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ARTICLE

Dyssomnias and Parasomnias in Early Childhood

Dominique Petit, PhD[a], Évelyne Touchette, MPs[a,b], Richard E. Tremblay, PhD[c], Michel Boivin, PhD[c,d], Jacques Montplaisir, MD, PhD[a,e]

[a]Sleep Disorders Center, Sacre-Cœur Hospital, Departments of [b]Psychology and [e]Psychiatry, and [c]Research Unit on Children's Psychosocial Maladjustment, University of Montreal, Montreal, Quebec, Canada; [d]Department of Psychology, Laval University, Quebec City, Quebec, Canada

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ABSTRACT

OBJECTIVES. Our aim for this study was to determine the prevalence of dyssomnias and various parasomnias in early childhood and to describe their temporal evolution, gender differences, and correlates.

METHODS. This research is part of a longitudinal study of child development. A randomized, 3-level, stratified survey design was used to study a representative sample of infants who were born in 1997–1998 in the province of Quebec (Canada). When the children were 2.5 years of age, 1997 families agreed to be interviewed. The presence of dyssomnias or parasomnias was obtained from a self-administered questionnaire that was completed by the mother at each round of measures.

RESULTS. The percentage of children with frequent night wakings decreased steadily from 36.3% at age 2.5 to 13.2% at age 6. Similarly, the percentage of children who had difficulty falling asleep at night decreased significantly from 16.0% at ages 3.5 and 4 to 10% at age 5 and to 7.4% at age 6. The overall prevalence of each parasomnia for the period studied was as follows: somnambulism, 14.5%; sleep terrors, 39.8%; somniloquy, 84.4%; enuresis, 25.0%; bruxism, 45.6%; and rhythmic movements, 9.2%. Persistent somnambulism at age 6 was significantly correlated with sleep terrors and somniloquy. Persistent sleep terrors at age 6 were also correlated with somniloquy. Finally, persistent sleep terrors at age 6 were correlated with frequent night wakings. Separation anxiety was associated with persistent night wakings and with somnambulism, bruxism, sleep terrors, and somniloquy.

CONCLUSIONS. There is a high prevalence of night wakings and sleep-onset difficulties in preschool children. Parasomnias are highly prevalent in early childhood and are associated with separation anxiety. However, they have little impact on sleep duration.

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Key Words
sleep, parasomnias, night wakings, sleep onset, gender differences, epidemiology

Abbreviation
SES—socioeconomic status

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Address correspondence to Jacques Montplaisir, MD, PhD, Sleep Disorders Center, Sacre-Cœur Hospital, 5400 Gouin Blvd W, Montreal, Quebec, Canada H4J 1C5. E-mail: jy.montplaisir@.umontreal.ca

DYSSOMNIAS REFER TO difficulties with sleep that, in children, consist mainly of 2 problems: frequent night wakings (≥1 awakening per night)[1] and difficulty in falling asleep (≥20–30 minutes).[1,2] Large-scale epidemiologic surveys have reported that between one quarter and one third of children between the ages of 6 months and 5 years have difficulties in going to bed, falling asleep, or sleeping through the night.[3–6] In toddlers, waking up during the night is strongly associated with parental behaviors surrounding the sleep period.[7] Do associations with other areas of the child's life emerge as the child gets older?

Children often experience 1 or a combination of parasomnias. The American Academy of Sleep Medicine defines parasomnias as "undesirable physical events or experiences that occur during entry into sleep, within sleep or during arousals from sleep."[8] Somnambulism and sleep terrors are classified as disorders of arousal. Somnambulism is defined as "a series of complex behaviors that are usually initiated during arousals from slow-wave sleep and culminate in walking around with an altered state of consciousness," whereas sleep terrors are "arousals from slow-wave sleep accompanied by a cry or piercing scream and autonomic nervous system and behavioral manifestations of intense fear." Somniloquy is defined as talking during sleep "with varying degrees of comprehensibility." It can arise from both slow-wave sleep and rapid-eye-movement sleep. Sleep-related rhythmic-movement disorder "is characterized by repetitive, stereotyped, and rhythmic motor behaviors that occur predominantly at sleep onset and involve large muscle groups"; it includes body-rocking, head-rolling, and head-banging. Sleep enuresis "is characterized by recurrent involuntary voiding that occurs during sleep. In sleep enuresis, recurrent involuntary voiding occurs at least twice a week during sleep after 5 years of age." Sleep-related bruxism "is an oral activity characterized by grinding or clenching teeth during sleep, usually associated with sleep arousals."

Parasomnias are considered benign phenomena, especially in children, and do not usually have a serious impact on sleep quality or quantity. However, in more severe cases, they can result in injuries and sleep disruption or can be very disturbing for either the child or the family. Most studies on childhood parasomnias have been done in a retrospective manner (eg, adults were asked whether they had experienced parasomnias as children and, if so, at what age). One study[9] that was conducted in our laboratory established the prevalence and evolution of parasomnias in children from ages 10 to 13 with retrospective questions asked to the mother for the period between ages 3 and 10. Prospective studies on parasomnias are lacking in early childhood, an important period for understanding the emergence and the development of these events.

