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Influence of psychosocial factors on the development of sleep bruxism among children

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Background. Bruxism is described as an orofacial parafunction that affects both children and adults. The maintenance of the childhood habit into adulthood may compromise health. As there are few studies on this issue, there is a need for further research on sleep bruxism among children.

Aim. The aim of this study was to assess the prevalence of sleep bruxism in children and the influence of psychosocial factors.

Methods. A cross-sectional study was carried out on 652 randomly selected children aged 7–10 years at public and private schools in Belo Horizonte, Brazil. The instruments used were: questionnaire for parents, Child Stress Scale, and the scales on neuroticism and responsibility from the prevalidated Big Five Questionnaire for Children. Psychological tests were administered and evaluated by psychologists. Sleep bruxism among children was reported by parents. The Social Vulnerability Index from the city hall database was used to determine the social classification of the families. The chi-squared test, binary and multivariate logistic regressions were used, with the significance level set at 5%.

Results. A 35.3% prevalence of bruxism was found. No association was found between bruxism and stress, gender, age, or social vulnerability. The adjusted logistic model determined that children with high levels of neuroticism (OR = 1.9, CI 1.3–2.6) and responsibility (OR = 2.2, CI 1.0–5.0) are twice as likely to have the habit of sleep bruxism when compared to those who have low levels of these personality traits.

Conclusions. A high degree of responsibility and neuroticism, which are individual personality traits, are determinant factors for the development of sleep bruxism among children.

Introduction

Bruxism is an oral disease with a multifactor aetiology, described as an unusual orofacial parafunction that affects both children and adults[1–8]. In the field of sleep medicine, bruxism is defined as one of a number of parasomnias that, which are undesirable physical events that occur mainly during sleep, taking the form of motor or autonomic phenomena[1–4]. Some individuals clench their teeth during waking hours (day-time bruxism), and others grind their teeth while sleeping (sleep bruxism)[1,2].

It is believed that individuals with bruxism develop this habit because of the influence of emotional factors, such as having to deal with an accumulation of tasks, loss, expectations, conflict, self-image, self-esteem, and anxiety[2,4,9–11]. The capacity to deal with stress is unique to each individual and may be directly related to the formation of individual personality[4]. Maintaining this childhood habit into adulthood may compromise health, leading to problems with the temporomandibular joint, facial muscles, and tooth wear as well as periodontal problems and even the loss of dental elements through trauma[12–16]. Occlusion instability during the replacement of the primary teeth by the permanent dentition is another aetiological factor that may be related to bruxism in children[7].

There is considerable discrepancy in the literature regarding the prevalence of bruxism[2–8].

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A study carried out on children in Hong Kong using polysonography over a single night found an 8.5% prevalence of the habit[2]. Research developed in Argentina found that 29% of child participants had the habit of bruxism[17]. In Brazil, a study based on parents' reports found a 43% prevalence of sleep bruxism in children[12]. A study carried out on American children also used parents' reports to assess sleep bruxism habits among schoolchildren and found a prevalence of 38%[6].

The difference in results among studies on bruxism in children demonstrates the need to encourage research on this subject. The aim of this cross-sectional study was to assess the prevalence of sleep bruxism among Brazilian schoolchildren, determining possible associations with socio-demographic factors, stress levels, and personality traits.

Materials and methods

Study design and sample

A population-based study representative of the city of Belo Horizonte (Brazil) was developed. Belo Horizonte is the state capital of Minas Gerais, located in the south-eastern region of Brazil. It has 2 238 526 inhabitants, with 182 891 children enrolled in the elementary school system (www.pbh.gov.br). A total of 652 children enrolled in the second grade participated in the study. The children ranged from 7 to 10 years of age, and were from nine public and private schools, which were randomly selected by lots.

