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Benefits of Sleep for Undergraduate Students' Academic Performance

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ABSTRACT

The study and importance of sleep for physical health has intensified. The purpose of this study was to understand the effect of sleep behaviors on academic performance among undergraduate students and to examine two groups: hospitality students and shift workers. An online survey was used to collect data from 240 students, including 62 hospitality students and 86 shift workers. Data were analyzed using analysis of variance. Of the 240 participants, three quarters delayed their sleep–wake schedule on weekends, half did not achieve their sleep requirements, and one fifth reported poor sleep quality. Participants who maintained a consistent sleep schedule and/or got enough sleep had a grade point average 0.28 to 0.52 points higher than those who did not. No difference in sleep behaviors was found between hospitality and nonhospitality students or between shift workers and nonshift workers. This suggests that the same sleep problems may exist across student groups.

KEYWORDS

Academic performance; hospitality student; shift worker; sleep

Sleep is an important human need and the effects of sleep problems have been widely studied, yet people habitually sacrifice sleep time for purposes perceived to be more important or more valuable. People seem to ignore the necessity of making sleep a priority, yet people might be convinced to prioritize sleep if they internalize that sleep is beneficial. Buysse (2014) observed that many studies have demonstrated the impact of sleep disorders in the clinical context, but few studies have focused on the benefits of sleep in the natural context.

In addition to sleep researchers, social scientists in many disciplines have investigated sleep's effects on cognitive functioning (e.g., Draganich & Erdal, 2014) and academic performance (e.g., Curcio, Ferrara, & Gennaro, 2006). The effects of shift work on employees' sleep have been studied for workers in many occupations, such as flight crews (Signal et al., 2014), nurses (Karhula et al., 2013), and train conductors (Darwent, Dawson, & Roach, 2012).

However, only a few hospitality studies have focused on sleep (e.g., Chiang, Arendt, Zheng, & Hanisch, 2014). Arguments for studying and emphasizing sleep in hospitality education are as follows. First, undergraduate students, who are an important workforce component for the hospitality industry, commonly delay sleep on weekends, which means that they go to bed later on weekends than on weekdays. This sleep behavior has been found to have negative impacts (Kelly, Kelly, & Clanton, 2001; Trockel, Barnes, & Egget, 2000). And second, shift work, one of the characteristics of the hospitality industry and defined as work hours other than the normal 9 a.m. to 5 p.m., has been found to impact employees' sleep quantity (National Sleep Foundation [NSF], 2008). Not only do hospitality students need to be made aware of potential sleep problems as part of their professional training, but they may also struggle personally with the impacts of sleep deprivation because of curriculum requirements for work experiences and the shift work common to the hospitality industry.

The purpose of this study was to explore the benefits of adequate sleep on the academic performance of hospitality students. Three sleep behaviors were studied: sleep habits, sleep hours, and sleep quality. A review of previous studies revealed that the relationship between sleep and the academic performance of undergraduate students has not been verified; therefore, the initial goal of this study was to examine the potential influence of sleep on undergraduate academic performance. Hospitality students were then compared to nonhospitality students on their sleep behaviors and academic performance. Given the unique characteristics of the hospitality industry, the sleep behaviors of shift workers and their academic performance were examined as well. Following that, the effects of different

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factors on sleep and academic performance were explored.

The following research questions were investigated:

(1) What are the sleep behaviors of undergraduate students?
(2) Are there differences in academic performance between undergraduate students with different sleep behaviors? If so, what is the nature of these differences?
(3) How do hospitality students' sleep behaviors differ from those of nonhospitality students?
(4) Are there differences in academic performance between hospitality students and nonhospitality students? If so, are these differences associated with sleep behaviors?
(5) How do shift workers' sleep behaviors differ from those of nonshift workers?
(6) Are there differences in academic performance between shift workers and nonshift workers? If so, are these differences associated with sleep behaviors?

Literature Review

Sleep Behaviors

Sleep is a physiological need, but individual sleep behaviors vary because of individual characteristics (e.g., gender, age) or needs. The NSF has published annual sleep reports since 2002 and expanded its study beyond the United States in 2013. In the 2005 NSF study, 1,508 adults completed 20-min telephone interviews regarding their sleep habits and styles (NSF, 2005). The 2005 report showed that U.S. adults on average slept 6.8 hr per night on weekdays and 7.4 hr per night on weekends. Of course, personal needs for sleep differ. In the 2005 NSF report, actual sleep hours were compared with perceived sleep needs to determine whether participants perceived that they got enough sleep. Perceived sleep needs was defined as the minimum number of sleep hours people self-reported that they needed to function their best during the day. The results showed that 40% of participants got more than their perceived sleep needs, 32% of participants got the same, and 22% got less; 5% did not report (NSF, 2005).