The aims of the present study were to (1) determine the prevalence of dyssomnias and of various parasomnias (somnambulism, somniloquy, sleep terrors, enuresis, bruxism, and rhythmic movements) from 2.5 to 6 years of age, (2) describe their temporal evolution (disappearance versus new cases), (3) assess gender differences, (4) examine associations between various parasomnias and dyssomnias, and (5) study associations between dyssomnias and parasomnias and other areas of the child's life.

METHODS

This research is part of a large longitudinal study entitled Quebec Longitudinal Study of Child Development conducted by the Quebec Institute of Statistics (Canada).[10] Infants were recruited from the Quebec Master Birth Registry of the Ministry of Health and Social Services. A randomized, 3-level, stratified survey design was used to study a representative sample of infants who were born in 1997–1998 in the province of Quebec. The 3 levels were (1) geographic regions of Quebec, (2) each region subdivided in areas that were representative of the number of births in the region, and (3) number of children selected per area proportional to the number of births and to the gender ratio of this area. Families who lived in the northern part of the province of Quebec, Inuit territories, and First Nations reserves were excluded for technical reasons. Also, children with important medical problems were excluded from this cohort.

Sample Description

Of the 2940 children who were first selected, 265 were excluded, leaving 2675 who were invited to participate. Of these, 452 families refused to participate. Therefore, a total of 2223 children who were born in 1997–1998 and aged ~5 months were included in this longitudinal study. At the second round, 2045 children who were aged ~17 months were studied. Finally—and this is the purpose of this article—1997 families agreed to be reinterviewed when the children were 29 months (nearly 2.5 years of age), 1950 children were studied again at the age of 41 months (~3.5 years of age), 1944 children were studied again at the age of ~4 years, 1759 children were studied again at ~5 years of age, and 1492 children were studied again at ~6 years of age. Table 1 presents the number of children who were studied in each year of

TABLE 1 **Description of the Longitudinal Sample**

Age, y	Boys, *n* (%)	Girls, *n* (%)	Dropouts	Total No. of Children
2.5	1006 (50.4)	991 (49.6)	NA	1997
3.5	979 (50.2)	971 (49.8)	27	1950
4	977 (50.3)	967 (49.7)	6	1944
5	875 (49.7)	884 (50.3)	185	1759
6	734 (49.2)	758 (50.8)	267	1492

NA indicates not applicable.

the study, the number and the proportion of boys and girls, and the number of dropouts from the previous year.

In the initial cohort, most (84.5%) children had a Canadian nonimmigrant mother; 15.5% were first-generation immigrants. The majority of the sample was white (88.4%), whereas black, Native Amerindian, Arab, and Asian children represent 3.4%, 0.3%, 2.0%, and 1.6% of the sample, respectively. Most (76.3%) mothers spoke French as a first language, 8.7% spoke English, and 15.0% had another first language.

Outcome Measures

Data were collected by a questionnaire and an interview that was conducted in English or French. First, the Self-Administered Questionnaire for the Mother, which took ~20 minutes to complete, provided information on the child's sleep duration at 6 years of age and parental behaviors around their child's sleep period when the child was 2.5 years of age. Night wakings were defined as waking up at least once every night. Difficulty falling asleep was defined as taking ≥30 minutes to fall asleep. Dyssomnias and parasomnias (somnambulism, sleep terrors, sleeptalking, bruxism, and rhythmic movements) were assessed at the ages of 2.5, 3.5, 4, 5, and 6 years. Enuresis was evaluated at the ages of 5 and 6 years only because the minimum age criterion for a clinical diagnosis of enuresis is 5 years of age. For each parasomnia, the sample was separated into a category that comprised children who "never" had the parasomnia and a category that comprised children who had the parasomnia for each age at least occasionally.

Second, the Interviewer Completed Computerized Questionnaire, a face-to-face structured interview with the mother, provided information on her immigrant status and depression state (scores in the upper 10th percentile) when the child was 5 months of age. It also included questions on the child's gender of the, birth weight, and socioeconomic status (SES) at 6 years of age and whether a divorce had occurred during the period of up to 6 years. Finally, this questionnaire provided information on the child's social development at 6 years of age, more specifically on separation anxiety, hyperactivity-inattention, and aggressive behaviors. Separation anxiety was assessed from 5 questions: In the past 3 months, how often would you say your child (1) clung to adults or was too dependent, (2) did not want to sleep alone, (3) got very upset when separated from his or her parents, (4) was preoccupied by losing his or her parents, and (5) felt physical discomfort?

