

# Television-viewing Habits and Sleep Disturbance in School Children

Judith Owens, MD, MPH\*; Rolanda Maxim, MD\*; Melissa McGuinn, BA‡; Chantelle Nobile, BA‡; Michael Msall, MD\*; and Anthony Alario, MD\*

**ABSTRACT.** *Objective.* To investigate the relationship between specific television-viewing habits and both sleep habits and sleep disturbances in school children.

*Methods.* The parents of 495 children in grades kindergarten through fourth grade in three public elementary schools completed two retrospective survey questionnaires, one assessing their children's sleep behaviors and the other examining television-viewing habits of both the child and the family. Sleep domains assessed included bedtime resistance, sleep onset delay, sleep duration, anxiety around sleep, parasomnias, night wakings, and daytime sleepiness. Teachers from all three schools also completed daytime sleepiness questionnaires ( $N = 402$ ) for the sample.

*Results.* Most of the television-viewing practices examined in this study were associated with at least one type of sleep disturbance. Despite overall close monitoring of television-viewing habits, one quarter of the parents reported the presence of a television set in the child's bedroom. The television-viewing habits associated most significantly with sleep disturbance were increased daily television viewing amounts and increased television viewing at bedtime, especially in the context of having a television set in the child's bedroom. The sleep domains that appeared to be affected most consistently by television were bedtime resistance, sleep onset delay, and anxiety around sleep, followed by shortened sleep duration. The parent's threshold for defining "problem sleep behavior" in their child was also important in determining the significance of the association between sleep disturbance and television-viewing habits.

*Conclusion.* Health care practitioners should be aware of the potential negative impact of television viewing at bedtime. Parents should be questioned about their children's television-viewing habits as part of general screening for sleep disturbances and as part of anticipatory guidance in regards to healthy sleep habits in children. In particular, the presence of a television set in the child's bedroom may be a relatively underrecognized, but important, contributor to sleep problems in school children. *Pediatrics* 1999;104(3). URL: <http://www.pediatrics.org/cgi/content/full/104/3/e27>; television, sleep.

From the Departments of \*Pediatrics\* and ‡Child and Family Psychiatry, Hasbro Children's Hospital and Brown University School of Medicine, Providence, Rhode Island.

An abstract of this study was presented at the Ambulatory Pediatrics Association Annual Meeting; May 4, 1998; New Orleans, LA.

Received for publication Oct 15, 1998; accepted Apr 8, 1999.

Reprint requests to (J.O.) Department of Pediatrics, Division of Pediatric Ambulatory Medicine, Rhode Island Hospital, 593 Eddy St, Providence, RI 02903. E-mail: owensleep@aol.com

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ABBREVIATIONS. CSHQ, Children's Sleep Habits Questionnaire; SES, socioeconomic status; TQ, Teacher's Daytime Sleepiness Questionnaire; CTVQ, Children's Television-Viewing Habits Questionnaire; PS, problem sleep(er).

Television is a powerful influence in the lives of most children.<sup>1,2</sup> On average, American children spend almost as much time per week watching television (~25 hours)<sup>3</sup> as they spend in school. Children's television-viewing habits have been reported to be associated with a variety of significant behavioral consequences, including obesity and poor eating habits,<sup>4</sup> decreased physical activity and physical fitness,<sup>5</sup> and impaired school performance.<sup>6</sup> An association between children's exposure to violent images on television and subsequent aggressive behavior also has been documented repeatedly in the literature.<sup>3,7</sup> Extended and frequent television viewing also has been shown to decrease the time and opportunity available for social interaction within the family.<sup>8</sup>

Clinical experience with both adults and children with sleep problems strongly implicates television-viewing habits as a potentially significant influence on sleep behavior. For example, a retrospective chart review of patients evaluated in our Pediatric Sleep Disorders Clinic revealed that television-viewing habits (such as falling asleep in front of the television) were mentioned specifically by parents as contributing to sleep problems in >25% of children diagnosed with behavioral sleep disorders, such as limit setting and sleep onset association sleep disorders. There are a number of theoretic ways in which television-viewing habits could have this impact on sleep. Television viewing may simply serve to displace sleep time, thus shortening sleep duration to unacceptable limits. The time spent by the child in television viewing may substitute for other less sedentary and/or less passive activities (like playing outside, engaging in sports activities), resulting in poor-quality sleep. The content of the television programs viewed, by virtue of excessively violent and/or stimulating themes, may result in difficulty falling asleep and/or night wakings related to anxiety. The presence of an independent factor, such as poor parental limit-setting, may account for both excessive television viewing and bedtime resistance. Finally, parental television-viewing habits and attitudes about television may impact significantly on both television-viewing habits and sleep in their children.

