

SLEEP DISORDERS ARE ASSOCIATED WITH IMPULSIVITY IN SCHOOL CHILDREN AGED 8 TO 10 YEARS

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ABSTRACT - *Context:* Sleep has an important function in the physical and emotional development of children. Some studies suggest an association between impulsivity and sleep disorders. However, little is known about this association in schoolchildren aged 8 to 10 years. *Method:* We studied 1180 children, 547 with sleep disorders (SD) and 633 without SD (control group), classified with SD questionnaires. Within the SD group, 53 children with sleep-related respiratory disorders (SRRD) and 521 children with non-respiratory sleep disorders (NRSD) were analyzed. We assessed emotional indicators of impulsivity with Bender test. *Results:* More SD children presented impulsivity than control group ($p < 0.05$). More NRSD and 10 years old children presented impulsivity than control group of the same age ($p = 0.001$). Impulsivity and SRRD were associated with 8 years old children ($p < 0.05$). *Conclusion:* Children with SD, 8 years old children with SRRD, and 10 years old children with NRSD presented higher proportion of impulsivity than control children.

KEY WORDS: sleep disorders, schoolchildren, snoring, apnea, hypopnea, impulsivity.

Distúrbios de sono associam-se com impulsividade em escolares de 8 a 10 anos de idade

RESUMO - *Contexto:* O sono tem função importante no desenvolvimento físico e emocional das crianças. Alguns estudos sugerem a associação de impulsividade e distúrbios do sono, sendo pouco conhecida esta associação em escolares na faixa etária de 8 a 10 anos. *Método:* Estudamos 1180 crianças, 547 com distúrbio do sono (DS) e 633 normais (grupo controle), classificadas através de questionários sobre distúrbios do sono. Dentro do grupo DS, analisamos separadamente as crianças com distúrbio respiratório relacionado ao sono (DRRS) e com distúrbios não respiratórios do sono (DNRS). Aplicamos o Teste Gestáltico de Bender (TB) para detectar os indicadores emocionais de impulsividade. *Resultados:* Maior número de crianças com DS apresentaram impulsividade em relação às crianças do grupo controle ($p < 0,05$). Mais crianças de 10 anos de idade do grupo DNRS apresentaram impulsividade em relação ao grupo controle da mesma idade ($p = 0,001$). Impulsividade e DRRS estiveram associados apenas entre as crianças de 8 anos de idade ($p < 0,05$). *Conclusão:* Crianças com DS em geral, crianças com DRRS de 8 anos de idade, e crianças com 10 anos de idade do grupo DNRS apresentaram maior proporção de indicadores de impulsividade do que crianças do grupo controle.

PALAVRAS-CHAVE. distúrbios do sono, crianças, ronco, apnéia, hipopnéia, impulsividade.

Impulsivity is an important characteristic of personality and is defined as a tendency toward an action with little or no planning in order to reduce the impact of an aversive stimulus¹⁻³. Impulsivity is fundamental for survival, but may acquire dysfunctional aspects depending on its intensity and the context in which it manifests, assuming characteristics such as impatience, difficulty in awaiting one's turn, difficulty in postponing an answer before the question has been completed, interruption and/or

intrusion in unrelated subjects, lack of attention and concentration, difficulty in expression, exposure to dangerous situations without measuring the consequences, and poor tolerance to frustration^{1,4,5}. The prevalence of sleep disorders (SD) in school-age children is 35%⁶, sleep-related respiratory disorders is 3%⁷, and impulsivity is 3 to 16%⁷⁻⁹.

School-age children with impulsive and dysfunctional behaviors show difficulties in falling asleep, refuse to lie down, present feelings of anxiety

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or fear at bedtime, stop taking a nap at an early age, and show nocturnal agitation, frequent nocturnal arousals and/or difficulties in falling asleep again⁷⁻¹⁰. Some investigators have suggested a multifactorial etiology of impulsivity and its complications^{9,11}, with evidence indicating that disturbances in the circadian rhythm alter sleep in impulsive individuals, causing a reduction in slow-wave sleep and REM sleep^{8,9,11}. Literature data suggest that impulsivity, aggressiveness, anxiety and hyperactivity interfere with the sleep scenario of children, compromising their performance in school^{6,7,12,13}. These behaviors delay the sleep onset, promote restless sleep and reluctance to go to the bed.