Hyperactivity-inattention was assessed by 10 questions: In the past 3 months, how often would you say your child (1) could not sit still, was restless, or hyperactive, (2) could not stop fidgeting, (3) was impulsive or acted without thinking, (4) had difficulty waiting for his or her turn in games, (5) could not settle down to do anything for more than a few moments, (6) could not wait when you promised something, (7) was easily distracted, had trouble sticking to any activity, (8) was unable to concentrate, (9) could not pay attention for long, and (10) was inattentive?

The presence of aggressive behaviors was evaluated by 10 questions: In the past 3 months, how often would you say your child (1) got into fights, (2) reacted in an aggressive manner when teased, (3) tried to dominate other children, (4) reacted in a aggressive manner when contradicted, (5) reacted with anger and fighting when somebody accidentally hurt him or her (eg, bumping into him or her), (6) physically attacked people, (7) hit, bit, or kicked other children, (8) reacted in an aggressive manner when something was taken away from him or her, (9) scared other children to get what he or she wanted, and (10) encouraged other children to pick on a particular child? Separation anxiety, hyperactivity-inattention, and aggressive behaviors were evaluated by examination of the percentages of children who had scores in the upper 10th percentile.

The ethics review committee of the Montreal Sacre-Cœur Hospital approved the study. It was centrally managed at the Quebec Institute of Statistics, which was responsible for data collection. Before participating in the study, all families had received detailed information by mail on the aims and procedures of the research program and had signed a consent form.

Statistical Analyses

Statistical analyses were conducted by using SPSS 10 (SPSS Inc, Chicago, IL). A complete set of data was obtained for night wakings ($n = 988$), sleep-onset difficulties ($n = 1045$), sleepwalking ($n = 1085$), sleep terrors ($n = 1043$), somniloquy ($n = 1041$), enuresis ($n = 1137$), bruxism ($n = 1082$), and rhythmic movements ($n = 1058$). Cochran Q tests assessed variations in the prevalence of each dyssomnia and parasomnia across time (age groups), then posthoc comparisons with McNemar tests pinpointed the ages at which changes had occurred. Correlations between various parasomnias and dyssomnias were assessed using Spearman correlation coefficients. χ^2 tests compared persistent sufferers (of a dyssomnia or parasomnia) and nonsufferers on different categorical variables (eg, low birth weight, mother's depression, immigrant status, parental behaviors, family characteristics, behavioral measures), and t tests were used for between-group comparisons on nocturnal sleep time. The "persistent" quality was defined as still having a problem (with a dyssomnia or parasomnia) at the latest time of measure, which was at 6 years of age. For all tests conducted, the significance level was set at $P < .01$ to take into account the number of comparisons for each dyssomnia and parasomnia.

RESULTS

Prevalence and Evolution of Dyssomnias

Table 2 presents the prevalence of dyssomnias and parasomnias for the cohort at ages 2.5, 3.5, 4, 5, and 6 years as well as the overall prevalence for the entire study period. The overall prevalence represents the percentage of children in the sample who experienced the specific dyssomnia or parasomnia at least once during the study period. Cochran Q tests revealed age effects in the prevalence of night wakings and sleep-onset difficulties. The percentage of children with frequent night wakings (≥1 awakening every night) decreased steadily from 36.3% at 2.5 years to 13.2% at age 6; the prevalence at each age was significantly lower than that at the previous age, except between ages 3.5 and 2.5. Similarly, the percentage of children who had difficulty falling asleep at night (≥30 minutes) increased significantly from 12.2% at age 2.5 to 16.0% at ages 3.5 and 4 then decreased significantly to 10% at age 5 and to 7.4% at age 6.

For children who had frequent night wakings at some point in the study (n = 599, or 60.6% of the whole cohort), the problem was already apparent at 2.5 years for 59.9%; new cases then decreased each year to reach 2.5% at age 6 (Table 3). The offset of night wakings, however, was evenly distributed across ages, but in one fifth of those affected, the problem persisted until 6 years of age. A similar portrait emerges when sleep-onset difficulties are considered (n = 345, or 33% of the whole cohort). In most children with sleep-onset difficulties, the problem appeared at 2.5 to 3.5 years of age (69.3%) with few new cases later on. The offset of the problem was distributed across ages (with a peak at age 5) with more than one fifth of persistent cases (Table 3). Of the 108 children who had either of the dyssomnias (persistent night wakings or persistent sleep-onset difficulties), only 10 (9.3%) had from both problems.

Prevalence and Evolution of Parasomnias

The overall prevalence of each parasomnia from 2.5 to 6 years was as follows (Table 2): somnambulism, 14.5%; sleep terrors, 39.8%; somniloquy, 84.4%; enuresis, 25.0%; bruxism, 45.6%; and rhythmic movements, 9.2%. Again, Cochran Q tests yielded significant age effects in the prevalence of all categories, except somnambulism (Table 2). Posthoc McNemar tests revealed that sleep terrors were more frequent at ages 2.5, 3.5, and 4 than at ages 5 and 6. Somniloquy was more frequent at ages 3.5, 4, 5, and 6 than at age 2.5 and at ages 4, 5, and 6 than at age 3.5. The prevalence of bruxism increased steadily with age, whereas rhythmic movements (body-rocking and head-banging) were more prevalent at age 2.5 than at all later ages. Enuresis was more frequent at age 5 than at age 6.

