Bruxism, oral parafunctions, anamnestic and clinical findings of temporomandibular disorders in children

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SUMMARY The reported prevalence of temporomandibular disorders (TMD) present during childhood and adolescence ranges between 7% and 68%. The range of the reported prevalence of sleep bruxism in children is also wide. The purpose of the current study was threefold: (i) determine the prevalence of oral parafunctions, sleep bruxism and of anamnestic and clinical findings of TMD among Israeli children with primary or mixed dentition; (ii) to establish whether the parafunctional activities are associated with anamnestic and clinical findings of TMD in this population and (iii) to examine the possible impact of stressful life events on the prevalence of bruxism, oral parafunctions, and anamnestic and clinical findings of TMD in children. A total of 244 children (183 girls and 61 boys) aged 5–12 years were included in the study. Each participant underwent a full TMD examination. Parents, in collaboration with their children, completed a questionnaire on TMD symptoms, oral parafunctions and stressful life events in their children's life. Most participants (78·8%) reported at least one oral habit. Of these, only 'jaw play' was associated with TMD anamnestic and clinical findings. Stressful life events were associated only with the performance of multiple oral habits. These findings indicate that the performance of oral parafunctions is commonplace during childhood, with younger children exhibiting fewer oral parafunctions than adolescents. Stressful life events are related with an increase in the performance of multiple oral parafunctions in children but the later are not necessarily associated with anamnestic and clinical findings of TMD in the paediatric population.

KEYWORDS: children, bruxism, oral parafunctions, temporomandibular, stress, life events

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Introduction

A number of epidemiological studies have reported that while signs and symptoms of temporomandibular disorders (TMD) are present during childhood and adolescence, their prevalence is lower than in adults (1, 2). The reported prevalence of TMD in children ranges between 7% and 68% (3). This wide variation stems from differences in the criteria used for determining TMD, examination protocols and sample populations. The range of the reported prevalence of sleep bruxism in children is also wide (4–6). It may be due to the postulated influence of psychosocial factors on the development of sleep bruxism among children (7).

Oral habits or parafunctions, defined as any oral nonfunctional activity or behaviour involving the masticatory system, are neither uncommon nor are they always harmful (8). It is only when such activities exceed an individual's physiologic tolerance that breakdown of the masticatory system may occur. In such cases the initial breakdown takes place in the tissue

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with the lowest structural tolerance in that particular individual, e.g. joints, teeth or muscles (1).

Oral habits or parafunctions have been reported to be common worldwide, with many children and adolescents performing them on a daily basis (9–12). Oral habits include a variety of activities, such as continuous gum chewing, nail biting, and chewing on writing implements (pencils, pens). Oral habits such as these are common among adolescents in Israel, and they were shown to have a potentially detrimental effect on the masticatory system (13–15).

The purpose of the current study was threefold: (i) to determine the prevalence of oral parafunctions, sleep bruxism and of anamnestic and clinical findings of TMD among Israeli children with primary or mixed dentition; (ii) to establish whether the parafunctional activities are associated with anamnestic and clinical findings of TMD in this population and (iii) to examine the possible impact of stressful life events on the prevalence of bruxism, oral parafunctions, and anamnestic and clinical findings of TMD in children.

Materials and methods

This study was carried out with the approval of the Tel Aviv University Ethics Committee for conducting studies on human subjects. An informed consent form, explaining the purpose of this study, was attached to the questionnaire and returned signed by the parent (or surrogates) with the completed questionnaire. All the parts of the study (including the clinical examination) were carried out only on those children that expressed his/her willingness to be examined and queried.

Study population

Questionnaires were distributed to 559 children (334 girls and 225 boys) aged 5–12 years, who were attending a private school in central Israel. The children received a full explanation of the nature of the study and were asked to return the filled-in questionnaire, and the signed informed consent form, on the day of their scheduled dental examination. A total of 265 questionnaires were returned, yielding a 47% response rate. Twenty-one children were excluded: 8 were using Ritalin or its equivalent, 10 were undergoing orthodontic treatment and 3 had a history of trauma to the face. The final study population consisted of 244 children (183 girls and 61 boys) aged 5–12 years (Table 1).

