



*Author(s): Paul P. Doghramji, MD  
Medical Director, Ursinus College*

## **SLEEP PROBLEMS IN COLLEGE STUDENTS**

### **Introduction**

College life presents many new and stressful challenges, such as increased freedom, self-responsibility, disorganized lifestyle, variable schedules, repeated deadlines, dormitory living, and social and academic obligations.<sup>1</sup> To meet these demands, students voluntarily alter their sleeping habits.<sup>2</sup> Consequently, in 2000-2001, more than 70% of college students had some degree of sleep-related concern (**Table 1**).<sup>3-5</sup> Bulboltz et al (2001) recently found that only 11% of a sample of US college undergraduate students (N = 191) had good sleep quality.<sup>4</sup>

Sleep quality refers to a composite of sleep quantity, length of time to fall asleep, number of awakenings at night, length of time to fall back asleep after awakening, feeling of fatigue/restfulness upon awakening in the morning, and general satisfaction with sleep.<sup>2</sup> Research has shown that poor sleep quality can have neurobehavioral and physiological consequences that negatively impact students' health, well-being, and academic functioning.<sup>1,4,6</sup> Thus, professionals involved in the care of college students should always explore the possibility of poor sleep quality as part of standard patient work-up.

### **Changing Sleep Patterns of College Students**

College students are invariably sleep deprived.<sup>7,8</sup> In 2001, university undergraduates reported a median duration of total sleep of 6.65 hours,<sup>7</sup> which is far below the recommended 8.5 to 9.25 hours for their age group.<sup>9</sup> In addition to reduced total sleep time, students often shift their sleep/wake schedule toward later times for both bedtime and wake time, according to one US survey, by an average of 2 hours.<sup>8,10</sup> In addition, college students often deprive themselves of sleep during the week and attempt to "catch up" on sleep by sleeping longer hours on the weekend.<sup>5,11,12</sup> However, optimal healthy sleep is best done at the same time, day in and day out, at the same time, and in the same quantity. Therefore, such irregularities in sleep pattern produce an unhealthy circadian rhythm disorder (delayed sleep phase disorder) that occurs in approximately 12% of college students, which is double the frequency in the general population (6%–7%).<sup>1,5</sup> Individuals with delayed sleep phase disorder have difficulty falling asleep during the week, problems awakening at a planned time, and morning sleepiness.<sup>5</sup> The pattern of insufficient and irregularly timed sleep inevitably leads to sleep problems and overall poor sleep quality.<sup>4</sup>

### **Factors Contributing to Poor Sleep Quality**

Factors contributing to erratic sleep patterns and poor sleep quality include academic demands (which may require all-night study sessions, especially at examination time), repeated prolonged exposure to light at

the wrong time of day because of all-night study sessions and late-night computer work (which can disrupt biological sleep/wake rhythm regulation),<sup>13</sup> social interaction with peers (which may lead to later bedtimes),<sup>10</sup> and worrying while falling asleep.<sup>11</sup> Students who are more concerned about using their time effectively to meet all of the demands placed on them are more likely to experience sleep problems.<sup>12</sup> In addition, environmental noise<sup>11</sup> and use of prescription stimulants to help with concentration, increase alertness, and help with studying are likely to disrupt sleep.<sup>14,15</sup>

## Consequences of Poor Sleep Quality

Students' poor sleep habits and consequent poor sleep quality can have mental and physiological consequences (Table 2).<sup>4,6,10,11,16-18</sup>

### *Mental Consequences*

Students who chronically sleep 1 to 2 hours less each day tend to accumulate a "sleep debt" that leads to excessive daytime sleepiness.<sup>6,10</sup> Sleep deprivation to less than 6 to 7 hours per night can lead to significant impairment of daytime alertness, impaired neurocognitive and psychomotor performance (reduced attention, concentration, memory, problem-solving ability, critical thinking), increased risk of sleep-related motor vehicle accidents,<sup>6,11,16</sup> and diminished academic performance, often resulting in poor grades.<sup>8,10,18</sup> Sleep-deprived students tend to avoid more difficult tasks.<sup>19</sup> Sleep-deprived students also are often not aware that their academic difficulties may be related to lack of sleep<sup>20</sup> and may even wrongfully rate their cognitive performance as being better than the performance of students who had a normal night's sleep, which would explain the commonly heard comment "I don't understand why I did so badly, I studied for hours."<sup>4,20</sup>

