Sleep and Behavior Problems in School-Aged Children

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ABSTRACT. *Objectives.* **The primary purposes of the present study were to survey the prevalence of sleep problems in school-aged children and to examine these associations with parental perception of sleep problems, medical history, and childhood psychopathology.**

Methods. **Sleep and medical history questionnaires and the Child Behavior Checklist were administered to the parents of 472 children between ages 4 and 12 years receiving routine pediatric care from urban, rural, and suburban pediatric practices.**

Results. **Although sleep problems were reported for 10.8% of the sample during the past 6 months, less than one half of the parents who identified sleep problems reported that they had discussed sleep with their child's pediatrician. The best predictor of current sleep problems was a history of sleep problems before age 2 years. Sleep problems such as snoring, tiredness during the day, and taking excessive time to fall asleep were very common, occurring at least 1 night per week in over 20% of the total sample. Factor analysis of the sleep problems questionnaire resulted in 5 sleep problem factors that accounted for 58.7% of the variance. Specific sleep problem factors include: parasomnias, enuresis/gags, tiredness, noisy sleep, and insomnia. Sleep problem factor scores were differentially associated with medical history variables and measures of childhood psychopathology. Children rated highly on parasomnias were more likely to have frequent falls and to display pica. Parasomnias and noisy sleep were inversely associated with socioeconomic status (SES). Children from lower SES families were rated higher on these factors than children from higher SES families. Enuresis/gags was the only sleep problem factor associated with age. Younger children scored higher on this factor. Duration of naps was highly correlated with age and with bed times during the week and weekends. As expected, younger children were more likely to nap for longer periods and to have earlier bed times. In addition, higher tiredness factor scores were associated with napping and with later bed times during the week and weekend. Boys were much more likely than were girls to have higher scores on enuresis/gags, and higher enuresis/gags scores were associated with an increased prevalence of trauma and falls. Bed times were not associated with any other sleep problem factor score. Children rated highly on tiredness were more likely to have a history of hospitalizations. Tiredness factor scores were strongly associated with the sleep practice of sharing a bed but not with sharing a room. Sharing a room was not associated with any sleep problem factor score. High scores on noisy sleep were associated with allergies, falls frequently, and with sharing a bed. Children with high scores on the insomnias were also more likely to display an increased prevalence of allergies.**

Conclusions. **Parental perception of global sleep problems was surprisingly common in school-aged children receiving routine pediatric care. Parental reports of their children's sleep problems may be a red flag for specific sleep problems and psychiatric, social, or medical problems. Sleep problems should be queried about during pediatric visits for school-aged children.** *Pediatrics* **2001;107(4). URL: http://www.pediatrics.org/cgi/content/full/107/4/e60;** ***sleep problems, insomnia, behavioral problems.***

ABBREVIATIONS. ADHD, attention-deficit/hyperactivity disorder; CBCL, Child Behavior Checklist; SES, socioeconomic status; NS, not significant.

Sleep problems are common across the lifespan, although the prevalence of particular kinds of problems may vary with age. For example, difficulties settling down or sleeping through the night are common in infants and toddlers, whereas preadolescent school-aged children are thought to have fewer such problems but display an increased incidence of parasomnias, such as sleepwalking, nightmares, bruxism, and enuresis.[1,2] Adolescents and adults develop more severe problems with insomnia and daytime sleepiness. In adults, it has been increasingly recognized that chronic sleep difficulties are associated with significant functional impairment and psychiatric illness. For example, most adult patients with psychiatric illness show polysomnographic evidence of disturbed sleep.[3] Surveys of community samples suggest that one third to one half of adults with insomnia have psychiatric disorders,[4,5] whereas over three quarters of patients seen in medical settings for sleep problems are diagnosed with psychiatric disorders.[6] Thus, in adults, sleep disturbance may be an important marker for the presence of psychiatric illness.

Much less is known about the clinical significance of sleep abnormalities in school-aged children. In contrast to adults, children seldom complain of poor sleep or seek treatment on their own. As noted by Horne,[7] "Often, sleep problems in children are not of

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the child but of the parents, who may have unwittingly created the problem in the first place, or worry unduly about a relatively minor matter that is inflated out of proportion, or transmit their anxieties to the child. . . . " There seems little doubt that sleep problems can be environmentally induced or influenced, especially by cramped and chaotic settings and inconsistent parenting. In other instances, children's sleep problems may be the result of or mask serious medical problems that can be treated successfully, such as untoward effects of medications, epilepsy, or sleep apnea.

