

## Children's Sleep and School Psychology Practice

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Much contemporary research has demonstrated the multiple ways that sleep is important for child and adolescent development. This article reviews that research with an emphasis on how sleep parameters are related to school adjustment and achievement. Five areas of sleep research are reviewed to discern implications for practice with children using an evaluation rubric of strong, moderate, and weak evidence. The research has implications for assessment of sleep and sleepiness in the schools, for primary and secondary prevention activities, and for interventions by school psychologists targeting children and adolescents with sleep problems that affect their school functioning.

*Keywords:* sleep, sleep disorders, cognitive functioning, treatment, prevention

Considerable sleep research with children and adolescents has been conducted in the past 25 years, and much of that research has practice applications not only for children with sleep disorders, but also for those who have no demonstrable sleep disorders. Included are children and adolescents with academic and behavior problems who constitute the preponderance of school psychologists' caseloads. This research also has implications for the health, well-being, and academic performance of all children and adolescents in schools, even those with no known serious school problems.

The specific topics addressed in this review are:

1. Sleep and cognitive/academic performance,

2. Sleep problems and clinical disorders,
3. Sleep, stress, and health,
4. Changes in sleep with puberty onset, and
5. Empirically supported prevention and treatment.

Because space limitations preclude an exhaustive literature review, we selected citations for recency as well as scientific rigor. We rate evidence in each area as strong, moderate, or weak. The rating criteria are as follows:

Strong evidence (at least two studies that are experimental or use causal modeling methods; many correlational studies; strongest measures of variables; few or no contradictory results)

Moderate evidence (many correlational studies; good measures of variables; few or no contradictory results)

Weak evidence (a few correlational studies only, weaker measurement of variables; some contradictory results)

Prefatory to the review, it is necessary to describe how sleep is assessed and measured.

Self- and parent-report questionnaires that give a broad overview of a child's sleep patterns are used frequently by researchers and pediatric sleep practitioners. Most often used are the Pediatric Sleep Questionnaire (PSQ; Chervin, Hedger, Dilon, & Pituch, 2000), the Children's

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This work was supported by National Science Foundation grants 0339115 and 0623936 to JAB and ME and National Institute of Child Health & Human Development grant HD04792H8 to ARW.

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Sleep Habits Questionnaire (CSHQ; Owens, Spirito, & McGuinn, 2000), the School Sleep Habits Survey (SHS; Wolfson & Carskadon, 1998; Wolfson et al., 2003), the Sleep Disorders Inventory for Students (SDIS; Luginbuehl, 2003; the only normed instrument of the group), and the BEARS (Owens & Dalzell, 2005). Illustrative of the topics covered by all of the questionnaires, BEARS stands for *Bedtime Problems*, including problems going to bed and falling asleep; *Excessive Daytime Sleepiness*; *Awakenings during the night*; *Regularity of sleep/wake periods and average length of sleep*; and *Snoring*).

Actigraphy (activity monitoring) has been established as a valid and reliable method of assessing current sleep-wake patterns in children and adolescents; comparisons of actigraph measures with concurrent polysomnography (PSG) typically yield overall agreement rates in the range of 78% to 90%. An actigraph is a small device, similar in size and appearance to a wristwatch, which is worn on the arm or leg to measure frequency and intensity of movement. When actigraphy is paired with sleep diaries and questionnaires, an accurate picture of sleep duration and quality may be obtained in the home over an extended period of time (Acebo et al., 1999; Sadeh, Sharkey, & Carskadon, 1994).

PSG conducted in a hospital or clinic laboratory is considered the "gold standard" of sleep assessment. Using electroencephalography, electrocardiography, electromyography, oxygen saturation rates, and direct or videotaped observation, PSG is the only method whereby time in the four sleep stages can be assessed. Because PSG is so expensive and intrusive, it is used primarily with children suspected of having clinical sleep disorders. Limitations of PSG include (a) scheduling time in the laboratory based on the child and parent's reports of "usual" schedule which may or may not be representative, (b) whether sleep in a strange hospital setting is representative, and (c) relying on a single night's recordings for determination of problems.