The poor academic performance in sleep-deprived students may be connected to loss of REM sleep. Students who sleep less than 8 hours per night miss some of the last 2 hours of REM sleep. Those 2 hours of REM sleep tend to be the most important for further processing of newly learned material.<sup>21-23</sup> Therefore, if students are experiencing sleep deprivation (with decreased REM sleep), irregular sleep schedules, or poor sleep quality, the rate at which they learn new material will be reduced.<sup>21</sup> However, even if students sleep 8 hours per night, if they shift their sleep/wake cycle by 2 hours, they may experience difficulty concentrating.<sup>1</sup>

A recent study of 200 first-year college students who averaged 7 hours of sleep on weekdays and 8 hours on weekends found that among several health-related variables analyzed (including sleep habits; mood states; perceived stress; time management; exercise; eating; social, spiritual, or religious support; hours worked per week; gender; and age), lower grade point average was the most strongly correlated with later weekday and later weekend wake times, followed by later weekday and weekend bedtimes.<sup>18</sup> Independent of all other variables, for each hour of delay in weekday and weekend wake times, the predicted grade point average decreased by 0.132 and 0.115 points, respectively, on a standard 0.00 to 4.00 grading scale. Consistent with these findings, students meeting the criteria for delayed sleep phase disorder<sup>5</sup> have been shown to have significantly lower grades, greater feelings of drowsiness, and more irritability compared with students without the syndrome.<sup>1</sup>

Students who report poor sleep quality tend to demonstrate a high level of psychosocial distress, manifesting as increased irritability, anxiety, tension, depression, confusion, and lower satisfaction with life.<sup>2,10,11</sup> Chronic shifting of the sleep/wake cycle has also been associated with feelings of depression, reduced affability, and increased irritability.<sup>1</sup> Students who report excessive daytime sleepiness also disclose more frequent use of marijuana and alcohol and may potentially have a greater tendency to abuse caffeine and nicotine.<sup>1,10</sup>

### *Physiological Consequences*

Sleep deprivation can potentially have adverse endocrine, immunologic, metabolic, and cardiovascular

consequences, depending on the chronicity and extent of reduced sleep time.<sup>6,17</sup> When sleep is restricted to 4 hours per night in healthy young adults, abnormal endocrine responses (increased evening cortisol levels, increased sympathetic activation, decreased thyrotropin activity, and decreased glucose tolerance) and altered secretory patterns of appetite-regulating hormones (decreased leptin and increased ghrelin secretion) are observed. The latter effect is likely to increase appetite, which may promote weight gain and obesity.<sup>6</sup>

Chronic sleep deprivation has also been associated with alteration of immune system function, the potential consequences being increased susceptibility to illness due to impaired host defenses<sup>17</sup> and activation of systemic inflammatory immune responses involved in the pathogenesis of insulin resistance and cardiovascular disease.<sup>6</sup> With respect to the latter, epidemiological studies have observed an increase in cardiovascular events in subjects averaging  $\leq 5$  or  $\leq 7$  hours of sleep per night.<sup>6</sup> Other studies of the affects of insomnia have also shown that it can be an affective predictor of hypertension in adult males,<sup>24</sup> and CAD mortality in middle-aged individual.<sup>25</sup> A high incidence of diabetes has also been observed in middle-age males with sleep complaints or short-duration sleep.<sup>26</sup> In addition, further studies of the affect of insomnia have established a link between poor sleep and risk for the development of mood, anxiety, suicide, and substance-abuse disorders in young adults.<sup>27-29</sup>

