

Adolescent Sleep Update

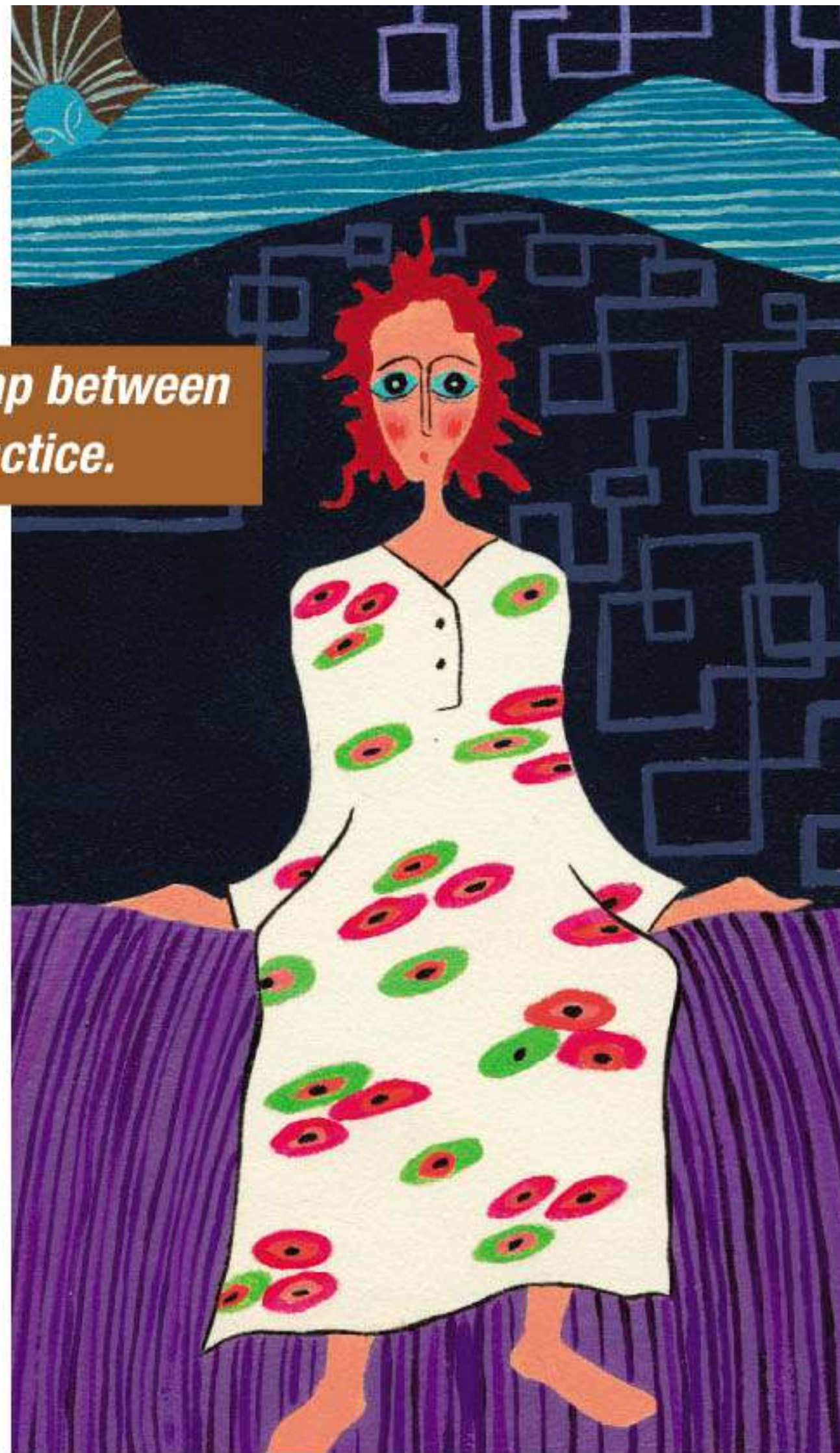
*Narrowing the gap between
research and practice.*

By Amy R. Wolfson, PhD

Over the last two decades, researchers have established an increasingly more nuanced understanding of adolescents' sleep demands, patterns, and underlying bioregulatory processes.^{1,2} Simultaneously, with regard to perceived sleep need, teachers, parents, and adolescents themselves have consistently indicated that teens get an inadequate amount of sleep. In response to these findings, researchers and sleep clinicians have begun to assess a range of countermeasures and interventional strategies aimed at improving teens' sleep and daytime functioning.