In preschool-aged children, sleep problems have been correlated with childhood behavior problems.[8,9] Both subjective (parental) reports and objective (actigraphic) documentation of sleep disturbance in toddlers have been associated with temperamental variables.[10] In a study of healthy preadolescents, sleep problems were associated with an increased risk of learning and behavioral problems.[11] Parental reports of sleep problems have also been associated with several child psychiatric disorders, including attention-deficit/hyperactivity disorder (ADHD),[12–14] mental retardation,[15] and childhood depression.[16] However, polysomnographic evaluation of children and adolescents with depression has demonstrated fewer abnormalities than in adult depressives, but prolonged latency to sleep onset and reduced sleep efficiency in comparison to normal controls are characteristically observed.[3] Similarly, polysomnographic studies of sleep in hyperactive children indicate few abnormalities in sleep architecture,[17,18] despite parental reports of frequent sleep disturbance in children with ADHD.[19]

The goals of the present study were to survey the prevalence of sleep problems in a nonpsychiatric-referred population of preadolescent children (ages 4–12 years) and to determine whether sleep problems were associated with medical or psychiatric symptomatology. Preadolescent school-aged children were chosen for study because of the relative lack of data for this age group, the availability of reliable instruments to rate behavior, and the widely held beliefs that sleep is not particularly problematic and that daytime alertness is high in this age group. A pediatric rather than a psychiatric clinic sample was chosen to control for possible ascertainment biases related to referral for psychiatric problems.

METHODS

Sample

The reference population consisted of children between 4 and 12 years old who were receiving routine pediatric care. To obtain a geographically representative and ethnically and socioeconomically diverse sample, participants were recruited from a pediatric clinic located within an urban teaching hospital and from 3 pediatric practices located in suburban Illinois (Hoffman Estates and Flossmore, respectively) and a rural/suburban area (Merrillville, Indiana). All practices were staffed by board-certified pediatricians. Participants were entered over a 6-month period. The refusal rate was unknown.

Survey Method

Parents were requested to complete the questionnaires during pediatric outpatient visits while waiting for their child's appointment. Each questionnaire was accompanied by a cover letter describing the study and requesting participation.

Instruments

1. Sleep Behavior Questionnaire. This 25-item parent-completed questionnaire developed by the authors assesses sleep practices and behaviors. It yields information about the child's sleeping habits (ie, bed/waking time, daytime naps, sleeping arrangements); sleep problems (eg, difficulty falling asleep, frequent nighttime awakenings, bedwetting, etc); and behaviors (eg, snoring, talking in sleep, etc), rated according to the frequency of their occurrence (never, less than once a week, at least once a week, every night, and don't know). Before conducting the study, sleep questionnaires were pilot tested on child psychiatry outpatients.
2. Health and Family Information. This 2-page questionnaire includes demographic information on both parents and the child, as well as medical and developmental history information.
3. Child Behavior Checklist (CBCL).[20] The CBCL is a widely used instrument that assesses both broad (internalizing and externalizing) and narrow band (eg, attention problem, somatic complaints) factors or dimensions of childhood psychopathology. There are 113 items that are rated not, somewhat, or very true, which load on the various broad and narrow band factors.

The study protocol was approved by the institutional review board of the University of Chicago.

Data Analysis

The present study had a primarily descriptive focus in that it sought to investigate the prevalence of specific sleep problems and their association with medical history and psychological functioning. *P* values from χ^2 analyses describe the extent of association among sleep problems and health history and demographic variables.

To examine the factor structure of the 14 sleep problems surveyed on the sleep behavior questionnaire, exploratory factor analytic procedures, following the recommendations of Cattell,[21] were used. Principal factor analysis with squared multiple correlations as communality estimates were conducted using oblique (Oblimin) rotation criteria (*SPSS for Windows, Version 7.0*, SPSS, Chicago, IL). Because presumably sleep problem factors are interrelated and nonorthogonal, oblique rotation was conducted to enhance the interpretability of the factors. The number of factors to extract was determined based on examination of the scree plot and eigen values >1. Correlation, χ^2, and multiple regression analyses were used to examine the association among sleep, behavior problems, demographics, and medical history variables.

RESULTS

Study Population

Demographic and descriptive information on the sample is reported in Table 1. Sleep questionnaires were completed on 472 children (253 boys and 219 girls) between 4 and 12 years old. Although all Hollingshead socioeconomic status (SES) classes were represented,[22] 77% were middle SES or above (classes I, II, and III; Table 1). On the CBCL, the mean is 50 and a *T* score >70 is considered clinically significant.[20]

Prevalence of Global and Specific Sleep Problems

Global reports of sleep problems were defined as an affirmative response to the question, "During the past 6 months, has your child had sleep problems for 2 weeks or longer?" and were reported for 10.8% (n = 50) of the sample. Sleep problems were not associated with the demographic variables of SES (χ^2 = 1.16; not significant [NS]) or gender (χ^2 = 2.31; NS), or with sleep practices of sharing a room (χ^2 = 13; NS), or sharing a bed (χ^2 = 1.6; NS). However, parents of children with sleep problems were more