### **Management of Students With Problem Sleep**

To assess the student's sleep problem, a comprehensive sleep history should be obtained. At times it may help for students to keep a detailed sleep log (including, at minimum, sleep/wake times, sleep duration, night awakenings, napping, tiredness, alcohol/caffeine ingestion, physical activity, and mood).<sup>12</sup> Sleep history should cover predisposing factors, precipitating factors, and perpetuating factors. When the situation is a difficult and/or uncertain sleep problem, students may need a referral to a sleep center.<sup>12</sup>

### **Treatment of Sleep Problems**

Regardless of treatment approach (**Table 3**),<sup>1,12,30-33</sup> the main goal of treatment is to improve sleep quality.<sup>2</sup>

#### *Nonclinical Treatments*

Primary nonclinical approaches include education and behavioral techniques.<sup>12</sup> Students should be educated about the impact that poor sleep habits have on their daily and academic performance and taught proper sleep habits (ie, good sleep hygiene) such as exercising regularly no later than the late afternoon or early evening; avoiding coffee, alcohol, and nicotine; maintaining a strict bedtime/wake time schedule during weekdays and weekends; and maintaining a good sleep environment (eg, quiet, dark room; using the bed only for sleeping).<sup>1,12,30</sup> For students who have shifted their sleep/wake times out of phase with their circadian rhythm, 30 to 60 minutes of bright light therapy using a light box or a source that emits a broad light spectrum will effectively reestablish their circadian rhythm and improve sleep quality.<sup>1,12</sup>

#### *Clinical Treatments*

Psychological and behavioral interventions (**Table 3**) are effective in the treatment of insomnia and should be tried first.<sup>1,31,33</sup> Stimulus control involves minimizing or avoiding sleep-preventing situations, for example, avoiding daytime napping, extreme noise/temperature, the use of caffeine, tobacco, or alcohol at night; leaving the bedroom if unable to fall asleep within 20 minutes; using the bedroom only for sleep or intimacy; and going to bed when sleepy.<sup>1,33</sup> Sleep restriction, therapy, or sleep consolidation, demands a dedicated, persevering patient who is asked to delay bedtime often by 4 hours in order to ensure falling asleep easily and staying asleep. This will increase the ratio of actual sleep time to amount of time in bed. As the weeks progress, bedtime is done earlier and earlier until normal sleep time is reached. This method has been shown to be the most effective of the behavioral treatments.

Relaxation training involves progressive muscle relaxation, biofeedback, or cognitive imagery to reduce arousal level in order to facilitate sleep onset.<sup>1,33</sup> Cognitive-behavioral therapy uses combinations of cognitive and behavioral interventions and may improve sleep for up to 24 months.<sup>33</sup> The cognitive component is aimed at changing patients' beliefs, misconceptions, and attitudes about sleep.<sup>31</sup> An abbreviated cognitive behavioral insomnia therapy has been used successfully in the primary care setting.<sup>32</sup> Behavioral and cognitive interventions have minimal adverse effects; disadvantages include high initial cost, lack of insurance coverage, and possible unavailability of trained therapists.<sup>33</sup> When nonpharmacologic measures do not adequately alleviate insomnia, short-term treatment with a hypnotic agent may be helpful.

Benzodiazepines are useful for short-term treatment of insomnia but are associated with significant side effects, risk of dependency, and rebound insomnia following withdrawal. The newer nonbenzodiazepine hypnotics (eg, zolpidem, saleplon, eszopiclone) are effective and, compared with benzodiazepines, appear to have fewer side effects and do not cause REM sleep rebound.<sup>33</sup> However, these newer agents can cause next-day impaired memory and psychomotor retardation. More recently, melatonin receptor agonists have been studied, and one such is currently available (ramelteon). Its advantage is that it is not a scheduled substance thus no risk of dependence, but also no rebound insomnia, tolerance or withdrawal. However it has only been shown to be effective at sleep initiation, and may not be effective on the first night of administration if 1/3 of patients who take it.