Table 1. Age and gender of study children

Age (*y*)	Boys (*n*)	Girls (*n*)	Total (*n*)
5–7	15	69	84
8–9	24	53	77
10–12	22	61	83
Total	61	183	244

Questionnaires

The questionnaire was adapted from similar questionnaires that had been used in previous studies on TMD in adolescents (13, 15). Since in the present study the questionnaire was to be filled out by parents in collaboration with the children, rather than by the examinees themselves, proper modifications have been made. The questionnaire was aimed to elicit the following information (yes/no):

1 Temporomandibular anamnestic findings (at least once a week during the last 3 months)
   a. Reported pain when chewing solid food or a feeling of tiredness in the facial muscles when chewing.
   b. Joint sticking, defined as experiencing a sudden momentary self-releasing locking of the jaw that prevents full opening or the feeling that the jaw is stuck and cannot be released with ease.
   c. Joint noises: sensation of noises (clicking, popping or grating) during jaw movement.

2 Oral habits (on a daily basis)
   a. Biting down on hard objects (pens, pencils, etc.).
   b. Crushing hard candies, ice, popsicles, etc. with the teeth.
   c. Biting fingernails.
   d. Taking apart toys/games (e.g. Lego blocks) with the teeth.
   e. Opening bottles with the teeth.
   f. Gum chewing – average number of hours per day.
   g. 'Jaw-play' (involuntary small mandibular movements without tooth contact).

3 Bruxism. 'Sleep bruxism' was defined according to the minimal criteria of the American Academy of Sleep Medicine [AASM (16)] as follows:
   a. Parental reporting of the child's grinding or clenching of teeth while asleep (in our study defined as performed at least once a week during the past 3 months).

b. The absence of any other medical or psychological disorder (e.g. sleep-related epilepsy) that could account for the abnormal movements of the mouth and jaw during sleep.
c. The absence of other sleep disorders (e.g. obstructive sleep apnea syndrome).

A child was considered to demonstrate signs of possible clenching if he/she exhibited soft tissues signs of either linea alba or tongue indentations.

4 Stressful life events

In order to examine the possible impact of stressful life events on the prevalence of bruxism, oral parafunctions, anamnestic and clinical findings of TMD, parents were asked about stressful life events in the family over the past year as follows (yes/no):

a. Birth of a sibling
b. Change of address
c. Divorce of the parents
d. Death of a family member.

Clinical examination

Clinical examination of the study group was carried out by one of the investigators (PFR) on the school premises (school nurse's room). Each child was examined while seated on a regular chair.

Prior to the opening of the study, the examining investigator (PFR) practiced the clinical procedure on 10 children who were not part of the study group. Quantification of pressure on palpation was determined according to the training practice session of the International Consortium for TMD (17). Each of the initial 10 children was examined twice, with an interval of 30 min between examinations, with the results of the first examination not being available to the investigator while performing the second one. The intra-rater reliability of the pilot examinations was 1·00 for non-continuous variables (KAPPA) and 0·91 for continuous variables (Interclass Correlation).

Extraoral examination

The following parameters were examined:

1 The presence of temporomandibular joint (TMJ) sounds which were either clearly audible or felt using the index finger during opening and closing of the mouth were recorded. Only those sounds that were detected in at least two out of three consecutive opening/closing actions were considered positive (as per RDC/TMD [17]).