Sample calculation

The sample size was calculated to give a standard error of 5%. A 99% confidence interval level and a 35.0% prevalence of sleep bruxism were used for the calculation. The prevalence of sleep bruxism was determined in a pilot study carried out with 175 schoolchildren between 7 and 11 years of age randomly selected from private and state schools of Belo Horizonte; these children were not part of the study population. The minimum sample size to satisfy the requirements was estimated at 603 children. In order to ensure representivity, the sample was stratified according to city district, type of institution, and age of the child. The choice of the institutions and children was randomized until the target number was reached.

Sample recruitment

Following authorization from the Research Ethics Committee of the Federal University of Minas Gerais, permission was granted by the administration of the schools. Terms of informed consent and a pretested questionnaire were distributed to the parents of all students enrolled in second grade classes at the nine selected schools, totalling 882 children. The documents were attached to the students' homework papers. A total of 734 parents authorized the study (83.2%). Data collection took place in the first semester of 2006.

The following inclusion criteria were adopted: children whose parents authorized participation and related in questionnaire no other medical or mental disorders (e.g. sleep-related epilepsy, accounts for abnormal movements during sleep); no other sleep disorders (e.g. obstructive sleep apnoea syndrome)[4,8], who exhibited sufficient reading skills for understanding the psychological tests and for whom the three data collection instruments were answered [fully completed parent questionnaire, Child Stress Scale (CSS) and Big Five Questionnaire for Children (BFQ-C)]. Eighty-two children failed to fulfil all the criteria and were excluded from the study (11.2%). The determination of sufficient reading skills among the schoolchildren was based on teachers' reports.

Parents' questionnaire

The presence or absence of sleep bruxism was determined through parents' reports[6]. Data were collected by a self-completed questionnaire sent to the parents attached to the students' homework. The questionnaire included a total of 10 questions, eliciting information on the child's history of audible night teeth grinding, oral habits, medical history, and socio-demographic information[4,6]. To ensure that sleeping arrangements were related to the reporting of bruxism, the survey inquired as to the number of times a parent checks on a child during the

night, the proximity of the parents' and child's bedrooms, and whether the doors of the parents' and children's rooms remain open or closed[6].

The diagnosis of sleep bruxism was supported by the classification criteria proposed by the American Academy of Sleep Medicine (AASM)[8]. The AASM criteria are: parents indicating the occurrence of audible night teeth grinding; no other medical or mental disorders (e.g. sleep-related epilepsy, accounts for abnormal movements during sleep); and no other sleep disorders (e.g. obstructive sleep apnoea syndrome)[4].

Psychological tests

The CSS is a Brazilian test that measures childhood stress. It was developed and validated in the city of Sao Paulo (Brazil) with 255 Brazilian schoolchildren between 6 and 14 years of age[18]. This test is made up of 35 statements related to reactions that are commonly triggered by stress: physical, psychological, psychological with a depressive component, and psychophysiological. In the validation process, the authors obtained internal consistency coefficients (Cronbach's alpha) ranging from 0.72 to 0.90, and Spearman's correlation coefficient between the factors studied was 0.73[18]. The response to each item employs a 5-point Likert scale and is recorded according to the intensity with which the child experiences the symptoms described, ranging from 0 (never) to 4 (always).

The BFQ-C test assesses personality traits[19]. Studies in the psychology of individual differences indicate that personality traits may additionally explain important behaviour outcomes[19–22]. By definition, traits reflect more stable patterns of feelings, thoughts, and actions that are consistent across situations and stable over time[9]. It is thus possible to observe psychological traits since childhood[9–11]. The most scientifically robust personality model is the five-factor model, which addresses: neuroticism, openness, extraversion, responsibility/conscientiousness, and agreeableness[9,19]. Neuroticism and responsibility/conscientiousness were thought to be important to this study[9]. The first is related to vulnerability to negative emotions, anxiety, anger, guilt, and clinical depression. The second is related to self-discipline, behaving dutifully, and striving for achievement[9–11]. It was believed that higher scores regarding these traits may have an effect on the health of individuals.