Two temporal progression profiles can be seen in Table 3 for parasomnias. The total n of each column is

TABLE 2 Prevalence of Dyssomnias and Parasomnias During Early Childhood

Age, y	Dyssomnias, n (%)		Parasomnias, n (%)					
	Night Wakings (n = 988; B: 477/G: 511)	Sleep-Onset Difficulties (n = 1045; B: 508/G: 537)	Somnambulism (n = 1035; B: 505/G: 530)	Sleep Terrors (n = 1043; B: 501/G: 542)	Somniloquy (n = 1041; B: 503/G: 538)	Enuresis (n = 1137; B: 551/G: 586)	Bruxism (n = 1062; B: 510/G: 552)	Rhythmic Movements (n = 1058; B: 507/G: 551)
2.5	359 (36.3)	127 (12.2)	34 (3.3)	208 (19.9)	505 (48.5)	NA	110 (10.4)	58 (5.5)
3.5	281 (28.4)	167 (16.0)	26 (2.5)	217 (20.8)	561 (53.9)	NA	180 (16.9)	29 (2.7)
4.0	252 (25.5)	167 (16.0)	42 (4.1)	181 (17.4)	606 (58.2)	NA	228 (21.5)	29 (2.7)
5.0	168 (17.0)	104 (10.0)	50 (4.8)	123 (11.8)	634 (60.9)	243 (21.4)	295 (27.8)	28 (2.6)
6.0	130 (13.2)	77 (7.4)	81 (7.8)	118 (11.3)	605 (58.1)	183 (16.1)	346 (32.6)	21 (2.0)
Overall	599 (60.6)	345 (33.0)	150 (14.5)	415 (39.8)	879 (84.4)	284 (25.0)	484 (45.6)	97 (9.2)
P	<.001	<.001	NS	<.001	<.001	<.001	<.001	<.004

B indicates boys; G: girls; NS, not significant; NA, not applicable because enuresis was defined as persistent bed-wetting in children 5 years and older. For each sleep problem, the n value represents the number of children for whom there was a complete set of data (without missing answers). "Overall" signifies the number (and percentage) of children who experienced the sleep problem at least once during the study period (from 2.5 to 6 years).

TABLE 3 **Ages of Onset and Offset for Children With a Dyssomnia or a Parasomnia**

Age, y	Dyssomnias		Parasomnias					
	Night Wakings ($n = 599$), *n* (%)	Sleep-Onset Difficulties ($n = 345$), *n* (%)	Somnambulism ($n = 150$), *n* (%)	Sleep Terrors[a] ($n = 415$), *n* (%)	Somniloquy[a] ($n = 879$), *n* (%)	Enuresis ($n = 284$), *n* (%)	Bruxism ($n = 484$), *n* (%)	Rhythmic Movements[a] ($n = 97$), *n* (%)
Onset								
2.5	359 (59.9)	127 (36.8)	34 (22.7)	208 (50.1)	505 (57.5)	NA	110 (22.7)	58 (59.8)
3.5	121 (20.2)	112 (32.5)	20 (13.3)	107 (25.8)	192 (21.8)	NA	115 (23.8)	14 (14.4)
4.0	75 (12.5)	62 (18.0)	23 (15.3)	52 (12.5)	90 (10.2)	NA	85 (17.6)	7 (7.2)
5.0	29 (4.9)	27 (7.8)	31 (20.7)	26 (6.3)	57 (6.5)	243 (85.6)	92 (19.0)	11 (11.3)
6.0	15 (2.5)	17 (4.9)	42 (28.0)	22 (5.3)	35 (4.0)	41 (14.4)	82 (16.9)	7 (7.2)
Offset								
3.5	115 (19.2)	47 (13.6)	19 (12.7)	62 (15.0)	33 (3.8)	NA	20 (4.1)	32 (33.0)
4.0	102 (17.0)	61 (17.7)	8 (5.3)	79 (19.0)	45 (5.1)	NA	23 (4.8)	11 (11.3)
5.0	137 (22.9)	98 (28.4)	20 (13.3)	84 (20.2)	59 (6.7)	—	28 (5.8)	15 (15.5)
6.0	115 (19.2)	62 (18.0)	22 (14.7)	72 (17.4)	137 (15.6)	101 (35.6)	67 (13.8)	18 (18.6)
Persistent	130 (21.7)	77 (22.3)	81 (54.0)	118 (28.4)	605 (68.8)	183 (64.4)	346 (71.5)	21 (21.6)
Throughout	20 (3.3)	7 (2.0)	3 (2.0)	17 (10.6)	35 (4.0)	142 (50.0)	42 (8.7)	6 (6.2)

NA indicates not applicable. For each sleep problem, the *n* value at the top of each column indicates the number of children who experienced the problem at least once in the study period; it corresponds to the number in the "overall" row of Table 2. Age of onset was defined as the age when a given dyssomnia or parasomnia was first reported, and the age of offset was defined as the last time the dyssomnias or parasomnias were reported. Note that a dyssomnia or parasomnia may alternatively disappear and reappear. The term "persistent" signifies the number (and percentage) of children who still had the sleep problem at 6 years of age (also includes children for whom the problem appeared at 6 years). The term "throughout" represents the number (and percentage) of children afflicted with the sleep problem throughout the study period.