## Summary and Conclusions

All college students should be educated about the importance of maintaining good sleep habits, because this population tends to develop poor sleep habits that lead to sleep deprivation, poor sleep quality, and insomnia. These sleep problems can significantly impair students' academic performance and can also have a negative impact on their overall mental and physical health. Students presenting with sleep problems should be treated appropriately to avoid negative consequences.

*Publisher's Note: Readers are welcome to provide comments to the author and/or publisher by emailing info@collegehealthadvisor.com.*

## References

1. Buboltz WC Jr, Soper B, Brown F, Jenkins S. Treatment approaches for sleep difficulties in college students. *Counselling Psychol Q* 2002;15:229-237.
2. Pilcher JJ, Ginter DR, Sadowsky B. Sleep quality versus sleep quantity: relationships between sleep and measures of health, well-being and sleepiness in college students. *J Psychosom Res* 1997;42:583-596.
3. Hicks RA, Fernandez C, Pellegrini RJ. Striking changes in the sleep satisfaction of university students over the last two decades. *Percept Mot Skills* 2001;93:660.
4. Buboltz WC Jr, Brown F, Soper B. Sleep habits and patterns of college students: a preliminary study. *J Am Coll Health* 2001;50:131-135.
5. Brown FC, Soper B, Buboltz WC Jr. Prevalence of delayed sleep phase syndrome in university students. *Coll Student J* 2001;35:472-476.
6. Banks S, Dinges DF. Behavioral and physiological consequences of sleep restriction. *J Clin Sleep Med* 2007;3:519-528.

7. Hicks RA, Fernandez C, Pellegrini RJ. The changing sleep habits of university students: an update. *Percept Mot Skills* 2001a;93:648.
8. Tsai L-L, Li S-P. Sleep patterns in college students. Gender and grade differences. *J Psychosom Res* 2004;56:231-237.
9. National Sleep Foundation. *Adolescent Sleep Needs and Patterns*. Research Report and Resource Guide. Available at: <http://www.sleepfoundation.org>. Accessed March 10, 2008.
10. National Institutes of Health. National Heart, Lung, and Blood Institute. National Center on Sleep Disorders Research and Office of Prevention, Education, and Control. Working Group Report on Problem Sleepiness. 1997. Available at: [http://www.nhlbi.nih.gov/health/prof/sleep/pslp\\_wg](http://www.nhlbi.nih.gov/health/prof/sleep/pslp_wg). Accessed March 10, 2008.
11. Brown FC, Buboltz WC Jr, Soper B. Relationship of sleep hygiene awareness, sleep hygiene practices, and sleep quality in university students. *Behav Med* 2002;28:33-38.
12. Jensen DR. Understanding sleep disorders in a college student population. *J Coll Counseling* 2003;6:25-34.
13. Voelker R. Stress, sleep loss, and substance abuse create potent recipe for college depression. *JAMA* 2004;291:2177-2179.
14. Teter CJ, McCabe SE, Cranford JA, Boyd CJ, Guthrie SK. Prevalence and motives for illicit use of prescription stimulants in an undergraduate student sample. *J Am Coll Health* 2005;53:253-262.
15. Teter CJ, McCabe Se, LaGrange K, Cranford JA, Boyd CJ. Illicit use of specific prescription stimulants among college students: prevalence, motives, and routes of administration. *Pharmacotherapy* 2006;26:1501-1510.
16. Smith S, Carrington M, Trinder J. Subjective and predicted sleepiness while driving in young adults. *Accid Anal Prev* 2005;37:1066-1073.
17. Mindell JA, Owens JA. *A Clinical Guide to Pediatric Sleep: Diagnosis and Management of Sleep Problems in Children and Adolescents*. 1st ed. Philadelphia; PA: Lippincott Williams & Wilkins; 2003.
18. Trockel MT, Barnes MD, Egget DL. Health-related variables and academic performance among first-year college students: implications for sleep and other behaviors. *J Am Coll Health* 2000;49:125-131.
19. Engle-Friedman M, Riela S, Golan R, et al. The effect of sleep loss on next day effort. *J Sleep Res* 2003;12:113-124.
20. Pilcher JJ, Walters AS. How sleep deprivation affects psychological variables related to college students' cognitive performance. *J Am Coll Health* 1997;46:121-126.
21. Smith C. Sleep states and memory processes in humans: procedural versus declarative memory systems. *Sleep Med Rev* 2001;5:491-506.
22. Smith C, Lapp L. Increases in number of REMS and REM density in humans following an intensive learning period. *Sleep* 1991;14:325-330.