The aim of the present study was to determine whether impulsivity is more prevalent in children with sleep disorders than in those without sleep disorders, and within which kind of sleep disorder.

METHOD

Population and place of study – We studied children from nine elementary public schools in the city of Sao Paulo, Brazil, between August 1999 and June 2000. The schools were chosen by drawing lots among 35 possible schools, which represented each neighborhood of the region to which the Federal University of Sao Paulo (UNIFESP) belonged. The Ethics Committee of the UNIFESP approved the study and the school Principals and the parents signed a free informed consent form.

A total of 5400 questionnaires regarding sleep alterations during childhood were sent out^{13,14} for 7- to 10-years-old children. A total of 3,612 (67%) questionnaires answered by the parents returned, with 490 (14%) being excluded because they were filled out incorrectly, included children under 7 or above 10 years old, and included children with neurological and psychiatric disorders. From these 3,122 questionnaires we draw 640 (21%) children with sleep disorders that in other study, were evaluated regarding association with cognitive dysfunction¹³

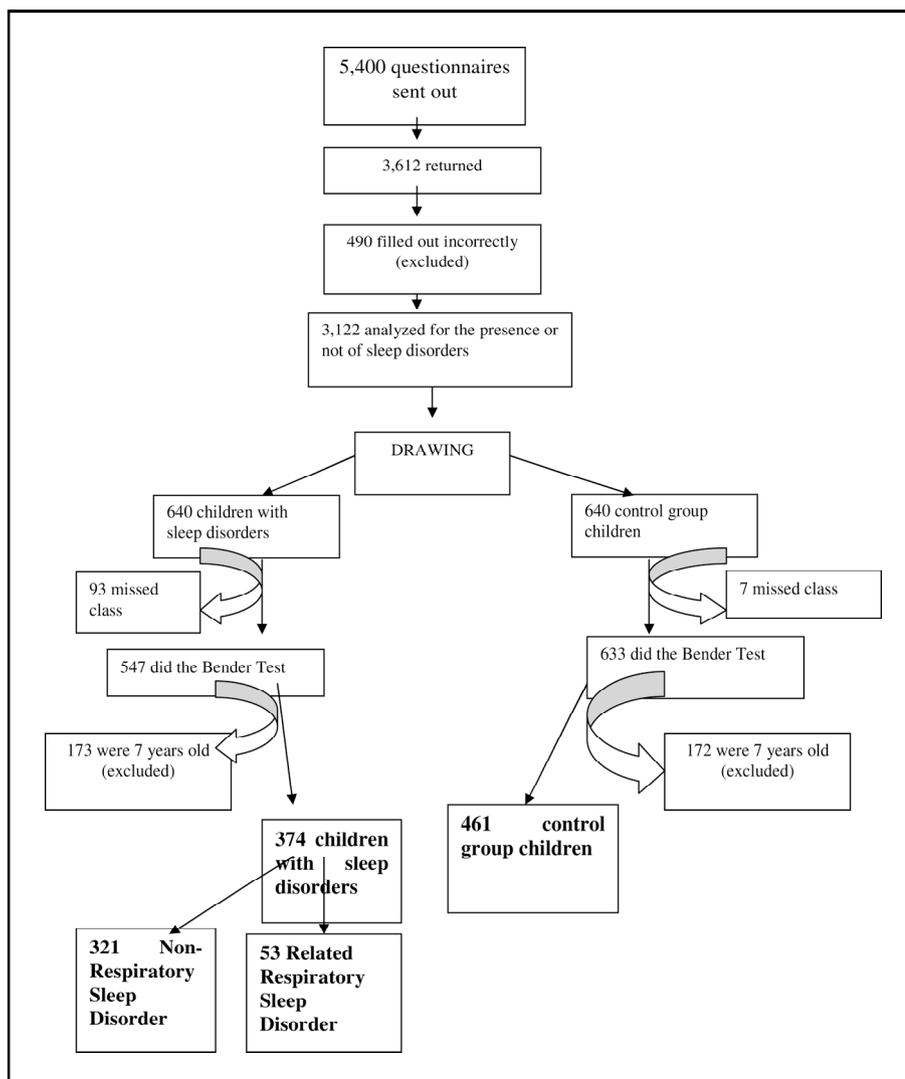


Fig 1. Selection of children for the study.

and the remaining 2,482 children were analyzed regarding normal sleep habits¹⁴.