The rapid development of technology has changed people's lifestyle, with potential ill effects on sleep thereby impacting human health as well as performance (Fernández-Mendoza et al., 2009). The general sleep habit of a delayed weekend sleep-wake schedule is prevalent among college students/young adults. Chiang et al. (2014) studied the sleep habits of 172 undergraduate students, some of whom were hospitality students, and found that the greatest percentage of participants went to bed between 12 a.m. and 12:59 a.m. on weekdays (36.0%) and between 2 a.m. and 4:59 a.m. on weekends (36.6%). On weekdays most participants (82.0%) awoke between 6 a.m. and 8:59 a.m., whereas on weekends most (72.7%) awoke between 9 a.m. and 1:59 p.m. The findings suggest that undergraduate students woke up later on weekends to compensate for the late weekend bedtime (Chiang et al., 2014).

Studies found that the bedtimes and wake-up times of college students were delayed up to 2 hr on weekends compared with weekdays (Buboltz, Brown, & Soper, 2001; Lund, Reider, Whiting, & Roxanne Prichard, 2010). Buboltz et al. (2001), who examined sleep habits and patterns in a rural southern U.S. university, found that the mean weekend bedtime of 191 undergraduate students (M = 1:17 a.m., SD = 96 min) was 97 min later than the mean weekday bedtime (M = 11:40 p.m., SD = 62 min). The mean weekend wake-up time (M = 9:45 a.m., SD = 106 min) was about 2 hr later than the mean weekday wake-up time (M = 7:42 a.m., SD = 96 min). Lund et al. (2010) conducted a sleep study of 1,125 undergraduate students at a private university in the Midwest and reported that the mean weekend bedtime (M = 1:44 a.m., SD = 79 min) was 87 min later than the mean weekday bedtime (M = 12:17 a.m., SD = 71 min), whereas the mean weekend wake-up time (M = 10:08 a.m., SD = 88 min) was 88 min later than the mean weekday wake-up time (M = 8:02 a.m., SD = 76 min). Coveney (2014) found that spending time on social activities was a key reason college students slept in late or reduced their sleep hours.

General sleep problems such as delayed wake-up times and reduced sleep hours may have negative effects on college students' academic performance. Trockel et al. (2000) studied 243 freshmen and concluded that 0.132 grade point average (GPA) points (based on a 4-point grade scale) were lost if the student regularly woke up 1 hr later on weekdays, and 0.115 points of GPA were lost if the student woke up 1 hr later on weekends. No significant effect was found related to time of going to bed, either on weekdays or on weekends (Trockel et al., 2000). Kelly et al. (2001), using a sample of 147 college students, found that the mean GPA of short sleepers (six or fewer hours in a 24-hr period) was 0.5 points lower than that of long sleepers (nine or more hours in a 24-hr period), at 2.74 and 3.24, respectively. In addition, Chiang et al. (2014) found a negative relationship between sleep latency and cumulative GPA ($\beta = -0.116$, $p < .01$) among 172 undergraduate students.

The findings regarding the relationship between sleep quality and student GPA have been inconsistent.

Howell, Jahrig, and Powell (2004) examined the association between sleep quality and GPA using a sample of 414 Canadian undergraduate students but found no significant correlation. However, Gomes, Tavares, and Azevedo (2011) studied 1,654 Portuguese undergraduate students and concluded that self-reported sleep quality was one of the main factors that predicted academic performance.

Sleep and the Hospitality Industry

The importance of sleep should not be ignored with hospitality students in particular, because two common aspects of the hospitality field can result in sleep problems correlated with poor academic performance. These aspects are the requirement for work experience and the nature of the hospitality industry itself. Hospitality students usually hold part-time jobs or internships because work experience is a common requirement in many hospitality degree programs. Employed hospitality students may encounter numerous issues, such as the stress of managing school and work, missing extracurricular activities, and lower grades than expected (Jogaratnam & Buchanan, 2004; Schoffstall & Arendt, 2014).

Shift work (e.g., early hours, late hours, overnight hours, and irregular schedules) is a common characteristic of hospitality jobs and may affect a worker's health, sleep habits, and academic performance (Cleveland et al., 2007; Horton & Snyder, 2009; Wyatt, 2001). Sleep-related issues are of paramount interest to the hospitality industry because two hospitality areas—accommodation and food services—have the highest proportion of shift workers (39.8%) in the United States (Bureau of Labor Statistics, 2005). However, the importance of sleep for students who are working a shift schedule has received limited attention in the hospitality field.