[a] Parasomnias with a relatively early onset.

the number of children who were afflicted with that particular parasomnia at any point in the study. Sleep terrors, somniloquy, and rhythmic movements appeared early with few new cases thereafter. In contrast, new cases of somnambulism and bruxism appeared almost equally at all ages.

Gender Differences

Gender differences for persistent dyssomnias and parasomnias at age 6 were also assessed. There were no differences for frequent night wakings or sleep-onset difficulties. For persistent parasomnias, significant gender differences were found for somnambulism prevalence (61.7% of boys and 38.3% of girls versus 47.0% of boys and 53.0% of girls for those without parasomnias; $P < .01$) and enuresis prevalence (63.4% of boys and 36.6% of girls versus 44.7% of boys and 55.3% of girls for those without parasomnias; $P < .001$), yielding a boy-to-girl ratio of ~2:1. There were no gender differences for the prevalence of sleep terrors, somniloquy, bruxism, or rhythmic movements.

Associations Between Persistent Parasomnias and Dyssomnias

Persistent somnambulism was correlated with persistent sleep terrors ($r = 0.21$, $P < .01$) and persistent somniloquy ($r = 0.16$, $P < .001$). Persistent sleep terrors were also correlated with persistent somniloquy ($r = 0.19$, $P < .001$). Among persistent somnambulism cases, 98.5% also talked in their sleep and 41.1% had sleep terrors. Among sleep terror sufferers, 92.5% also talked in their sleep. Finally, sleep terrors were correlated with frequent night wakings ($r = 0.31$, $P < .001$). Approximately 56.3% of sleep terror sufferers were considered as having frequent night wakings. There was no relationship between frequent night wakings and sleep-onset difficulties.

Factors That Were Associated With Persistent Dyssomnias

Children with persistent frequent night wakings at age 6 (~22% of those who had the problem at any point) differed from children without dyssomnias in having higher separation anxiety scores and having been put to bed already asleep in a greater proportion when they were 2.5 years of age (Table 4). Persistent sleep-onset difficulties were associated with insufficient SES: twice as many children with sleep-onset difficulty had a low family SES than did those without dyssomnias (Table 4). Surprisingly, persistent sleep-onset difficulties were not clearly associated with co-sleeping or separation anxiety; only trends were observed for those 2 factors. Both dyssomnias were associated with a lower nocturnal sleep time. Finally, neither dyssomnia was associated with hyperactivity-inattention. Only a trend for more aggressive behaviors was seen in children with sleep-onset difficulties (Table 4).

Factors That Were Associated With Persistent Parasomnias

Factors that were assessed for their relationship to the emergence of parasomnias appear in Table 5. Persistent somnambulism, sleep terrors, somniloquy, and bruxism all were found to be associated with separation anxiety. Persistent somnambulism was also related to a high hyperactivity-inattention score. Sleep terrors were also related to a recent divorce of the parents. As for persistent sleep bruxism, parental presence at bedtime was found

TABLE 4 **Factors That Were Assessed in Relation to Persistent Dyssomnias at 6 Years of Age**

Factors	Persistent Night Wakings			Persistent Sleep-Onset Difficulties		
	Yes ($n = 130$)	No ($n = 389$)	*P*	Yes ($n = 77$)	No ($n = 700$)	*P*
Low birth weight <2.5 kg, %	4.8	3.7	.61	5.3	3.5	.45
Mother characteristic at 5 mo, %						
Immigrant status	7.0	6.4	.80	5.2	5.4	.93
Depression (>90th percentile)	11.8	7.4	.13	14.3	7.4	.03
Parental behaviors at 29 mo, %						
Bedtime (parental presence)	27.3	14.9	.002[a]	19.7	21.4	.74
Awakenings (reactive co-sleeping)	17.4	13.0	.26	26.6	15.2	.02
Family characteristic at 6 y, %						
Insufficient SES	11.9	12.3	.90	27.3	11.7	<.001[a]
Type, modified (divorce)	33.9	26.1	.09	31.6	26.3	.33
Social development at 6 y, %						
Separation anxiety (>90th percentile)	26.6	14.4	.002[a]	26.0	15.7	.02
Hyperactivity-inattention (>90th percentile)	14.8	11.7	.35	16.9	10.6	.10
Aggressive behaviors (>90th percentile), %	12.5	13.3	.82	20.8	11.6	.02
Sleep parameters at 6 y, mean (SD)						
Nocturnal sleep time, h, min	10, 22 (50)	10, 39 (45)	.001[a]	10, 13 (52)	10, 35 (50)	<.001[a]

The term "persistent" signifies that the sleep problem was still present at 6 years of age (and includes children for whom the problem appeared at 6 years). Children with a persistent sleep problem were compared with children who never had that problem (*n* values in the "no" categories are equal to the number of children with a complete data set for that problem minus the number of children in the overall category for that problem; see Table 2).