The 640 children with sleep disorders (SD group) and other 640 children without sleep disorders (control group) were selected by drawing lots and submitted to emotional cognitive assessment by the Bender-Gestalt test¹⁵. Ninety-three children of the SD group and 7 children of the control group were not tested because they did not appear on the day of application of the test. Thus, 547 children with SD and 633 control children were submitted to the Bender test. The psychologist (MM) who analyzed the Bender test was unaware to which group, SD or control group, each child belonged. Since our objective was to evaluate the emotional characteristic "impulsivity", 173 children of the SD group and 172 of the control group aged 7 years were excluded because the Bender test is not adequate for detecting this emotional variable in this age group¹⁶ (Fig 1).

For this study we analyzed 835 children, 374 with sleep disorders and 461 without sleep disorders. To assure statistical power to our sampling procedure, we calculated the sample size by the standard error formula, taking in account a confidence interval of 95% and a sample error of 5%. We used a prevalence of 35% for SD to calculate a sample size⁶. For a transversal study we rea-

ched a sample of 364 children with sleep disorders, 47 children with sleep related respiratory disorder, and 215 children with impulsivity; but because the initial number estimated allowed samples just slightly bigger, we used all children included up front.

Classification of sleep disorders - The SD group (374 children) was subdivided into two groups: 1) 53 children with sleep-related respiratory disorders (SRRD group), and 2) 321 children with sleep disorders other than respiratory ones, called non-respiratory sleep disorders (NRSD group). The NRSD group consisted of children with awakening disorder, sleep-wake transition disorder and excessive daytime sleepiness. The diagnostic criteria of each sleep disorder modality were those adopted by Brunet et al⁶. The diagnosis of SRRD was made based on the responses to the following questions: 1) Does the child have difficulty in breathing during sleep? 2) Does he/she sigh in order to breathe or is he/she unable to breathe during sleep? 3) Does he/she snore? The SRRD and NRSD groups were compared to the control group consisting of 461 children with normal sleep.

Diagnosis of impulsivity - A team of 12 psychologists went to the schools and applied the Bender test, which was used as a diagnostic indicator of impulsivity^{16,17}. One of these researchers (MM), who were unaware of the results of the sleep disorder questionnaires, analyzed all 835 Bender tests. The drawings were analyzed according to the criteria of Koppitz¹⁵ and impulsivity was considered to be present when one copy of the drawings showed three or four of the following alterations in graphic perception of the original model of the drawings: 1) order of execution of the drawings (confusing arrangement in the planning and arrangement on paper); 2) replacement of the original model of circles with lines; reinforced lines of the drawings (the entire drawing or part of it shows strong lines with the marks remaining, even when erased); 3) request for a second drawing attempt (the drawing or part of it is spontaneously abandoned and a new drawing is performed); 4) expansion of the drawings (two or more sheets of paper are used to complete the drawing of the 9 models, each model is drawn on a separate sheet or 8 models are drawn on one sheet and the last one on a separate sheet). Impulsivity was recorded and computed on an Excel spreadsheet.

Statistical analysis - The chi-square test was used to determine possible associations between impulsivity and NRSD and between impulsivity and SRRD compared to normal children, taking into account age and gender. A p value <0.05 was considered to be significant.

RESULTS

The proportion of individuals in terms of age or gender did not differ between the SD, SRRD, NRSD, and control groups (Tables 1 and 2).

Table 1. Demographic data of the children of the study and control groups.

Age (years)	Gender	All SD (N)	SRRD (N)	NRSD (N)	Control group (N)
8	Male	72	14	58	74
	Female	71	10	61	87
9	Male	73	7	66	83
	Female	70	9	61	76
10	Male	46	10	36	68
	Female	42	3	39	73
Total		374	53	321	461

SD, Sleep disorders; SRRD, Sleep-related respiratory disorders; NRSD, non-respiratory sleep disorders.