### Sleep and Cognitive/Academic Performance

Researchers have investigated numerous parameters of sleep quantity and quality in relation to children's cognitive and academic perfor-

mance. Reviews of this literature (Curcio, Ferrara, & De Gennaro, 2006; Mitru, Millrood, & Mateika, 2002; Sadeh, 2007; Wolfson & Carskadon, 2003) indicate that shortened total sleep time, erratic sleep/wake schedules, late bedtimes and rise times, and poor sleep quality are associated with poorer school performance. School performance outcomes have included teacher ratings, grades, individual and group achievement tests, specialized tests of neurocognitive functioning, and comprehensive norm-referenced intelligence batteries. Studies that have focused on sleep/wake patterns and academic grades suggest that restricted sleep, erratic sleep schedules, sleeping-in on weekends, longer sleep latencies, and sleepiness contribute to poor school performance for a wide age range of children. The literature consists of more than 30 studies (e.g., Buckhalt, El-Sheikh, & Keller, 2007; Sadeh, Gruber, & Raviv, 2002; Wolfson & Carskadon, 1998), of which the majority have been cross-sectional using simple or multiple correlation. A few longitudinal studies have been done using path analysis or structural equation modeling (e.g., Buckhalt, El-Sheikh, Keller, & Ryan, in press). Of note, adding to the extensive correlational and experimental literature showing cognitive impairment associated with sleep deprivation in adults (Durmer & Dinges, 2005), a small number of experimental studies with children have been conducted with consistent findings of diminished cognitive performance after sleep is restricted by as little as one hour per night (Fallone, Acebo, Seifer, & Carskadon, 2005; Randazzo, Muehlbach, Schweitzer, & Walsh, 1998; Sadeh, Gruber, & Raviv, 2003).

Other researchers have approached the issue of sleep and school performance from a school schedule or circadian rhythm perspective. These studies compared sleep/wake patterns and academic performance for early- versus late-starting middle or high schools or for students who are more morning types versus those who function best in the afternoon/evening (eveningness). The studies suggest that self-reported eveningness, delayed sleep schedules, and early school start times are associated with daytime sleepiness, dozing in class, attention difficulties, and lower grades (Giannotti, Cortesi, Sebastiani, & Ottaviano, 2002; Hansen, Janssen, Schiff, Zee, & Dubocovich, 2005; Wolfson, Spaulding, Dandrow, & Baroni, 2007).

*Strong evidence of effects for daytime sleepiness, attention difficulties, and poorer academic performance (defined as teacher ratings, grades, individual and group achievement tests, and lower scores on specialized tests of neurocognitive functioning and comprehensive norm-referenced intelligence batteries) for children with no known clinical disorders.*

### Sleep Problems and Clinical Disorders

Much attention has been given to the sleep of children with clinically diagnosed conditions. First, there are children who have diagnosed sleep disorders. These disorders are classified in two diagnostic systems, the *International Classification of Sleep Disorders* (American Academy of Sleep Medicine, 2005), and the *Diagnostic and Statistical Manual (DSM-IV-TR)* (American Psychiatric Association, 2000). Descriptions of disorders are also found in articles written to guide practitioners in identification and treatment (Donaldson & Owens, 2006). In a plethora of studies (over 50 studies since 2000; Beebe, 2006), children with sleep disorders have been found to have problems in multiple cognitive, behavioral, emotional, and health domains, and these problems are related to academic performance and behavior (Beebe, 2006; Blunden & Beebe, 2006; Blunden, Lushington, Lorenzen, Martin, & Kennedy, 2005; Halbower & Mahone, 2006). While the majority of the studies are correlational, some research allows for causal inference. Children treated with tonsillectomy and adenoidectomy surgery have been shown to have better sleep and increased cognitive performance compared with untreated controls (e.g., Montgomery-Downs, Crabtree, & Gozal, 2005).

