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# **An Exploratory Study: College Students' Sleep Patterns and their Perceived Academic Functioning**

by Valerie Stokes and Amy Schweinle

## **Abstract**

We explored college students' sleep habits and their perceived academic functioning. Differences in amount of sleep and shifting bedtime-waking patterns were explored as were the relationships between sleep patterns and students' perceptions of academic functioning, including attendance, grades, concentration, and homework completion. Results suggested that students not only slept consistently less than the average recommended sleep amounts but also, perhaps more importantly, they exhibited an inconsistent sleep pattern throughout the average week. Further, they did not indicate awareness that their sleep patterns affected their academic functioning. Implications and intervention strategies to address students' sleep patterns are discussed.

## **College Students' Sleep Patterns and Academic Functioning**

Experiencing a loss of adequate sleep (i.e. less than 7 hours per night) on a consistent basis can lead to sleep deprivation (National Commission on Sleep Disorders Research, 1993). Sleep deprivation can have adverse effects in the general population. Sleep deprivation, sleepiness and insomnia have been shown to be related to work-related accidents (Leger, 1995), vehicle accidents (Horne & Reyner, 1996), higher rates of minor psychiatric disorders in medical students (Hildago & Caumo, 2002), diabetes, mood disorders, obesity (Stickgold, 2004), cardiovascular dysfunction (Somers, 2004), and shifts in mood (Engle-Friedman, Riela, Golan, Ventuneac, Davis, Jefferson, & Major, 2003).

College students are known to reduce their sleep to a sleep deprived state (Jensen, 2003). Students are sleep-deprived as often as one in every three days (Engle-Friedman, et al, 2003) and Hicks, Fernandez, and Pelligrini (2001) noted a decrease in the median hours of sleep in university students over past twenty years. Problems with sleep quantity and quality are increasing among college students (Hicks, Mistry, Lucero, Marical & Pelligrini, 1990). This lack of sleep quantity can be related to increased worry (Kelly, 2002) and lower life satisfaction (Kelly, 2004), hallucinations (Souper, Kelly, & VonBergen, 1997), and affected academic functioning (Kelly W.E., Kelly K.E., & Clanton, 2001). For example, Trokel, Barnes and Eggert (2000) found a negative correlation between GPA and weekday/weekend wake-up times, weekday/weekend bedtimes and number of hours of sleep on weekend nights. A notable finding was that "for each hour of delay in reported average wake-up time, the predicted GPA decreased by 0.132 on a standard 0.00 to 4.00 grading scale" (Trokel et al. 2000, p.128).

The detriment in GPA may be a function of reduced overall cognitive functioning. Glennville, Broughton, Wing & Wilkinson (1978) concluded that even lack of sleep for one night in a twenty-four hour period affected reaction time and short-term memory. Engle-Friedman et al. (2003) reported reduced ability in math task effort, slower reaction time and selection of less difficult tasks when under sleep loss conditions, even though sleep-deprived students perceived their effort equal to non-sleep deprived. Sleep-deprived college students have difficulty recognizing that their performance is affected by loss of sleep (Pilcher & Walters, 1997). Reduced sleep is related to a decline in cognitive functioning, which may be of special concern for college students who are in an environment requiring high levels of cognitive functioning. This distinction may be especially important for the numbers of college students who tend to stay up late and rise late in the morning. As such, they may be likely to miss their potential peak cognitive performance for studying and/or alertness in the morning (see Lee, Kim, & Suh, 2003).

Research on college student sleep habits initially focused primarily on sleep quantity and quality, with more recent emphasis on habits of sleep timing patterns; particularly, variability in sleep patterns between weekdays versus weekends. Pilcher, Schoeling, & Prosansky (2000) noted college students' reported a greater "sleep rebound" on the weekends as compared to an older adults group. The present exploratory research confirmed these findings and examined the roles of sleep time, bedtime and wake time for college students' perceived academic functioning as defined by class attendance, grades, concentration, and homework completion. It is not enough to study sleep quantity and sleep quality, we must also study sleep timing patterns, including bed and wake times and napping. Thus, the following questions were addressed: (1) Are there differences in sleep patterns between weekday and weekend nights across gender? (2) Do students perceive their sleep habits to be detrimental to their academic functioning? (3) Do student's nap behaviors influence their functioning and sleep patterns?