[a] Statistically significant at the threshold selected.

in a greater proportion in those with bruxism than in those without parasomnias. Persistent rhythmic movements were related to insufficient SES and depression in the mother. Enuresis could not be linked to any particular factor, except gender. Finally, none of the parasomnias covaried with low birth weight or immigrant status of the mother.

DISCUSSION

Dyssomnias: Prevalence, Gender Differences, and Associations

This study confirms in a prospective manner the high prevalence of night wakings and sleep-onset difficulties in preschool children. The incidence of both decreased steadily each year to reach 13.2% and 7.4%, respectively, at 6 years of age. It must be stressed that it is not the same children who present with the 2 types of problems; no association was found between them. Although some smaller studies have reported comorbidity of night wakings and sleep-onset difficulties in the same children,[11,12] others (1 based on 5813 school-aged children)[13,14] are consistent with our results in finding little or no association. As reported by other studies on children who were older than 1 year,[11–13,15] no gender difference was found for either type of dyssomnia.

Frequent Night Wakings

In this study, frequent night wakings were associated with slightly less nocturnal sleep time. Night wakers ("signalers") were in fact found to stay awake longer after they wake up than "self-soothers."[2] This study also shows that persistent night wakings at 6 years of age are associated with separation anxiety. However, separation anxiety in the child often stems from insecure attachment or separation issues in the mother. Scher and Blumberg[16] found that 1-year-old signalers were more commonly found among mothers with high separation anxiety scores. In another study, all mothers of young children with disturbed sleep were classified as insecurely attached compared with 57% of mothers of children with normal sleep.[17] In fact, it was shown with video recordings[2] that all children wake up at least a few times a night. The difference between "good sleepers" and "night wakers" is often determined by whether the child decides/needs to signal the awakening. In sum, insecure attachment between mother and child will affect both (1) the child's capacity to fall asleep alone and soothe himself or herself back to sleep if an awakening occurs without signaling it to the parents and (2) the behaviors that are adopted by the mother at the child's bedtime and in response to his or her awakening at night.

As a matter of fact, the present study also found an association of frequent night wakings with parental behaviors of staying present until the child falls asleep (at bedtime). The same parental behaviors have been previously identified as problematic in a study of the same cohort at ages 5, 17, and 29 months; they were among the factors that were most strongly associated with the behavior of not sleeping through the night.[18] As early as 1979, Anders[19] stressed the importance of adopting parental behaviors that foster sleep autonomy in the very young child and showed that sleep problems in infancy covary with parenting styles at bedtime. Similarly, certain parental behaviors in response to night wakings,

TABLE 5 **Factors That Were Assessed in Relation to Persistent Parasomnias at 6 Years of Age**

Factors	Persistent Somnambulism			Persistent Sleep Terrors			Persistent Somniloquy		
	Yes ($n = 80$)	No ($n = 862$)	*P*	Yes ($n = 118$)	No ($n = 623$)	*P*	Yes ($n = 589$)	No ($n = 157$)	*P*
Low birth weight <2.5 kg, %	6.3	3.6	.24	3.4	3.2	.90	4.6	1.9	.13
Mother characteristic at 5 mo, %									
Immigrant status	5.0	6.6	.58	8.5	5.6	.23	5.6	7.0	.51
Depression (>90th percentile)	8.8	8.2	.88	10.2	7.1	.24	8.5	8.9	.87
Parental behaviors at 29 mo, %									
Bedtime (parental presence)	26.3	21.3	.31	23.7	20.9	.48	22.6	17.5	.18
Awakenings (reactive co-sleeping)	20	14.7	.24	10.4	16.9	.09	14.7	21.7	.07
Family characteristic at 6 y, %									
Insufficient SES	13.9	13	.81	15.4	12.1	.33	13.5	10.3	.29
Type, modified (divorce)	32.5	25.8	.20	35.9	24.6	.01[a]	28.2	20.4	.05
Social development at 6 y, %									
Separation anxiety (>90th percentile)	31.3	16.5	.001[a]	28.0	14.8	<.001[a]	19.7	10.8	.01[a]
Hyperactivity-inattention (>90th percentile)	25.0	11.0	<.001[a]	14.4	9.0	.07	12.7	9.6	.28
Aggressive behaviors (>90th percentile), %	16.3	13.3	.47	19.5	12.0	.03	14.9	13.4	.62
Sleep parameters at 6 y, mean (SD)									
Nocturnal sleep time, h, min	10, 30 (53)	10, 32 (49)	.77	10, 29 (52)	10, 34 (48)	.27	10, 31 (48)	10, 38 (51)	.15