A second category of clinical conditions encompasses children whose primary diagnosis is not a sleep disorder, but another clinical condition. A substantial literature has documented sleep problems in children and adolescents with attention-deficit/hyperactivity disorder (ADHD; Cohen-Zion & Ancoli-Israel, 2004; Corkum, Tannock, & Moldofsky, 1998), and it is suspected that a sizable portion of children diagnosed with ADHD have undiagnosed sleep disorders. Problems with sleep have long been among the diagnostic indicators for depression, and sleep disorders, depression, and bipolar disorder have high comorbidity rates (Dahl et al.,

1996; Ivanenko, Crabtree, & Gozal, 2005). Similarly, sleep problems and anxiety commonly manifest together in childhood (Gregory & Eley, 2005).

Children with mental retardation, autism spectrum disorders, and other developmental disorders have been found to experience a high rate of sleep problems (Stores & Wiggs, 2001). For autism, estimates are that between 44% and 83% of cases report some type and degree of problem with sleep (Williams, Sears, & Allard, 2004). Similarly high rates, from 34% to 80%, have been reported for children with intellectual disabilities (Richdale, Francis, Gavidia-Payne, & Cotton, 2000). Children with epilepsy also have more sleep disorders than healthy children. (Cortesi, Giannotti, & Ottaviano, 1999).

*Strong evidence that children with sleep disorders have neurocognitive problems. Moderate evidence that children with ADHD, mental retardation, autism, anxiety, depression, and epilepsy have sleep problems that relate to school performance.*

### Sleep, Stress, and Health

Children who are experiencing recent and/or current stressors typically manifest sleep problems that may be transient, but may also become long-lasting. Sleep disturbance has been referred to as the "hallmark of posttraumatic stress disorder" (Ross, Ball, Sullivan, & Caroff, 1989), and research confirms that sleep problems are ubiquitous among abused children (Glod, Teicher, Hartman, & Harakal, 1997). Environmental stressors, such as those associated with wars, terrorist attacks, and natural disasters, precipitate sleep disturbance in children and adolescents (Lavie, 2001). Even stresses associated with normative levels of marital conflict and emotional insecurity have been related to sleep problems (El-Sheikh, Buckhalt, Cummings, & Keller, 2007; El-Sheikh, Buckhalt, Mize, & Acebo, 2006).

One of the most prevalent medical conditions affecting children is asthma, and rates have been increasing (McQuaid, Mitchell, & Esteban, 2006). Good breathing is necessary for quality sleep, and children with asthma have been shown to have problems falling asleep, difficulty staying asleep, and poor sleep quality. These problems in turn are related to fatigue,

difficulty in concentrating, and irritability (Desager, Nelen, Weyler, & De Backer, 2004).

Another serious health concern is overweight and obesity, for which rates in the United States are rising at an alarming rate (Jelalian, Wember, Bungeroth, & Birmhaer, 2007). These children have high rates of sleep problems (Redline et al., 1999), partly because of airway obstruction associated with higher body mass (Amin & Daniels, 2002). Obesity and asthma co-occur in many children (Lucas & Platt-Mills, 2006), and sleep problems may add to difficulties these children experience at school. Even though obesity affects children of all social classes, the highest rates occur among those with least income. Considerable evidence exists for the hypothesis that the adverse health impact of low socioeconomic status (SES) may be partly mediated by insufficient sleep duration and quality (Apollon, Sparling, Nadig, Marco, & Wolfson, 2008; Chervin et al., 2003; Gupta, Mueller, Chan, & Meininger, 2002).