Most hospitality undergraduate programs require hospitality work experience as part of a student's preparation for future work in the industry. Students are challenged to balance the demands of school and work while still getting enough sleep (Jogaratnam & Buchanan, 2004; Schoffstall & Arendt, 2014). Shift work, a key characteristic of the hospitality industry, has been shown to have a negative effect on sleep (NSF, 2008). Despite this, it would be difficult and unwise to restrict hospitality students' work experiences or to change the nature of the industry itself. Hospitality administrators therefore would benefit from an understanding of hospitality student sleep behavior and its effect on academic performance. In response to the lack of sleep research in the hospitality field, this study explored the benefits of sleep for hospitality and nonhospitality undergraduate students' academic performance.

Methods

Procedure

The sample population consisted of 23,990 undergraduate students enrolled during the Fall 2012 semester at a public university in the Midwest. Because of the popularity and convenience of the Internet, an online survey was used to collect the data. The study was approved by the university's institutional review board before any participants were contacted. Prior to data collection, the online survey was reviewed by three experts in the fields of hospitality management (HM) and psychology, and a pilot study was done with 68 undergraduate HM students. For the purposes of this study, HM students included a broad range classification including but not limited to lodging, food and beverage, events, and tourism. No questions or scales were changed as a result of the piloting process; therefore, pilot responses were included in the final data set.

A list of all undergraduate students at the university was obtained from the Office of the Registrar. Students with a missing GPA and/or credits (n = 8,079) were removed from the list. In addition, 68 students who participated in the pilot study were also removed from the list to avoid duplicate respondents. Finally, the modified list was divided by gender and every sixth student was selected from each list; thus, the sample had the same percentage of males and females as the total undergraduate student population. A total of 2,639 undergraduate students (1,536 males and 1,103 females) were selected.

The study was conducted in the middle of the fall semester, and students interested in participating were directed to the online survey through a link included in a recruitment e-mail. We provided a $25 gift card incentive awarded on a random basis and also sent reminders to students to increase the response rate, as recommended by Dillman, Smyth, and Christian (2007).

Measurement

The online survey consisted of two sections. The first section, with 11 items, collected demographic information, including student identification number, e-mail address, gender, age, race/ethnicity, academic major, class rank, employment status, managerial or supervisory responsibility, work shift, and hours worked per week.

The second section, with seven items, was adopted from the Pittsburgh Sleep Quality Index and collected sleep data, including data on sleep habits (four items),

sleep hours (two items), and sleep quality (one item; Buysse, Reynolds, Monk, Berman, & Kupfer, 1989). The Pittsburgh Sleep Quality Index was proven to be a reliable (Cronbach's α = .80) and valid instrument in previous sleep studies (Backhaus, Junghanns, Broocks, Riemann, & Hohagen, 2002; Carpenter & Andrykowski, 1998). Sleep habits and sleep hours were scaled in time periods. Sleep habits were measured by bedtimes and wake-up times on weekdays and weekends. Sleep hours were measured by both actual sleep hours and perceived sleep needs. For the purposes of this study, perceived sleep needs was defined as the average hours of sleep a person believes he or she needs to function at his or her best. This definition was adopted from the NSF (2005). Sleep quality was measured using a 5-point Likert-type scale (1 = *very bad* to 5 = *very good*).

Although not part of the survey, academic performance was measured by GPA. To increase the validity of data, we obtained GPAs from the Office of the Registrar rather than using self-report. These data were linked to participants by their student identification numbers and e-mail addresses for purposes of analysis.

Data Analysis

Collected data were analyzed using SPSS Version 21.0. Missing data were replaced by mean or mode imputation, which is a commonly used method of replacing missing data (Batista & Monard, 2003). Descriptive statistics, such as frequencies, were calculated. Comparisons were analyzed using one-way analysis of variance.

Results

Participant Profile

Participants consisted of 240 undergraduate students out of the 2,707 initially contacted (8.9% response rate). The participant profile is shown in Table 1. The majority of participants were female (n = 165, 68.8%), 18–24 years old (n = 234, 97.5%), and Caucasian (n = 203, 84.6%). The percentages of sophomores (n = 80), juniors (n = 83), and seniors (n = 77) were approximately equal (33.3%, 34.6%, and 32.1%, respectively). Freshmen were excluded because they did not yet have a college GPA and were still in a period of adjusting to college life. About one fourth of participants (n = 62, 25.8%) were HM majors, and the rest (n = 178, 74.2%) were non-HM majors. Seventy percent of participants were employed (n = 168), and 26.8% of those were working in the hospitality industry (n = 45). Of the 168 employed participants, approximately half (n = 86, 51.2%) worked the evening shift, the overnight shift, or rotating shifts (classified as shift workers); nearly half (n = 82, 48.8%) worked the day shift (classified as nonshift workers). About half (n = 91, 54.2%) worked 11–20 hr per week. A quarter (n = 42, 25.0%) had managerial or supervisory responsibilities.