## **Method**

### ***Participants***

The sample consisted of 583 undergraduate college students enrolled and residing on campus at a small, rural Midwest college. Ages ranged from 17 to 29 years ( $M = 19.37$ ,  $SD = 1.27$ ), with 26% ( $n=151$ ) male and 74% ( $n=432$ ) female. The sample percentages for the overall campus gender distribution are 38% and 62%, respectively. One respondent was excluded due to age of more than four standard deviations from the mean and a notable outlier.

### ***Instrument***

The self-report sleep survey contained 11 questions covering sleep quantity, sleep satisfaction, bedtime and wake time patterns, napping and pertinent demographic information including age, gender, residence, academic status, GPA and major. The items included interval numbers (e.g. actual hours), likert scales (e.g. 1-7 satisfaction), and nominal personal data (e.g. age).

The survey contained items addressing the following: amount of sleep, bedtime and wake time, nap time and academic functioning. Students reported the average amount of sleep they received on weekdays and on weekends, after prompting to recall the previous night's sleep. They also reported their average bedtime and wake time for both weekdays and weekends. Students also reported the number of naps per week and the actual hours slept during the daytime. To assess the perceived impact of sleep on academic functioning, students were presented with a list of four academic areas (class attendance, grades, study concentration, and homework completion) and were asked to identify which they perceive were affected by their sleep pattern.

### ***Procedures and Data Analysis***

Prior to distribution, the survey and protocols were reviewed and approved by the Institutional Review Board. The survey contained a written statement that participation was voluntary and anonymous. All students living in on-campus housing were given the opportunity to participate through residence life programming. The response rate was 49%. Confidentiality was assured and students provided consent prior to completing the survey.

## **Results**

The primary goals of this research were (a) to determine if there is a difference in the role of amount of sleep versus sleep schedule and (b) if these affected perceived academic functioning. It is not only important to detect differences in sleep, but also whether or not these differences affect functioning and if students perceive it as a detriment to functioning. If so, do students compensate for the detriment?

### ***Differences in Sleep Patterns***

The first step was to determine if there were; indeed, differences in amount of sleep and sleep schedule across the week, and by gender. Differences in amount of sleep, bedtime, and wake time were evaluated with a split-plot factorial ANOVA with day of the week (weekday or weekend) as a within-subjects variable and gender as a between-subjects variable. Each dependent variable was considered in turn. Table 1 (see page 30) presents descriptive statistics for each of these analyses.

***Amount of Sleep.*** Students slept significantly longer on the weekends than on weekdays (an average of 28.45 minutes longer),  $F(1, 577) = 488.59, MSE = 1.31, p < .001$ , see Figure 1 (see page 31). This pattern was not significantly different for males than females; interaction,  $F(1, 577) = 2.93, p = .09$ . Further, amount of sleep did not significantly differ by gender,  $F(1, 577) = .63, p = .43$ .

**Table 1**

Means (and Standard Deviations) of Indicators of Students' Sleep Patterns

	Amount of Sleep			
	Weekday	<u>n</u>	Weekend	<u>n</u>
Male	6.44 (.99)	151	8.27 (1.44)	150
Female	6.50 (.98)	431	8.06 (1.49)	429
	Bed time			
	Weekday	<u>n</u>	Weekend	<u>n</u>
Male	5.29 (1.01)	150	6.31 (.95)	148
Female	4.87 (.99)	431	5.79 (1.09)	429
	Wake time			
	Weekday	<u>n</u>	Weekend	<u>n</u>
Male	5.22 (.91)	139	7.65 (1.48)	147
Female	4.86 (.87)	413	6.92 (1.22)	426

