



## Original Article

## Aggressive behavior, bullying, snoring, and sleepiness in schoolchildren ☆

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## ABSTRACT

**Background:** To assess whether urban schoolchildren with aggressive behavior are more likely than peers to have symptoms suggestive of sleep-disordered breathing.

**Methods:** Cross-sectional survey of sleep and behavior in schoolchildren. Validated screening assessments for conduct problems (Connor's rating scale), bullying behavior, and sleep-disordered breathing (pediatric sleep questionnaire) were completed by parents. Teachers completed Connor's teacher rating scale.

**Results:** Among 341 subjects (51% female), 110 (32%) were rated by a parent or teacher as having a conduct problem (T-score  $\geq 65$ ) and 78 (23%) had symptoms suggestive of sleep-disordered breathing. Children with conduct problems, bullying, or discipline referrals, in comparison to non-aggressive peers, more often had symptoms suggestive of sleep-disordered breathing (each  $p < 0.05$ ). Children with vs. without conduct problems were more likely to snore habitually ( $p < 0.5$ ). However, a sleepiness subscale alone, and not a snoring subscale, predicted conduct problems after accounting for age, gender, a measure of socioeconomic status, and stimulant use.

**Conclusions:** Urban schoolchildren with aggressive behaviors may have symptoms of sleep-disordered breathing with disproportionate frequency. Sleepiness may impair emotional regulation necessary to control aggression.

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## 1. Introduction

Aggressive behaviors are common among children and present a major challenge at schools. Conduct problems include destructive tendencies, quarreling, constant fighting, disobedience, and other related behaviors. Children who bully are often diagnosed with conduct disorder, affecting 2–9% of US children [1,2]. Societal concern about aggressive behaviors has risen exponentially, as reflected by new local, state, and national programs to address it [3–5]. The prevalence of such behavior among elementary schoolchildren is approximately 25% [6,7] and higher in boys [8]. Children who bully are at risk for later psychiatric symptoms, delinquency, substance abuse, antisocial behavior, violence, and criminal

activity [9,10], while childhood victims of bullying suffer impaired self-image, depression, and decreased quality of life [11]. Aggression, violence, and related problems are particular concerns in urban, low-income communities with a high representation of minority residents [12]. Causes of aggressive behaviors are heterogeneous and include well-studied social and cultural underpinnings. Strategies to address these challenges could be beneficial if understanding of their childhood antecedents could be improved.

One possible biological contributor to aggressive behaviors may be sleep-disordered breathing (SDB), a spectrum that includes habitual snoring at one end and obstructive sleep apnea at the other. Frank sleep apnea is estimated to affect 1–4% of young children [13] and is characterized by repeated partial or complete upper airway obstruction during sleep, disruption of normal ventilation, hypoxemia, and sleep fragmentation. Sleep-disordered breathing has shown a robust association with hyperactive and inattentive behavior in multiple studies [14–18] and an early clinical series reported high frequencies of aggressive behavior in children referred for SDB [19]. One cross-sectional study of 2–14-year-old children in general pediatric clinics found that even after

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adjustment for hyperactivity and stimulant use, children with SDB symptoms (e.g., habitual snoring), in comparison to others, were still more likely to be rated as bullies, constant fighters, quarrelsome, or cruel [20]. These observations are particularly important because childhood SDB, most often occult [21], can be readily diagnosed and treated. Furthermore, behavioral problems may improve substantially after SDB treatment, usually by adenotonsillectomy [22–25]. However, whereas several studies have focused on aggressive behavior in referred children with and without SDB, none have examined SDB risk in a broader group of school-aged children with and without aggressive behavior. The extent to which aggressive behaviors may be explained by generally occult SDB in elementary schoolchildren, especially in urban community settings, remains largely unstudied, and was therefore the main question in this cross-sectional survey.

## 2. Methods

This study was approved by the Institutional Review Board and the School Board. The city of Ypsilanti, in Southeast Michigan, comprises about 24,000 people, including large numbers of immigrants and minorities. Approximately 30% of children live below the poverty line (US Census 2000), 52% of students are male and 58% qualify for school lunch assistance. The racial distribution is 63% African American and 30% Caucasian [26]. In May 2006, parents of children in grades 2–5 of the Ypsilanti Public School System were mailed a letter describing the study; a consent form; and surveys about their child's sleep and behavior. On receipt of the completed surveys and written consent to obtain information from teachers, the latter were asked to complete a behavior rating scale for each subject. Families who participated received a \$20 gift card and teachers received a \$10 book token. The second and fifth grades were chosen for this study because second graders are at an age when adenotonsillar hypertrophy is typically prominent, fifth graders have had an additional 3 years to develop any consequences of SDB, and objective performance assessments were available for all students in these two grades.