A team of researchers underwent standardized training for the administration of the CSS and BFQ-C psychological tests. This team was made up of a psychologist, who supervised the process, and four undergraduate psychology students, who administered the tests. The participation of undergraduate psychology students was determined by Brazilian education law. All analyses of the tests and the final results were carried out by the psychologist.

The standardization process was performed by means of meetings with the team of researchers to study the test administration criteria, followed by a pilot study. The pilot study was carried out with 175 schoolchildren between 7 and 11 years of age randomly selected from private and state schools in the city of Belo Horizonte; these children were not part of the main study. All instruments were prevalidated. Data from the pilot study were submitted to factor analysis using internal scales. Test–retest reliability was assessed using 20 randomly selected schoolchildren. Intra-class correlation ranged from 0.72 to 0.91, which validated the standardization of the training.

Scoring system

For the statistical analysis, median response values were dichotomized. The sum of all responses assessed overall stress (total CSS). The sum of responses related to each type of stress measured each type of reaction. Overall scores below 37 points for the sum of all statements on the scale were classified as denoting 'low stress', whereas scores of 37 points or more were denominated 'high'. For stress with physical reactions, values less than 9 points were classified as 'low' stress, whereas values 9 points or more denoted 'high' stress. For stress with psychological reactions, values less than 13 points were considered 'low' stress, whereas values 13 points or more were considered 'high' stress. For stress with psychological reactions with a depressive component, values less than 4 points were considered 'low' stress, whereas values 4 points or more were

considered 'high' stress. For stress with psycho-physiological reactions, values less than 8 points were considered 'low' stress, whereas values 8 points or more were considered 'high' stress. The final score ranged from 0 to 240 points.

The assessment of personality traits was performed by administering the neuroticism and responsibility scales of the BFQ-C test[19]. The BFQ-C was developed and validated by Barbaranelli *et al.*[19] on Italian children. Each scale is made up of 15 questions. Responses follow a 5-point Likert scale ranging from 'never' to 'always'. The final sum ranges from 15 to 75 points for each scale. Median scores were determined for the two scales, and dichotomized into 'high' and 'low' levels. Scores equal to or higher than 37 points were denominated as 'high neuroticism', whereas scores lower than 37 were denominated as 'low neuroticism'. Regarding responsibility, scores equal to or above 54 were denominated as 'high responsibility', and scores below 54 were denominated as 'low responsibility'. These two scales were translated and validated in this study.

Validation of data collection instruments

For use in this study, the BFQ-C was submitted to prior analysis of its psychometric properties on a sample of 616 children between 7 and 9 years of age, 285 of whom were boys (46.3%) and 331 were girls (53.7%). The BFQ-C was translated and cross-adapted to Brazilian Portuguese.

Internal consistency of the psychological scales was analysed using Cronbach'a alpha coefficient, and obtained the following values: 0.90 for overall stress, 0.70 for stress with physical reactions, 0.76 for stress with psychological reactions, 0.75 for stress with psychological reactions with a depressive component, 0.64 for stress with psycho-physiological reactions, 0.88 for responsibility, and 0.85 for neuroticism. Test–retest accuracy was studied on 68 children aged 7 to 9 years, with a 1-month interval between the first and second administration, and coefficients ranging from 0.77 to 0.92 (intra-class correlation coefficient).

Factor analysis was used to obtain information on relationships between the items, and thereby explore the subjacent (latent) structure of the scale employed. The KMO statistical test and Bartlett's test were used in the prior analysis of the sample quality for the factor analysis, obtaining a value of 0.854 and significance of 0.000 for KMO and Bartlett, respectively. This, therefore, indicated the possibility of proceeding with the exploratory factor analysis.

Regarding factor validity (identification of relationships between the items and determination of the latent structure of the scale employed), an extraction of factors was performed using principal component analysis. The results revealed seven components with eigenvalues above 1.0. The two first components explained much more of the variance than the remaining components. These two components had eigenvalues of 4.489 and 3.644, explaining 27.11% of the variance. The screening test revealed an inflexion of the curve after the third component, which allows the inference that two components should be interpreted. For such, a Varimax rotation was performed because of the theoretical presupposition of independence between factors. Table 1 displays the factor loads above 0.30 with regard to the components.