Despite both a clinical and a theoretic basis for an

association between television viewing and sleep disturbances in school children, few studies of risk factors for sleep problems have included any examination of television-viewing habits. Adult with insomnia have been found to engage in increased amounts of television viewing compared with normal sleepers.<sup>9</sup> In contrast, one retrospective pediatric study showed no correlation between increased amounts of television viewing and shortened sleep duration.<sup>10</sup> However, a 9-month prospective study showed that the introduction of television viewing into the lifestyle of children in India was associated with an increased incidence of sleep disturbances.<sup>6</sup>

The following study examines the relationship between television-viewing habits and sleep disturbances in a large group of elementary school children. The television-viewing habits hypothesized to impact on sleep included the amount, timing, and location of television viewing (especially late evening viewing and the presence of a television in the child's bedroom); the role of television in the family lifestyle; the content, especially in regard to violent themes, of television programs typically viewed; the extent and nature of parental restrictions on television viewing; and the use of television by the parent and child as a sleep aid. The types of sleep disturbances that were hypothesized to be most likely related to television-viewing habits included bedtime refusal, delayed sleep onset or difficulty settling, shortened sleep duration, and frequent night wakings, especially because of nightmares. Finally, we hypothesized that daytime sleepiness, as defined by parent and teacher observations of behaviors commonly associated with daytime somnolence in children, also would be affected by television viewing.

## METHODS

### Subjects

The study population consisted of 1099 students 4 through 10 years of age, enrolled in kindergarten through fourth grade in three public elementary schools in a predominantly white, middle-income, English-speaking suburban school district in southeastern New England. Forty-six teachers from the three schools also were surveyed about their students. Subjects from each of the three schools were surveyed separately during one of three periods during the school year (spring, fall, winter). Of the total of 1099 questionnaire packets mailed, 520 questionnaires were not returned; there were 54 refusals, and 10 subjects moved (response rate = 46.9%). A total of 20 children were excluded from the final sample because they had a history of significant psychiatric illness or were receiving medication with likely effects on sleep, such as psychostimulants, anticonvulsants, or antihistamines, leaving a final sample of 495. Mean age of the children was 91.44 months (SD  $\pm$  18.14 months), the age range was 58–132 months, and sample was 50.0% female. Hollingshead Socioeconomic Status (SES) Scores ranged from 18.5 (class 1) to 66 (class 5) (mean: 45.3  $\pm$  11.4; class 4). Teachers questionnaires were completed on 452 subjects, of whom 402 also had a completed Children's Sleep Habits Questionnaire (CSHQ) (mean age: 92.10 months [SD  $\pm$  18.10 months], with 49.3% being female).

### Measures

The questionnaires consisted of the following two measures of sleep-related behavior and one measure of television-viewing habits.

The CSHQ is a retrospective, 45-item parent questionnaire that has been used previously to examine sleep behavior in children.<sup>11</sup>

The CSHQ includes items relating to a number of key sleep domains: bedtime behavior and sleep onset, sleep duration, anxiety related to sleep, behavior during sleep, night wakings, morning waking, and daytime sleepiness. Parents are asked to recall events occurring over the past week or during a typical week, if the past week was unusual (eg, child had acute illness, television set malfunction, etc). Items are rated on a three-point scale ranging from "usually" if the sleep behavior occurred 5 to 7 times per week, to "sometimes" for 2 to 4 times per week, and "rarely" for 0–1 time per week. Some items were reversed to make higher scores uniformly indicative of more disturbed sleep. In addition, the parent also was asked to indicate whether a given sleep behavior represented a "problem," by circling "yes," "no" or "not applicable" after each item.

The Teacher's Daytime Sleepiness Questionnaire (TQ) is a 10-item, 1-week retrospective survey of students' daytime behaviors that are likely to be observed in the school setting in association with sleep disturbances (difficulty staying awake, yawning, complaining about sleep, etc). The scale originally was developed for use in our Pediatric Sleep Disorders Clinic. Items were selected, based on clinical experience and literature review, and then modified, based on pilot sampling in the clinic. Items are rated on a three-point scale, ranging from usually (every day) to sometimes (at least one time per week) to never or rarely (less than one time per week), with a higher score indicating more daytime sleepiness behavior.

