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The State of Sleep Among College Students at a Large Public University

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Abstract. Objective: Data about college student sleep were collected and used to develop an education campaign to improve sleep. **Participants**: On-campus residents at a large state university were surveyed on 4 occasions, October 2005 to April 2007. Sample size was 675 to 1,823 students. Fall 2005 mean age = 18.5 years, *SD* = 1.03 (range 18–30) years. Initial survey included 935 males and 1,859 females (2005–2006). Matched pairs data (2006–2007) included 91 males and 107 females. Twenty-six males and 22 females participated in interviews. **Methods**: A survey administered online included the Pittsburgh Sleep Quality Index, along with an 8-question in-person interview. **Results**: Poor sleep interacted with academics and mental health, and an education campaign positively affected student sleep. **Conclusions**: Teaching students how to effectively manage sleep can improve their well-being. Sleep may also be a gateway topic for health care professionals to address sensitive health issues such as depression.

Keywords: college students, health, residence hall life, sleep, stress

Sleep is an important and common thread weaving through the fabric of health for young adults. Although common knowledge tells us that the average college student does not get enough sleep, there is limited research supporting this hypothesis. In recent years, the importance of sleep in all age groups has come to the forefront of scientific and popular literature in the United States. The National Sleep Foundation reports that insufficient sleep can be damaging and even life-threatening. Research has linked lack of sleep with increased accidents and morbidity.[1] Inadequate sleep also contributes to decreased cognitive, psychomotor, and emotional functioning.

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College students are well known for their erratic sleep schedules and late bedtimes. Depending upon the study, 25% to 50% of college students report significant levels of daytime sleepiness,[2,3] which may interfere with the performance of daily tasks such as driving and academics.[4,5] According to the Fall 2009 National College Health Assessment, 20% of college students in a nationwide survey reported sleep difficulties as a factor affecting their individual academic performance, ranking them second behind "stress."[6] In addition, research has shown that students with the highest level of academic performance went to bed and got up earlier than their low-performing peers.[7] Part of the problem with sleep may be that students, especially in their first year, may not yet know how to balance their schedules and effectively manage stress. Away from their home environment with parents enforcing curfews, college students have control over choosing to stay up late as well as deciding whether they will attend morning classes.

Recent research also shows that sleep and alcohol use are often related in college students. Lund and colleagues[3] report that poor-quality sleepers reported drinking more alcohol than optimal-quality sleepers and were twice as likely to use alcohol to induce sleep as better sleepers. Singleton and Wolfson[8] also found that students who drank more alcohol went to bed later, slept less, and showed greater differences between weekday and weekend sleep timing and duration. This is significant because research has shown that students who do not adhere to a regular bedtime and rise time schedule are more likely to be poor sleepers.[9]

Previous studies have documented that female students generally have poorer sleep patterns than males and suffer more consequences as a result. Although the average college student exhibits some form of sleep disturbance, women report more disturbances than men.[10] These women with inadequate sleep are at greater risk for poor academic performance, as well as more physical, social, and

TABLE 1. Characteristics of Study Participants

	Fall 2005 Survey ($N = 1,823$)				Spring 2006 Survey ($N = 971$)				Fall 2006 Survey ($N = 1,044$)				Spring 2007 Survey ($N = 675$)			
	n	%	*M*	*SD*	*n*	%	*M*	*SD*	*n*	%	*M*	*SD*	*N*	%	*M*	*SD*
Demographic characteristics																
Male	627	34.4			308	37.1			380	36.4			227	33.7		
Female	1196	65.6			663	68.3			664	63.6			448	66.3		
Age			18.6	1.023			19.00	.985			18.40	.755			18.90	.872
GPA			Not collected	—			3.18	.690			3.42	.521			3.19	.655
Ethnicity																
Caucasian		75.3				77.0				75.7				77.8		
Hispanic/Latino		8.3				7.5				9.7				8.9		
Asian/Pacific Islander		7.1				8.0				6.1				5.0		
Interracial		2.8				2.8				2.6				2.8		
Other		2.9				2.1				2.3				2.5		
African American		2.4				1.6				1.6				1.3		
Native American/Alaska Native		1.2				1.1				1.9				1.5		
Classification																
Freshman		74.3				64.3				81.2				66.5		
Sophomore		17.0				24.0				11.5				21.4		
Junior		6.8				8.6				5.4				9.1		
Senior		2.0				3.1				1.9				3.1		
Have a roommate?																
Yes		91.8				84.1				92.6				87.0		