2 TMJ sensitivity to palpation (yes/no) that was checked using a pressure of 0·5 kg (17).

3 Sensitivity to palpation of the masseter (deep and superficial, left and right sides) and the temporalis (anterior portion, left and right sides) was checked using a pressure of 1 kg for children over 10 years old as recommended by the RDC/TMD (17) and by Wahlund *et al.* (18), and a pressure of 0·5 kg for children up to 10 years old as recommended by Castelo *et al.* (19) according to Fricton and Schiffman (20). Sensitivity to palpation was evaluated at six sites altogether, i.e. the anterior temporalis muscles and the deep and superficial masseter muscles on each side. The children reported their sensitivity to palpation on a faces pain rating scale, which is considered a reliable and replicable tool for use with children (21). The faces pain rating scale was chosen for the present study since young children may have difficulty reading and/or rating by means of a numerical/linear scale. This scale is appropriate for children from the age of 3 years and up, and has been utilised in numerous studies of pain in the paediatric population, demonstrating a high correlation to the visual analogue scale used in adults (22–24). The scale consists of six faces that were assigned a rating from 0 to 5 (0 = no pain and 5 = most intense pain). Each child was asked to choose the face that mostly closely described his/her own level of pain.

Following the examination, the mean sensitivity to palpation of muscles for each of the six examined sites was calculated and multiplied by two.

Intraoral examination

The following parameters were examined:

The presence of wear facets on teeth was assessed according to a modification of the method by Johansson *et al.* (25). Scores were calculated as: follows: none (grade 0) = no wear, mild (grade 1) = enamel only, moderate (grade 2) = enamel and dentin and severe (grade 3) = significant loss of tooth structure. The assessed teeth included the primary incisors, canines, and molars, the permanent incisors and the lower first molars. The most severe worn tooth from each dental group was registered for each subject. In order to prevent bias any tooth that exhibited severe signs of erosion was excluded.

Table 2. Prevalence anamnestic and clinical findings of TMD in the examined population and comparison between boys and girls (chi-square test)

Symptom	% Boys $n = 61$	% Girls $n = 183$	% Population $n = 244$	*P*-value (gender)	Following Bonferroni correction $\alpha = 0{\cdot}0071$
Reported joint noise	**9·8%**	**2·2%**	**4·1%**	**=0·009**	**TEN**
Pain or tiredness in the masticatory muscles	8·2%	2·7%	4·3%	<0·05	NS
Joint 'sticking'	0·5%	0·0%	0·4%	=0·05	NS
Clicking on examination	10 (16·3%)	13 (7%)	36 (14·6%)	>0·05	NS
Crepitation on examination	1 (1·6%)	1 (0·5%)	7 (2·9%)	>0·05	NS
TMJ sensitivity to palpation	14 (22·9%)	52 (28·6%)	66 (27·2%)	>0·05	NS

TMJ, Temporomandibular joint; TEN, tendency to statistical significance (in bold); NS, non-significant.

Table 3. Prevalence of symptoms in the examined population and comparison between group ages (chi-square test)

Symptom/age	5–7 $n = 84$	8–9 $n = 77$	10–12 $n = 83$	*P*-value (age)	Following Bonferroni correction $\alpha = 0{\cdot}017$
Reported joint noise	4·0%	3·8%	4·5%	>0·05	NS
Pain/tiredness in the masticatory muscles	1·2%	7·9%	13·3%	>0·05	NS
Joint 'sticking'	0·2%	0·4%	0·6%	>0·05	NS

NS, non-significant.

Statistical methods

Statistical analyses were carried out using SPSS statistical software* (version 14·0 *). Two-tail tests were used in all cases, and the probability with 95% confidence intervals was computed ($P < 0{\cdot}05$). In order not to exceed an overall type I error of 0·05, in case of multiple tests the Bonferroni correction was used. Namely, for each examination we set alpha to 0·05 divided by the number of repetitions. When *P* was not significant even before Bonferroni correction, it was written >0·05.

Results

Anamnestic and clinical findings of TMD

There were no statistical differences in the prevalence of anamnestic and clinical findings of TMD between boys and girls (chi-square, Table 2). Age had no main significance in the prevalence of anamnestic findings even before Bonferroni correction (Table 3).

The extent of mouth opening naturally increased with age ($P < 0{\cdot}001$, chi-square, Table 4), but there was no significant correlation between the end-feel and age.