Laboratory and field studies indicate that the biological need for sleep (about 9 hours per night) does not change from ages 10 to 17 years. Indeed, older teenagers sleep more than younger teens when given the opportunity in a laboratory setting or on weekends, summers, and vacations.¹ Numerous studies across a variety of geographic and cultural settings point out, however, that middle school and high school adolescents in the "real world" typically obtain less sleep than younger, elementary school-aged children. Also, the timing of sleep gets later as children enter and pass through adolescence, a developmental period characterized by staying up later at night and sleeping in later in the morning. This delay of sleep in adolescents is most obvious on weekend nights, whereas on weekdays their sleep patterns are largely determined by school start-time schedules.³⁻⁵ Survey results consistently indicate that middle and high school students who start school at 7:15 AM or earlier obtain less total sleep on school nights due to earlier rise times in comparison to students at later starting schools.³⁻⁶ Imposition of early school start times for adolescents appears to require teenagers to have bedtimes that are impractical and/or infeasible, and, as a result, they have insufficient time for sleeping.

Furthermore, insufficient sleep has serious emotional, behavioral, and cognitive consequences for adolescents. Sleepiness-related crashes are most common in drivers aged 16 to 25 years, particularly for boys.⁷ Cognitive function and psychomotor skills are closely related to sleep, and laboratory studies have connected sleep loss to significant decreases in children's and adolescents' performance.⁸⁻¹⁰ Similarly, findings from a variety of studies that examined sleep and school performance indicate that shortened total sleep time, erratic sleep/wake schedules, late bed and rise times, and poor sleep quality are negatively associated with academic performance for adolescents from middle school through the college years.¹¹



SCHOOL START TIMES AND SLEEP

A number of school districts have responded to research reports regarding the prevalence of inadequate sleep among middle and high school students with a systematic countermeasure—delaying school start times. Other districts have and continue to debate the issue.

A decade ago, Wahlstrom and colleagues, whose chief area of expertise is educational policy, compared more than 18,000 high school students in the Minneapolis School District before and after the district's school start time changed from 7:15 AM in the 1996-97 school year to 8:40 AM beginning with the 1997-1998 school year.^{12,13} The researchers compared attendance, enrollment, grades obtained from official school records, and sleep patterns acquired from a self-report survey. They reported several statistically significant results:

1. Attendance rates for students in grades 9 through 11 improved;
2. The percentage of high school students continuously enrolled in the district or the same school also increased;
3. Grades showed a slight but not statistically significant improvement; and
4. The students reported bedtimes similar to students in schools that did not change start times, obtaining nearly a hour more sleep on school nights during the 1999-2000 school year.^{12,13}

Similar findings were reported for middle school students in an urban New England school district. Seventh and eighth graders at a later-starting middle school (8:37 AM) reported less tardiness, less daytime sleepiness, better academic per-

formance, more school-night total sleep, and later rise times in comparison to middle school students at an earlier starting school (7:15 AM).⁵

It is difficult to track just how many public school districts around the country have delayed the start of their middle and high schools in response to teenagers' sleep quantity and schedule needs. In a study titled "A Survey of Factors Influencing High School Start Times," Wolfson and Carskadon surveyed 345 public high school personnel regarding high school start times, factors influencing school start times, and decision-making around school schedules.¹⁴ Most schools had not changed—or even contemplated changing—their school start times. Of those schools in which changes were contemplated, 32% noted concerns about teenagers' sleep needs and about 50% of the respondents endorsed possible positive outcomes, such as lower tardiness and absenteeism rates. Perceived barriers to changing school schedules reported by this group included a schedule change's impact on sports practices, after-school activities, and the to-and-from-school transportation system.¹¹

ADVOCACY AND RESEARCH

Since the late 1990s, the independent nonprofit National Sleep Foundation (NSF) has tried to track school start-time changes as a part of its ongoing focus on educating the public about adolescents' sleep needs. Specifically, in 2000 it established the Sleep and Teens Task Force, which is made up of researchers and clinicians in the field. That same year, the task force published a report, *Adolescent Sleep Needs and Patterns*, documenting existing research about sleep-related issues affecting adolescents.¹⁵

More recently, as a way of advocating for sleep-friendly schools, NSF developed a tool kit to assist school professionals, parents, and teens in pushing for later school start times.¹⁶ The tool kit includes background information, advocacy strategies, school district case studies, sleep education materials, and sample school district resolutions. NSF has given out more than 1,500 tool kit CDs, reports Darrel Droblich, senior director of government and transportation affairs for the NSF. However, it has been unable to track the use and impact of the tool kit any further. Unfortunately,

there is no reporting mechanism through professional education organizations; however, according to informal NSF data, the foundation estimates that close to 80 US school districts have delayed the start of their high schools and more than 140 districts are contemplating a change.