TABLE 1. Demographic and Descriptive Characteristics of Sample*

Ages (Years)	Mean (SD)			
	4–6 (n = 179)	7–10 (n = 221)	11–12 (n = 72)	Total Sample (n = 472)
CBCL externalizing	49 (10.7)	49.1 (11.2)	48.3 (11.5)	49 (11)
CBCL internalizing	48.2 (10.1)	51.3 (10.8)	50.9 (11.4)	50.1 (11)
CBCL total	97.2 (18.8)	100.3 (20)	99.1 (20.9)	98.9 (19.7)
SES (Hollingshead)	2.6 (1.3)	2.4 (1.2)	2.6 (1.2)	2.5 (1.2)
	Frequency			
SES				
I (high)	22% (40)	27% (59)	19% (14)	24% (113)
II	31% (55)	26% (58)	31% (22)	29% (135)
III	19% (34)	26% (58)	26% (19)	23% (111)
IV	13% (23)	5% (12)	15% (11)	10% (46)
V (low)	11% (20)	8% (18)	6% (4)	9% (42)
Missing	4% (7)	7% (16)	3% (2)	5% (25)

SD indicates standard deviation.
* T scores above 65 are usually considered significant.

likely to speak with their child's pediatrician about sleep (χ^2 = 16.8; $P < .001$). In the entire sample, however, only 20 parents reported discussing sleep with the pediatrician (8 from families with sleep problems and 12 from families without sleep problems).

The prevalence of specific types of sleep problems by age is reported in Table 2. As can be seen, problems such as snoring, tiredness during the day, and taking excessive time to fall asleep were very common, occurring at least 1 night per week in over 20% of the sample. It should be noted that for some sleep behaviors the prevalence was higher than for parents' global report of sleep problems. Head banging and sleep walking were less common, occurring at least 1 night per week in <5% of the sample.

Table 3 compares the results of the current study with previous sleep surveys of community samples not selected for presence of sleep problem.[11,23–27]

As can be seen, rates of sleep-specific problems such as daytime tiredness and difficulty falling asleep were slightly higher in the current study relative to previous studies.

Association Among Current Sleep Problems, Previous Sleep Problems, and Demographics

In the present study, sleep problems were reported to have been present in 17.2% of the sample before age 2 years, indicating that parents reported that their children had more sleep problems when their children were in the preschool age range. Children with current sleep problems were more likely to have displayed sleep problems at age 2 years (χ^2 = 26.16; $P < .001$). However, approximately two thirds of those with sleep problems at age 2 years were not rated as displaying current sleep problems. For some children, sleep problems were of recent onset because over one half (n = 27) of those with current sleep problems did not display sleep problems at age 2 years.

A stepwise logistic regression was performed to evaluate the relative contributions of sleep problems at age 2 years, SES, and gender to the prediction of current sleep problems. The results were highly significant (χ^2 = 23.5; $P < .0001$), resulting in 89.6% classified correctly. However, sleep problems before age 2 years was the only significant predictor. Thus, although the prevalence of sleep problems declines with age, parents of school-aged children continue to report sleep problems for a significant percentage of the sample, and previous sleep problems were the single best predictor of current sleep problems.

Sleep Problems and Medical History

The associations among parent perception of global sleep problems and 14 previous lifetime medical and developmental problems identified as the most common medical problems through the Heath and Family Information Questionnaire are reported in Table 4. As can be seen, global reports of sleep problems were associated with parental report of children's allergies, ear infection, and hearing problems.

Factor Analysis of Sleep Problems

Principle factor analysis of the 14 sleep items was conducted and resulted in a 5-factor solution that accounted for 58.7% of the variance. Factor loadings <0.35 were required for inclusion on that factor. The factor score structure matrix is reported in Table 5.

The first and largest factor, factor I, parasomnias, accounted for 25% of the variance. This factor is defined by items reflecting parasomnias, such as walking in sleep, nightmares, night terrors, and banging head or rocking in sleep. Snoring, talking in sleep, and waking in sleep had secondary loadings on this factor as well. Factor II, enuresis/gags, accounted for 9.5% of the variance and is defined by 2 items suggesting neurodevelopmental immaturity, enuresis, and choking. Banging head or rocking in sleep also loaded on this factor. Factor III, tiredness, accounted for 9.3% of the variance and was saturated with items reflecting increased need for sleep and snoring. Factor IV, noisy sleep, accounted for 7.6% of the variance and was saturated by items that produce noise, such as bruxism and talking in sleep. Factor V, insomnia, accounted for 7.1% of the vari-