*SPSS Inc., Chicago, IL, USA

Table 4. Correlation between age, range of mouth opening and muscular sensitivity to palpation independent *t*-test

		Age	Following Bonferroni correction $\alpha = 0{\cdot}017$
PMO	Pearson correlation	*0·330*	Sig.
	Sig. (two-tailed)	*P < 0·001*	
	n	*239*	
AMO	Pearson correlation	*0·310*	Sig.
	Sig. (two-tailed)	*P < 0·001*	
	n	*239*	
Muscular sensitivity to palpation	Pearson correlation	−0·153	TEN.
	Sig. (two-tailed)	P = 0·018	
	n	239	

PMO, passive mouth opening; AMO, active mouth opening; *n*, number of participants; Sig., statistically significant (in italics); TEN, tendency to statistical significance.

Boys generally expressed more sensitivity to muscle palpation than girls (5·24 vs. 4·23); and there was a negative correlation with age, i.e. less sensitivity among older children ($r = -0{\cdot}153$) but these correlation did not reach the required α by Bonferroni correction ($\alpha = 0{\cdot}0125$, $P = 0{\cdot}015$ independent *t*-test, $P = 0{\cdot}018$ Pearson correlation coefficient correspondingly).

Association between anamnestic and clinical findings

A tendency to significant negative association was found between mouth opening (AMO & PMO) and anamnestic findings ('sticking' of the TMJ and/or muscular tiredness and/or pain while chewing hard food) ($\alpha = 0{\cdot}017$, $P < 0{\cdot}003$, independent *t*-test). The average AMO and PMO values for children who reported these symptoms were smaller than AMOs and PMOs in asymptomatic children (AMO 45·9 ± 4·9 mm vs. 50·3 ± 5·9 mm, respectively; PMO 47·0 ± 4·74 mm vs. 51·0 ± 5·7 mm, respectively ($\alpha = 0{\cdot}017$, $P < 0{\cdot}007$, independent *t*-test). Children who reported 'joint sticking' and/or pain or tiredness while chewing hard food also had statistically higher mean muscle sensitivity to palpation compared to children without those reactions (ANCOVA, $F_{(1,236)} = 29{\cdot}87$, $P < 0{\cdot}0001$, controlling for gender, 5·92, STD = 2·6, $n = 65$ vs. 3·94, STD = 2·6, $n = 174$).

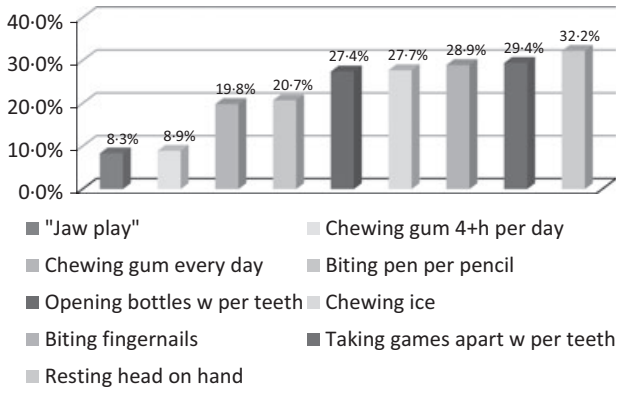

Fig. 1. Prevalence of oral parafunctions.

There was a positive association between reported clicks and clicks that could be detected in the clinical examination ($P < 0{\cdot}001$, chi-square test). A tendency to significance was found between clicks noted in the clinical examination and sensitivity to palpation of the TMJ ($\alpha = 0{\cdot}017$, $P < 0{\cdot}03$, chi-square test).

Oral parafunctions (oral habits) and their association with TM anamnestic and clinical findings

The most common habit among girls was resting the head on one hand, and the most common among boys was breaking apart parts of games (such as Lego™ building blocks) using their teeth (41%). Jaw-play was practiced by 8·3% of the children (Fig. 1). The average number of oral habits per child was 2·2; there was no gender difference, and 78·8% of the children reporting performing at least one oral habit. The number of oral habits reported by the children can be found in Fig. 2. The prevalence of oral habits, according to age, controlling for gender (ANCOVA) reveals that resting the head on the hand was more common in older children (Table 5).