Numerous studies report high rates of sleep disordered breathing and asthma in African American and low SES children (Redline et al., 1999; Rosen et al., 2003; Stepanski, Zayyad, Nigro, Lopata, & Basner, 1999). Poor children in densely populated urban areas are at greater risk because of high levels of air pollution associated with industrial, automobile and truck exhaust, allergens borne by cockroaches, mice, and rats, and the high stresses associated with urban living, all of which have been linked to asthma (Byrd & Joad, 2006).

Race and SES have been shown to moderate the relationship between poor sleep and compromised cognitive performance and school achievement (Buckhalt et al., 2007; Buckhalt, et al., in press; El-Sheikh et al., 2007). African American and European American children and those from lower and higher SES had similar scores on ability and achievement tests when they had good sleep quality and less variability in sleep, but when sleep was disrupted, lower SES and African American children had poorer performance.

*Strong evidence that lower academic performance of children under stress is related to sleep. Strong evidence that children with asthma have cognitive problems associated with sleep. Strong evidence that SES affects relations between sleep and academic perfor-*

*mance. Moderate evidence for poorer sleep in overweight and obese children.*

### Changes in Sleep With Puberty Onset

Numerous problems, including emotional dysregulation and poor school performance, have been associated with insufficient sleep in adolescence (Dahl & Lewin, 2002; Wolfson & Carskadon, 2003). Laboratory and field studies indicate that the biological need for sleep (about 9 hours/night) does not change from ages 10 to 17 (Carskadon & Acebo, 2002), but the timing of sleep changes; children enter and pass through adolescence as they stay up later in the evening and sleep later in the morning. This shift in sleep (phase delay) has a biological component linked to melatonin levels that peak later in the evening in comparison to younger children and adults. The delayed sleep pattern is most obvious on weekends, whereas sleep schedules are largely determined on weekdays by school start time schedules. As a result, when adolescents (middle and high school) need to rise earlier than their natural wake time to get ready for school, but need 8.5 to 9.5 hours of sleep, they often experience excessive daytime sleepiness. (Carskadon et al., 1998; Jenni, Achermann, & Carskadon, 2005; Taylor, Jenni, Acebo, & Carskadon, 2005).

Survey results consistently indicate that middle and high school students who start school at 7:15 a.m. or earlier get less sleep on school nights in comparison to students at later-starting schools (Wahlstrom, 1999; Wolfson et al., 2007). Many school districts have taken adolescent sleep phase delay into account and shifted to later high school start times. The National Sleep Foundation (2008) has published much on the school start time issue on their website, including case studies of school districts where start times have been changed in recent years.

*Strong evidence for changes in circadian rhythm in puberty.*

### Empirically Supported Treatment and Prevention

Bedtime resistance, night wakings, and trouble falling and/or returning to sleep are common sleep difficulties for young children, particularly infants, toddlers, and preschoolers. Yet



considerably less is known regarding elementary school-age children's sleep problems and disorders. In one study, 37% of a sample of 500 had at least one significant problem according to parent report. Children identified more difficulties than did their parents, particularly sleep-onset delay and night wakings (Owens, Spirito, McGuinn, & Nobile, 2000). Sleep problems first presenting in infancy may continue into the school years, negatively affect the child's daytime behavior, disrupt family functioning, and possibly become chronic (Mindell, Kuhn, Lewin, Meltzer, & Sadeh, 2006). Numerous intervention strategies have been tried for these problems, including behavior management, parent education, and medication. Clear evidence exists for the effectiveness of behavioral treatments for children of all ages (Mindell et al., 2006), including children with ADHD and other conditions (Cohen-Zion & Ancoli-Israel, 2004; Mullane & Corkum, 2006). Compared with pharmacological interventions, behavioral strategies tend to be more effective and more acceptable to parents, children, and clinicians (Mindell et al., 2006).