TABLE 2. Prevalence of Specific Sleep Problems by Age Group (Percentage of Sample)*

Behavior	Don't Know/ Missing	Never	<1/Week	>1/Week	>7 Times/Week
Bangs head/rocks					
4–6 y old	4.0	88.8	2.2	2.8	2.2
7–10 y old	6.4	84.6	3.6	2.7	2.7
11–12 y old	5.6	81.9	4.2	4.2	4.2
Total sample	5.2	86.0	3.2	2.9	1.1
Falls asleep during the day					
4–6 y old	6.7	52.0	26.8	12.3	2.2
7–10 y old	5.4	65.2	20.8	7.2	1.4
11–12 y old	7.0	65.3	20.8	5.6	1.4
Total sample	6.1	60.0	23.0	8.9	1.7
Grinds teeth					
4–6 y old	10.1	62.6	11.2	10.6	5.6
7–10 y old	11.8	60.2	12.7	6.8	8.6
11–12 y old	8.4	68.1	13.9	4.2	5.6
Total sample	10.6	62.0	12.0	7.8	7.0
Gags or chokes					
4–6 y old	5.6	86.0	3.9	2.8	1.7
7–10 y old	6.8	87.3	2.7	0.9	2.3
11–12 y old	2.8	91.7	4.2	1.4	
Total sample	5.7	87.0	3.4	1.7	1.7
Nightmares					
4–6 y old	5.0	62.0	24.6	6.1	2.2
7–10 y old	7.2	56.6	28.1	6.3	1.8
11–12 y old	1.4	77.8	11.1	6.9	2.8
Total sample	5.5	62.0	24.0	6.4	2.1
Snores					
4–6 y old	4.5	55.3	17.3	10.6	12.3
7–10 y old	6.8	53.8	15.8	10.9	12.7
11–12 y old	5.6	56.9	19.4	11.1	6.9
Total sample	5.7	55.0	17.0	11.0	12.0
Takes >30 min to fall asleep					
4–6 y old	5.0	46.9	22.3	17.3	8.4
7–10 y old	6.4	44.8	27.6	13.1	8.1
11–12 y old	4.2	45.8	26.4	15.3	8.3
Total sample	5.5	46.0	25.0	15.0	8.3
Talks in sleep					
4–6 y old	5.0	57.5	20.1	15.1	2.2
7–10 y old	6.8	51.1	22.2	14.0	5.9
11–12 y old	4.2	52.8	18.1	18.1	6.9
Total sample	5.8	54.0	21.0	15.0	4.7
Tired during the day					
4–6 y old	5.6	45.8	27.9	17.9	2.8
7–10 y old	5.4	44.3	29.0	17.2	4.1
11–12 y old	5.6	47.2	27.8	12.5	6.9
Total sample	5.8	45.0	28.0	17.0	4.0
Too much energy to sleep					
4–6 y old	6.2	59.2	19.6	10.1	5.0
7–10 y old	7.2	62.9	13.6	10.4	5.9
11–12 y old	2.8	72.2	16.7	6.9	1.4
Total sample	6.2	63.0	16.0	9.7	4.9
Wakes frequently					
4–6 y old	2.2	55.3	21.8	15.6	5.0
7–10 y old	5.0	57.9	23.5	10.4	3.2
11–12 y old	4.2	61.1	20.8	9.7	4.2
Total sample	3.9	5.7	22.0	12.0	4.0
Wakes in terror					
4–6 y old	3.4	79.3	12.3	3.4	1.7
7–10 y old	6.3	78.3	9.0	4.1	2.3
11–12 y old	1.4	86.1	6.9	4.2	1.4
Total sample	4.4	80.0	10.0	3.8	1.9
Walks in sleep					
4–6 y old	10.1	82.1	5.0	2.8	
7–10 y old	10.9	77.8	9.0	1.8	0.5
11–12 y old	4.2	83.3	9.7	1.4	1.4
Total sample	9.5	80.0	7.6	2.1	0.4
Wets bed					
4–6 y old	5.0	70.4	14.0	6.7	3.9
7–10 y old	5.9	77.4	5.4	4.5	6.8
11–12 y old	2.8	88.9	4.2	2.8	1.4
Total sample	5.2	77.0	8.5	5.1	4.9

* Age groups: 4 to 6 years (n = 179), 7 to 10 years (n = 221), 11 to 12 years (n = 72).