### 2.1. Measures

The survey included demographic information (qualification for the school lunch assistance program was used as a proxy for socioeconomic status), followed by the sleep-related breathing disorder (SRBD) scale of the pediatric sleep questionnaire [27] and the 48-item Conners' parent rating scale [28]. Teachers completed the Conners' teacher rating scale [29] and items from the brief child social behavior rating scale [30], which includes a question about bullying, and were asked to provide the number of discipline referrals each child received.

### 2.2. Pediatric sleep questionnaire SRBD scale

The SRBD scale, validated in children aged 2–18 years, contains 22 items about snoring, sleepiness, and inattentive/hyperactive behaviors [27]. Responses are “yes” = 1, “no” = 0, or “don't know” (considered missing). The mean response on non-missing items is the total score. A threshold of 0.33, indicating that 33% of symptom-items are positive, is considered a positive screen for pediatric SDB [27]. Since its development, this scale has been used in a variety of research settings [21,31–36] and has been translated to other languages [37]. For the purposes of this study responses to the 6 behavioral items were not included in the scoring to avoid artificial associations with bullying behaviors. The question-item concerning habitual snoring (“Does your child snore more than half the time?”) was examined separately [20,38].

### 2.3. Four item snoring subscale

This subscale was scored as described above and comprised the following questions: while sleeping does your child (1) snore more than half the time? (2) Always snore? (3) Snore loudly? (4) Have “heavy” or loud breathing?

### 2.4. Four item sleepiness subscale

This is the only subjective pediatric measure validated against sleep laboratory tests for daytime sleepiness [34] and includes the following questions: does your child (1) wake up feeling un-refreshed in the morning? (2) Have a problem with sleepiness during the day? (3) Has a teacher or other supervisor commented that your child appears sleepy during the day? (4) Is it hard to wake your child up in the morning? Scoring was done as described above.

### 2.5. Conners' parent rating scale (CPRS)

This well-validated tool identifies behavioral problems in children aged 3–17 years [28]. Each question is rated from 0 to 3, where 0 = not true at all, 1 = just a little, 2 = pretty much, and 3 = very much. The short version yields six factors: conduct problem, learning problem, psychosomatic, impulsive-hyperactive, anxiety, and hyperactivity index, all with an age and gender-adjusted mean T-score of 50 and a standard deviation (SD) of 10. This CPRS version (1989) [28] was used specifically because of a question-item on bullying, which does not appear in a more recent version (2002) [39].

### 2.6. Conners' teacher rating scale (CTRS)

This tool has been validated in children aged 3–17 years [29]. Each of 28 items asks for a rating from 0 to 3, where 0 = not true at all, 1 = just a little, 2 = pretty much, and 3 = very much. It yields four factors: conduct problem, hyperactivity, inattentive-passive, hyperactivity index. All indices have a mean T-score of 50 and SD of 10.

### 2.7. Teacher rating of bullying behavior and discipline referrals

As the CTRS does not inquire directly about bullying, teachers were asked to complete the teacher's aggression rating subscale from the child social behavior rating scale [30]. One item asked whether each child “threatens or bullies other children”, with responses 1 = never, 2 = hardly true, 3 = sometimes true, 4 = usually true, and 5 = almost always true. Teachers were also asked how many discipline referrals each child received in the academic year just ending. These referrals are generally for disruptive behavior at school. Children were classified as having disruptive behavior if they had  $\geq 2$  discipline referrals.

### 2.8. Identification of children with behavioral problems

A conduct problem was considered present if the conduct problem domain on either the CPRS or the CTRS was  $\geq 1.5$  SD above the mean (T-score  $\geq 65$ ). Cut points of 2 or 1.5 SD are most commonly used; we chose 1.5 SD in this study to identify the maximum possible number of children whose behavior might be influenced in full or partial form by SDB. Similarly, bullying behavior was considered present if a parent endorsed the CPRS question-item, “bullies others”, with either “pretty much” or “very much”, or if a teacher endorsed the item “threatens or bullies other children”, with either “usually true” or “almost always” true.

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