The only oral parafunctions which were found to be statistically related to anamnestic and clinical findings of TMD were jaw-play combined with reported clicks and with pain or tiredness during chewing ($P < 0{\cdot}001$, chi-square test) and jaw-play with objectively detectable clicks ($P < 0{\cdot}001$, chi-square test).

Sleep bruxism

Thirty-three children (13·52%) were labelled as 'sleep bruxers' according to the minimal criteria of the AASM

Table 5. Oral habits events according to age, controlling for gender (ANCOVA)

	Positive finding			Negative finding					
Habit/sge	Mean age	s.d.	*n*	Mean age	s.d.	*n*	*F*	*P*-value	Following Bonferroni correction $\alpha = 0{\cdot}0062$
Daily gum chewing	9·94	1·59	47	9·19	1·89	194	6·244	<0·02	NS
Biting fingernails	9·56	1·82	70	9·26	1·87	172	1·259	>0·05	NS
Biting pen/pencils	8·90	1·61	50	9·46	1·92	190	3·577	>0·05	NS
Jaw play	10·20	1·61	20	9·27	1·87	220	4·664	<0·05	NS
Chewing ice	9·51	1·96	67	9·29	1·82	175	0·689	>0·05	NS
Resting head on hand	*9·85*	*1·79*	*78*	*9·10*	*1·86*	*161*	*8·696*	*<0·005*	*Sig.*
Taking games apart w/teeth	9·07	1·76	71	9·46	1·89	171	2·237	>0·05	NS
Opening bottles w/teeth	9·25	1·84	65	9·37	1·87	175	0·196	>0·05	NS

Sig., statistically significant (in italics); NS, non-significant.

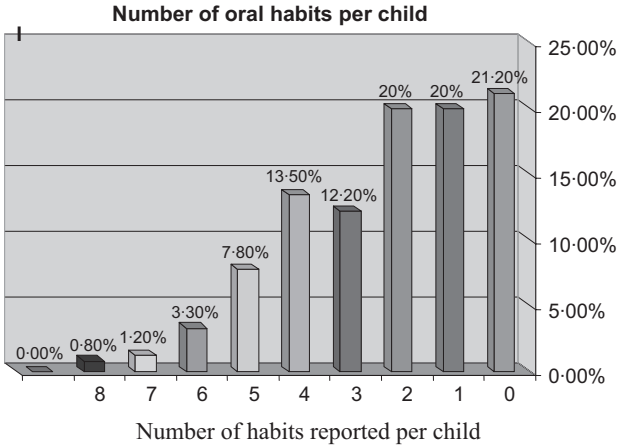

Fig. 2. Number of reported oral habits.

(15) for the diagnosis of sleep bruxism). There was no significant gender-based difference. Twelve children (out of 84, 14·28%) were 5–7 years old, 10 (out of 77, 12·98%), were 8–9 years old and 11 (out of 83, 13·25%) were 10–12 years old.

The relationship between sleep bruxism and anamnestic and clinical findings of TMD

Sleep Bruxism was not found to be significantly associated with any anamnestic symptom (Fisher's exact test) or clinical findings (independent *t*-test) of TMD.

Tooth attrition and its correlation with oral habits

Signs of tooth attrition were found in the majority of children examined. Most of the children exhibited only wear of the enamel (grade 1) which was found in 56·1% of the primary mandibular molars, in 53·3% of the primary canines, and in 45·9% of the primary maxillary incisors. There were no abfraction lesions. More severe wear, including dentin wear and/or significant loss of tooth structure (grades 2 and 3), was found in 22·6% of primary canine teeth, 12·7% of primary maxillary anterior teeth, and 10·6% of primary mandibular molars. Severe attrition of permanent teeth was rare. The only tooth that exhibited a significant correlation between attrition and age was the first permanent molar (Spearman's $r = 0{\cdot}268$; $P < 0{\cdot}001$). Dental attrition was not found to be statistically related to any oral habit, or to reported sleep bruxism.

Signs of clenching in the soft tissues

Forty-six (18·8%) children exhibited marked imprints of the teeth on their inner cheeks (linea alba), while 10 (4·2%) demonstrated signs of tongue indentations consistent with clenching behaviour. The prevalence of signs in soft oral tissues (linea alba and or tongue indentation) was significantly higher among boys (28·1% vs. 15·9%,; $\alpha = 0{\cdot}05$, $P < 0{\cdot}05$, chi-square test).