TABLE 3. Prevalence of Sleep Behaviors During Previous 6 Months: Comparison With Previous Studies

Study	Current	Simonds and Parraga[26]	Kahn et al[11]	Fischer et al*[24]	Fischer et al*[24]	Blader et al[23]	Smedje et al[27]	Paavoner et al[25]
Year	2000	1982	1989	1989	1989	1997	1999	2000
Sample	Urban/ suburban	Rural community	Urban community	Urban/rural community	Urban/rural community	Urban community	Sweden, general population	Finland, general population
n	472	309	972	149 boys/ 120 girls	247	987	1844	6017
Age range (y)	4–12	5–17	8–10	6–8.5	8.5–11	5–12	5–7	8–9
Frequency of complaints	>Weekly	≥Weekly	Variable by symptom	≥6 times in 6 mo		≥Weekly	≥Weekly	Many nights or every night
Difficulties going to sleep	23.3		14	6.0/4.8	6.3/3.3	12.9	11.9	11.1
Wakes during night or restless sleep	16	27.6		14.8/15.0	7.9/9.0	6.0	20.8	7.1
Fatigue	21	4.9				17.8		
Daytime sleepiness	10.6	2.3					3.6	
Nightmares	8.5	1.7	15	3.4/2.7	1.4/5.0		3.0	5.4
Night terrors	5.7	1.3	15	2.0/0.9	1.9/1.0	0.8	1.0	0.8
Bruxism	14.8	7.5		5.4/12.4	4.7/4.0		9.6	
Snores	23	7.5					11.7	
Talks in sleep	19.7	12.7	7	11.4/8.8	8.9/10.1		7.6	
Sleepwalks	2.4	2.3	5	2.0/3.5	0.5/2.0	0.6	0.6	3.3
Enuresis	10	4.3	2	9.4/1.8	2.3/3.0	2.5	5.3	9.5
Bangs head/ rocks	4			2.7/0	2.3/2.5		1.5	

* Prevalences are given for boys and girls.

TABLE 4. Sleep Problems and Medical History Measures

Previous Lifetime Health History of . . .	During the Past 6 Months, Has Your Child Had Sleep Problems for 2 Weeks or Longer?		*P* Value
	No (Percent)	Yes (Percent)	
Allergy ($n = 116$)	22.3	48	.001
Asthma ($n = 61$)	12.4	20	NS
Colic ($n = 19$)	4.4	4	NS
Ear infections ($n = 82$)	16.2	30	.02
Frequent falls ($n = 32$)	6.1	14	.04
Head trauma ($n = 24$)	4.6	10	NS
Hearing problems ($n = 30$)	5.6	14	.02
Hospitalizations ($n = 90$)	19	22	NS
Pica ($n = 12$)	2	6	NS
Seizures ($n = 7$)	1.7	0	NS
Soiling ($n = 9$)	1.7	4	NS
Surgeries ($n = 72$)	15	18	NS
Trauma ($n = 50$)	10	15	NS
Vision problems ($n = 90$)	19	22	NS

ance and was defined by items reflecting difficulty falling asleep, frequent waking, and excess energy.

Association of Sleep Problem Factor Scores With Sleep Practices and Perceptions

Factor scores were generated for each child and were correlated with demographic variables and measures of sleep practices (see Table 6).

Parasomnias and noisy sleep were inversely associated with socioeconomic status. Children from lower SES families were rated higher on these factors than were children from higher SES families. Enuresis/gags was the only sleep problem factor inversely associated with age. Younger children scored higher on this factor. Duration of naps was highly correlated with age ($r = -0.22$; $P < .001$) and with bed times during the week ($r = 0.37$; $P < .01$) and weekends ($r = 0.39$; $P < .001$). As expected, younger children were more likely to nap for longer periods and to have earlier bed times. In addition, higher tiredness factor scores were associated with napping and with later bed times during the week ($r = 0.13$; $P < .02$) and weekend ($r = 0.10$; $P < .04$). Bed times were not associated with any other sleep problem factor score.

Sleep Problem Factors, Sleep Practices, and Medical History

To examine the relationship among severity of sleep problem factor and medical and developmental history variables, each sleep problem factor score

TABLE 5. Factor Structure Matrix: Total Sample of Pediatric Patients

Item	Factors				
	I	II	III	IV	V
I, parasomnias					
Wakes in terror	0.85	0.11	0.20	0.11	0.26
Complains of nightmares	0.77	0.21	0.08	0.21	0.30
Walks in sleep	0.46	0.12	0.20	0.42	0.08
Bangs head/rocks	0.43	0.40	0.13	0.32	0.13
II, enuresis/gags					
Wets bed	0.08	0.76	0.07	−0.06	0.09
Gags or chokes in sleep	0.19	0.71	0.21	0.31	0.02
III, tiredness					
Falls asleep during day	0.07	0.28	0.78	−0.04	0.27
Tired during the day	0.07	0.16	0.70	0.23	0.43
Snores	0.35	−0.09	0.62	0.33	−0.12
IV, noisy sleep					
Grinds teeth	0.05	0.18	0.12	0.83	0.24
Talks in sleep	0.45	0.00	0.26	0.62	0.25
V, insomnia					
Takes >30 min to fall asleep	0.22	−0.01	0.14	0.21	0.83
Too much energy to sleep	0.19	0.09	0.31	0.19	0.70
Wakes frequently	0.37	0.18	0.19	0.20	0.68
Eigen value	3.55	1.32	1.28	1.06	1.00
% total variance	25%	9.5%	9.3%	7.6%	7.1

