

Sleep and Adolescents

Principals should be aware of the importance of adequate sleep and the consequences of sleep deprivation on students' mental health, behavior, and school functioning.

By Peg Dawson

First-period English class, 7:40 a.m. Most of the ninth-grade students stare glassy-eyed at their teacher. Two lay their heads on the desk. Another comes in late. One is absent but arrives during second period.

This scenario is all too common in secondary schools throughout the United States. In most cases, it is less the result of disinterested students or a boring teacher than the symptoms of chronic sleepiness. Lack of sleep is associated with academic and behavior problems, tardiness and absenteeism, reduced alertness, and heightened irritability. Sleep researchers suggest that between 15% and 30% of all children may have a sleep disturbance at some point during childhood (Kahn et al., 1989), and some estimates indicate that between 33% and 75% of all adolescents have sleep problems (Morrison, McGee, & Stantan, 1992; Strauch & Meier, 1988). To put this in perspective, the prevalence rate for attention deficit hyperactivity disorder (ADHD) is conservatively estimated to affect 3%–5% of children (Barkley, 1998) and the Childhood Asthma Foundation (2004) reports that up to 20% of children may have asthma.

Normal Sleep Patterns

Sleep is broadly classified into two types: rapid-eye-movement (REM) sleep and non-REM sleep (NREM). Cycling through all of the sleep stages for an adequate amount of time is essential to being fully rested. NREM sleep consists of four stages that range from drowsiness to deep sleep. In the early stages (I and II), individuals awake easily and may not even realize that they have been sleeping. In the deeper stages (III and IV), waking is difficult. When awakened, individuals in stages III and IV may feel disoriented and confused. In NREM sleep their muscles are more relaxed than when awake. Although the sleeper in stages III and IV is able to move, this doesn't happen because the brain is not sending signals to the muscles to move.

REM sleep refers to active sleep, which is when dreaming occurs. During REM sleep, the breath and heart rate become irregular, the eyes move rapidly back and forth under the eyelids, and body temperature is impaired so a sleeper does not sweat when hot or shiver when cold. Below the neck, however, the body is essentially paralyzed because the nerve

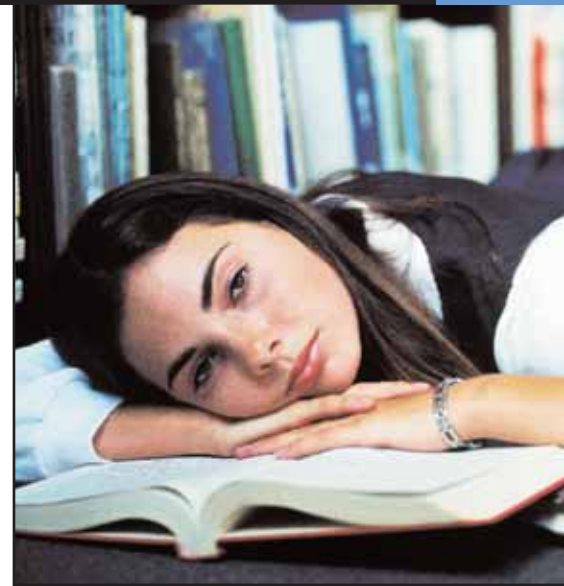
impulses to the muscles are blocked.

Both REM and NREM sleep states develop before birth. Sleep cycle patterns and the amount of sleep needed changes from infancy to childhood, but at the age of four, most children sleep 10 hours a night and cycle through sleep patterns much like those of adults.

Adolescent Sleep Patterns

Adolescent sleep patterns deserve particular attention because of their potential to affect school performance. Adolescents typically get significantly less sleep than younger children, not because they *need* less sleep but because their schedule and biorhythms impede adequate sleep. Researchers studying the optimal sleep periods of adolescents have found that under controlled conditions (e.g., with no clocks and lighting cues), adolescents typically sleep nine hours a night (Carskadon, 2002). Although research indicates that adolescents require at least as much sleep as they did as pre-teens, 8.5–9.25 hours per night, fewer than 15% of adolescents report that they sleep at least 8.5 hours on school nights and more than 25% report that they get less than 6.5 hours of sleep on school nights (National Sleep Foundation, 2000). Thus, a large number of adolescents are constantly coping with “sleep debt” during the school year.