emotional problems.[5] For males and females, educational messages about improving sleep tend to focus on the number of hours slept, but the hazards of poor sleep quality are also important to relay to students. Poor-quality sleep has negative effects on physical health,[11] and may also make students feel more tense, irritable, anxious, depressed, angry, and confused.[12]

Few studies exist to help student health professionals understand the determinants of sleep among college students, and educational programming that focuses on sleep hygiene is rare. We designed our research both to gather data about college student sleep and to expand the existing literature on sleep interventions. Our study combines 3 unique components of research and education: (1) a quantitative examination of sleep issues using an established sleep assessment; (2) in-depth qualitative interviews with students to discover detailed facts about day to day life as it relates to sleep; and (3) a health media campaign designed to bring concise sleep hygiene education to on-campus residents at a large southwestern, public university. This article will present results from this multimethod assessment of student sleep, administered over the course of 2 academic school years, as well as information on the content and effectiveness of the sleep hygiene education campaign.

METHODS

Participants

Survey data were collected from a total sample of 4,513 college students aged 18 years or older. For the 2005–2006 school year, the sample was 66.5% female (932 males and 1,854 females). Matched pairs data from 2006–2007 included 91 males and 107 females. Most students were freshmen, with a median age of 18 years in the fall and 19 years in the spring (range 18 to 30). Students were predominantly Caucasian and almost all had a roommate. See Table 1 for details.

Forty-eight of the survey completers (26 males, 22 females) were also randomly selected to participate in a brief in-person interview. Interviewees represented a random sample of the larger group of survey completers and did not differ significantly from the larger group on the basis of sex, age, ethnicity, or other factors. The University of Arizona's Institutional Review Board Human Subjects Research Committee approved the study. Participation was completely voluntary.

Materials

The online survey consisted of 34 questions. The primary sleep measure was the Pittsburgh Sleep Quality Index (the PSQI), a 19-item questionnaire designed to measure

self-reported sleep quality and disturbance over a 1-month period.[13] The PSQI has strong internal consistency (Cronbach's $\alpha = .83$) across its 7 subscales, which include questions to assess subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction. Global PSQI scores have been found to differ significantly across groups, with patients diagnosed with either insomnia or depression showing higher PSQI scores than control individuals. A cutoff score of 5 correctly identified 88.5% of all patients and controls (Cohen's kappa = .75, $p < .001$).[13] The PSQI has been administered to clinical and nonclinical populations, including college students.[3]

The survey also included 9 items to address student demographics (5 of which, including age, gender, ethnicity, school-year classification, and living situation, were utilized in this analysis). Twelve items were researcher-developed questions designed to capture factors associated with inadequate sleep in college students. Several of these items asked about consequences of inadequate sleep (for example, "In the past month how often have you fallen asleep in class?"), whereas others pertained to potential sleep disrupters (for example, "How often does activity/noise level in the residence hall interrupt your ability to sleep?"). The final 2 questions asked about students' exposure to sleep-education materials disseminated as part of the intervention and if they thought their sleep had improved after seeing these materials. Of these 12 items, questions pertaining to grade point average (GPA), mental health, and responses to the educational intervention were included in this analysis. The final survey instrument included 16 multiple choice, 8 Likert-type items, and 10 open-ended questions and was piloted with feedback from 10 student volunteers at the student health service.