23. Smith CT, Nixon MR, Nader RS. Posttraining increases in REM sleep intensity implicate REM sleep in memory processing and provide a biological marker of learning potential. *Learn Mem* 2004;11:714-719.
24. Suka M, Yoshida K, Sugimori H. Persistent insomnia is a predictor of hypertension in Japanese male workers. *J Occup Health*. 2003;45:344-350.
25. Mallon L, Broman JE, Hetta J. Sleep complaints predict coronary artery disease mortality in males: a 12-year follow-up study of a middle-aged Swedish population. *J Intern Med*. 2002;251:207-216.
26. Mallon L, Broman JE, Hetta J. High incidence of diabetes in men with sleep complaints or short sleep duration: a 12-year follow-up study of a middle-aged population. *Diabetes Care*. 2005;28:2762-2767.
27. Ford DE, Kamerow DB. Epidemiologic study of sleep disturbances and psychiatric disorders. an opportunity for prevention? *JAMA*. 1989;262:1479-1484.
28. Breslau N, Roth T, Rosenthal L, Andreski P. Sleep disturbance and psychiatric disorders: a longitudinal epidemiological study of young adults. **Biol Psychiatry**. 1996;39:411-418.
29. Agargun MY, Kara H, Solmaz M. Sleep disturbances and suicidal behavior in patients with major depression. *J Clin Psychiatry*. 1997;58:249-251
30. Stepanski EJ, Wyatt JK. Use of sleep hygiene in the treatment of insomnia. *Sleep Med Rev* 2003;7:215-225.
31. Morgenthaler T, Kramer M, Alessi C, et al. Practice parameters for the psychological and behavioral treatment of insomnia: an update. An American Academy of Sleep Medicine Report. *Sleep* 2006;29:1415-1419.
32. Edinger JD, Sampson WS. A primary care “friendly” cognitive behavioral insomnia therapy. *Sleep* 2003;26:177-182.
33. Ramakrishnan K, Scheid DC. Treatment options for insomnia. *Am Fam Physician* 2007;76:517-526.

**Table 1. Common Sleep Concerns Reported by College Students<sup>4,5</sup>**

- Difficulty falling asleep
- Difficulty staying asleep
- Disturbed night sleep
- Frequently waking up during the night
- Waking too early
- Morning tiredness
- General sleep difficulties
- Daytime napping

**Table 2. Consequences of Poor Sleep Quality**<sup>4,6,8,10,11,16,17</sup>

*Mental consequences*

Excessive daytime sleepiness

Diminished psychomotor and neurocognitive performance

Diminished academic performance

Mood changes

Increased risk of substance abuse (caffeine, nicotine, alcohol, marijuana)

*Physiological consequences*

Diminished immune system function

Altered endocrine, metabolic, and cardiovascular responses

**Table 3. Treatment Approaches to Students' Sleep Problems**<sup>1,12,30-33</sup>

*Nonclinical interventions*

- Education and behavioral techniques
  - Sleep hygiene program
- Regular exercise
- Light therapy

*Clinical interventions*

- Behavioral therapies
  - Stimulus control
  - Relaxation training
  - Sleep restriction therapy (paradoxical intention therapy)
- Cognitive therapy
- Combination cognitive-behavioral therapy
- Pharmacologic treatment of insomnia