**Figure 1**

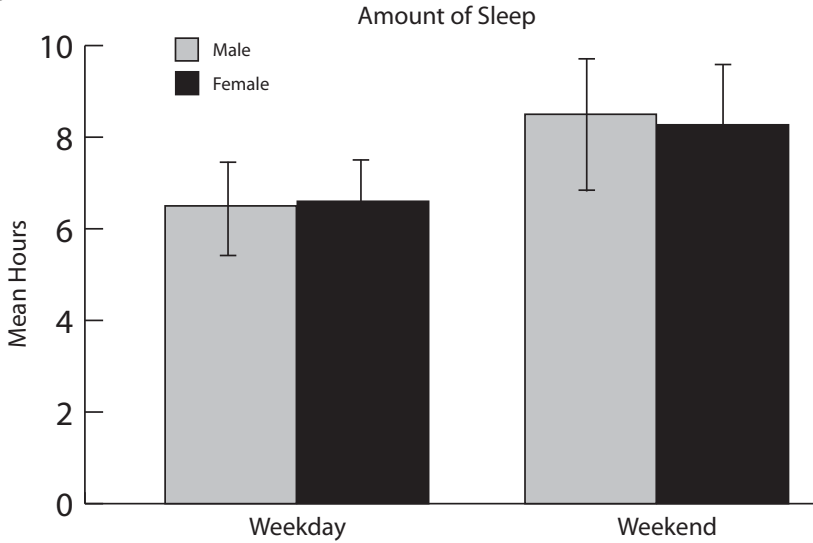


Figure 1. Mean amount of sleep on weekends and weekdays for male and female students. Error bars reflect standard errors.

**Figure 2**

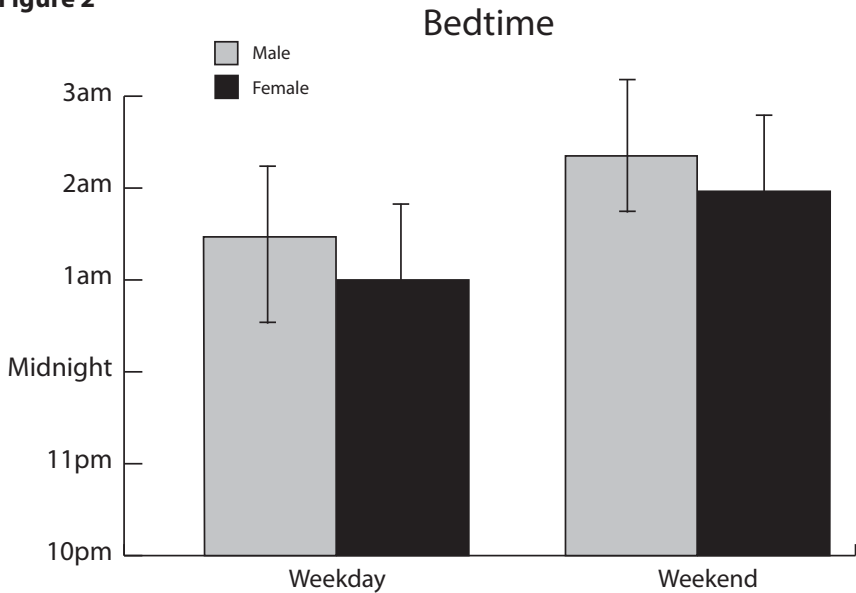


Figure 2. Mean bed time on weekends and weekdays for male and female students. Error bars reflect standard errors.

**Table 2**

Perceived impact of academic function, as well as napping, by weekday/ weekend sleep time, bedtime and wake time.

	Weekday			Weekend		
	Sleep time	Bedtime	Wake time	Sleep time	Bedtime	Wake time
Class attendance	-.01	.14*	.15**	0.10	.12*	.19*
Grades	-.01	-.01	-.01	0.0	-.01	-.01
Study concentration	.10*	-.12**	-.05	-0.01	-.01	-.05
Homework completion	.09*	-.05	.04	0.02	-.04	.01
Nap time	-.12**	.23**	.07	.11*	.08*	.21**

\*p < .05, \*\*p < .01. Point-biserial correlations were used with academic functioning variables while Pearson correlations were used with nap time.

**Figure 3**

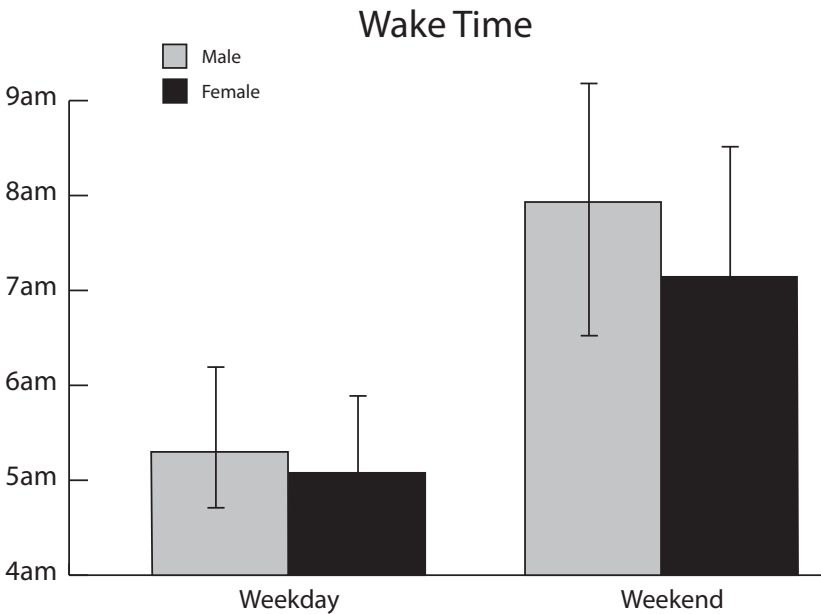


Figure 3. Mean wake time on weekends and weekdays for male and female students. Error bars reflect standard errors.