	Persistent Enuresis			Persistent Bruxism			Persistent Rhythmic Movements		
	Yes ($n = 173$)	No ($n = 807$)	*P*	Yes ($n = 346$)	No ($n = 578$)	*P*	Yes ($n = 21$)	No ($n = 961$)	*P*
Low birth weight <2.5 kg, %	5.8	2.9	.06	4.4	3.0	.26	9.5	3.6	.15
Mother characteristic at 5 mo, %									
Immigrant status	8.1	6.2	.35	6.6	5.7	.56	14.3	5.4	.08
Depression (>90th percentile)	11.1	7.4	.11	8.7	8	.70	28.6	7.4	<.001[a]
Parental behaviors at 29 mo, %									
Bedtime (parental presence)	22.2	22.1	.97	26.1	18.8	.01[a]	14.3	21.7	.41
Awakenings (reactive co-sleeping)	16.1	16.4	.92	19.6	14.2	.05	15.8	16.2	.96
Family characteristic at 6 y, %									
Insufficient SES	30.6	25.4	.15	12.2	13.6	.54	33.3	12.1	.004[a]
Type, modified (divorce)	16.3	11.8	.11	28.2	25.0	.28	38.1	25.8	.20
Social development at 6 y, %									
Separation anxiety (>90th percentile)	20.8	16.9	.21	21.7	14.2	.003[a]	19.0	16.5	.76
Hyperactivity-inattention (>90th percentile)	11.0	12.3	.64	13.9	9.9	.06	14.3	9.9	.51
Aggressive behaviors (>90th percentile), %	18.5	12.1	.03	15.3	13.1	.36	23.8	13.0	.15
Sleep parameters at 6 y, mean (SD)									
Nocturnal sleep time, h, min	10, 30 (52)	10, 32 (49)	.50	10, 30 (48)	10, 33 (50)	.34	10, 35 (59)	10, 34 (47)	.92

The term "persistent" signifies that the sleep problem was still present at 6 years of age (and includes children for whom the problem appeared at 6 years). Children with a persistent parasomnia were compared with children who never had that parasomnia (*n* values in the "no" categories are equal to the number of children with a complete data set for that parasomnia minus the number of children in the overall category for that parasomnia; see Table 2).

[a] Statistically significant at the threshold selected.

such as bringing the child into the parents' bed, will have the same effect. In support of this notion, behavioral methods of treating children's sleep disturbances that also redress parental behaviors vis-à-vis the child's sleep periods markedly improve or completely resolve the disturbance in 90% of cases.[20]

Sleep-Onset Difficulties

Persistent sleep-onset difficulties at age 6 showed an association with low family SES. This could be explained by a poor quality of sleep environment (eg, noise, sleeping arrangements), although this study did not assess this possibility. The association could also result from parental difficulties in setting limits on their children's behavior around bedtime because of confined space or restricted resources available to them. This dyssomnia was also associated with less sleeping time. Children with sleep-onset difficulties do not seem to compensate for sleep that is lost at the beginning of the night because wake-up times often depend on social obligations (eg, school, child care because of parents' leaving for work) and consequently are not adjustable.

Parasomnias: Prevalence, Gender Differences, and Correlates

Parasomnias are highly prevalent in preschoolers; 88% of the children in this cohort had at least 1 parasomnia during the study period. The most frequent parasomnias were somniloquy, bruxism, and sleep terrors, each affecting ≥40% of the study sample.

Somniloquy

Although considered the most frequent parasomnia, somniloquy is usually without consequences and is rarely a reason for consultation. The overall prevalence of somniloquy for preschoolers in this study (84%) is higher than what was reported in older children and adolescents. For example, an overall prevalence of 56% has been reported for children aged 3 to 13 years using mainly retrospective data.[9] The association that was observed in this study between persistent somniloquy and separation anxiety is not easily explained because somniloquy is such a prevalent parasomnia that it is considered a normal sleep behavior among children.

Sleep Bruxism

Sleep bruxism was also found to be very common in early childhood. A longitudinal study reported that the prevalence of bruxism decreased progressively with age up to adolescence.[9] This study shows that the prevalence increases at least between 2.5 to 6 years of age. In addition, the overall prevalence that was found here is much higher than what has been reported in previous studies of older children,[21–23] which is consistent with the later progressive decrease in prevalence in adolescence.[9] An age-related decline in prevalence also has been described throughout adulthood in a population-based study.[24] Persistent sleep bruxism was found to be related to the parental behavior of staying with the child until he or she falls asleep. This could, in turn, be related to separation anxiety in the child, which also has been found to be associated to bruxism. Anxiety in general has been reported to be a factor that is associated with sleep bruxism in adolescents and adults.[25,26]