Table 2. Distribution of impulsive behavior among children of the study and control groups.

Age (years)	Gender	Impulsivity SD (N)	Impulsivity SRRD (N)	Impulsivity NRSD (N)	Control group (N)
8	Male	64	13	51	66
	Female	64	8	56	74
9	Male	65	6	59	67
	Female	61	8	53	59
10	Male	40	9	31	47
	Female	41	3	38	49
Total		335	47	288	362

SD, Sleep disorders; SRRD, Sleep-related respiratory disorders; NRSD, non-respiratory sleep disorders.

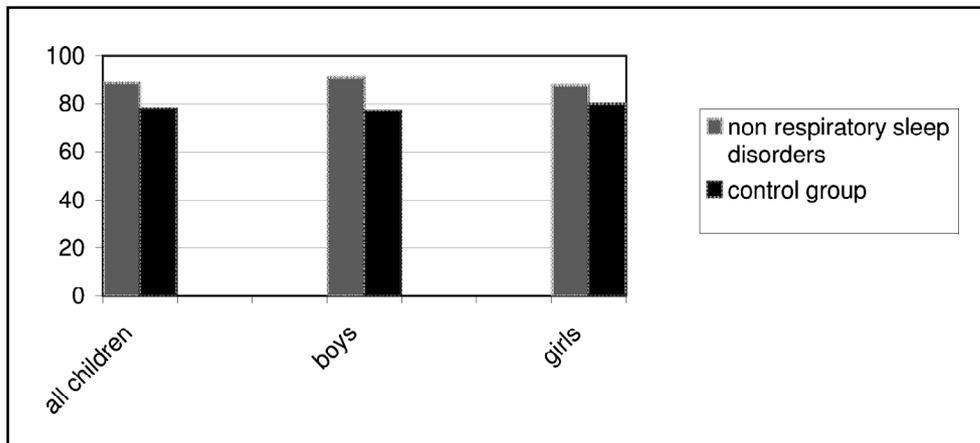


Fig 2. Frequency of impulsivity in children with non-respiratory sleep disorders versus the control group.

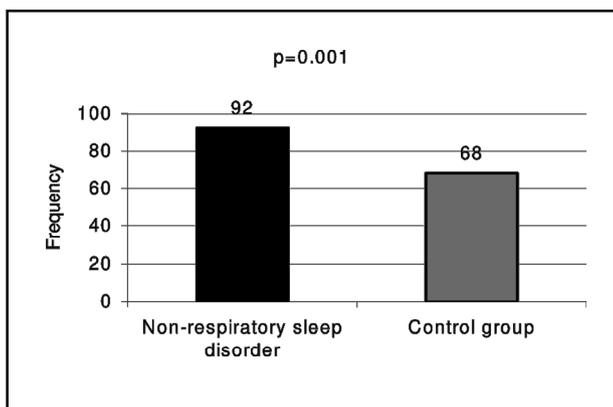


Fig 3. Frequency of impulsivity in 10-year-old children with non-respiratory sleep disorders versus the control group.

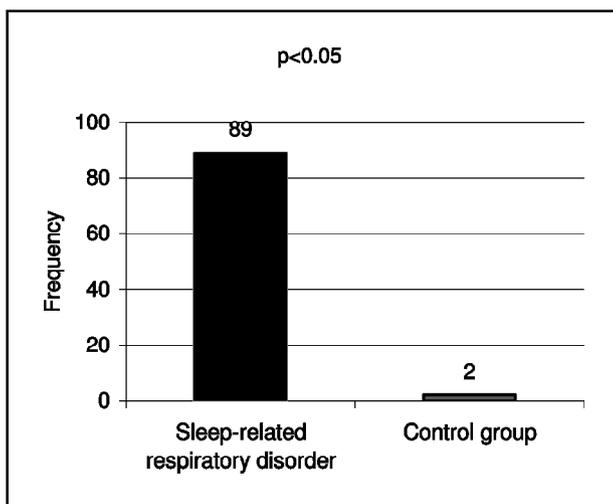


Fig 4. Frequency of impulsivity in 8-year-old children with sleep-related respiratory disorders versus the control group.