In order to identify whether there was a developmental factor (increase in scores with age) subjacent to the BFQ-C responses, association analysis was performed. A low, albeit significant, association was found for neuroticism, but no association was found between age and responsibility (Pearson's correlation coefficient). It should be pointed out that studies carried out with other personality scales for children, such as the Eysenck Personality Questionnaire, also observed slight increases in neuroticism between 8 and 15 years of age[20,21]. Table 2 displays the descriptive statistics for each age. The denomination 'N factor' was adopted to identify neuroticism, whereas 'R factor' was used for responsibility.

The Student's *t*-test (comparison of means) was used to determine possible associations between gender and personality traits. This analysis was performed following the Kolmogorov–Smirnoff test, which determined that the assumption of normality was confirmed, thereby explaining the parametric investigation.

Table 1. Distribution of factor load values for the Big Five Questionnaire for Children test.

Item	*R* factor [Responsibility]	*N* factor [Neuroticism]
BFC_R1	0.213	
BFC_R2	**0.432**	
BFC_R3	**0.398**	
BFC_R4	**0.545**	
BFC_R5	**0.605**	
BFC_R6	**0.634**	
BFC_R7	**0.551**	
BFC_R8	**0.540**	
BFC_R9	**0.412**	
BFC_R10	**0.620**	
BFC_R11	**0.531**	
BFC_R12	**0.630**	
BFC_R13	**0.648**	
BFC_R14	**0.337**	
BFC_R15	**0.438**	
BFC_N1		**0.622**
BFC_N2		**0.549**
BFC_N3		**0.474**
BFC_N4		**0.599**
BFC_N5		**0.467**
BFC_N6		**0.260**
BFC_N7		**0.538**
BFC_N8		**0.509**
BFC_N9		**0.395**
BFC_N10		**0.543**
BFC_N11		**0.574**
BFC_N12		**0.510**
BFC_N13		**0.533**
BFC_N14		**0.395**
BFC_N15		**0.482**
Explained variance (%)	14.96	12.15

Bold type indicates factor load above 0.30.

No significant differences were found between boys and girls regarding neuroticism ($P = 0.992$). However, there was a significant difference favouring girls with regard to responsibility ($P = 0.027$).

Social classification

The Social Vulnerability Index (SVI) developed by the City of Belo Horizonte was used to analyse family exposure to social influence factors. This index measures the vulnerability of the population to social exclusion through the determination of neighbourhood infrastructure, access to work, income, sanitation services, health care services, education, legal assistance, and public transportation[22]. There are five different classes, for which class I is made up of families with the greatest social vulnerability, and class V is composed of families with the least vulnerability[22]. The location SVI was used for the selection of the schools by lots, and the residential SVI of the children was considered in the data analysis. For the statistical analysis, the SVI was grouped into two categories: lesser and greater vulnerability; Classes I and II were grouped in the category of 'greater vulnerability', and classes III–V were grouped in the category of 'lesser vulnerability'.

Statistical analysis

The chi-squared test was used to analyse the different variables investigated in the study, at a confidence level of 95%. Unconditional, simple, and multivariate stepwise logistic regressions were used to estimate the likelihood of the occurrence of bruxism. All variables with a P value less than or equal to 0.05 were included stepwise to determine the significant factors in the final model. Spearman's correlation was used to determine correlations between social classification, school location, and child's residence. Cronbach's alpha coefficient

Table 2. Factor analysis values associated to age.

Age	*N*	Mean	SD	Minimum	Maximum	*r*	n.sig
N factor	90	36.09	11.330	19	69		
7	466	38.39	10.714	17	71		
8	60	40.80	11.513	18	75		
9	616	38.29	10.930	17	75	0.106	0.008
R factor	90	54.54	11.818	21	75		
7	466	54.61	10.789	18	75		
8	60	53.21	10.871	24	75		
9	616	54.46	10.949	18	75	0.025	0.533

Table 3. Comparison of the Belo Horizonte population and study sample according to social vulnerability.