Interviews in Fall 2005 and Fall 2006 were conducted from an 8-question interview guide. In both years, when students came in to the student health service, they were asked to complete the PSQI once again during the first part of the interview. This enabled the researchers to compare a student's PSQI score and their self-reported rating of their own sleep, collected as part of the interview on the same day. Interviews were not audiotaped but were documented through interviewer notes.

Procedure

The survey instrument was administered online through the Survey Monkey Web site. All undergraduate students living in university housing were sent an e-mail asking them to participate in the study. A link in the e-mail sent them to the Survey Monkey site, where they could read consent information, including the purpose of the study and its risks and benefits. A prize raffle was incorporated into the end of each online survey as a small incentive for participants. At each time point, prizes included 4 $15 gift cards and 1 $100 gift card to Best Buy. Data collection occurred in 4 separate "waves" over a $1\frac{1}{2}$-year period (Fall 2005, Spring 2006, Fall 2006, and Spring 2007). At each time point, all students living in residence halls were targeted (n = 5,500–5,700). The highest response rate was seen in Fall 2005, with 1,823 out of 5,500 surveys returned, a response rate of 33%.

In Fall 2006, students who chose to participate in the survey ($n = 971$) were given the option to have their anonymous responses from Fall 2006 and Spring 2007 linked to enable the researchers to conduct paired data analyses. Students entered a code for themselves prior to each survey to allow for comparisons across time. The total number of respondents for the paired data was 198.

The final item on the survey asked students if they would be willing to participate in a 30-minute in-person interview regarding their sleep habits. In Fall 2005, approximately 500 students responded that they would be willing, and of these, 30 students (16 males and 14 females) were randomly selected. In Fall 2006, over 250 students agreed to be interviewed, and a total of 18 students (10 males and 8 females) were randomly chosen from this group.

A sleep media campaign was developed for the Spring 2006 semester using preliminary research results. After testing multiple messages with over 40 students, the "Go to Bed" campaign was chosen, which took the form of posters highlighting the benefits of sleep. Resident assistants and hall directors each received multiple copies of the posters and were encouraged to place them in highly visible areas of their residence halls. A 2-page health education "Snoozeletter," which included several brief articles on student sleep and common questions and answers about sleep was also developed and distributed to all students residing on campus. Finally, advertisements were placed in the student newspaper with educational content similar to the posters every other week during the Spring 2006 semester. See Figure 1 for an example of a campaign poster. All materials from the campaign are viewable at http://campushealthmedia.arizona.edu/sleep.htm. The total cost for this intervention was approximately $2,500, funded by a grant from the Pacific Coast College Health Association.

RESULTS

PSQI Scores

According to the authors of the PSQI, a global score of > 5 indicates that "a subject is having severe difficulties in at least two [of the seven component] areas, or moderate difficulties in more than three areas."[13(p205)] In other words, a score of > 5 generally denotes that the subject has poor perceived sleep quality and may in fact have a clinically diagnosable sleep disorder.[9] Using the Fall 2005 data set, which had the highest response rate, male respondents reported a mean PSQI score of 6.38 ($SD = 2.82$) and females reported a score of 6.69 ($SD = 2.79$).

Sleep Measures

In addition to the calculation of an overall score, the survey permitted estimation of several common sleep measures in this sample. Table 2 reports mean values for these parameters across 4 time points.

FIGURE 1. "Go to Bed" campaign poster (color figure available online).

TABLE 2. Sleep Measures

	Fall 2005		Spring 2006		Fall 2006		Spring 2007	
Sleep measure	Mean	*SD* (min)	Mean	*SD* (min)	Mean	*SD* (min)	Mean	*SD* (min)
Usual bedtime	12:43 AM	79.8	12:41 AM	82.2	12:21 AM	66.0	12:44 AM	78.6
Usual minutes to fall asleep	24.7	28.0	26.8	24.7	24.8	23.9	27.6	29.2
Usual wake-up time	8:16 AM	82.2	8:31 AM	81.0	8:01 AM	67.8	8:24 AM	73.8
Hours and minutes of sleep per night	6 h 41 min	78.0	6 h 52 min	75.0	6 h 50 min	72.6	6 h 47 min	74.4

Analysis of Interviews

Interview notes were imported into ATLAS.ti, a qualitative data management program. A code tree was constructed by one of the authors (K.M.O.) to enable thematic coding of student responses. For example, a single code captured participant expressions of how sleep related to academic performance. All responses associated with codes of interest for this article were reviewed in order to illuminate perceptions expressed by the majority of participants, and to select appropriate topical quotations.