The Children's Television-Viewing Habits Questionnaire (CTVQ) is a 23-item, retrospective survey developed for this project after an extensive review of television viewing questionnaires.<sup>12,13</sup> It includes items regarding amount and timing of television viewed on both weekends and weekdays; incorporation of television into the bedtime routine or use as a sleep aid; presence of a television in the child's bedroom; occurrence of frightening dreams with television-related content; child's preferences regarding television viewing versus other after-school activities and the roles that television plays in the child's lifestyle (entertainment, education, etc); parental use of television in their own bedtime routine; and parent's perception of television's effect on the child's sleep.

In addition to the CTVQ, parents also were asked to fill out a checklist of specific television programs viewed by the child on two separate weekdays. The television content was categorized using the newly revised TV Parental Guidelines that consists of six categories of programs grouped as follows: TV-Y (appropriate for all children); TV-Y7 (may frighten children younger than age 7); TV-G; TV-PG (moderate violence, no strong language, or infrequent coarse language or some suggestive sexual dialogue); TV-MA (graphic violence, explicit sexual activity or crude and indecent language); and TV-14 (contains material unsuitable for children younger than age 14). The six categories were scored on a scale of 0 to 3, with higher scores corresponding to increased violent or other adult content of the show. TV-Y and TV-G were scored 0, TV-Y7 and TV-PG were scored 1, TV-14 was scored 2, and TV-MA was scored 3. Each program viewed was assigned a score from 0 to 3, and individual scores were added to give a daily total. The television content score was expressed as a mean total score averaged over the 2 days.

### Procedures

A packet containing an informed consent form, a brief survey regarding parents' education and occupation and the child's current medical problems and concurrent medication, the CSHQ, and the CTVQ. The CTVQ was sent home with the student to be completed by the parent/guardian. A second mailing and reminder were sent to all parents that had not returned the questionnaire within 2 weeks of the initial mailing. We were unable to obtain detailed information on nonresponders because of school board requests for anonymity. Each teacher was contacted and asked to fill out a TQ on every student in the class. As an incentive, each participating school received financial support for educational software.

All statistical analyses, including appropriate parametric and nonparametric analyses for continuous and categorical variables, were conducted using the Statistical Program for Social Sciences (SPSS). All significance levels were set at  $P \leq .05$ .

## RESULTS

### Television viewing Characteristics

The frequencies of individual items on the CTVQ were tabulated to enable comparison between our sample and other study populations. The mean number of television sets per family was  $2.58 \pm 1.07$  (median: 2.); 11.4% of the families had four or more sets, 99.8% of the sample owned at least one VCR, and 76.6% subscribed to a cable service. The most common location for a television was the living room (97.6%); only 2.4% reported having a television in the family eating area. The mean amount of television viewed per weekday by the children was  $2.07 \pm 1.32$  hours, with 70.1% of the children watching  $\leq 2$  hours per weekday; 29.8%,  $\leq 1$  hour; and 5.8%,  $\geq 4$  hours per weekday. The mean daily amount of television viewing for sample children on weekends was  $2.85 \pm 1.54$  on Saturday, and  $2.58 \pm 1.52$  on Sunday. Average amount of television viewing was significantly higher in boys than in girls ( $\chi^2 = 5.67, P < .05$ ) and in families of lower SES ( $t = 3.62, P < .001$ ), but did not differ by the child's age. Sample parents watched on average  $2.09 \pm 1.47$  hours on weekdays and  $2.13 \pm 1.50$  and  $2.18 \pm 1.56$  hours on Saturday and Sunday; 64.9% of the sample parents watched  $\leq 2$  hours during the week. In terms of timing of television viewing, the most frequently reported periods in which children "usually" (5–7 times per week) watched television were after school (11.7%) and during the evening hours (13.3%), although 9.2% were reported to usually watch television immediately on waking in the morning.