STOCK PHOTO IMAGE



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With the onset of puberty, adolescents begin to experience a sleep-phase delay in their biological clock (i.e., circadian rhythms) and develop a natural tendency to fall asleep later in the evening and wake up later in the morning. Even adolescents who are sleep deprived tend to feel alert in the evening, making it more difficult for them to go to bed at a reasonable hour. Sleep is triggered by the release of melatonin, a natural body hormone. Toward dawn, melatonin shuts off as the hormone cortisol increases, signaling the individual to wake up. The pattern and timing of melatonin secretion makes it hard for adolescents to fall asleep and wake up at the times necessary to get enough restful sleep. Schools with start times before 8:30 a.m. place students at a disadvantage in terms of arousal and alertness, not only for early morning classes but also throughout the day because adolescents' biological rhythms are out of sync with typical school routines.

Disturbances and Disorders

In addition to "normal" sleep deprivation, sleep disorders can have serious consequences for children and adolescents. Although some sleep disturbances are mild, fairly common, and relatively easy to treat, others may be more stubborn or an indication of potential physical problems that could have long-term consequences if left untreated. Among adolescents, the most common sleep disorder is *delayed sleep-phase syndrome*, which affects an estimated 7% of the adolescent population. It can be difficult to diagnose because the symptoms can mimic the typical sleep patterns of adolescents. The person's sleep, or circadian, rhythm is interrupted, making it difficult to fall asleep at a reasonable hour (sleep onset may be delayed until 2:00 to 4:00 a.m.) and wake up in the morning. Treatment may include light therapy (exposure to bright light in the morning), chronotherapy (gradually

advancing the adolescent's sleep schedule one hour per night until a normal routine is achieved), a consistent sleep schedule, and a short-course of sedative medication to help achieve a new schedule. In some cases, it may be necessary to adjust an adolescent's school day to a later start.

Other sleep disorders, far less common in adolescents, include night terrors, sleep walking, nighttime bedwetting, sleep-onset anxiety, obstructive sleep apnea, and narcolepsy. If administrators become aware of students experiencing symptoms of sleep disturbance, a consultation with the school nurse is advised to determine the need for a medical evaluation to rule out sleep disorders.

Recognizing Sleep Disorders

Side effects associated with sleep disturbances or deprivation are likely to show up in school. In addition to excessive sleepiness, tardiness, and academic and behavior problems, symptoms often include inattention, irritability, hyperactivity, and impulse control problems. Therefore, it is important for educators to screen for sleep problems when concerns exist about a student's attention or behavior problems. In-school screening might take the form of a diagnostic interview with the student's parents that is conducted by the school psychologist or social worker. A diagnostic interview should include questions about student's normal sleep patterns (including bedtime routines, typical bedtime, and wake time on school days and weekends) questions about whether the child has trouble falling asleep or staying asleep, and questions about the frequency of nightmares. Sleep disorders are generally diagnosed by a pediatrician or a sleep specialist. Because not all pediatricians recognize the variety of sleep problems that children and adolescents experience, it may be helpful for school personnel to be prepared to refer parents to a sleep specialist or sleep clinic.

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CASE STUDY: A PARENT'S PERSPECTIVE

The first signs of trouble came when our son Josh began to fall asleep in class in the sixth grade. At the time, we chalked it up to a boring teacher. However, as events unfolded later, we probably should have been more concerned.

Although Josh's school had an early start time, he managed fairly successfully until early in the eighth grade when he began to complain about having trouble paying attention in class. An ADHD evaluation indicated attention problems, and Josh was placed on a trial of stimulant medication. However, we discovered no relationship between the stimulant and Josh's ratings of attention, and the medication was discontinued.

By ninth grade, Josh's grades and behavior became more erratic. Josh also began to have significant problems waking up in the morning. Although he tended to stay up late using his computer, when he went to bed at a reasonable hour he complained that he couldn't fall asleep. Our family physician suggested that Josh might be depressed, and we agreed to try an antidepressant medication. Unfortunately, after an encouraging start, the medication failed to help his mood.