The districts range from large, urban school districts, such as Denver and Minneapolis, to smaller, suburban districts or towns, such as Wilton, Conn, or West Des Moines, Iowa. The focus has been primarily on high schools, so it is difficult to estimate what percentage of these changes included middle schools. Moreover, a delay might be as short as 7:15 AM to 7:30 AM versus 8:00 AM to 9:00 AM. In addition, the 2006 NSF Sleep in America poll reported that, for most sixth to eighth graders, school starts at 8:00 AM or later (69%). However, a little more than half of the high school students reported that their classes start before 8:00 AM (52%).¹⁷ Clearly, a more formal, empirically based reporting mechanism is needed to evaluate and track school start-time changes and related sleep education recommendations.

THE NEXT GENERATION IN SENSOR TECHNOLOGY...



(Polyvinylidene fluoride)

- Reach AHI sooner
- Consistent Oral and Nasal airflow detection
- No cannula or transducer box required
- More accurate than air pressure transducer¹
- Compares with a pneumotach²
- Compares with an esophageal balloon³



PHONE 888-212-1100
FAX 763-781-4120
www.dymedix.com

¹ Todd Eiken, RPSGT- Sleep Review™ Sept. 2005
² Richard Berry, MD- CHEST Sept. 2005
³ William Orr, PhD- AP55 2003

PREVENTIVE MEASURES

Another important countermeasure or approach to the treatment of sleep problems due to inadequate and irregular sleep patterns in adolescents is to prevent their occurrence in the first place. Findings from five large-scale studies document that parent education may be the most economical and efficient strategy for treating and preventing behavior-related sleep problems in children.¹⁸⁻²⁰ In general, parent education programs have targeted bedtime routines, consistent sleep schedules, and parental involvement in sleep onset and night wakings. Future programs should consider targeting parents of older children and adolescents. For example, in a needs assessment of inner-city middle school-age children, young adolescents seemed receptive to involving their parents in helping them decrease television viewing close to bedtime and in assisting with bedtime routines.²¹

Previous research has demonstrated that identifying teachable moments is a high priority for preventive/intervention programs. Middle school is a key time for the development of both positive and negative health-related habits, such as food likes and dislikes, exercise behaviors, and drug experimentation.²²⁻²⁴ Preventive pediatric care, however, is unlikely as adolescents seldom see health care providers and report the lowest rates of outpatient visits.^{25,26} In contrast, most children and adolescents are in school, making it a natural setting for preventive/intervention programs.²⁷

In recent years, a handful of sleep education programs have been created for elementary school through college-age students. In Wolfson and Carskadon's first bell survey, approximately 50% of high school respondents noted that sleep is included in their district's high school health and/or biology course offerings.¹⁴ To date, however, the majority of curricula are didactic in format as opposed to intervention-oriented. Similarly, most of the programs have not been evaluated for effectiveness and other outcome variables. Cortesi and colleagues evaluated the effects of a 2-hour sleep educational program with a group of high school students in Italy.²⁸ Targeted students and a comparison group were evaluated on their knowledge immediately following the course and 3 months later. Both groups had poor baseline knowledge of

sleep, but the education group had an average 50% gain in percentage of correct answers after the course as well as a 3-month retention of information in comparison to the control group. Similarly, Brown and colleagues developed a sleep education program for first-year college-age students (Sleep Treatment and Education Program, STEPS) and found that students who participated in the program reported significantly improved

sleep quality and hygiene practices 6 weeks post-treatment.²⁹

Currently, Wolfson and colleagues are evaluating the efficacy and effectiveness of the Young Adolescent Sleep-Smart Pacesetter Program. This social learning-based approach focuses on changing behavior and/or preventing problematic sleep/wake behaviors for young teenagers. Preliminary findings suggest that this preventive/intervention



**View, Score, Interpret
Online... Anywhere™**

SleepEx SV™

Sleep Center Management Software

SleepEx SV streamlines the workflow of your sleep lab by providing multi-site patient & tech scheduling; remote access to view patient studies and records; secure transfer of sleep studies for remote scoring, reviewing and archiving; and immediate notification of sleep study status every step of the way.

- Efficient lab management – multi-site scheduling, remote access, digital signature capability
- Core management reports – scheduling, interpretations, referrals, scoring, and more
- Secure data transfer, storage, and archiving
- Scoring management tool & physician over-read management
- Optional DME module
- No need to purchase a fileserver. Your database and studies hosted on Pro-Tech's secure server

Come see us at FOCUS 2007, booth #106

For a software demonstration call
1-800-919-3900
or visit our website at
www.pro-tech.com

The
**Sleep
Center
Solution™**

PRO-TECH®
Celebrating 20 years
of Excellence

approach is effective in increasing total sleep time, developing more consistent sleep schedules, and increasing middle schoolers' confidence in their ability to get enough sleep and keep a healthy bedtime routine.^{30,31}

A few examples of other sleep education programs include:

1. At the elementary school level, the National Center on Sleep Disorders Research at the National Heart, Lung, and Blood Institute (NHLBI) initiated the Sleep Well. Do Well. Star Sleeper Campaign.³²