Parents also were asked to indicate whether television viewing was a preferred after-school activity in the context of 11 possible activity choices. Television viewing was reported to be the first preference of only 5.2% of the children, although it was one of the top three choices for 34.6%, and ranked fifth overall in preference, after playing with friends, playing outdoors, doing homework, and reading. By comparison, reading was the first preferred activity for 3.2%, and one of the top three choices for 17.3%. There were no significant differences in age, gender, or SES on television after-school preference. Parents also reported overwhelmingly that their children watched television for entertainment (96.8%), with much lower percentages using television as a relief from boredom (32.4%), for educational purposes (19.5%), or as a reward (8.9%). Parents endorsed having rules regarding their children's television viewing: 93.3% had rules about the type of programs viewed, 61.6% about the amount of television, and 70.2% about timing of viewing; 47.8% required permission to turn on the television, and 34.5% enforced all four rules (3.7% reported no rules). Significantly more prohibitions about television viewing were reported for younger children ( $t = 2.11, P < .05$ ) and for families from higher SES groups ( $t = 2.56, P = .01$ ). In terms of the content of television programs viewed, the mean total score for the six television parental guideline categories was  $0.68 \pm 1.06$ ; the modal score was 0, with 45.2% of the sample receiving a score of 0 (viewed only TV-Y or TV-G pro-

grams). Only 3.0% of the sample received a total content score  $\geq 3$ .

### Television and Bedtime Behavior

In terms of specific bedtime-related television behaviors, 26.0% of the sample children and 67% of the parents had a television set in their bedroom; presence of a bedroom television in children was significantly associated with older age ( $t = -2.45, P < .01$ ) and lower SES ( $t = 5.48, P < .001$ ). Although only 2.6% of the parents reported that their child used or needed television as an aid to fall asleep (more commonly in boys) ( $\chi^2 = 5.22, P < .05$ ), 76.5% did report that television viewing was part of their child's usual bedtime routine. The practice of falling asleep in front of the television at least 2 nights a week occurred in 15.6% of the children; this was significantly more common in younger children ( $t = 2.72, P < .01$ ) and those from lower SES families ( $t = 2.91, P < .01$ ). In contrast, 67.0% of the parents reported needing or using a television to fall asleep themselves. Of parents, 19.9% reported that they frequently disagreed with their child about bedtime television, and 8.8% reported their child having weekly television-related nightmares. Overall, however, the majority of parents (89.9%) felt that television had little or no effect on their child's sleep. Only 6.5% reported a negative effect, with parents of older children more likely to report a negative television effect ( $P < .05$ ).

### Reduction of Television Variables

Based on preliminary analysis, including the frequency distribution of the individual items on the television questionnaire as well as the original hypotheses regarding the television-viewing habits most likely to influence or be associated with sleep disturbance, eight television variables were selected as the independent variables for additional analysis. These were 1) average amount of television watched per weekday (0–2 hours vs  $> 2$  hours), based on the group mean as well as on current recommendations for daily viewing amounts<sup>6</sup>; 2) television viewing as a preferred activity (no vs yes as first or second preferred activity); 3) child using television as a sleep aid (rarely/not at all vs sometimes/usually); 4) television viewing at bedtime score (average of three items; score  $\leq 1$  SD above the mean vs  $> 1$  SD); 5) presence of a television in the child's bedroom (no/yes); 6) number of rules regarding television viewing (0–1 vs 1 or more rules); 7) television violence content score, (score  $\leq 1$  SD above the mean vs  $> 1$  SD); and 8) parental overall rating of television effect on child's sleep (negative, no effect, or positive).

### Correlation of Television Items

Pearson's  $r$  and nonparametric correlations were calculated to assess the relationship among the various television variables. Television in the child's bedroom showed a modest positive correlation with increased hours of television viewing ( $r = .32, P < .001$ ). The strongest correlation among television variables was between television viewing at bedtime and use of television as a sleep aid ( $r = .52, P < .001$ ). Neither presence of a television in the child's and in

the parent's bedroom nor use of television as a sleep aid by parent or child was highly correlated, but the number of hours of television watched daily on weekdays and weekends by parent and child was correlated ( $r = .501$  and  $r = .67$ ,  $P < .001$ ).

### Reduction of Sleep Variables

For the purposes of this analyses, the CSHQ items were then grouped conceptually into eight subscales reflecting the following sleep domains: 1) bedtime resistance, 2) sleep onset delay, 3) sleep duration, 4) sleep anxiety, 5) night wakings, 6) parasomnias, 7) daytime sleepiness, and a total sleep disturbance scale that was composed of those subscales felt to reflect the most problematic sleep behaviors in school children (1–3 and 5). The subscales were assessed for internal consistency; Cronbach's  $\alpha$  coefficients, number of subscale items, mean scores, and SDs of the subscale scores are listed in Table 1. Higher subscale scores indicate more disturbed sleep.