Disconnect Between Sleep Rating and Sleep Experience

The survey asked respondents to rate the quality of their sleep in the last month on a 5-point scale from "very good" to "very bad." Across the 4 time points, the percentage of survey respondents reporting that their sleep quality was "very good" was about 10%, whereas approximately 60% of students rated their sleep quality as "fairly good." Around 25% of students rated their last month's sleep quality as "fairly bad," whereas only about 5% rated their sleep as "very bad." Despite this positive spin, 88% of survey respondents found it problematic to keep up enough enthusiasm to get things done in the past month. In addition, many of the students surveyed reported having trouble staying awake while driving, eating meals, or engaging in social activities (overall average 50%).

In interviews, many students commented on the effect of sleep on their personal well-being and interactions with others, saying it was easier to be cheerful, peppy, outgoing, mentally stable, and to manage stress when they got adequate sleep. However, there was also an element of minimizing the importance of sleep that came through in the interviewees' comments. Students emphasized that their sleep was fine, especially those who classified their sleep as very good or fairly good. This disconnect between the assertion that one's own sleep is not a "problem," poor PSQI scores, and narratives that describe inadequate sleep may reflect the reality of sleep at a large public university. Students may be comparing themselves to individuals with serious sleep deficiencies or simply referencing the fact that their sleep was good when they could get enough of it. With that frame of reference, the students interviewed for this project probably felt they were doing quite well balancing their sleep and the myriad other demands on their time.

Sleep and Academics

Comparing college GPA and PSQI score during the Spring 2006 Survey (GPA was not asked in the fall of 2005, since this was largely a freshman population), a weak negative association was observed. As sleep quality increased (as indicated by a lower PSQI score), a modest increase in GPA was seen ($r = -.193$, $p < .000$). On average, students who had not pulled an "all-nighter" (staying awake all night until daybreak) in the past week showed an overall GPA of 3.26, compared with an average of 3.05 for those who did stay up all night ($p = .000$; Spring 2006 data set). Students also cited poor sleep as a significant factor that affected the quality of their coursework (Figure 2).

Interviews also supported links between sleep and academics. For example, "I did sleep through some of those morning classes and I guess it affected some of my grades on the tests" (*Freshman male reporting poor sleep*). Many students talked about common effects of sleep loss that they experienced in academic settings, such as a reduced ability to focus, concentrate, and remember things. Even those who were not convinced that inadequate sleep had negative effects on them still reported minor adjustments to their everyday lives that needed to be made in the face of less sleep—for example, "I might need to study a little longer and try to concentrate harder" (*Freshman male reporting fair sleep*).

Gender Differences in Sleep

Significant differences in self-reported sleep quality were seen between males and females. Fall 2005 data showed a mean PSQI score of 6.38 ($SD = 2.82$) among males, but 6.69 ($SD = 2.79$) among females ($p = .036$). When paired data was analyzed from the Fall 2006–Spring 2007 data set, female sleep quality worsened only slightly across the school year, whereas males showed better sleep quality in the fall and greatly decreased quality, as measured by the PSQI, during the spring (Figure 3).