TABLE 6. Correlations of Sleep Factor Scores With Demographics and Sleep Practices

Variable	Sleep Factor				
	I, Parasomnias	II, Enuresis/Gags	III, Tiredness	IV, Noisy Sleep	V, Insomnia
Age	0.02	−0.10*	−0.07	0.00	−0.06
SES	0.13*	0.04	0.14*	0.01	−0.03
Bed time during week	0.09	0.02	0.13*	0.01	0.08
Bed time during weekend	0.04	−0.02	0.10*	−0.04	0.02
Length of naps	−0.04	−0.13**	0.19**	−0.07	0.05

* $P < .05$; ** $P < .001$.

was stratified into high, medium, and low problem groups using the 0.33 and 0.66 percentile as cutoff scores. χ^2 analysis was used to examine the relationship among sleep problem factor scores and dichotomous medical history and demographic measures, parental global ratings of recent sleep problems, history before age 2 years of sleep problems, and whether sleep problems were discussed with the child's doctor.

Parental subjective global ratings of sleep problems were associated with higher sleep factor scores for insomnia ($\chi^2 = 41.7$; $P < .001$), parasomnias ($\chi^2 = 19.5$; $P < .001$), enuresis/gags ($\chi^2 = 8.89$; $P < .01$) and noisy sleep ($\chi^2 = 7.0$; $P < .05$), but not with tiredness ($\chi^2 = 0.64$; NS). Thus, with the exception of tiredness, global ratings were strongly associated with specific sleep problem factor scores.

Children who rated highly on parasomnias were more likely to have frequent falls ($\chi^2 = 11.2$; $P < .01$) and to display pica ($\chi^2 = 9.86$; $P < .01$). Children with high scores on this factor were more likely to be rated by their parents as displaying significant sleep problems during the past 6 months ($\chi^2 = 23.47$; $P < .001$). There was a trend for this group to speak to their child's pediatrician about sleep ($\chi^2 = 6.3$; $P < .05$), and these children were more likely to be taking medication ($\chi^2 = 6.18$; $P < .05$) than were children who rated low on this factor. In addition, children with high parasomnias scores were viewed as having an early history of early sleep problems with onset before age 2 years but were not more likely to share a room or bed than children with low scores ($\chi^2 = 9.16$; $P < .01$). There were no differences on any other medical or demographic variable.

Boys were much more likely than were girls to have higher scores on factor II, enuresis/gags ($\chi^2 = 7.2$; $P < .05$). Higher enuresis/gags scores were associated with an increased prevalence of trauma ($\chi^2 = 10.2$; $P < .01$) and falls ($\chi^2 = 7.42$; $P < .01$). Additionally, children with high scores on enuresis/gags were more likely to be perceived by their parents as displaying sleep problems over the previous 6 months ($\chi^2 = 9.90$; $P < .01$) than were those with low factor scores.

Children rated highly on factor III, tiredness, were more likely to have a history of hospitalizations ($\chi^2 = 10.02$; $P < .01$). Tiredness factor scores were strongly associated with the sleep practice of sharing a bed ($\chi^2 = 12.33$; $P < .01$), but not with sharing a room ($\chi^2 = 3.23$; NS). Sharing a room was not associated with any sleep problem factor score.

High scores on factor IV, noisy sleep, were associated with allergies ($\chi^2 = 9.47$; $P < .001$), falls frequently ($\chi^2 = 8.65$; $P < 01$), and with sharing a bed ($\chi^2 = 15.5$; $P < 01$).

Children with high scores on factor V, insomnia, were also more likely to display an increased prevalence of allergies ($\chi^2 = 11.81$; $P < .01$). In addition, these children were more likely to display an early

history of sleep problems before age 2 years (χ^2 = 14.5; $P < .001$).

Sleep Problems and Psychopathology

As portrayed in Table 7, sleep problems factor scores were highly correlated with CBCL internalizing and externalizing scores and with the majority of CBCL factor scores. Multivariate stepwise regression analyses for each of the sleep problem factors revealed that although each sleep problem factor score was predicted by CBCL scores, there was a differential pattern of CBCL scores for each factor (see Table 8).

