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Personality traits and temporomandibular disorders in a group of children with bruxing behaviour

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SUMMARY The aim of the present study was to compare the personality pattern, the anxiety level and the temporomandibular disorders (TMD) between bruxist and non-bruxist children with mixed dentition. Fifty-two subjects, with a mean age of 9·45 years (range 8–11) were evaluated and classified as bruxist (n = 26), according to the American Academy of Sleep Medicine (AASM) and the presence of dental wear clinically visible, under the same conditions of artificial light and position. The control children (n = 26) did not present dental wear and did not accomplished all the AASM criteria. The personality pattern and the anxiety of the bruxist children were studied by means of the Children's Personality Questionnaire (CPQ) and the Conners' Parents Rating Scales (CPRS), respectively, and compared with the personality traits and the anxiety level of a non-bruxist population. The TMD were also evaluated using the Research Diagnostic Criteria for temporomandibular disorders (RDC/TMD) criteria. The data were analysed with the student's t-test, Fisher's exact test and chi-squared tests. A multivariated analysis was performed using a logistic regression with the stepwise likelihood ratio method. Compared with the controls, the bruxist children had significantly higher tension personality and were more anxiety prone. The bruxist children presented more TMD-related signs and symptoms than children in the control group. A strong correlation was found among bruxism, TMD, the high anxiety level and the high tension personality trait.

KEYWORDS: personality traits, anxiety, temporomandibular disorder, bruxism, children

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Introduction

Sleep bruxism (SB) is an unusual orofacial movement described as a parafunction in dentistry and as a parasomnia in sleep medicine (1). The aetiology of sleep bruxism has been defined as multifactorial (2). It is regulated centrally, but influenced peripherally (3). This fact means that oral habits (4), temporomandibular disorders (TMD) (5–8), malocclusions (9–11), hypopnoea (12), high anxiety levels (13), personality (14) and stress (15), among others (16) could influence the occurrence of bruxism peripherally as they act as a motor stimulus to the central nervous system, which reacts with an alteration in the neurotransmission of dopamine (17, 18) and the answer is the clenching or grinding of the teeth.

The prevalence of Sleep Bruxism is difficult to estimate, as quite often the subjects are unaware of having the disorder (19). There is no reported gender difference and it is more frequent in the younger generation, with a decline over age (19). The symptoms recognized in children can persist in the adulthood (20).

Attempts have been made to specify the personality traits of bruxers, reported to be more anxious or vulnerable to stress. The studies of the personality traits in bruxist children are limited (21). Kuch *et al.* (21) did not found any association between the children's personality and bruxism. The study did not include a

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control group and the instrument to evaluate the personality was an interview and not a validated assessment (21). On the other hand, Kampe *et al.* (22), found a positive relationship between bruxism and personality traits in adults, increasing the controversy.

The aim of the present study was to describe the personality traits and the anxiety level of bruxist children and their association with the TMDs present in bruxist children.

Subjects and methods

A case–control study was performed. Fifty-two subjects (26 bruxist and 26 non-bruxist), aged between 8 and 11 years (average age 9·45 s.d. 0·68 years), third- to fifth-grade students from the Montessori School in Medellín, Colombia, were enrolled in the present study. All the subjects were required to be healthy, had normal facial morphology, absence of other types of oral habits and had no history of trauma.

Eighty-seven children and their parents were initially invited to participate in the study. The procedures were explained fully to the participants. Ten parents argued that they did not have time to participate in the study, 19 did not return the written informed consent and six were excluded because they did not have a matching case subject.

Finally, the written informed consent from the participating children ($n = 52$) and their parents was obtained prior to the investigation.

The sample size was calculated with a confidence of 95% and a statistical power of 80%. The number of subjects required in each group to make the comparisons was at least 20.

Inclusion criteria

The bruxist children ($n = 26$) were selected when they accomplished the classification criteria proposed by the American Academy of Sleep Medicine (AASM) (23) for bruxism and presented clinically visible dental wear under the same conditions of artificial light and position. The AASM criteria for bruxism are the following:

1. The children's parents indicated the occurrence of tooth grinding or tooth clenching during sleep.
2. No other medical or mental disorders (e.g. sleep-related epilepsy, accounts for the abnormal movements during sleep).
3. Other sleep disorders (e.g. obstructive sleep apnoea syndrome) were absent.

All the parents were required to sleep close to their children at least 2 weeks before the beginning of the study.

