviors are easier to change than others. Maintaining a consistent sleep-wake schedule

and going to bed without being thirsty are relatively easy habits to change; reducing worry before falling asleep is more complicated and could require counseling or psychotherapy. Reducing environmental noise while one is trying to sleep can be particularly challenging—especially in university dormitories.

These findings support the use of sleep-hygiene instruction as an intervention and prevention strategy to improve university students' sleep practices. However, the findings also suggest that some aspects of sleep hygiene (eg, promoting regular sleep-wake schedules) need to be emphasized more than others. Because of the nature of the college lifestyle, sleep-hygiene instructions should include practical suggestions for changing habits. For example, reducing environmental noise might include talking with resident advisors, changing dormitory quiet hours, and encouraging students to use earplugs that are adapted for sleeping.

When one considers these results, it is important to recognize that although some behaviors were not significantly associated with overall sleep quality, they should still be addressed in sleep treatment and prevention programs. Behaviors that we found were associated with sleep quality were those endorsed by a significant percentage of the respondents. Thus, some behaviors may not occur frequently enough to have an influence on the entire sample, but they could greatly affect individuals. Clearly, behaviors such as drinking caffeine[36,37] and consuming alcohol[38–40] have been demonstrated to interfere with sleep quality, just as daily exercise is known to improve sleep quality.[35,41,42]

It is important to consider that this study is limited by its correlational procedure. Thus, additional research that uses experimental design is needed to determine whether changing sleep-hygiene knowledge and practices influences overall sleep quality. Researchers may wish to develop sleep-education programs and examine their influence on students' sleep practices. It is only through such endeavors that researchers can develop interventions to treat and prevent sleep difficulties in students and others who are at high risk for sleep difficulties.

NOTE

For further information, please address correspondence to Franklin C. Brown, PhD, Postdoctoral Fellow, Neuropsychology Program, Department of Psychiatry, DHMC/Dartmouth Medical School, Lebanon, NH 03756 (e-mail: dentategyrus@hotmail.com).

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