The sleep problem factors parasomnias, tiredness, and insomnia were strongly predicted by CBCL factor scores with 17% to 22% of the variance in sleep problem factor scores accounted for by 3 CBCL scores. In contrast, enuresis/gags and noisy sleep were weakly associated with psychopathology, because only 4% and 6% of the variance was accounted for, respectively.

Over one fifth of the variance in parasomnias was accounted for by 3 CBCL factors: anxious/depressed, thought problems, and social problems. Factor III, tiredness, was predicted by social problems and somatic complaints. Thus, children who rated highly on physical symptoms and social difficulties were more prone toward tiredness and snoring. Nearly 20% of the variance in the insomnia factor was accounted for by 3 CBCL factors, anxious/depressed, attention problems, and somatic complaints. Thus, children with anxiety or attention symptoms had more difficulty getting to sleep and maintaining sleep.

Enuresis/gags was predicted by one CBCL factor, thought problems. Finally, noisy sleep was predicted by CBCL aggression, indicating that children rated as aggressive were more likely to be noisy sleepers.

DISCUSSION

The present study adds to our knowledge of parental perception of sleep problems in school-aged children and their association with psychopathology and medical history variables. Parental perception of global sleep problems was surprisingly common in school-aged children receiving routine pediatric care: nearly 11% of parents surveyed believed that their child had a sleep problem. Over one fifth of the sample reported specific sleep abnormalities at least weekly, including prolonged sleep latency, snoring, and tiredness during the day, suggesting that parental perceptions of specific sleep problems are even more prevalent than previously indicated. The obtained prevalence rates for specific sleep problems are somewhat higher than in previous studies conducted in rural areas or in Europe, especially for tiredness during the day and difficulty falling asleep. It is certainly possible that the prevalence of these sleep problems may have increased during the 7- to 14-year period since the publication of the earlier studies. Also, studies differ in sample characteristics, clinical thresholds, and duration criteria for defining a sleep problem. For example, Kahn et al[11] required sleep problems to persist for >6 months and to occur at least twice a week. Another study of US children of the same age required the problem to occur 3 times per night.[23] Different criteria between studies may explain some of the differences in prevalence. However, studies are consistent in suggesting some sleep problems in 30% to 50% of children in this age range. Moreover, the functional impairment of these sleep difficulties is further supported by the findings of Kahn et al (1989), who reported that >28% of the parents expressed a desire for counseling on sleep difficulties and 4% were relying on regular use of sedatives.

As suggested by Owens et al[28], both sociological factors (eg, over scheduling of children, television use, day care, family stress) and medical predisposing factors (eg, increases in asthma, upper respiratory infections, otitis media) may contribute to an increased rate of sleep deprivation, snoring, and other sleep problems in American school children. Sleep practices (such as room sharing or bed sharing) that are commonly practiced in the United States may further contribute to these difficulties. Certainly, more cross-cultural and epidemiologic studies are needed to determine whether differences among studies are the result of different measures of sleep problems, sampling techniques, cohort effects, or societal trends reflecting an increase in sleep problems and poor sleeping habits in today's youth.

Factor analysis of 14 sleep problems resulted in a 5-factor solution: parasomnias, enuresis/gags, tiredness, noisy sleep, and insomnia. For several of the sleep problem factors, these results are generally in keeping with a recent factor analysis of 9 sleep behaviors in ADHD children that resulted in a 3-fac-

TABLE 7. Correlation of Sleep Factor Scores With CBCL Factor Scores

Variable	Sleep Factors				
	I, Parasomnias	II, Enuresis/Gags	III, Tiredness	IV, Noisy Sleep	V, Insomnia
Externalizing	0.31**	0.17**	0.31**	0.27**	0.40**
Internalizing	0.37**	0.12*	0.35**	0.26**	0.40**
Withdrawn	0.37**	0.05	0.26**	0.21**	0.27**
Somatic complaints	0.22**	0.05	0.28**	0.16**	0.26**
Anxious/depressed	0.41**	0.12*	0.26**	0.21**	0.39**
Social problem	0.36**	0.10*	0.34**	0.19**	0.37**
Thought problems	0.40**	0.20**	0.23**	0.20**	0.31**
Attention problem	0.31**	0.16**	0.31**	0.21**	0.38**
Delinquent behavior	0.25**	0.23**	0.08	0.09	0.22**
Aggressive behavior	0.36**	0.19**	0.30**	0.26**	0.38**

* $P < .05$; ** $P < .001$.