The children in the control group ($n = 26$) were paired by age, accomplished the second and third criteria of the AASM, but not the first one and did not present clinically detectable dental wear. The children of the control group were chosen through pair matching procedures, so that each bruxer child had a matching age control.

Inventories

The study was conducted using the Children's Personality Questionnaire (CPQ) (24), the Conners' Parents Rating Scales (CPRS) (25) and the RDC-TMD (26).

Children's Personality Questionnaire

The CPQ is suitable for administration in children aged 8–12 years and had been used previously by different authors to evaluate personality traits in different situations (27–29).

The questionnaire targets 14 dimensions of personality taken from a factor analysis of personality performed initially by Cattell in 1950. It totals 280 items, made up of form A (divided into parts A1 and A2, each of which is composed of 70 items (five for each of the 14 personality factors) and form B (likewise divided into two parts, B1 and B2, each containing 70 items). To reduce error caused by deliberate false responses, the items were written to be as neutral as possible with regard to social desirability, and items with low face validity were used so that children might not know how to make themselves 'look good'.

The test listed above is based on self-assessment and was compiled by the participants individually in the presence of an examiner who, unaware both of the aim of the study and of the type of diagnosis reached, ensured that the subjects carried out the tests properly. The CPQ was administered to all the 52 subjects included in the study in a room free of noises and distractions, in groups of 10, at the same hour to all of them.

The following personality traits were evaluated:

A. Outgoing–reserved.
B. Intelligent–dull.

C. Ego strength–weakness.
D. Excitable–placid
E. Dominant–submissive.
F. Happy-go-lucky–serious.
G. Conscientious–frivolous.
H. Venturesome–shy.
I. Sensitive–tough.
J. Restrained–vigorous.
N. Shrewd–artless.
O. Apprehensive–self-assured.
Q3. Self-controlled–lax.
Q4. Tense–relaxed.

Additionally, the CPQ evaluated three factors of second order:
Q1. Low anxiety–high anxiety.
Q2. Introversion–extraversion.
Q3. Tough-mindedness.

The CPQ inventory is designed to be self-responded by the children. The internal consistency reliabilities for the primary scales (30) of the CPQ average 0·76 (ranging from 0·68 to 0·87 over the 16 scales) in a normative sample of 10 261 individuals. Test–retest reliabilities for a 2-week interval ranged from 0·69 to 0·87 with a median of 0·80. Two-month test–retest reliabilities ranged from 0·56 to 0·79 with a median of 0·69. Two-week test–retest estimates ranged from 0·84 to 0·91 with a mean of 0·87, and 2-month test–retest estimates ranged from 0·70 to 0·82 with a median of 0·80.

Because the CPQ dimensions were developed through a factor analysis, construct validity is provided by studies confirming its factor structure (30, 31). Additionally, the factor structure has been confirmed in a range of languages, including Spanish.

The anxiety is included in the CPQ as a personality trait. It was decided to measure anxiety more deeply. Therefore, anxiety was also measured with the CPRS.

Conners' Parents Rating Scales

The Conners' Parent Rating Scale (CPRS) is a popular research and clinical tool for obtaining parental reports of childhood behaviour problems. The revised CPRS (CPRS-R) (25) has norms derived from a large, representative sample of North American children, uses confirmatory factor analysis to develop a definitive factor structure, and has an updated item content to reflect recent knowledge and developments concerning childhood behaviour problems. Exploratory and confirmatory factor-analytic results revealed a seven-factor model including the following factors: cognitive problems, oppositional, hyperactivity–impulsivity, anxious–shy, perfectionism, social problems and psychosomatic. The psychometric properties of the revised scale appear adequate as demonstrated by good internal reliability coefficients (Cronbach's $\alpha = 0{\cdot}70$) (32), high test–retest reliability (Pearson's $r = 0{\cdot}83$) (32), and effective discriminatory power (25).

Research diagnostic criteria for temporomandibular disorders

The research diagnostic criteria for temporomandibular disorders (RDC/TMD) have been developed for scientific evaluation of the TMD and are available to researchers and clinicians. The RDC/TMD were developed by a team of international clinical research experts gathered together (with NIDCR support) to develop, to the largest extent possible, an operationalized system for diagnosing and classifying RDC/TMD, based on the best available scientific data, within the context of a biopsychosocial model. Its reliability values ranged from good to excellent for the RDC/TMD clinical examination in children and adolescents (26, 33).

The clinical examination in this study was based upon the RDC/TMD, Axis I booklet, which is an updated version of the original publication and involved the clinical assessment of the following TMD signs and symptoms.