### *Treatment of Preschool and School-Age Children*

Following an extensive review, Mindell et al. (2006) concluded that extinction and parent education are effective for most problems with young children. Using empirical evidence from controlled group studies, they found strong support using Sackett (1996) criteria for evidence-based treatment. Graduated extinction, bedtime fading combined with positive routines, and scheduled awakenings were all effective strategies (Kuhn & Elliott, 2003; Ramchandani, Wiggs, Webb, & Stores, 2000). Extinction involves having parents put their child to bed at a set time and then ignoring (i.e., not attending to crying, tantrums, calling out to parents, etc.) the child until a set time the following morning (Ferber, 2006). A modified variation is extinction with parental presence where parent(s) remain in the child's room at bedtime, but ignore their bedtime resistant behaviors. Graduated extinction usually involves a variety of approaches that allow a child to develop "self-soothing" skills or the ability to fall and/or return to sleep on his or her own. Parents are instructed to ignore bedtime crying and com-

plaining for designated periods (Mindell, 2005; Reid, Walter, & O'Leary, 1999). Positive routines combined with bedtime fading help parents develop consistent bedtime routines and by delaying bedtime the child falls asleep easily and begins to associate bedtime cues, positive parent-child interactions and sleep onset.

### *Treatment of Adolescents*

Guidelines for treatment of sleep problems in adolescents have only recently become available (Millman et al., 2005) and there is need for more treatment outcome studies. Adult research has shown that cognitive-behavioral treatment (CBT) for insomnia is effective for 70% to 80% of adults, including young adults (Jacobs, Pace-Schott, Stickgold, & Otto, 2004; Morin et al., 2006) in comparison to pharmacotherapy. CBT strategies generally include targeting sleep hygiene, including the following: comfortable, dark, and quiet sleep environment; consistent bedtime and waking routines including weekends; avoiding excessive hunger but also large amounts food close to bedtime; passing up naps in the late afternoon and early evening; avoiding stimulating activities one hour before bedtime such as television, telephone conversations, computer activities, or exercising; and eliminating caffeine 4 to 6 hours before bedtime. Relaxation therapy helps slow racing thoughts and relaxes muscles so that a more restful, calm sleep is possible. Stimulus Control techniques help associate bed and bedtime with sleep as opposed to other activities (e.g., studying, talking on the phone, using a laptop computer).

CBT is effective with reducing sleep-onset latency and increasing sleep efficiency, but few studies have evaluated efficacy with adolescents, and those had small sample sizes and/or relied on a single-case design (Mindell, 2003). One exception is the study by Bootzin and Stevens (2005) who employed a six-session treatment program with 55 adolescents in a substance abuse program. Those who completed at least four sessions manifested improved sleep. Additional large-scale studies on the efficacy of these approaches for treating insomnia and related difficulties in adolescents would further advance the field.

Delayed Sleep Phase Syndrome (DSPS) is especially troublesome for many adolescents according to reviews of DSPS and other circa-

dian rhythm disorders (Garcia, Rosen, & Mahowald, 2001). DSPS is manifested by sleep onset times that are delayed several hours relative to conventional bedtimes (e.g., 3:00 a.m. rather than 11:00 p.m.). Conversely, the time to wake up drifts to correspondingly later times (e.g., 11:00 a.m. rather than 7:00 a.m.). Adolescents with DSPS typically complain of sleep-onset insomnia when attempting to go to bed at a "normal" time, and experience extreme difficulty arising at a desired "normal" wake time.

Intervention for DSPS or circadian rhythm disorders involves phototherapy and/or chronotherapy along with collaboration with the school for later arrival. Phototherapy involves increasing morning light (e.g., using a light box at 10,000 lux or natural sun light) and decreasing evening light (e.g., avoiding exposure to bright light close to bedtime). Chronotherapy involves progressive phase delay of bedtime and wake time until the circadian schedule is "normalized," typically over a week to 10 days.