Preliminary analysis suggests that the CSHQ and subscales have adequate validity and reliability. To assess test–retest reliability, 50 sample parents in this study completed a second CSHQ after an average interval of 2 weeks. The 2-week test–retest reliability as calculated by Pearson's correlations for all subscales was 0.62 and for the total sleep disturbance subscale was .96, with a range on the individual subscales from .52 (bedtime struggles) to .79 (sleep anxiety), all significant at  $P < .01$ . The validity of the measure has been supported both by comparison to concurrent measures of sleep/wake activity obtained using actigraphy<sup>11</sup> and by finding significant differences on all subscale scores between the normative population and a clinical, sleep-disordered group.<sup>14</sup>

To analyze children with the most disturbed sleep separately, problem sleepers (PS) (vs not problem) were defined as having a mean score on a given CSHQ subscale  $>1$  SD above the standardized mean. Percentages of the sample falling into the PS categories are also listed in Table 1. We also performed all subsequent analyses using a higher threshold for the

definition of PS as having a mean score on a given CSHQ subscale  $>2$  SD above the standardized mean. We obtained equivalent results on almost all television variables (Table 2). Therefore, because of the small number resulting from the  $>2$  SDs above the mean PS definition, all additional results are presented using the lower threshold ( $>1$  SD) definition to err on the side of maintaining integrity of the statistical analysis.

PS versus not PS subscale groups also were compared by  $t$  tests and  $\chi^2$  analyses on age, gender, and SES (Table 1). Significant age differences were found on the night wakings (PS children were younger:  $t = 1.92$ ,  $P = .05$ ) and daytime sleepiness (PS children were older:  $t = 2.10$ ,  $P < .05$ ) subscales. Boys had significantly higher daytime sleepiness scores than did girls ( $\chi^2 = 7.55$ ,  $P < .01$ ). None of the PS subscale scores differed significantly for SES.

Pearson's  $r$  correlations were calculated to assess the relationship among the sleep subscales. For the PS subscales, all significant between-subscale correlations at the  $P < .05$  level or better were low ( $r$  range: 0.10–0.28), the highest correlation being between bedtime resistance and night wakings.

A CSHQ Total Parent Problem score also was computed by assigning 1 point to each subscale item (of a possible 30 total subscale items) that a parent endorsed (answered yes) as a problem, and then by adding all the problem items to form a total score. (Two items on the daytime sleepiness subscale were not included because they did not ask whether the item was a problem.) The mean total problem score for the sample was  $0.89 \pm 2.38$ .

The TQ was also analyzed. Factor analysis of the TQ yielded a one-factor solution with seven items loading at  $\geq 0.60$ .  $\alpha$  Coefficient for this factor was .80. On the individual scale items, approximately one tenth of the sample was described by a teacher as having difficulty staying awake in the morning (9.1%) or in the afternoon (11.4%), or as complaining about their sleep (10.6%), although only 5% and 1.5%, respectively, were identified as disrupting school because of sleepiness or taking daytime naps.

**TABLE 1.** CSHQ, Sleep Subscale Characteristics\*

Subscale	No. of Items	Cronbach's $\alpha$	PS (% With Subscale Score $>1$ SD Above Mean)	Demographics (Associated With Increased PS Subscale Score)
Bedtime resistance	6	0.69	10.5	NS
Sleep onset delay	1	—	21	NS
Sleep duration	3	0.68	10.1	NS
Sleep anxiety	4	0.69	10.3	NS
Parasomnias	7	0.38	13.6	NS
Night wakings	3	0.53	12.6	↑ Younger**
Daytime sleepiness	9	0.56	18.0	↑ Older**
				↑ Boys***
Total sleep disturbance	13	0.75	8.0	NS
TQ	7	0.80	11.1	↓ SES***

\* Table includes number of items in subscales, Cronbach's  $\alpha$  percent of sample population with subscale scores  $>1$  SD above mean score for subscale PS children, and significant differences on subscale scores for age, gender, and SES.

\*\*  $P \leq .05$ .

\*\*  $P \leq .01$ .

\*\*\*  $P \leq .001$ .

NS indicates nonsignificant.