Table 1 also identifies the profiles of the following four subgroups: HM major, non-HM major, shift worker, and nonshift worker. Compared with all participants, the HM group had a lower percentage of seniors (32.1% vs. 9.7%, respectively). We found that a higher percentage of participants worked in the hospitality industry when we compared the HM group with the non-HM group as well as when we compared the shift worker group with the nonshift worker group (32.3% vs. 14.0%, 37.2% vs. 15.9%, respectively).

Sleep Behaviors

Sleep behaviors of participants are presented in Table 1. Regarding sleep habits, 80.4% of participants (n = 193) went to bed later and 90.0% of participants (n = 216) got up later on weekends compared to weekdays. Regarding sleep hours, about half of the participants (n = 130, 54.2%) reported actual sleep hours of between 7 and 8.5 hr, although more than half of the participants (n = 153, 63.8%) reported that they needed 7–8.5 hr to function well. A cross-comparison of participants' actual sleep hours and perceived sleep needs showed that 47.9% of participants (n = 115) slept less than their perceived needs, 42.1% (n = 101) slept as much as their perceived needs, and 10.0% (n = 24) slept more than their perceived needs. Regarding sleep quality, 40.0% of participants (n = 96) reported that their sleep quality was fairly good or very good.

Sleep behaviors of the four subgroups are shown in Table 1. The percentage of HM participants (88.7%) who went to bed later on weekends was higher than that of non-HM participants (77.5%). Similar sleep behaviors were found between shift workers and nonshift workers.

Student GPA

The average student GPA was 3.06 (SD = 0.67) for all participating students. Table 2 presents mean comparisons of student GPA by major, employment status, managerial or supervisory responsibility, work shift, work hours, bedtimes, wake-up times, actual sleep hours versus perceived sleep needs, and sleep quality. Results of the analysis of variance revealed that the mean GPAs of participants who slept less than, the same as, or more than their perceived needs differed significantly. The mean GPA of those who slept less

Table 1. Characteristics of participants (*N*s = 168–240).