Pain site Present pain was evaluated as ipsilateral or contralateral that was provoked by clinical examination of the masticatory muscles and/or jaw function. Mandibular range of motion (mm): jaw opening patterns were determined. The vertical range of motion (extent of active unassisted opening without the occurrence of pain) and the extent of mandibular lateral and protrusive movements without pain were evaluated. The mandibular deviation was not included in the RDC/TMD, but was assessed as well, measuring the midline in closed position and in maximum aperture. The difference between them was registered. All the measurements were performed with a millimetre flexible acetate ruler (ETM scale®*).

TMJ sounds Clicking, grating and crepitus sounds were palpated during lateral, vertical and protrusive movements of the mandible and were registered as a whole.

*Patented and produced by Martha Tomoyo, Medellin, Colombia.

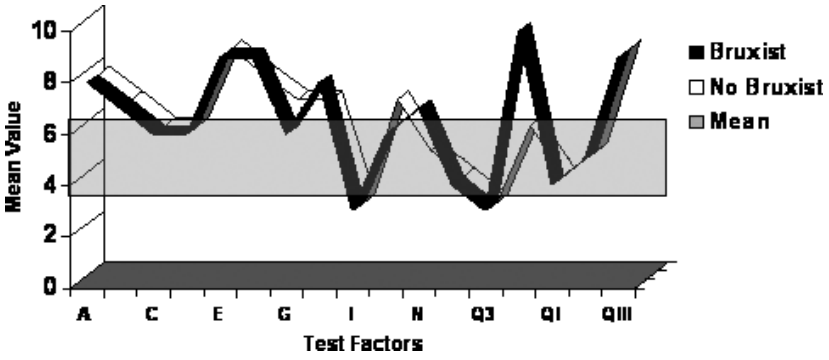

Fig. 1. Personality profile of bruxist and non-bruxist children.

Muscle and joint palpation for tenderness: assessment of extra- and intra-oral masticatory and related muscles (20 sites) was performed by bilateral palpation for tenderness and pain. The four sites of the TMJ were also examined by bilateral palpation.

Self-reported TMD pain in this investigation was based upon the subjects' responses to two questions: (i) do you have pain in your temples, face, temporomandibular joint (TMJ), or jaws once a week or more? and (ii) do you have pain when you open your mouth wide or chew once a week or more? Test–retest reliability of 0·83 (κ) was previously found for the two questions in another study (34). The whole questionnaire of the RDC/TMD was not used because the questions were not easy to answer by the 8- and 9-year-old children.

The examiners evaluating the condition of bruxism/non-bruxism were blind to those who performed the personality evaluation and those who measured the anxiety and evaluated the TMD.

Error of the method

Standardizations of the examiners and calibration of all the techniques to evaluate the children regarding the clinical examination (two paediatric dentists), the personality traits (two examiners) and anxiety (one psychologist) were made on 12 subjects different from the ones included in the investigation. The intratester and intertester error was not statistically significant (ICC > 0·9 and κ > 0·7).

Subjects underwent repeated clinical examinations by two calibrated examiners to assess signs and symptoms per the RDC/TMD. Interexaminer and intra-examiner reliability was assessed for clinical examination, questionnaire items and diagnosis. Reliability values ranged from acceptable to excellent for the RDC/TMD clinical examination and the two questions (ICC > 0·7 and κ > 0·81).

Statistical analysis

All data were analysed with SPSS 11·0 for windows.[†] Distributions were tested using the Shapiro–Wilk's test. Differences between the anxiety of the control group and the bruxist subjects were tested by means of Student's *t*-test.

The personality traits and the TMDs were compared between the two groups, using the two-tailed Fisher's exact test and chi-squared tests.

A multivariate logistic regression analysis was carried out with the stepwise likelihood ratio method. For all tests, significance was set at 5% ($P < 0·05$).

Results

Personality differences between bruxist and non-bruxist children

The personality profile of the bruxist and the non-bruxist children can be seen in Figure 1. There was a significant difference between the subjects of the bruxing group and the control children, regarding the tense (Q4, first order) personality trait (Table 1).

Anxiety level differences between bruxist and non-bruxist children

The mean value of anxiety, measured with the CPRS was higher for the bruxist group than for the control group (Table 1).

[†]SPSS® Inc., Chicago, IL, USA.