TABLE 8. The Prediction of Sleep Problem Factor From CBCL Narrow Band Factors

Sleep Problem Factor	CBCL Factor	*F*	Significance Level	R^2 (Adjusted)
I, parasomnias	Anxious/depressed	76.2	0.001	0.17
	Thought	49.6	0.001	0.21
	Social	34.9	0.001	0.22
II, enuresis/gags	Thought	15.1	0.001	0.04
III, tiredness/snoring	Social	48.9	0.001	0.11
	Somatic	30.5	0.001	0.14
IV, noisy sleep	Aggressive	26.2	0.001	0.06
V, insomnia	Anxious/depressed	65.9	0.001	0.15
	Attention	43.0	0.001	0.18
	Somatic	30.2	0.001	0.19

tor solution: dyssomnias, sleep-related involuntary movements, and parasomnias.[12] However, unlike the current study, snoring and enuresis were not included in their analysis.

In the present study, snoring and tiredness emerged on the same factor. Snoring can contribute to daytime sleepiness and is associated with obstructive sleep apnea, often related to hypertrophy of tonsils and/or adenoids or obesity. When snoring is present, additional evaluation is needed to differentiate benign or primary snoring from obstructive sleep apnea. Once identified, treatment with nasal continuous positive airway pressure or surgical removal of the adenoids may improve daytime alertness.[29]

Additional evaluation is also needed for the child who takes excessive time to fall asleep, because this may be the result of a host of factors including insufficient limit setting, environmental events, psychological factors, such as anxiety or oppositional behavior, or related to acute or chronic medical disorders and treatments.

In contrast to the above is the younger child with high scores on enuresis/gags: this factor had the lowest associations with measures of psychopathology. Such children may be less likely to require additional psychological evaluation, unless these problems persist. This is consistent with previous research showing that the relationship between enuresis and psychopathology is highly influenced by ascertainment and referral biases and that the majority of children with enuresis do not display significant psychopathology.[30]

There are several limitations that should be considered in interpreting the results. With regard to our sample of primarily middle to upper middle class families receiving pediatric care, we attempted to increase diversity in the sample by surveying several different practices. However, the results may not be generalizable to individuals without health care providers or from lower SES or rural populations. Nonetheless, it is likely that the sample is representative of children seen in urban and suburban pediatric clinics. Unfortunately, we were not able to look at site differences within our sample or differences between those who responded and those who declined. It is unknown whether those who did not complete the questionnaires differed in important ways from those who elected to participate.

The second limitation is the reliance on parental report and the possibility of rater biases. Sleep problems, medical history, and child psychopathology were all evaluated based on the parent as the primary informant. The validity of parent-report measures of childhood sleep and medical history is uncertain, and traditional self-report measures of sleep have not correlated highly with objective measures.[31] Consequently, the present study is an examination of parental perceptions of sleep problems rather than sleep problems per se and subject to a host of rater biases.[10] Nonetheless, parent reports may be valid in the relative rather than in the absolute sense.[16] Future studies should examine the relationship among sleep, medical history, and psychopathology that are confirmed using independent sources of information, including medical records and polysomnographic measures of sleep.

The third limitation is the design of the study, which was correlational in nature. Such a design can lead to hypotheses about the relationship between sleep problems and psychopathology, but causality cannot be inferred. The association between sleep problems and psychopathology is complex, because sleep problems can be a cause, an effect, or a correlate of psychopathology.

The results are in keeping with a recent study by Lavigne et al[32] that demonstrated that preschool-aged children who slept less were more likely to display psychiatric disorders. Moreover, when a continuous measure of psychopathology, the CBCL was used, there was an association between CBCL scores and the amount of sleep obtained during the previous 24 hours.[32]

Studies in adults have suggested that sleep disturbance may be a risk factor for the development of depression.[5] Our results raise the possibility that the increasing prevalence of depression, ADHD, and other psychiatric disorders in children and adolescents could be at least in part attributable to sleep problems early in life. Additional studies will be needed to determine whether childhood sleep difficulties are causally related to the development of psychiatric or other medical illnesses.

CONCLUSION

This study highlights several important reasons why pediatricians should ask about sleep in preadolescent children. These include the frequent prevalence of sleep difficulties in this age range, the possibility of identifying treatable problems, such as

apnea or enuresis, and the fact that sleep problems are so strongly related to other psychological and medical problems. Inquiring about sleep problems may provide valuable information about behavioral (noncompliance), emotional (fears, depression), or medical problems (asthma, medication) that are co-occurring with reports of sleep problems. Inquiring about sleep may be an important keystone behavior that can provide insight into a variety of other behaviors, including those related to psychiatric and medical functioning. The fact that so few of the parents who reported sleep problems in their children discussed sleep with their pediatrician suggests that interviewing parents and children about sleep needs to be emphasized more during routine pediatric visits. Moreover, discussing sleep patterns provides an opportunity to learn more about the child and family, to evaluate environmental and family interaction, and to educate the parents about good sleep hygiene with the hope of preventing more serious or chronic sleep-related problems.

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