	HM		Non-HM		Shift[a]		Nonshift[a]		Total	
	(*n* = 62)		(*n* = 178)		(*n* = 86)		(*n* = 82)		(*N* = 240)	
Characteristic	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%
Gender										
Female	54	87.1	111	62.4	64	74.4	55	67.1	165	68.8
Male	8	12.9	67	37.6	22	25.6	27	32.9	75	31.3
Age (years)										
18–24	62	100.0	172	96.6	84	97.7	79	96.3	234	97.5
25–34	0	0.0	4	2.2	0	0.0	3	3.7	4	1.7
35–44	0	0.0	2	1.1	2	2.3	0	0.0	2	0.8
45 or older	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Race/Ethnicity										
African American (non-Hispanic)	2	3.2	2	1.1	2	2.3	1	1.2	4	1.7
Asian/Pacific Islander	1	1.6	15	8.4	3	3.5	3	3.7	16	6.7
Caucasian (non-Hispanic)	52	83.9	151	84.8	74	86.0	73	89.0	203	84.6
Latino or Hispanic	4	6.5	9	5.1	5	5.8	4	4.9	13	5.4
Native American	1	1.6	0	0.0	1	1.2	0	0.0	1	0.4
Other	2	3.2	1	0.6	1	1.2	1	1.2	3	1.3
Classification Status										
Sophomore	36	58.1	44	24.7	33	38.4	19	23.2	80	33.3
Junior	20	32.3	63	35.4	26	30.2	26	31.7	83	34.6
Senior	6	9.7	71	39.9	27	31.4	37	45.1	77	32.1
Employment										
Working in the hospitality industry	20	32.3	25	14.0	32	37.2	13	15.9	45	18.8
Working in other industries	25	40.3	98	55.1	54	62.8	69	84.1	123	51.3
Not working	17	27.4	55	30.9	0	0.0	0	0.0	72	30.0
Managerial or Supervisory Responsibility[b]										
Yes	16	35.6	26	21.1	26	30.2	16	19.5	42	25.0
No	29	64.4	97	78.9	60	69.8	66	80.5	126	75.0
Work Shift[b]										
Day shift	16	35.6	66	53.7	0	0.0	82	48.8	82	48.8
Evening shift	15	33.3	26	21.1	41	24.4	0	0.0	41	24.4
Overnight shift	0	0.0	2	1.6	2	1.2	0	0.0	2	1.2
Rotating shifts	14	31.1	29	23.6	43	25.6	0	0.0	43	25.6
Average Work Hours per Week[b]										
Less than or equal to 10	9	20.0	35	28.5	21	24.4	23	28.0	44	26.2
11–20	23	51.1	68	55.3	40	46.5	51	62.2	91	54.2
21–30	10	22.2	14	11.4	20	23.3	4	4.9	24	14.3
31–40	3	6.7	5	4.1	4	4.7	4	4.9	8	4.8
More than 40	0	0.0	1	0.8	1	1.2	0	0.0	1	0.6
Bedtimes[c]										
Later on weekends	55	88.7	138	77.5	68	79.1	63	76.8	193	80.4
Same as weekdays	6	9.7	34	19.1	15	17.4	15	18.3	40	16.7
Earlier on weekends	1	1.6	6	3.4	3	3.5	4	4.9	7	2.9
Wake-Up Times[c]										
Later on weekends	56	90.3	160	89.9	79	91.9	73	89.0	216	90.0
Same as weekdays	4	6.5	13	7.3	4	4.7	6	7.3	17	7.1
Earlier on weekends	2	3.2	5	2.8	3	3.5	3	3.7	7	2.9
Actual Sleep Hours										
Less than 3	0	0.0	1	0.6	1	1.2	0	0.0	1	0.4
3–4.5	0	0.0	8	4.5	2	2.3	2	2.4	8	3.3
5–6.5	24	38.7	71	39.9	39	45.3	28	34.1	95	39.6
7–8.5	36	58.1	94	52.8	42	48.8	49	59.8	130	54.2
9–10.5	2	3.2	4	2.2	2	2.3	3	3.7	6	2.5
Perceived Sleep Needs										
Less than 3 hr	0	0.0	2	1.1	1	1.2	0	0.0	2	0.8
3–4.5 hr	0	0.0	3	1.7	2	2.3	1	1.2	3	1.3
5–6.5 hr	13	21.0	22	12.4	14	16.3	11	13.4	35	14.6
7–8.5 hr	40	64.5	113	63.5	54	62.8	49	59.8	153	63.8
9–10.5 hr	9	14.5	38	21.3	15	17.4	21	25.6	47	19.6
Actual Sleep Hours vs. Perceived Sleep Needs										
Less	24	38.7	91	51.1	42	48.8	39	47.6	115	47.9
Same	30	48.4	71	39.9	35	40.7	35	42.7	101	42.1
More	8	12.9	16	9.0	9	10.5	8	9.8	24	10.0
Sleep Quality										
Very bad	1	1.6	5	2.8	3	3.5	0	0.0	6	2.5
Fairly bad	10	16.1	36	20.2	17	19.8	19	23.2	46	19.2
Neutral	20	32.3	72	40.4	30	34.9	37	45.1	92	38.3
Fairly good	29	46.8	54	30.3	32	37.2	24	29.3	83	34.6
Very good	2	3.2	11	6.2	4	4.7	2	2.4	13	5.4

Note. HM = hospitality management.
[a]Shift work includes the evening shift, the overnight shift, and rotating shifts. Nonshift includes the day shift.
[b]*N* = 168 (45 of 168 participants with a job had a HM major, and 123 of 168 participants with a job had a non-HM major; 86 of 168 participants reported shift work, and 82 of 168 participants reported nonshift work).
[c]Bedtimes and wake-up times were compared weekends to weekdays.

Table 2. Mean grade point average comparisons based on various demographic and sleep characteristics.

Variable	*n*	M	SD	F	*p*
Academic Major				4.613	<.05
HM	62	2.90	0.48		
Other than HM	178	3.11	0.72		
Employment				2.328	.100
Hospitality industry	45	2.88	0.73		
Other industry	123	3.13	0.59		
Not working	72	3.05	0.74		
Managerial or Supervisory Responsibility[a]				1.086	.299
Yes	42	2.97	0.68		
No	126	3.09	0.63		
Work Shift[a]				0.914	.341
Day	82	3.11	0.59		
Evening, overnight, or rotating	86	3.01	0.69		
Average Work Hours per Week[a]				1.584	.208
Less than or equal to 10	44	3.17	0.66		
11–20	91	3.06	0.64		
More than 20	33	2.91	0.61		
Bedtimes[b]				0.084	.772
Later on weekends	193	3.05	0.67		
Same as or earlier on weekends	47	3.08	0.67		
Wake-Up Times[b]				2.248	.135
Later on weekends	216	3.04	0.67		
Same as or earlier on weekends	24	3.25	0.63		
Actual Sleep Hours vs. Perceived Sleep Needs				11.428	<.01
Less	115	2.91	0.70		
Equal or more	125	3.19	0.61		
Sleep Quality				1.664	.192
Fairly bad or worse	52	2.97	0.70		
Neutral	92	3.01	0.69		
Fairly good or better	96	3.15	0.63		
Major and Sleep Hours					
HM				0.052	.820
Less than perceived sleep hours	24	2.88	0.45		
Equal to or more than perceived sleep hours	38	2.91	0.51		
Other than HM				15.175	<.001
Less than perceived sleep hours	91	2.91	0.75		
Equal to or more than perceived sleep hours	87	3.32	0.62		
Shift and Sleep Hours				7.465	<.01
Shift worker					
Less than perceived sleep hours	42	2.82	0.71		
Equal to or more than perceived sleep hours	44	3.21	0.61		
Nonshift worker				1.916	.170
Less than perceived sleep hours	39	3.02	0.61		
Equal to or more than perceived sleep hours	43	3.19	0.56		