Our next move was private school. Maybe Josh's dislike for school was the problem. We found a small boarding school that was more aligned with his interests in computers. In the beginning, Josh liked his teachers, enjoyed his classes, and joined an after-school group of computer networking techies. Although we gave him a clock with an extra-loud alarm, Josh still reported difficulty waking up in the morning, and it dawned on me that his sleep problem might be more than just a recalcitrant teenager challenging authority. By attending sleep workshops and reading, I learned about delayed sleep-phase syndrome, the symptoms of which I recognized immediately: can't fall asleep at night, can't wake up in the morning, tired all day except in the evening. I realized the problem was physiological and not a matter of will power.

I took Josh to a sleep specialist who asked a lot of questions, including questions about Josh's napping pattern. Josh could nap in the mid to late afternoon, but once evening came he could not fall asleep no matter how sleepy he felt. The sleep specialist described this as "the dead zone"—the time of day where the body is physiologically almost incapable of sleeping. Unfortunately, Josh's whole sleep schedule was phase-delayed and his dead zone lasted later into the night than it typically does for adolescents. Whereas the average teenager is ready to sleep at about 11:00 p.m., Josh couldn't fall asleep until 2:00 to 3:00 a.m. When he had to wake up for class at 7:00 a.m., he was in the deepest part of his sleep cycle. With a better understanding of the problem, we thought that we could finally find an effective way to treat the problem. Unfortunately, effective treatment was about as elusive as an accurate diagnosis.

There are a number of treatments for delayed sleep-phase syndrome, and we tried them all. We first tried chronotherapy. In this approach, Josh went to bed two hours later on consecutive nights with the goal of cycling through the 24-hour day until he reached a reasonable bedtime hour. We abandoned this approach after the fourth night when we realized we had effectively shifted his sleep schedule so that he stayed up all night and slept all day! Josh also tried the hormone melatonin, and although it helped him fall asleep more quickly, waking up was still difficult and he felt particularly groggy on days he took melatonin. We tried light therapy for a short time as well. Exposure to very bright lights early in the morning (the same lights used to treat Seasonal Affective Disorder) has been found to gradually shift the sleep phase earlier in the evening. Unfortunately, Josh found it very difficult to tolerate bright lights early in the morning.

After two more challenging years in boarding school (falling asleep in early classes or missing them all together), Josh returned to public school for his senior year. By that time, I knew school would be a disaster without modifications to his schedule. Armed with the sleep specialist's report, I met with the school's Section 504 coordinator. Josh did not need special education status, but I hoped for a delayed start time. I contacted the local community college and was able to patch together a program that had Josh attend high school from 10:00 a.m. to 1:00 p.m. and then take two computer courses at the community college at 5:00 p.m. In between, he worked at a local telecommunications company. The Section 504 coordinator and I had to overcome the resistance of Josh's guidance counselor, who was worried that Josh would accumulate insufficient "seat time" for graduation. In the end, we worked it out and Josh successfully completed his senior year.

The school's willingness to work with us to accommodate Josh's scheduling needs was crucial to his ability to persevere and succeed. Today, Josh is living in his own apartment and has a successful job with a computer security company. Although he still keeps late hours at night, the company he works for is flexible about the time he shows up at the office in the morning.

Editor's note: To protect the identity of the people mentioned in this case study, the author wishes to remain anonymous.

Behavior and Academic Performance

Whether it is the result of a sleep disorder or lifestyle patterns, sleep disruption can have a profound effect on school performance (Dahl, 1999). The most common consequences of insufficient sleep include the following:

- **Sleepiness.** This is most problematic during periods of low stimulation, such as passive or monotonous classroom instruction, reading, driving, or repetitive activities. Excessive sleepiness can cause brief mental lapses, called *micro-sleeps*, which impede concentration and retention and can be

dangerous when driving or operating equipment. Lack of sleep can cause conflicts with parents about getting up for school; lead to an increased use of such stimulants as caffeine or nicotine; and can have a synergistic effect with alcohol, increasing the impairment.

- **Tiredness.** This refers to the psychological effect of excessive sleepiness. Feeling tired makes it difficult for students to initiate and persist at certain types of behavior, especially tasks they view as boring or tedious. The effects are more pronounced for tasks that involve long-term or abstract goals or

consequences (e.g., completing a science fair project or working toward college admission).