Sleep Terrors

The incidences that are reported for sleep terrors in the literature are wide-ranging.[9,22,23,27] Discrepancies may be the result of the age range studied, the sampling method, and the definition used. Using an operational definition, we obtained a fairly high overall prevalence. This might reflect that our cohort of children was very young, probably at a period when sleep terrors are their peak of occurrence. However, it is nonetheless possible that some mothers mistook nightmares for sleep terrors. The observed association between sleep terrors and night wakings is probably attributable to the high level of behavioral and autonomic activity that accompanies sleep terrors. In addition, although a child can remain asleep through an entire sleep terror, even one with extensive episode of crying and yelling, the parents may perceive the child to be awake. The association that was found between somnambulism and sleep terrors, which has been reported before,[8,9] is not surprising because these 2 parasomnias both arise from slow-wave sleep. Therefore, a predisposition to slow-wave sleep disturbance may lead to 1 or both parasomnias.

Separation anxiety emerged as a factor that was associated with both sleep terrors and somnambulism. Anxiety has been reported to increase the occurrence of parasomnias in adults and children, especially somnambulism and sleep terrors.[28–30] On the basis of clinical and research experience, Rosen et al[30] proposed that these 2 disorders of arousal might be the nocturnal expression of otherwise repressed anger feelings toward life events (eg, separation, divorce, parental conflict, family moves), which also translates into separation anxiety.

Somnambulism

The overall prevalence of somnambulism that we found for preschoolers (14.5%) is slightly lower than that reported for older children in other studies.[28,31,32] However, in our cohort, the occurrence of new cases was still on the rise at the last measurement (age 6). Indeed, the peak of occurrence for somnambulism (~17%) has been described to be at ~11 to 12 years.[32] Although many studies found no gender difference for somnambulism in older children and adolescents,[9,32] it was recently reported to be more common in boys than in girls, a finding that is consistent with our results, in a large cohort of children who were aged 4 to 9 years.[33] An explanation for the relationship between somnambulism and high hyperactivity-inattention scores is unclear. However, it has been reported that hyperactivity is increased in children with sleep problems[14,34] or daytime sleepiness[35] and that hyperactivity-inattention disorder often disappears when sleep disorders are treated.[34,36] It remains to be clarified whether children with persistent somnambulism are more sleepy during the daytime, although our results indicate that their nocturnal sleep time is not affected.

Enuresis

Enuresis was assessed only at ages 5 and 6 because the clinical diagnosis of this condition can be made only for children who are 5 years and older. Nonetheless, the prevalence that was found here is similar to that reported by 2 population-based studies,[37,38] which found that 20% to 33% of children were bed-wetting at the age of 5 years. The male predominance that was observed in this study for enuresis also has been well described.[9,37–41] Our results suggest that enuresis is not linked with anxiety in preschoolers, although other studies have shown a relationship in older children.[42–44] Anxiety probably emerges when the problem is long lasting. The child then is older, has more of a social life, and therefore is more self-conscious.

Rhythmic-Movement Disorder

The least prevalent parasomnia, rhythmic-movement disorder, was experienced by <10% of children during the study period. It is a parasomnia that both appears and disappears very early in life. The peak in incidence

has been determined to be between 9 and 18 months.[45] Indeed, the prevalence of rhythmic movements was reported to be higher (21%) in children of the same cohort studied at 17 months.[18] Nonetheless, the annual frequency that was reported in this study is still lower than what was reported in other studies for the same age range.[45,46] Sleep-related rhythmic-movement disorder was found to be associated with depression in the mother and low family SES. Body-rocking is usually considered a pleasant self-soothing behavior associated with sleep onset, but it has been suggested that it reflects an unbalanced mother–child relationship.[47] More realistically, the probability that a child uses self-soothing rhythmic movements to fall asleep might be greater in the face of adversity (depression of the mother and stress in the family as a result of low SES) than in a more stable household.

Finally, it seems that the presence of childhood parasomnias, even persistent ones, has little or no impact on sleep duration. This is noteworthy because sleep duration affects various spheres of child development, such as cognition,[48,49] physical development (BMI),[50,51] and behavior.[52,53]

Limitations

Some sleep problems that are known to affect children, such as sleep apnea syndrome, restless legs syndrome, and nightmares, were not reviewed in this article. Furthermore, comorbid health problems that could have an influence on dyssomnias or parasomnias were not studied. It must be said, however, that children with important medical problems were not included in this cohort. Before generalizing, then, one should keep in mind that the population studied here is mostly white and might not be representative of other populations. Objective sleep laboratory data also were not available to validate parental reports. However, a high correlation has been reported between the parents' estimates of young children's sleeping hours and their sleep time measured in the laboratory.[54] Finally, our study design allowed the identification of factors that covary with the presence of dyssomnias or parasomnias, but it does not reveal causal relationships. Despite these limitations, however, the study design simultaneously evaluates various early childhood dyssomnias and parasomnias in a prospective and longitudinal manner and clarifies their associations with other domains of the child's life.

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