**Bed Time.** Students reported the time they typically went to bed on weekends and weekdays. Students reported going to bed significantly later (an average of 57.19 minutes later) on weekends than on weekdays,  $F(1, 575) = 434.53$ ,  $MSE = .49$ ,  $p < .001$ , see Figure 2 (see page 31). Also, males went to bed about 27.44 minutes later than females, which was significant,  $F(1, 575) = 16739.95$ ,  $MSE = 1.63$ ,  $p < .001$ . However, the interaction of gender by time of week was not significant,  $F(1, 575) = 1.80$ ,  $p = .18$ , indicating that the pattern of sleep on weekdays and weekends was not drastically different for males than for females.

**Wake time.** Students reported the time they typically awoke on weekends and weekdays. The effects of day of the week and the interaction of gender by day were significant; day,  $F(1, 542) = 1344.37$ ,  $MSE = 0.77$ ,  $p < .001$ ; interaction,  $F(1, 542) = 9.50$ ,  $p = .002$ , see Figure 3 (facing page). There was also a significant effect of gender,  $F(1, 542) = 37.14$ ,  $MSE = 1.67$ ,  $p < .001$ .

Both males and females awoke later on weekends than on weekdays (a difference of 2.43 hours for males and 2.06 hours for females, on average); males,  $F(1, 542) = 523.11$ ,  $p < .001$ ; females,  $F(1, 542) = 1120.32$ ,  $p < .001$ , but the difference was less for females than for males. Males woke about 22 minutes later than females on weekdays and about 44 minutes later than females on weekends.

These results suggested that these students do not have consistent sleep patterns across the week. The amount of sleep, bedtime and wake time significantly changed from weekday to weekend. Students shifted their sleep schedule later on weekends and sleep more. Given that their sleep patterns were inconsistent, we next sought to determine which aspects of their sleep schedule were related to perceived detriments in academic functioning.

### ***Sleep Habits and Academic Functioning***

We wondered if students perceived their sleep patterns were a detriment to their academic functioning, specifically class attendance, grades, concentration, and homework completion. The relationships between students' self-reported academic functioning (class attendance, grades, study concentration, and homework completion) with reported amount of sleep, bedtime, and wake time for both weekday and weekend were evaluated with point-biserial correlations because the academic functioning variables are dichotomous, see Table 2 on page 32.

**Weekday.** Overall, because all the correlations were low or not significant further indicated that students did not perceive the impact of sleep patterns on their academic functioning. Specifically, bed and wake times, but not amount of sleep, were related to class attendance. Whether or not students felt their sleep affected their grades and homework completion was not related to their reported sleep patterns. However, their perception of effects on concentration was positively related to amount of sleep, but negatively related to later bedtime. Students who went to bed later, perceived they still had concentration while 'pulling a late nighter'- staying up late to study. Thus, students may draw more heavily on their bed and wake times to determine if their sleep patterns affect class attendance (perhaps because they miss early classes for sleeping late) and on the amount of sleep and bed time to determine adverse effects on concentration.



**Weekend.** With two exceptions, none of the correlations were significant, indicating that students did not perceive that their weekend sleep patterns impacted their academic functioning. Students did not perceive that their grades, study concentration, or homework completion might be affected by the hours of sleep, time they go to bed, or the time they arose on the weekend.

Even though there were relationships between reported sleep amounts and sleep schedules with academic functioning, students did not actually view their sleep as a detriment to long-term functioning. Of the 583 respondents, significantly fewer people felt that their sleep patterns affected their class attendance ( $n = 211$ , cumulative binomial  $p < .0001$ ) and grades ( $n = 252$ , cumulative binomial  $p = .0006$ ) than would be expected by chance. The number selecting homework was not significantly different from chance ( $n = 307$ , cumulative binomial  $p = .907$ ). However, they did feel that their sleep affected their short-term functioning; more students than expected felt that their sleep patterns affected their concentration ( $n = 486$ , cumulative binomial  $p > .999$ ). Thus, students were aware that their sleep patterns affected their concentration, but did not feel an adverse effect on homework, class attendance and grades.