Sleep disorders group – When we analyzed all children in the SD group compared against the control group, we find that 89 % of children from the SD group had impulsivity behaviors and only 22% presented impulsivity in the control group ($p<0.001$).

Non-respiratory sleep disorders – Children of the NRSD group (Fig 2) showed greater impulsivity (89%) than control children (78%; $p<0.05$).

Boys of the NRSD group showed greater impulsivity (91%) than boys of the control group (77%; $p<0.05$). The same was observed for girls (88% versus 80%; $p<0.05$). Children of the NRSD group aged 10 years (Fig 3) showed greater impulsivity (92%) than control children of the same age (68%; $p<0.05$).

Sleep related respiratory disorders – Boys and girls of the SRRD group did not differ in terms of impulsivity from boys and girls of the control group. Children with SRRD aged 8 years (Fig 4) showed greater impulsivity (89%) than control children of the same age (2%; $p<0.05$).

DISCUSSION

The present study demonstrated greater impulsivity in children with NRSD. Only the group of 8-year-old children with SRRD presented greater impulsivity than children without SRRD.

SRRD has been associated with impulsivity, characterized mainly by the refusal to lie down, difficulties in falling asleep and frequent nocturnal arousals⁷⁻⁹. Until now, these impulsive behaviors have been described as characteristics of disorders of initiating and maintaining sleep and of excessive daytime sleepiness. To our knowledge, this is the first report showing an association between impulsive behaviors and SRRD. This finding is important because it reveals another clinical symptom associated with SRRD in children. Although excessive daytime sleepiness has been associated with impulsive behavior⁸, a relationship between respiratory disorders and excessive daytime sleepiness is rarely observed in children^{18,19}.

Impulsivity associated with hyperactivity disorders predominates in males^{1,8}, a finding observed in the present study involving children with sleep disorders, what allow us to suppose that, at least in some children, sleep disorders, impulsivity and hyperactivity coexist. A larger number of 10-year-old children with NRSD presented impulsivity, a fact possibly related to the age group, since age has been described as an important factor in the determination of sleep habits, bedtimes and total sleep time¹⁴. The transition from childhood to adolescence causes natural changes in the preference of times, alterations in the sleep-wake cycle and the need to adapt to the tendency to sleep and wake up later. We suspect that sleep disorders, when present in this age group, are associated with the evolutive, social and behavioral factors cited above, which cause adaptive difficulties expressed in the form of impulsivity.

In Brazil, other rhythms are imposed on children due to the scarcity of schools, such as two different school periods, one in the morning (7:30AM to 12:30PM) and one in the afternoon (1:30PM to 5:30PM), in order to satisfy the large demand of school-age children. This social imposition requires the children to wake up earlier to arrive on time for class^{13,14,18-20}. The lack of information for parents and teachers regarding a child's need for sleep and the restriction of sleeping hours imposed by the school times may result in a decline in school performance^{19,20}, problems of attention^{1,19} and concentration, and psychological difficulties¹⁰ caused by impulsivity, thus compromising the initiatives regarding educational reforms whose aim is to improve basic education in Brazil. We therefore suggest that individuals involved in the complex change of educational attitude in Brazil²¹ should not only strive for the improvement of libraries, textbooks, laboratories, homework, teacher training, salaries and forms of assessment, but should also be concerned about health in general and sleep disorders in particular, which are often easily recognized and treated.

The main weakness of the present study is related to the use of a questionnaire for the diagnosis of sleep disorders which, according to our clinical practice, may underestimate the data because the responses depend on the observation and understanding of the parents and persons responsible for the child, who often do not fully perceive the phenomena that the child experiences. However,

no other alternative exists to obtain data for such a large number of individuals. The questionnaires have shown a good correlation with other forms of diagnosis, and analysis of the main component derived from the questionnaire permits the development of a parentally derived sleep profile in children, which shows good clinical agreement and epidemiological usefulness^{7,22}.

In conclusion, children with sleep disorders in general, and with NRSD in particular, show a greater predisposition to dysfunctional behaviors such as impulsivity than children without sleep disorders, mostly the older ones. Eight years old children with SRRD are more likely to show impulsivity.

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