**TABLE 2.**  $\chi^2$  and ANOVA Comparison of TV Viewing Habits Variables and CSHQ Subscale Mean Scores, PS Children vs Nonproblem Children by Subscale Score 1 SD > Mean

Television Variables (Dichotomized)	PS Children Sleep Subscales—(1 SD > Mean)								
	Bedtime Resistance	Sleep Onset Delay	Sleep Duration	Sleep Anxiety	Night Wakings	Daytime Sleepiness	Parasomnias	Total Sleep Disturbance	TQ
Average weekday hours of television viewed (0-2 vs 2+)	$\chi^2 = 5.91^*$	$\chi^2 = 5.94^{**}$	NS	$\chi^2 = 6.20^*$	$\chi^2 = 14.06^{***}$	NS	NS	$\chi^2 = 4.61^{**}$	$\chi^2 = 3.52 (P = .06)$
Television as preferred activity (no/yes)	NS	NS	NS	NS	NS	NS	NS	NS	NS
Number of television rules (0-1 vs 2+)	$\chi^2 = 3.22 (P = .07)^{\dagger}$	NS	NS	NS	NS	NS	NS	NS	NS
Television in child's bedroom (no/yes)	$\chi^2 = 3.41 (P = .06)^{\dagger}$	$\chi^2 = 5.34^{**}$	$\chi^2 = 6.02^*$	NS	NS	NS	NS	$\chi^2 = 4.85^{**}$	NS
Use of television as sleep aid (no/yes)	$\chi^2 = 26.07^{***}$	$\chi^2 = 24.60^{***}$	$\chi^2 = 13.77^{***}$	$\chi^2 = 13.26^{***}$	NS	NS	NS	$\chi^2 = 25.93^{***}$	NS
Bedtime television viewing scale score ( $\leq 1$ SD vs $> 1$ SD above mean)	$\chi^2 = 11.97^{***}$	$\chi^2 = 15.03^{***}$	$\chi^2 = 9.12^*$	$\chi^2 = 6.74^*$	$\chi^2 = 5.42^{**}$	NS	NS	$\chi^2 = 11.06^{***}$	NS
Television effect on sleep (negative/neutral/positive)	$F = 5.86^{\ddagger}$	NS	NS	$F = 4.00^{**\S}$	NS	NS	$F = 7.25^{***\parallel}$	$F = 10.97^{***\P}$	NS
Violent content television ( $\leq 1$ SD vs $> 1$ SD above mean)	NS	NS	NS	NS	NS	NS	NS	NS	NS

\*  $P \leq .05$ .

\*\*  $P \leq .01$ .

\*\*\*  $P \leq .001$ .

$\dagger$  indicates trend, ( $.05 < P < .10$ ).

NS = non-significant.

$\ddagger$  All analyses were also performed for subscale scores 2 SD > mean. Results in **bold** were also significant for the 2 SD > mean subscale score definition of PS.

$\S$  Tukey's Post Hoc Analysis: Neg > Neutral,  $P < 0.01$ .

$\parallel$  Tukey's Post Hoc Analysis: Neg > Neutral,  $P = .01$ .

$\P$  Tukey's Post Hoc Analysis: Neg > Neutral,  $P < .001$ .

$\P$  Tukey's Post Hoc Analysis: Neg > Neutral,  $P < .001$ ; Neg > Positive,  $P < .01$ .

There was a significant but low correlation ( $r = .114$ ,  $P < .05$ ) between daytime sleepiness as assessed by the mean total TQ score and the daytime sleepiness subscale on the parent's CSHQ. There also was a significant but low correlation ( $r = .152$ ,  $P = .01$ ) between the mean total TQ scores and the total sleep disturbance subscale on the CSHQ.

### Television and Sleep Associations

To examine the association between the selected television-viewing habits (independent variable) and sleep disturbances (dependent variable), the television variables were dichotomized as noted above and  $\chi^2$  analysis was performed. Table 2 shows the  $\chi^2$  values for the dichotomized television variables and the CSHQ sleep subscales, using the 1 SD > mean definitions of PS scores. Results that differed between the 1 SD > mean and 2 SD > mean definitions of PS are indicated.

Because there were significant differences in age, gender, and SES among a number of both the television variables and the sleep scores, a logistic regression analysis was then performed, with television habits entered as the independent variables and the total sleep disturbance subscale scores and the bedtime resistance subscale scores as the dependent variables. The demographic variables of gender, age, and SES were entered first, followed by those television variables that had been associated most significantly with problematic total sleep disturbance subscale and bedtime resistance subscale scores. SES was dichotomized into a low SES group (mean Hollingshead score: 36.8; class 3) and a high SES group (mean: 55.4; class 5), with the group mean being significantly different at the  $P < .001$  level. However, because the number for the item indicating television as a sleep aide item was so small, this television variable was not included in the logistic regression analysis. The total sleep disturbance score was predicted by television in the child's bedroom ( $\beta = .73$ ,  $r = .14$ ,  $P = .02$ , OR = 2.7/1). On the bedtime resistance subscale, television in the child's bedroom ( $\beta = .89$ ,  $r = .13$ ,  $P = .02$ , OR = 2.4/1) and amount of television viewed per day ( $\beta = .77$ ,  $r = .09$ ,  $P = .05$ , OR = 2.2/1) were predictors of an increased bedtime resistance.