Note. HM = hospitality management.
[a]*N* = 168 (45 of 168 participants with a job had a HM major, and 123 of 168 participants with a job had a non-HM major).
[b]Bedtimes and wake-up times were compared weekends to weekdays.

than their perceived needs (M = 2.91, SD = 0.70) was lower than that of those who slept as much as or more than their perceived needs (M = 3.19, SD = 0.61). Figure 1 shows the association between sleep quality and GPA. The mean GPAs of each sleep quality group were as follows: very bad (M = 3.08, SD = 0.29), fairly bad (M = 2.95, SD = 0.73), neutral (M = 3.01, SD = 0.69), fairly good (M = 3.13, SD = 0.66), and very good (M = 3.32, SD = 0.37).

Comparing subgroups revealed a significant difference between the mean GPA of participants with a HM major and that of participants with a non-HM major. The mean GPA of HM major participants (M = 2.90, SD = 0.48) was lower than that of non-HM major participants (M = 3.11, SD = 0.72). In addition, the non-HM group exhibited a significant difference between the mean GPA of non-HM participants who slept less than their perceived needs (M = 2.91, SD = 0.75) and that of those who slept as

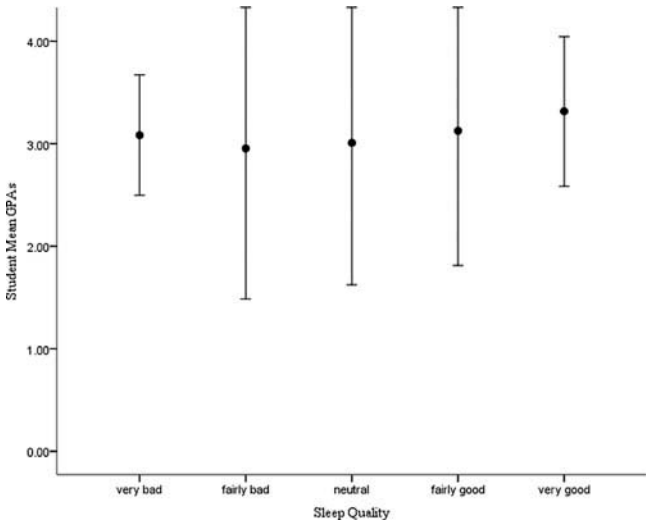

Figure 1. Student mean grade point averages (GPAs) of each sleep quality group. Error bars represent 2 *SD*.

much as or more than their perceived needs (M = 3.32, SD = 0.62). Another significant difference was observed between the mean GPA of shift workers who slept less than their perceived needs (M = 2.82, SD = 0.71) and that of those who slept as much as or more than their perceived needs (M = 3.21, SD = 0.61).

Discussion and Conclusion

This study examined the effects of sleep on academic performance in a sample of undergraduate students, including two potential high-risk groups: hospitality students and shift workers. Three sleep behaviors were studied: sleep habits, sleep hours, and sleep quality. First, a comparison between study sample and university population is provided. Second, principal findings are discussed: (a) a lower student GPA may be associated with delayed sleep habits on weekends, perceived insufficient sleep hours, and poor sleep quality for undergraduate students; (b) hospitality students had slightly different sleep behaviors and a lower mean GPA compared to nonhospitality students; and (c) no difference in sleep behaviors was observed between shift workers and nonshift workers, although shift workers who got insufficient sleep hours had a lower mean GPA than shift workers who achieved or exceeded their perceived sleep needs. Finally, this section is closed with some suggestions for program administrators and practitioners based on the findings of this study.

Overall, the division of the study sample by age was similar to that of the university population, as follows (study sample and university population, respectively): 18–24 years old (97.5% and 93.2%) and 25 years old or older (2.5% and 6.1%). The gender composition of the study sample was in contrast to the university population, as follows (study sample and university population, respectively): female (68.8% and 43.6%) and male (31.3% and 56.4%). One explanation for this might be that females have been found to be more willing to participate in surveys than males (Porter & Whitcomb, 2005). The similarities and differences in the compositions of the study sample and university population indicate the potential generalization of this study to other populations. However, findings would not be generalizable to other student segments in different life stages (e.g., adolescence) or those who have quit school.