- **Emotional changes.** The effect of excessive sleepiness on emotional states is highly variable across individuals and situations. It can include emotional lability, depressive symptoms, increased irritability, impatience, and low tolerance for frustration.
- **Changes in attention and executive functioning.** As indicated earlier, the symptoms associated with excessive sleepiness mimic attention problems such as ADHD, particularly with regard to the ability to perform complex tasks or tasks that require divided attention.

THE OUTCOMES OF EARLY SCHOOL START TIMES

A study of 17 school districts in the Minneapolis area looked at the effect of school start time on a wide set of variables, including student sleep patterns, academic achievement, student attendance, student behavior, instructional practices, after-school activities, athletics, and transportation. Findings from the study showed that schools with later start times benefited in the following ways:

- Students reported fewer depressive symptoms
- Absenteeism was reduced
- Students reported less difficulty staying awake in class and while taking tests, studying or doing homework, and working on a computer
- Fewer students reported that they fell asleep in class, arrived late to school because they overslept, and felt tired during the day
- Students reported getting significantly more sleep
- Students reported getting higher grades
- Start time did not appear to restrict participation in organized sports or other cocurricular activities
- 57% of teachers reported that a greater number of students were more alert during the first two periods of the day
- 51% of teachers reported that they saw fewer students sleeping at their desks
- The vast majority of staff members reported no negative effect from a later dismissal time
- Students reported going to bed no later as a result of the later start time and got about one additional hour of sleep each night
- In one school district, teachers reported that more students came in early to get extra help
- Teachers reported benefits for themselves, which included being able to prepare for class before school and being more alert and engaged for faculty meetings that were held before school rather than after school
- Teachers were evenly divided on whether they liked or disliked the change in start time, and only 3.5% wanted to return to the previous 7:15 a.m. start time
- 93% of parents indicated that they were pleased with the later start time for their high school-age children.

Source: Wahlstrom, K., Wrobel, G., & Kubow, P. (1998). *Minneapolis Public Schools start time study: Executive summary*. Minneapolis, MN: Center for Applied Research and Educational Improvement. Retrieved September 20, 2004, from <http://education.umn.edu/carei/reports/sst-1998es.pdf>

School Start Time

Improved understanding of adolescent sleep patterns has led some high schools to delay start times to better match students' sleep needs. Because research suggests that adolescents perform optimally with nine hours of sleep and that the typical adolescent does not feel tired enough to sleep before 11:00 p.m. (Carskadon, 1999), schools are experimenting with 8:30 a.m. or later start times. One study involving 17 school districts in the Minneapolis area looked at the effect of school start time on a wide set of variables, including student sleep patterns, academic achievement, student attendance, student behavior, instructional practices, after-school activities, athletics, and transportation (Wahlstrom, Wrobel, & Kubow, 1998). Although the study concluded that there were problems associated with making the transition to a later start time, the results after the first year were positive and promising (see "The Outcomes of Early School Start Times").

The Role of School Administrators

William Dement (1999), the world's leading authority on sleep and sleep disorders, writes, "After all the research I've done on sleep problems over the past four decades, my most significant find-

ing is that ignorance is the worst sleep disorder of them all.” School administrators can help address the effect of sleep problems with the following activities:

- Educating staff members, students, and parents about the importance of adequate sleep, the consequences of sleep deprivation, and the symptoms of sleep disorders
- Ensuring that staff members are aware of appropriate accommodations that might be necessary for students with chronic sleep problems
- Identifying appropriate community referral sources for families of students with significant sleep problems
- Integrating topics about sleep and the consequences of sleep deprivation into the health, biology, psychology, and drivers’ education curricula
- Examining the feasibility of modifying school schedules (start times) to better conform to adolescent sleep patterns, both for individual students and for the student body as a whole.

The actions and policies of school administrators can have a significant effect on the well-being of sleep-deprived students. Mitigating the effects of sleep problems has implications not only for school performance in the near term but also for students’ long-term health and quality of life. Given the pressures of the No Child Left Behind Act (NCLB) and the imperative to improve student outcomes, school administrators clearly need to better understand sleep and the effect of sleep deprivation on mental health and school functioning. **PL**

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