The means for the CSHQ total parent problem scores for each of the dichotomized television variables also were compared by  $t$  test (television preference,  $t = -1.13$ , NS) or ANOVA (television effect on sleep:  $F = 8.52$ ,  $P < .001$ ). If there were significant demographic variable differences between the two groups, an ANCOVA was performed. For four television variables, age and SES were covaried (number of television rules:  $F = .02$ , NS; violent content of television:  $F = .17$ , NS; television in child's bedroom:  $F = 15.85$ ,  $P < .001$ ; and bedtime television viewing:  $F = 13.64$ ,  $P < .001$ ); for one television variable, gender and SES were covaried (average weekday television hours viewed:  $F = 4.10$ ,  $P < .05$ ); and for one television variable, gender was covaried (use of television as sleep aid:  $F = 26.16$ ,  $P < .001$ ). Thus, there were significant SES differences between groups for five of the eight variables, in all cases with

the lower SES group having a higher total problem score. For the five television variables in which there was a significant difference between groups at the  $P < .05$  level, the mean total problem score was higher in the group with the more problematic television-viewing habits. Bedtime television viewing and amount of television viewed per day again emerged as the television variables most associated with problematic sleep.

### DISCUSSION

Most of the television-viewing practices hypothesized in this study to affect sleep adversely were found to be associated with at least one sleep disturbance. The television-viewing habits that were associated with the greatest number of sleep disturbances were bedtime television viewing, including the presence of a television in the child's bedroom and the child's use of television as a sleep aid, and amount of television viewed daily. A television in the child's bedroom also was the most powerful predictor of overall sleep disturbance and bedtime resistance in the logistic regression analysis, followed by the amount of television viewed per day. Increased amounts of television viewing were associated most significantly with difficulty getting to and staying asleep, probably at least partially related to the correlation between amount of television viewed and the presence of a television in the child's bedroom. The amount of television watched also was the only television variable with even a trend association with daytime sleepiness as defined by the TQ total score, suggesting that it has some impact on daytime functioning.

The number of rules regarding television viewing and the violent content of programs viewed appeared to have the least overall impact on sleep, possibly in part because there was little variability among these practices in the sample population. Television viewing as a preferred activity also appeared to have little overall impact on sleep, although the amount of television viewing was clearly associated with more problematic sleep. Finally, parental perception of television as having a positive, neutral, or negative effect on their child's sleep was associated with a variety of sleep disturbances. Post hoc analysis revealed that both negative and positive parental perceptions of television's effect on sleep, but not a neutral perspective, were associated with more problematic sleep.

The sleep domains that appeared to be most affected by television-viewing habits overall were bedtime resistance and sleep onset delay. Decreased sleep duration, possibly related to this increased bedtime resistance, was also impacted significantly by a number of television-viewing practices, particularly those that directly involved television viewing at bedtime. Parasomnias, as might be expected, were least affected by television habits overall, as was daytime sleepiness, although there was a trend association between daytime sleepiness-related behaviors as perceived by teachers and the amount of television viewed per day. The more sedentary lifestyle often associated with increased television view-

ing may have contributed both to the perception of sleepiness by teachers and to more problematic sleep.

It should be emphasized that this association between television-viewing habits and sleep disturbance emerged even in a sample population in which many of the reported television-viewing practices, such as average amount of television viewed per day, and television viewing during meals were of a modest proportion compared with reports from other studies,<sup>13,15,16</sup> and in which television viewing appeared to be overall closely monitored by parents. The amount of television viewed by children in the sample population was very close to the current American Academy of Pediatrics recommendations of no more than 2 hours per day,<sup>6</sup> although, as found in previous surveys, increased television viewing was associated with lower SES,<sup>1,13</sup> as were a number of other viewing practices in this population, such as rules regarding television viewing. That parents in this sample were also aware of the association between violent and provocative or disturbing television program content and negative effects on children's behavior<sup>6,7,17</sup> is suggested by the very low percentage of programs recorded on the television diaries that were considered even potentially inappropriate for young children.