### *Prevention Programs*

Clearly, one important approach to the treatment of sleep disturbances is to prevent their occurrence in young children as well as adolescents. Findings from five large-scale studies document that parent education/prevention may be the most economical and efficient strategy for young children (Mindell et al., 2006; Wolfson, Lacks, & Fatterman, 1992). Parent education programs have targeted bedtime routines, consistent sleep schedules, and parental involvement in sleep onset and night wakings. While most education programs target individual cases, a few general education programs have been created for children. Cortesi, Gianotti, Sebastiani, Bruni, and Ottaviano (2004) evaluated the effects of a 2-hour program with a large group of high school students. Targeted students and a comparison group were evaluated on their knowledge following the program and 3 months later. Both groups had poor baseline knowledge of sleep, but the education group had an average 50% greater gain in correct answers after the course as well as good long-term retention of information.

The *Sleep-Smart Pacesetter Program* (Rossi, Campbell, Vo, Marco, & Wolfson, 2002; Vo, LeChasseur, Wolfson, & Marco, 2003) is focused on changing behavior and/or preventing

problematic sleep/wake behaviors. It is based on a social learning model that emphasizes the following: informative instructions; participatory classroom activities (role playing, games); personal goal setting (sleep goal charts and diaries); feedback and reinforcement (relevant rewards and specific recommendations each session). Compared with controls, middle-school students who participated in the eight-session program increased sleep time and had more consistent sleep schedules across school nights and weekends. The program assumes a three-way dynamic interaction between personal factors (e.g., sleep need), environmental influences (e.g., bedroom/sleeping arrangements), and behavior (e.g., consumed caffeine or not). The following behavioral changes are promoted: (1) keeping consistent, regular bedtimes and rise times throughout the week; (2) a presleep routine to relax and create an environment conducive to quality sleep; (3) reduction of the amount of light exposed to close to bedtime, including light from televisions and computers, and increase in light at rise time to increase alertness (e.g., open shades/curtains); and (4) avoidance of caffeine. Although the prevention/education programs reviewed appear promising, much more research is needed to evaluate the effectiveness of such programs.

*Strong evidence for extinction in treating bedtime problems in young children. Strong evidence for preventive parent education with young children. Moderate evidence for cognitive behavior therapy with adolescents. Weak evidence for prevention programs with school-age children.*

### **Conclusions, Implications, and Recommendations for School Psychology Practice**

- More field-based research conducted in school settings is clearly needed. Much of the research has been conducted in pediatric clinics with children who have clinical disorders, and although much of it is easily translated into school practice implications, school-based research is likely to yield more direct benefits for school outcomes.

- School psychologists need to receive pre-service and continuing education in (a) how to recognize clinical sleep disorders, (b) recogniz-

ing sleep problems in children with disorders they deal with daily (e.g., ADHD), and recognizing the many instances of high-risk groups and conditions (e.g., asthma), (c) how to assess sleep, and (d) preventive education on sleep into the curriculum for all children.

- Practice guidelines for assessment and intervention need to be developed for school psychologists. These guidelines should be similar to existing guidelines for medical practice (e.g., Millman et al., 2005).

- In administering diagnostic tests to children referred for evaluation, school psychologists should determine whether children's sleep has been of sufficient length and quality to ensure optimal performance. In most cases, the child can be asked about typical sleep habits and sleep the previous few nights in particular, but completion of a sleep diary for a few days may be needed for some children. Although many test manuals and testing textbooks typically mention that children who are ill should not be tested, there is virtually no mention of sleepiness as factor to consider. The time of day when tests are administered should be considered as a factor that could affect performance. Some children are likely to be sleepy very early or very late in the day.

- When traumatic events occur at the local, regional, national, or international level, interventions designed to mitigate sleep problems should be incorporated into crisis management plans.

- School psychologists should contribute to discussions of school- and district-wide policies that affect students concerning sleep and sleepiness. Much study and discussion has been addressed to early bus route and school start times and how children are affected. Timing of high-stakes group testing is another important matter for which this knowledge base may be helpful in shaping policy.

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