The relationship between stressful life events and oral parafunctions, signs and symptoms

The questionnaires revealed that, according to the parents' report, 53 children (22·7% of the 233 parents that answered the questions relevant to these items) experienced stressful life events during the past year. While the performance of a single oral parafunction was not significantly related with reported stressful life events, the performance of >2 oral parafunctions was statistically significant ($\alpha = 0{\cdot}0055$, $P < 0{\cdot}005$, chi-square test). No statistically significant association was found between stressful life events and sleep bruxism, soft tissue signs of clenching, dental wear or muscle pain.

It was found that the mean age of the children who suffered from stressful events was statistically lower ($8{\cdot}91 \pm 1{\cdot}88$ vs. $9{\cdot}49 \pm 1{\cdot}84$) ($\alpha = 0{\cdot}05$, $P < 0{\cdot}05$, ANCOVA, controlling for gender).

Discussion

In 1989, Okeson and O'Donnell (26) established standards for the purpose of identifying TMDs in children. These included a questionnaire directed specifically at the parents asking about the precipitating factors to which the child had been exposed, child's oral habits (parafunctions), relevant signs of which the parent is aware, symptoms about which the child complains, and a clinical examination. Few other studies on TMD and oral parafunctions among children include both a questionnaire and a clinical examination (23, 27).

Okeson (1) stated that many of the children are in fact unaware of any TMJ sounds, despite the presence of such sounds upon clinical examination. Similarly, Riolo *et al.* (28) reported almost no relation between individual reporting of TMJ sounds and actual clinical joint noises that are audible when examining children. Contrary to Okeson (1) and Riolo *et al.* (28), the present

study found a significant association between temporomandibular symptoms (anamnestic findings), as reported in questionnaires, and temporomandibular signs, as found in a clinical examination. This may be due to the fact that our questionnaire was designed to be filled out by the parents (in collaboration with their children) possibility indicating that initial screening of children for TMD should be done with parental assistance.

Nilner and Lassing (9) showed that functional disturbances of the masticatory system are common in children aged 7–14 years (with 64% experiencing pain upon muscle palpation and 39% experiencing pain on TMJ palpation). These values are substantially higher than the prevalence found in the present study (27·6% experiencing pain on TMJ palpation). The difference between the two studies may be explained by the different age and/or different, ethnic/socioeconomic status of the study populations, differences between questionnaires, difference in the content and performance of the clinical examination, and other factors.

The effect of age on the prevalence of TMD with age among children and adolescents is, as yet, under debate. While Bosnjak *et al.* (24) stated that there is an increase in the prevalence of TMD with age it contradicts the findings of others who did report such an increase (1, 8). The present study found that age has no impact on the prevalence of TM anamnestic and clinical findings, with the exception of range of mouth opening that naturally increases with age.

A concerning finding of this study was that the mean palpation site tended to be moderately painful for the average participant (score of over five in boys and over four in girls, on a scale of 0–10). In the present study muscular sensitivity to palpation was checked using pressure of 1 kg for children over 9 years old as recommended by the RDC/TMD (17) and by Wahlund *et al.* (18), and pressure of 0·5 kg for children up to 9 years old as recommended by Castelo *et al.* (19) and Fricton and Schiffman (20). It may be that even the downward adjustments to pressure applied on palpation in younger children were not sufficient to achieve an accurate measure. We are of the opinion that a calibration research study should be undertaken in order to adjust the palpation pressure according to age, and perhaps also to gender, in children and adults.

The role of gender in TMD has also been extensively discussed in the literature (2, 11, 27). Gender differences are small in childhood (27), but starting from late adolescence, females exhibit more temporomandibular symptoms and more clinical signs than males (29). In the present study, the differences found between genders were clinically insignificant, in accordance with List *et al.* (27) who suggested that the discrepancy between genders might be related to increasing levels of oestrogen as girls enter adolescence.