Further analysis of the matched cohort revealed that females showed significantly shorter sleep duration and significantly greater wake after sleep onset. Among males, poorer sleep quality during the Spring 2007 semester was

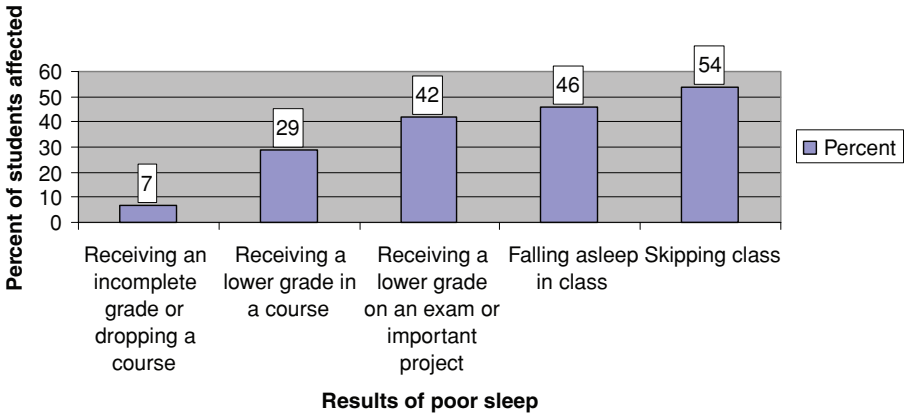

FIGURE 2. Poor sleep related to student academic performance (color figure available online).

associated with later bedtimes, increased sleep disturbances, increased alcohol use, and increased mental health issues. Mental health issues for the wider sample are discussed below, but surprisingly, alcohol use in the overall data set was not significantly correlated with PSQI score. This may reflect our self-selected sample. See Limitations for further detail.

Sleep and Mental Health

Sleep quality, as measured by the PSQI, and mental health issues, including interpersonal conflict, showed a clear association among survey completers. Students who stated they had experienced anxiety or depression within the academic year showed elevated PSQI scores (indicating poorer sleep quality) when compared to students who did not report anxiety or depression. Similarly, students who cited interpersonal conflict with a friend, family member, significant other or roommate within the past academic year also fared worse, on average, compared to their peers who did not experience these types of issues. Students who self-reported depression, anxiety, or conflict with a family member showed the largest differences in PSQI score, compared with those who did not report these factors.

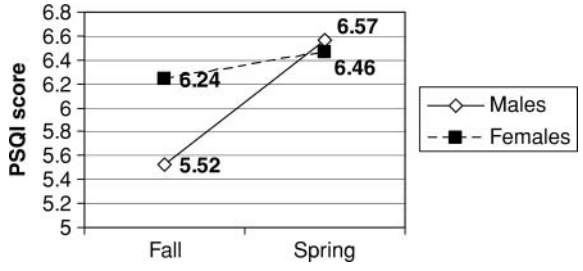

FIGURE 3. Sleep quality by gender.
PSQI = Pittsburgh Sleep Quality Index.

This link between mental health issues and sleep was apparent in interviews as well, and reflected an understanding of the 2-way relationship between sleep and mental health.[14] "My freshmen year I had a lot less sleep and severe depression from sleeping 3–4 hours sometimes in a whole week. This year I usually get 8–9 hours so I'm lucky" (*Sophomore male reporting good sleep*).

In addition to the sleep–mental health connections, it is also important to note the high frequency of self-reported mental health issues and interpersonal conflict cited in this sample. Over half of the students who responded to the online survey said they had experienced depression in the first few months of the academic year (prior to October 2005), and 69% reported experiencing anxiety in that same time frame. The high frequencies reported as part of this sleep survey may relate to our finding, discerned through analysis of interviews, of sleep as a "gateway topic." Students who are poor sleepers may also be experiencing mental health difficulties, and exploring one's sleep with a student health practitioner may lead to examination of more sensitive topics, such as depression and anxiety, which may be easier for some students to openly discuss within the context of sleep.