	SVI of BH* (%)	Residential SVI of the sample (%)
I	15	13.7
II	33	30.4
III	22	26.7
IV	18	16.9
V	12	10.4

*Source: www.e.g.fjp.mg.br.
SVI, Social Vulnerability Index.

and the intra-class coefficient were used to validate the scales of the psychological tests. The SPSS 12.0 program (Chicago, IL, USA) for microcomputers was used for the analysis.

Results

Among the 652 children, 340 (52.0%) were girls and 312 (48.0%) were boys between the ages of 7 and 10 years, with a predomination of 8-year-olds (84.2%). Most of the parents/guardians reported living together (67.0%), and 214 (33.0%) were separated. The majority of families were exposed to low social vulnerability (54.2%), whereas 45.8% pertained to the high vulnerability group. The location SVI was used for the selection of the schools by lots, and the residential SVI of the children was considered in the data analysis. The factorial validity of the correlation between location SVI of the school and residential SVI of the children was obtained using Spearman's correlation, obtaining a coefficient of 0.78. The sample distribution was similar to that found in the SVI for the city of Belo Horizonte (Table 3).

The habit of sleep bruxism was exhibited in 230 children (35.3%). More than half of the children without bruxism (55.2%) pertained to the group exposed to lesser social vulnerability, but no association was found between vulnerability and bruxism ($P = 0.457$). Table 4 displays the distribution of values regarding the association analysis between age, gender, social factors, and sleep bruxism among the children. Associations between bruxism, stress levels, and personality traits were analysed. There was an association with high neuroticism ($P = 0.000$), and high responsibility was on the threshold of significance ($P = 0.059$). Table 5 displays the distribution of values regarding the analysis between stress levels and personality traits dichotomized by the sample profile and habit of bruxism among the children.

Table 4. Association between age, gender, social factors, parental marital status, and sleep bruxism among the children.

	Bruxism		
Variable	**Present**	**Absent**	***P****
Age			
≤ 8 years	206 (89.6)	386 (91.5)	0.422
> 8 years	24 (10.4)	36 (8.5)	
Gender			
Male	100 (43.5)	212 (50.2)	0.098
Female	130 (56.5)	210 (49.8)	
Social vulnerability			
Low	120 (52.2)	233 (55.2)	0.457
High	110 (47.8)	189 (44.8)	
Marital status			
Live together	144 (62.9)	296 (70.5)	0.048
Separated	85 (37.1)	124 (29.5)	

Values between parentheses refer to percentage of ages in columns.
*Chi-squared test.

A logistic model was created to assess risk variations in the likelihood of the occurrence of bruxism. The selection of variables for the model was performed using the stepwise method, considering significance levels for the inclusion or exclusion of variables. The resulting model only included two independent variables: neuroticism and responsibility. Thus, there was an association between the development of bruxism and personality traits. Children with a high level of neuroticism (OR = 1.9, CI 1.3–2.6) and those with a high sense of responsibility (OR = 2.2, CI 1.0–5.0) were two times more likely to exhibit bruxism when compared to children with low levels of these traits. Table 6 displays values of the multivariate logistic regression analysis regarding personality traits and bruxism among the children. No association was found in the logistic model between stress and bruxism.

Discussion

This study administered instruments validated in Brazil to determine the association between

Table 5. Association between stress levels and personality traits dichotomized by the sample profile and bruxism among the children.