Table 1. Comparison of the personality traits measured with the CPQ and anxiety measured with the CPRS in the bruxist and non-bruxist groups

Personality trait (CPQ)	Bruxist		Non-bruxist		*P*-value
First order					
A	Outgoing	Reserved	Outgoing	Reserved	1
	20	6	22	4	
B	Intelligent	Dull	Intelligent	Dull	1
	19	7	20	6	
C	Ego strength	Weakness	Ego strength	Weakness	1
	19	7	19	7	
D	Excitable	Placid	Excitable	Placid	1
	8	18	7	19	
E	Dominant	Submissive	Dominant	Submissive	0·35
	12	14	17	9	
F	Happy-go-lucky	Serious	Happy-go-lucky	Serious	0·73
	13	13	11	15	
G	Conscientious	Frivolous	Conscientious	Frivolous	1
	11	15	15	8	
H	Venturesome	Shy	Venturesome	Shy	0·58
	11	15	12	14	
I	Sensitive	Tough	Sensitive	Tough	0·63
	5	21	5	21	
J	Restrained	Vigorous	Restrained	Vigorous	0·70
	10	16	8	18	
N	Shrewd	Artless	Shrewd	Artless	0·11
	11	15	13	13	
O	Apprehensive	Self-assured	Apprehensive	Self-assured	1
	3	23	4	22	
Q3	Self-controlled	Lax	Self-controlled	Lax	0·14
	9	17	6	20	
Q4	Tense	Relaxed	Tense	Relaxed	0·024
	15	11	6	20	
Second order					
Q1	High anxiety	Low anxiety	High anxiety	Low anxiety	1
	4	22	5	21	
Q2	Introversion	Extraversion	Introversion	Extraversion	0·25
	16	10	15	11	
Q3	Tough	Mindedness	Tough	Mindedness	0·16
	14	12	17	9	
Anxiety (CPRS)	1·90 (s.d. 1·13)		0·63 (s.d. 0·73)		0·0007

Temporomandibular disorders measured with the RDC/TMD

The TMDs were quantified using the RDC/TMD. The bruxist children presented more TMD-related signs and symptoms than the children in the control group (Table 2).

Multivariated analysis

For those variables where $P < 0{\cdot}2$ in the bivariate analysis, a multivariated analysis using logistic regression was performed.

The following variables were inserted step by step in the analysis:

The personality traits (CPQ): N, Q3 and Q4 of the first order and Q3 of the second order.

The anxiety level according to the CPRS.

The range of mouth opening, the joint sounds and extra-oral muscle tenderness measured with the RDC/TMD.

The deviation in mouth opening.

Pain when opening the mouth wide or chewing once a week or more.

Table 2. Comparison of the temporomandibular disorders evaluated with the RDC/TMD between the bruxist and non-bruxist children

Measurement	Bruxist	Non-bruxist	*P*-value
Clinical examination			
Number of subjects with pain on jaw movement	6	4	0·24
Mean of range of mouth opening (mm) (active unassisted opening)	34·33 (s.d. 5·99)	49·19 (s.d. 2·31)	0·013
Mean of deviation in mouth opening (mm) (additional measurement, is not part of the RDC/TMD)	1 (s.d. 0·70)	0·17 (s.d. 0·21)	0·002
Number of subjects with joint sounds (clicks and crepitation are not differed)	13	5	0·034
Number of subjects with extra-oral muscle tenderness	11	2	0·002
Number of subjects with intra-oral muscle tenderness	1	1	1·0
Questions			
Number of subjects with pain in temples, face, temporomandibular joint (TMJ), or jaws once a week or more	3	3	1
Number of subjects with pain when opening the mouth wide or chewing once a week or more	4	1	0·18

The final model was constructed with all the variables included in the multivariate analysis. In the final model, the Nagelkerke coefficient (measurement obtained with the logistic regression to determine the reliability of the variables included in the model to explain the phenomenon (bruxism), presented a value of 0·37, which showed that 37% of the differences between groups could be explained by the variables included in the model ($P = 0·008$). The Hosmer–Lemershow test assessed goodness-of-fit of the variables of the model and gave a statistical value for the chi-squared of 8·77 with $P = 0·45$, suggesting that the variables contained in the model adequately explained the findings of this investigation.

From the variables included in the final model, the odds ratio of the relaxed personality trait was 0·49, showing an association of the relaxed personality trait as a protector factor and the high tension personality trait as a risk factor to acquire bruxism. These findings were statistically significant ($P = 0·02$, 95% CI 0·27–0·89). The results of odds ratio revealed that the presence of an anxious condition increased the risk of being a bruxer. The odds ratio of the other personality traits was not statistically significant ($P > 0·16$).