Undergraduate Students

Sleep Habits and GPA

The results revealed the widespread presence of delayed sleep habits in the undergraduate population of the current study. Undergraduate students who maintained consistent sleep-wake times during the week had a higher mean GPA than those who did not.

We found that 73.3% of participants (n = 176) went to bed later and got up later on weekends than on weekdays after a cross-comparison of participants' bedtimes and wake-up times. Very few participants (n = 6, 2.5%) maintained consistent bedtimes and wake-up times across the entire week. In previous studies, Buboltz et al. (2001) and Lund et al. (2010) calculated average bedtimes and wake-up times on weekdays and weekends and found that on average undergraduate students went to bed between 87 and 97 min later and woke up between 71 and 120 min later on weekends than on weekdays. These data, with large deviations, showed various individual differences; however, the variances were not explained (Buboltz et al., 2001; Lund et al., 2010).

Then the mean GPAs were compared between two subgroups—the delayed sleep group and the regular sleep group—although the statistical mean difference could not be tested because of the wide variation in sample sizes. The mean GPA of participants with a regular sleep–wake schedule (n = 6) was 3.57 (SD = 0.54), and the mean GPA of those with a delayed sleep-wake schedule on weekends (n = 176) was 3.05 (SD = 0.68). Given the 0.52 difference in mean GPA, sleep schedules might be an important factor in undergraduate student success. To verify this inference, a group comparison with equal sample sizes should be considered for future study.

Sleep Hours and GPA

A higher percentage of undergraduate students slept less than their perceived needs compared to adults. The findings showed that undergraduate students whose actual sleep matched or exceeded their perceived sleep needs had a higher mean GPA than those whose actual sleep did not match their perceived needs.

According to the NSF, the recommended number of sleep hours for young adults (between 18 and 25 years old) is 7 to 9 hr per night, but the amount of perceived sleep need may vary among individuals (Hirshkowitz et al., 2015). In our study, the percentage of undergraduate students (56.7%) who actually slept seven or more hours was similar to that among U.S. adults overall (57%; NSF, 2005). However, the proportion of undergraduate students who slept less than their

perceived needs was 2 times higher than that among U. S. adults overall (48% vs. 22%, respectively; NSF, 2005).

This study found that achieving perceived sleep needs is important for achieving a higher GPA. The average GPA of undergraduate students whose sleep equaled or exceeded their perceived sleep needs (M = 3.19, SD = 0.61) was 0.28 points higher than that of those who reported sleeping less than their perceived needs (M = 2.91, SD = 0.70). Regarding actual sleep hours, Kelly et al. (2001) studied 147 college students and concluded that the mean GPA of students with a short sleep duration (≤6 hr) was 0.5 points lower than that of those with a long sleep duration (≥9 hr). However, no significant difference was found when the researchers compared general sleep duration (between 6 and 9 hr) and individual differences (Kelly et al., 2001).

Sleep Quality and GPA

The majority of undergraduate students responded that their sleep quality was neutral or fairly good. However, poor sleep quality could be a potential sleep problem for some high-performing students.

In the current study, 5.4% of participants reported that their sleep quality was very good, 34.6% fairly good, 38.3% neutral, 19.2% fairly bad, and 2.5% very bad. Lund et al.'s (2010) study of 1,125 U.S. undergraduate students found that 11% self-reported their sleep quality as very good, 55.0% fairly good, 30.0% fairly bad, and 3.9% very bad.

No significant differences were found in student GPA based on sleep quality in spite of the numeric differences. The data revealed that some students with high GPAs reported poor sleep quality, and the mean GPA of the very bad sleep quality group was higher than that of the fairly bad and neutral sleep quality groups. However, the mean GPAs of participants who reported poor sleep quality were lower than those of those who reported good sleep quality. Figure 1 shows the great variability in student GPAs in sleep quality groups. Using the very bad sleep quality group as an example, group mean GPA within 2 SD ranged from 2.50 to 3.66. Based on the letter grade criteria of the studied school, this range of student GPAs represents four grade levels of difference, where 2.50 is equal to C + and 3.66 is equal to B+ (the four levels being C+ → B– → B → B+). These findings might explain the lack of significant results in this study as well as the inconsistent relationship between sleep quality and student GPA found in previous studies (Gomes et al., 2011; Howell et al., 2004). Previous studies found poor sleep quality to be related to health and satisfaction with life (Lund et al., 2010; Pilcher, Ginter, & Sadowsky, 1997). Program administrators should be attentive to the issue of sleep quality in their efforts to assist undergraduate students in balancing school, work, and health.