Psych tests dichotomized by sample profile	Bruxism		*P**
	Present	Absent	
CSS total			
Low (< 37)	106 (46.1)	204 (48.3)	0.582
High (≥ 37)	124 (53.9)	218 (51.7)	
CSS physical reactions			
Low (< 9)	102 (44.3)	178 (42.2)	0.593
High (≥ 9)	128 (55.7)	244 (57.8)	
CSS psychological reactions			
Low (< 13)	85 (37.0)	201 (47.6)	0.009
High (≥ 13)	145 (63.0)	221 (52.4)	
CSS psychological reactions – depress			
Low (< 4)	65 (28.3)	161 (38.2)	0.011
High (≥ 4)	165 (71.7)	261 (61.8)	
CSS psycho-physiological reactions			
Low (< 8)	88 (38.3)	162 (38.4)	0.974
High (≥ 8)	142 (61.7)	260 (61.6)	
BFC neuroticism			
Low (< 37)	76 (33.0)	203 (48.1)	0.000
High (≥ 37)	154 (67.0)	219 (51.9)	
BFC responsibility			
High (≥ 54)	08 (3.5)	30 (7.1)	0.059
Low (< 54)	222 (96.5)	392 (92.9)	

Values between parentheses refer to percentages in columns.
*Chi-squared test.

Table 6. Multivariate logistic regression regarding neuroticism and responsibility associated to bruxism among the children.

Risk variable	Unadjusted OR (CI 95%)	*P*	Adjusted OR (CI 95%)	*P*
Neuroticism				
Low	1	0.000	1	0.000
High	1.8 (1.3–2.6)		1.9 (1.3–2.6)	
Responsibility				
Low	1	0.054	1	0.049
High	2.1 (0.9–4.7)		2.2 (1.0–5.0)	

CI, confidence interval; OR, odds ratio.

stress, personality traits, and sleep bruxism among children. The high prevalence of 35.3% demonstrates the need for further research on this subject. Other researchers have found different prevalence percentages among children from different cultures and age groups, using different collection methods[2–7]. A number of studies have found a difference in the prevalence of bruxism between genders, with a higher prevalence among females[23,24]. However, the multivariate model used in this study found no gender influence, thereby corroborating findings from another study[25].

We adopted parents' reports regarding audible nocturnal teeth grinding as the criterion for determining the prevalence of sleep bruxism among the children and based on criteria proposed by the AASM[8]. This method has been employed in other studies and was found to be reliable and valid in a study performed in Boston, MA, USA[6]. Most parents reported keeping their bedroom doors and those of their children open while sleeping (81.0%), and 64.0% reported visiting their children's rooms at least once a night, thereby offering the best foundation from which to provide information[6]. Other studies have employed electronic and digital instruments, showing satisfactory consistency in this method[1,25–28]. This method is, however, very complex and expensive for studies with large samples. This study had a large population base with an epidemiological nature, representative of the city of Belo Horizonte (Brazil), thereby rendering the use of complex, costly exams unviable.

Neuroticism and responsibility were associated to the development of bruxism. The components of neuroticism are anger, anxiety, sadness, irritability, and impatience[9,19–21]. Responsibility is related to self-discipline and a sense of duty[9,19]. These two personality traits make up the profile of individuals with the habit of bruxism. Assessing personality involves seeking explanations for different behavioural facets adopted by individuals over time and in different situations[4,9–11,19–21]. As sleep bruxism is considered a mechanism for releasing tension that has accumulated throughout the day[1,3,4,23–26], the manner in which an individual deals with daily conflicts is closely related to his/her personality traits[4]. Such traits in childhood can extend into adult life[9–11].

It is common for dentists to confect muscle-relaxing bite plates for adults to be used while sleeping in order to protect the teeth and periodontium[28–30]. However, this is a palliative measure, as the habit remains even while using the nocturnal bite plate[28–30].

The association between personality traits and habit of childhood bruxism suggests that psychological treatment during childhood may

allow individuals to understand their manner of facing conflict or tension, and have an affect on the control of the habit.

What this paper adds

- This paper offers additional information to the relatively sparse data on sleep bruxism among schoolchildren in a developing country.
- This paper assesses the association between psychosocial factors and sleep bruxism in children, emphasizing the role of personality traits.

Why this paper is important to paediatric dentists

- This paper explores the relationship between personality traits, stress, social class, and sleep bruxism in children.
- This paper stresses emotional factors in childhood that should be a concern for oral health professionals.

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