Sleep Media Campaign

Of the 971 students who responded to questions about the media campaign, 90 (9%) reported that their sleep habits had improved as a result of seeing these health education materials (Spring 2006 data set). These students did in fact show better sleep quality as measured by the PSQI, had a bedtime that was on average 20 minutes earlier, and they fell asleep faster and slept longer than their counterparts who did not cite improvement as a result of the sleep education materials. The "improved" and "unimproved" groups were not significantly different with regard to demographics or other indicator variables, suggesting that the health education was effective for these students.

COMMENT

Discussion

Although the last few years have brought more attention to the topic of sleep among college students, research conducted by college health professionals and results aimed at this audience are still rare. Our findings support much of what is reported in the literature about sleep's negative impact on academic performance and mental health complaints. They also mirror the gender differences often seen in studies of sleep in the general population, with women reporting poorer sleep. Previous research,[15,16] as well as anecdotal evidence, has indicated that the first year of college is a time of tremendous transition for students, and this research points to changes in sleep as a particularly problematic element of this transition. Global PSQI scores and sleep-timing measures reveal a pattern of insufficient and poor-quality sleep in this largely freshman college population. Personal narratives elicited through interviews show a disconnect between student perceptions of their sleep as good and their actual sleep behaviors as detrimental to their academic performance and mental health. These same narratives, however, help to show what daily—and nightly—life is like in the residence hall at a large public university. Specific activities, health problems, interactions with friends, and social expectations shape the sleep these students are able to get in this particular environment.

Our sleep education campaign, consisting of posters, newspaper advertisements, and newsletters featuring sleep-related topics, was a relatively low-cost intervention that produced quantifiable results. This demonstrable change points to the value of teaching college students about the benefits of improving their sleep. In addition, sleep's function as a "gateway topic" may provide benefits for student health professionals. On the basis of our in-person interviews, students experiencing issues of a more sensitive nature, such as problems with relationships or alcohol use, may find that participating in a conversation about sleep is a nonthreatening way to start talking about these issues with a practitioner from the student health or counseling service. One way this might be implemented would be to include a question about sleep on the health history form, which could then be explored during the student's visit.

Limitations

As with any research, the project described herein had a number of limitations. First, students self-selected to participate in both the online survey and the interview. This may have led students who were more concerned about their sleep to participate in the study. Students also had to be willing to share information with the student health service. Although responses were anonymous, this may have deterred some respondents. Students who respond to surveys longitudinally (like our sample followed from Fall 2006 to Spring 2007) may also be healthier than the general population of students. For example, 2 substance use measures common to both the Fall 2005 Sleep Survey and our Campus Health & Wellness Survey, administered annually, were significantly higher among the general survey respondents than students who completed the sleep survey (Table 3).

TABLE 3. Comparison of Alcohol and Tobacco Use Measures on 2 Surveys

Measure	Fall 2005 Sleep Survey ($N = 1,823$)	Spring 2006 Health & Wellness Survey ($N = 3,102$)
Usual number of alcoholic drinks when going out		
Mean	2.27	3.90
SD	3.03	3.61
Usual number of alcoholic drinks when going out		
Median	1.0	3.0
Past 30 day tobacco use %	11.6	25.2

Another limitation of this study is that data collection was by student self-report. Although this was the most effective way to obtain data from a relatively large number of students, accuracy may be compromised in some cases by poor recall or a desire to give the "right" answer on a survey. Finally, the survey was only administered to students residing in the residence halls at a university where the majority of students live off campus, so results may be limited in their applicability to all students.

Conclusions

This research collected both quantitative and qualitative data and explored specific factors that affect college students' sleep experience in the residence halls, and then implemented an effective, low-cost intervention. This research supports the fact that poor sleep is a challenge for many students residing on campus, and that sleep may be linked to student concerns related to mental health and academic performance. Our surveys and interviews revealed that students have a strong interest in sleep, and that discussions of sleep might be a useful starting point to address more sensitive issues of physical and mental health. As sleep relates to many aspects of student health and performance, interventions targeted at improving sleep also have the potential to improve both health and academic success. We hope that this research and intervention strategy may serve as a model for others seeking to improve overall student well-being.

NOTE

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