Although they did not indicate awareness of the long-term effects of sleep deprivation, they might have demonstrated behaviors indicative of this. The presence of a nap pattern may have represented the student's intent to accommodate for their lack of sleep.

### ***Napping and Academic Functioning***

We hypothesized that students might use naps to compensate for their weekday lack of sleep, we've used the term somnorexia – sleep restriction - to illuminate this pattern. Correlations between the student's hours of naptime per day with amount of sleep, bedtime, and wake time for both weekday and weekend were evaluated. For each student, global academic functioning was determined as the total number of areas of academic functioning (i.e., class attendance, homework completion, grades, concentration) they perceived to be affected by sleep. The amount of nap time per day was negatively associated with perceived global academic functioning, ( $r = .102$ ,  $p < .01$ ), see Table 2.

During the school week, the fewer hours students slept and the later their bedtime, the more hours they napped during the day. Yet, there was no relationship with students' wake time and napping during the week. However, on the weekends, ironically, more hours of napping were associated with increased amount of sleep at night. Students who went to bed later, woke up later, and slept more, also napped more. This may reflect a sleep bulimia pattern of sleep binging on the weekend - students slept more at night and slept more during the day.

## **Discussion**

These results support the notion that students tend to sleep less than recommended for a healthy sleep pattern (National Sleep Foundation, 2000). Not only do they receive inadequate amounts of sleep, but they are also inconsistent in their sleep patterns. The overall tendency is to sleep less during the week, then “play catch-up” on the

weekends contrasts the results Buboltz, Brown, & Soper (2001) found in their study of college student sleep habits and patterns. The pattern found in this study reflects sleep restriction during the weekday, somnolence, and binge sleeping habits on the weekend. More importantly, not only do students evidence a reduction in sleep, but also inconsistent sleep schedules across the week, waking later and napping more on weekends. The inconsistency is even more pronounced for males than for females. Even though prior research (Oexman, Knotts, & Kock, 2002) indicates that shifting sleep schedules create problems in functioning, students appeared unaware that their inconsistent sleep patterns caused them long-term academic problems.

Unfortunately, the students did not report awareness of the adverse effects on their long-term academic functioning. Although students were aware that it was a detriment to concentration while studying, they did not distinguish that it was related to their actual sleep patterns. Even though students may not view it as a problem, their behavior of daytime napping may be indicative of compensation for lack of sleep. Daytime sleeping may create a cyclical pattern of less night-time sleep coupled with daytime sleepiness resulting in a poor sleep pattern. This suggests that it may be hard to convince them that change is necessary when they do not perceive any long-term effects and they have a compensation coping strategy of napping.

### ***Limitations***

Our study was limited due to the geographic location of the small, private college located in the rural Midwest. This exploratory study was based on a survey developed specifically for the purposes of an institutional self-study report. The obvious shortcoming was the self-report data was not a previously tested instrument. Future studies could employ psychometric instruments, SQI (Sleep Quality Index) or the PSQI (Pittsburgh Sleep Quality Index). Further research needs to address why students evidence these patterns of sleep – for example, individual differences, related mental health concerns, and perhaps a systemic campus culture of sleeplessness by examining class and residence type. Also, experimentally-based research could address causal relations not only between amounts of sleep but patterns of sleep and wake with academic functioning to determine which factors are most important.

### ***Implications***

Given the results of the present study, colleges and universities might consider exploring the habits and patterns of their own students' sleep patterns. Currently, we may rely too heavily on the common notions that student sleep patterns are normal or may disregard this as a problem because of misinformed beliefs that "this is the way it's always been" on our college campuses. Further, college students may not be aware of the long-term potential impact of the sleep pattern on academics, lifestyle and relationships. Student development administrators and residence life staff might explore how the college systemic environment can encourage better sleep patterns by minimizing late night meetings, enforcing quiet hours in residence halls at night, and increasing student awareness that sleep patterns may have detrimental effects to their functioning. By addressing the larger issue – the campus culture of sleeplessness – perhaps we could improve students' academic functioning and well-being. We should strive to encourage students to live healthy and active lives, which definitely includes a good night's sleep.

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