The appreciation by many parents of the potentially negative effects of television also may have led to some so-called correct or socially desirable response bias on the part of those parents who participated in the study, ie, underreporting of amount and types of programs typically viewed and of their children's preference of television viewing relative to other activities. In addition, in this survey we were not able to address the possible discrepancy between amount of television specifically watched versus the amount of time a television is turned on, which also may have resulted in the parents' report being an underestimate of viewing time.<sup>18</sup> Although the impact of watching videos versus network and cable television programs was not separately addressed, all questions on the TVHQ pertaining to amounts of television viewed were purposefully called TV/VCR. Finally, in this study, we also did not ask specifically about time spent engaged in computer/video games, which possibly could have had an impact in terms of increased time spent in sedentary activities.

For reasons of confidentiality, we were not able to obtain information about the nonresponders in our sample. Because parents were aware of the purpose of the study, the so-called correct response bias also may have resulted in families who watch relatively less television being more likely to respond to the survey. This suggestion is supported by the low rates of television viewing reported in our sample. However, the fact that we were able to show an association between television-viewing practices and sleep disturbance even in this potentially low-risk population suggests that this association is a relatively robust one.

In comparison with findings from previous studies,<sup>1</sup> however, the presence of a television set in the

bedrooms of >25% of the sample children was high. Although most parents did not perceive that their child needed television to fall asleep, our results clearly indicate that television viewing at or around bedtime, including falling asleep in front of the television, is a common practice in many families. The correlations between increased amounts of television viewed by both parents and children and the presence of a television in the child's bedroom, and between bedtime viewing and use of television as a sleep aid, suggest that the practice of failing to turn off the television at bedtime as well as a more deliberate institution of bedtime viewing to aid sleep transition both may play a role in bedtime television habits.

The complex interaction found in this study among such factors as SES, the practice of television viewing at bedtime and in the bedroom, bedtime resistance, and ultimately inadequate sleep leading to daytime sleepiness and impaired daytime functioning suggests possible mechanisms by which television viewing may impact on sleep. It may be the case that in some families, there is a more predominant so-called TV culture, which includes increased television viewing by both parents and children, more television sets in the home (including in bedrooms), and a greater acceptance of television as part of the family's daily routine, including at bedtime. In the context of this heightened television culture, television viewing may have more of an indirect effect on sleep, for example, by encouraging children to spend more time in sedentary activities. In other families, television viewing at bedtime, and particularly having a television set in the child's bedroom, initially may be instituted deliberately by well-meaning parents as a response to bedtime struggles and/or prolonged sleep onset, especially for a child who tends to prefer television viewing to other activities. This attempt to ease the transition to sleep may provide a short-term solution, which then become entrenched once the child becomes dependent on the practice. This process may eventually lead to a vicious cycle, in which reliance on television as a transitional object leads to increased bedtime television viewing, which eventually results in even more delayed sleep onset and inadequate sleep duration. This may be an analogous situation to what has been proposed by some authors in regards to the practice of cosleeping as having fundamentally different long-term effects, depending on whether it is instituted as a cultural practice or as parental intervention for a sleep problem, such as night-waking.<sup>19</sup>

The cross-sectional nature of this study does not allow us to make any conclusive statements about possible cause and effect in the association between television viewing and sleep disturbance in children, and thus the proposed mechanism described above remains a speculative one. Future studies should address the development of this relationship in a longitudinal manner and include more objective measurement strategies for both television viewing and sleep disturbances such as actigraphy, as well as explore additional possible confounding factors, such as family stress<sup>20</sup> and parenting styles.<sup>21</sup>

## CONCLUSION

In summary, health care providers involved in the care of children and families, including mental health professionals, should be aware of the potential link between television viewing, especially the presence of a television in the child's bedroom, and sleep disturbances in school children. Recommendations regarding bedtime television viewing and television in the bedroom should be part of anticipatory guidance starting at the preschool level, and questions about bedtime television viewing should be included as part of routine behavioral screening. Because television-viewing habits may be a marker for sleep problems, discussion of bedtime television viewing with parents may uncover previously undetected sleep disturbances. In addition, this discussion can serve as an intervention point at which to introduce principles of sleep hygiene and the potential impact of inadequate sleep on the health, academic performance, and behavioral functioning of school children.

## ACKNOWLEDGMENT

This study was funded by a special projects grant from the Ambulatory Pediatrics Association.

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