Comparison: Hospitality vs. Nonhospitality Students

Sleep behaviors of hospitality students were similar to those of nonhospitality students; however, a significant difference in student GPA was found. The mean GPA of HM participants (M = 2.90, SD = 0.48) was 0.21 points lower than that of non-HM participants (M = 3.11, SD = 0.72). The sleep behaviors of HM students were expected to differ from those of non-HM students because of program requirements and the nature of the hospitality industry, but in fact the composition and sleep behaviors of HM participants were similar to those of the general undergraduate population, which means that the results with respect to undergraduate participants discussed previously could be applied to HM students. Horton and Snyder (2009) found that hospitality students' GPAs were affected by physical wellness factors, such as amount of sleep.

Comparison: Shift vs. Nonshift Workers

The collected data and the composition of the subsamples of shift workers and nonshift workers were very similar to those of the undergraduate population. The study found that 51.2% of undergraduate students reported working evening, overnight, or rotating shifts. These students were defined as shift workers. This is 3 times higher than the percentage (15.8%) of 20- to 24-year-old full-time shift workers documented in government reports (Bureau of Labor Statistics, 2005). In this study, a higher percentage of shift workers worked in the hospitality industry (37.2% vs. 15.9%), worked at a supervisory/managerial level (30.2% vs. 19.5%), and worked more than 20 hr (29.2% vs. 9.8%) compared to nonshift workers. However, no differences in sleep habits, sleep hours, or sleep quality were found between shift workers and nonshift workers.

Undergraduate shift workers had a lower mean GPA than nonshift workers. Although there was no statistically significant difference between the mean GPA of student employees doing shift work (M = 3.01, SD = 0.69) and that of those doing nonshift work (M = 3.11, SD = 0.59), there was a 0.10-point difference between the mean GPAs of these two

groups. Achieving perceived sleep needs is thus important for undergraduate shift workers with respect to their academic achievement. In this study, an internal significant difference was found among shift workers. The mean GPA of shift workers (M = 3.32, SD = 0.61) whose actual sleep hours were equal to or more than their perceived sleep hours was 0.39 points higher than that of those (M = 2.82, SD = 0.71) who slept less than their perceived sleep hours. This subgroup of shift workers seemed to have a good balance between study, work, and sleep.

In conclusion, maintaining regular sleep-wake times and achieving perceived sleep needs may be vital to undergraduate students' academic success. Program administrators should be aware that students might experience sleep issues even though they perform well. Although similar sleep problems were found across all student groups, hospitality students or students who perform shift work might need some specific recommendations to improve their sleep behaviors because of the academic and industrial characteristics of the hospitality field (e.g., program requirements, nonstandard work schedules).

Implications

Our novel findings suggest that future researchers look beyond sleep behaviors to develop effective methods of improving the academic performance of hospitality students or students working in the hospitality industry. Examples of these methods may include sleep programs or courses that have been developed for students, such as an online sleep education program (Quan, Anderson, & Hodge, 2013) or sleep workshop (Kloss et al., 2016).

Differing from most literature, the methods utilized in this study emphasized individual differences, whereby individual actual sleep hours were compared to perceived sleep needs (Hirshkowitz et al., 2015) rather than a set standard (i.e., a recommended sleep amount between 7 and 8 hr) as suggested by the National Heart, Lung, and Blood Institute (2012). It is recognized that people have different lifestyles and physical activity, so each person may have different perceived sleep needs. Future researchers could benefit from the methods used in this study to retain individual differences as part of the data analysis.

Limitations and Future Research

First, the limits of using shift work as the only variable that has an impact on sleep should be acknowledged. Other psychological and clinical factors might affect sleep in general, such as stress, caffeinated beverages, alcohol, and drugs. In addition, moderators and mediators of the relationship between sleep and student GPA were not included, such as class attendance, prior academic achievement, social activities, and accuracy of sleep quality. There is a lack of literature focusing on the effects of these critical factors on sleep and GPA among hospitality students, and no known study has explored whether hospitality students' sleep behaviors differ from those of nonhospitality students. In the current study, we found similarities in sleep behaviors between hospitality and nonhospitality students as well as between shift and nonshift workers, which suggests that the application of relative studies using general undergraduate samples for future hospitality research is reasonable.

Second, both the small sample size and the fact that participants came from a single university limit the generalizability of this study. Unexplained interactive effects may increase the error variance. Future researchers may want to use a nationwide sample and balance the sample size in terms of HM and non-HM students. With a larger sample size, researchers would be better able to explore the interactive effects of hospitality major and sleep on academic performance.

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