2. The NSF PJ Bear Sleep for Kids program.³³

3. At the young adolescent level, the National Space Biomedical Research Institute with Baylor College of

academic and social settings.³⁷

At the congressional level, US Congresswoman Zoe Lofgren (D-Calif) proposed the "Zzzzz's to A's" bill.³⁸ This legislation was to provide federal grants of up to \$25,000 to school districts to help cover the administrative costs of adjusting school start times. At the state level, the Connecticut legislature has considered a bill that would prohibit public schools from starting before 8:30 AM. Also at the state level, in January, in response to the concern that young drivers are at higher risk for sleep/fatigue-related crashes, Massachusetts signed into law the "Driver Education and Junior Operator's Licenses" bill.³⁹ It requires the formation of a special commission to study the impact of drowsy

(CSAP) network, the NSF has focused on children and adolescents.⁴⁰

The question remains as to whether adolescents (and the institutions they are connected to, such as family, school, etc) are getting the message. The good news is clearly that far more sleep resources are available to middle and high school students; however, serious concerns remain.

According to the NSF 2006 poll of about 1,600 adolescents and parents, the majority of US teenagers continue to get far less sleep than they need, have poor sleep hygiene (irregular sleep schedules, televisions in bedrooms, caffeine use, etc), and experience serious consequences, such as sleepy-driver accidents, school absenteeism, and diminished academic performance. At this juncture, then, what is needed? The following recommendations are certainly not exclusive, but they are crucial steps in improving the sleeping and waking lives of adolescents (as well as the adults in their lives).

1. Parents and other adults in teenagers' lives modeling adequate sleep habits.

2. Ongoing effort to delay the start of middle and high schools with an improved system for tracking changes.

3. More community-research partnerships that focus on adolescents' sleep needs.

4. Ongoing coverage of adolescent sleep research at professional meetings, both in the sleep field and in related disciplines (psychology, education, pediatrics, social work, etc).

5. Legislation on teen work hours, driver education/drowsy driving, and school start times.

6. Development and evaluation of preventive interventions and sleep education programs.

7. Increased federal and private funding for basic and applied research initiatives, as well as for education programs focused on child/adolescent sleep needs and related behavioral outcomes. **SR**

Amy R. Wolfson, PhD, is professor of psychology at College of the Holy Cross in Worcester, Mass, and the principal investigator of the Young Adolescent Sleep-Smart Pacesetter Program funded by the National Institute of Child Health and Human Development. She can be reached at sleepeditor@ascendmedia.com.

Imposition of early school start times for adolescents appears to require teenagers to have bedtimes that are impractical and/or infeasible, and, as a result, they have insufficient time for sleeping.

Medicine developed From Outerspace to Innerspace: Activities Guides for Teachers,³⁴ which addresses the body's biological clock and sleep.

4. For high school students, the NHLBI developed the Sleep, Sleep Disorders, and Biological Rhythms curriculum as a resource guide for teachers.³⁵

POLICY ADVANCES

At a national and state policy level, there have been a number of developments. Following the convening of a Working Group on Problem Sleepiness organized by the National Institutes of Health's National Center on Sleep Disorders Research and the Office of Prevention, Education, and Control, the NIH identified adolescents and young adults (ages 12-25) as a population at high risk for problem sleepiness based on "evidence that the prevalence of problem sleepiness is high and increasing in these groups, with particularly serious consequences."³⁶ More recently, in the National Institute of Mental Health's (NIMH) Blueprint for Change, NIMH discusses the serious emotional and behavioral health consequences of insufficient sleep among adolescents and strongly states how sleep deprivation, mood disturbance, impaired concentration, and reduced self-regulatory skills may lead to impaired functioning in

driving on highway safety and the effect of sleep deprivation on drivers.

MESSAGES IN THE MEDIA

Arguably, over the last decade, there has been a wealth of media coverage on teenagers' lack of sleep. Although it is difficult to quantify and evaluate, research on adolescents' sleep and the consequences of inadequate sleep has been covered in a wide range of venues. First, the topic has been documented in the popular media, including national and local newspapers, magazines, and television programs. Second, increasingly more education, health, and medical publications (professional and lay level) have outlined the issues. Third, numerous news, foundation, medical school, education, health, teen, and parenting Web sites and blogs discuss and promote adolescent sleep needs, cover the latest research, raise important questions, and make recommendations, largely based on empirical research.

Furthermore, the NSF is partnering with clinical and academic sleep centers throughout the United States and Canada (more than 800 to date) to combat sleep deprivation, fight sleep disorders, and educate the public about the importance of sleep. As a part of the Community Sleep Awareness Partner

References are available with the online version at www.sleepreviewmag.com.