It was found that children with deviation in mouth opening were significantly over-represented in the subjects having bruxism (OR = 1·59, 95% CI 1·03–2·44, $P = 0·04$ by logistic regression analysis). The logistic regression analysis also identified the range on mouth opening (OR = 1·89, 95% CI 1·11–3·19, $P = 0·02$) the joint sounds (OR = 1·09, 95% CI 0·62–1·94, $P = 0·76$) and the pain when opening the mouth wide or chewing once a week or more (OR = 1·03, 95% CI 1·01–1·05, $P = 0·01$), as associated with bruxism. The extra-oral muscle tenderness was negatively associated with bruxism (OR = 0·49, 95% CI 0·27–0·89, $P = 0·02$).

Discussion

As it was related in the introduction, bruxism is a multi-aetiological parasomnia that is mainly regulated centrally and influenced peripherally (3). It is a disruption in the neurotransmission of dopamine (3, 35). Therefore, this study was performed to explore the personality of the bruxist population and perhaps explain deeply this common behaviour in children. Indeed, a strong correlation was found of the tense personality trait and the anxiety condition with bruxism in children with mixed dentition that suffered bruxism.

Personality inventories have been criticized for many reasons, e.g. fake ability of response, influence of response styles, lack of insight about ones'

own motives and emotions, differing dimensionality obtained with different instruments (22). The critique has been overstated and the inventories represent 'The best general approach currently available to measuring personality characteristics' (22), as is the only method to make the personality traits comparable between subjects. However, the likelihood of a type I error is at least 62% for the CPQ items; so, in this investigation, the data interpretation and conclusions about the personality traits should be judicious.

In adults, the subjects can describe their anxiety characteristics, and how anxious they feel, they can even write and classify their anxiety. The findings of Kampe *et al.* (22) showed that when compared with non-bruxist adults, the bruxers described themselves as more anxiety prone. The anxiety state is also a prominent factor in the development of bruxing behaviour in children (36). However, to study anxiety in children is more difficult. Most of the children do not even know the meaning or don't know how it feels to be anxious (36).

Although there are scales to measure anxiety in children and are self-applied (37), it is important to quantify the children's anxiety through their parents or guardians. Certain questions to the parents and even to the teachers can define the anxiety status of the children (25) better than the children's own opinion of their anxious state. The CPRS have shown to measure anxiety, as defined by the DSM IV (38). Indeed the CPRS has been used as a gold standard to compare other scales to measure anxiety in children (39).

Anxiety is not always positively related to stress (40). However, the bruxing adults have been reported to be stressful and to present headaches, clenching, pain in the neck, back, throat or shoulders (22). Besides, signs of bruxism, such as headaches, have previously been related to high anxiety levels (37). Here, it was found a strong correlation between anxiety, a tense personality and bruxism. Perhaps, the anxiety and the tense personality during childhood could be predictors of early development of bruxism.

Some authors have shown that when the anxiety is treated, either with psychological techniques (41) or with drugs (42), the symptoms of bruxism decrease. However controversy does exist regarding the effectiveness of pharmacology for the treatment of bruxism (43) and longitudinal studies are necessary to evaluate the long-term results of psychological therapies to reduce bruxism, even in children.

Bruxist children studied in the present research had a high level of anxiety. The findings of this study are in line with the results of other studies where anxiety has been observed in bruxist patients (13, 16, 22, 41).

The relation of bruxism with TMD in children is strongly supported (44–46) and the existence of an association between TMD and anxiety, depression and stress had been studied earlier (47), but none demonstrated causality of that relation (48). Most of the reviewed investigations did not associate TMD with specific personality traits as described by the CPQ. However, in the present study, a strong correlation was found not only for the anxiety and TMD, but also for the tense personality trait, TMD and bruxism in children.

The objective of the present study was not to diagnose specific diseases of the TMJ, but to evaluate the association of the signs and symptoms of TMDs with the personality traits and bruxism; so, the complete RDC/TMD diagnosis was not obtained in this investigation.

There are reports of the RDC/TMD used in children as 10 years of age (33). It is a tool to evaluate TMD that has been widely used. However, further studies are necessary to assure that the RDC/TMD is completely reliable to be used in children of 8–9 years of age.

Conclusion

The personality profile of the subjects seemed to be strongly associated with the bruxing behaviour of the studied children. The results of this study indicate a possible etiological relationship between the high tension personality trait, bruxism and temporomandibular dysfunction.

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