The data regarding the prevalence of oral parafunctions (78·8% of the children reported performing at least one oral parafunction) correspond closely with those of Könönen *et al.* (10) and Widmalm *et al.* (11), who reported that 75% of their studies children described at least one oral parafunction. Contrary to former studies which used basically the same methodology as ours (13, 15), we found that most oral habits (except for jaw-play) had no significant relationship to the presence of temporomandibular signs and symptoms among our subjects. Those unintentional small mandibular movements without tooth contact (15) were significantly related to the subjective and objective hearing of a click during jaw function. Winocur *et al.* (13) expressed their opinion that 'jaw play' is carried out to relieve tension in the TMJ due to internal derangement, but has the potential to elicit a vicious cycle that causes or aggravates TMJ problems (e.g. clicks) and can cause secondary muscular discomfort. It is possible that 'jaw play' is part of the sign/symptom itself and not just another habit The prevalence of jaw play habits in the present study was low (about 8%), a fact that calls for caution since findings based on such a low prevalence may be not of clinical significance.

The issue of sleep bruxism in children and its implications continues to be a subject for debate in the dental literature. Although some studies have linked bruxism and other oral parafunctional habits to signs and symptoms of TMD (4, 13, 15), other authors have not found such correlations (5). In a recent review, Barbosa *et al.* (29) suggested that the unreliability of the clinical assessment of bruxism reduces confidence in conclusions about its relationship with TMD. In the present study, sleep bruxism was statistically related to reported presence of clicks, but not to clicks detected during clinical examination. This may indicate that the reported clicking is present only upon awakening and that it disappears afterward or, alternatively, that it appears after a period of clenching during wakefulness and is not due to a reducible displacement of the articular disc, but due to a disc adhesion caused by intracapsular pressure during

clenching. In the present study, we defined that a child was considered to demonstrate possible signs of clenching if s/he exhibited soft tissues signs of either linea alba or tongue indentations. Lavigne *et al.* (30) defined awake bruxism as: 'awareness of jaw clenching' and it depends solely on the individual's awareness (31). It is our belief that young children are not capable of such self awareness and that parents are not always capable to detect awake bruxism (clenching) in their children, due to lack of audible noise. While 18% of the examined children exhibited signs related to clenching, it was not possible to define whether they clench their teeth during sleep, wakefulness or both.

Interestingly, no significant association was found between sleep bruxism and dental attrition. In order to avoid bias, teeth that were suspected to be chemically eroded were excluded. Possibly we erroneously excluded teeth that were affected both chemically and physically (by antagonist teeth), causing an underestimation of the level of dental attrition. Furthermore, the correlation between attrition and bruxism is not clear (32–35). Lussi *et al.* (36) hypothesised that the rather high prevalence of tooth wear found in children (as compared to adults) could be due to a more pronounced overlapping of the erosive process with abrasion and/or attrition. The high attrition rate found in the primary dentition may be also due to morphological differences between the primary and permanent enamel (more porous, less mineralised, a greater diffusion coefficient, significantly softer, less elastic, a lower degree of microcrystal arrangement) (36–39). Possibly, the diagnosis of SB by the parents is not of enough validity, and more strict criteria are needed. This may also explain the finding that bruxism prevalence apparently did not decrease significantly with age.

Similarly, the question of whether psychological and/or psychosocial problems are causes of bruxism in children has not yet been answered decisively. Serra-Negra *et al.* (7) reported that personality traits of neuroticism and a high degree of responsibility were correlated with sleep bruxism among children, while stress was not. The conclusions of a recent review article (40) were that while awake clenching is associated with psychosocial factors and a number of psychopathological symptoms, there is no evidence to relate sleep bruxism with psychosocial disorders. The lack of relationship between stressful events and sleep bruxism or soft tissue signs of clenching in the present study may further support this notion. In spite the possibility of bias due to the relatively high socio-economic status of the present population (children attending a private school), the stressful life events investigated (birth of a sibling, change of address, divorce of the parents and death of a family member) are ones that are possible in every socio-economic class.

The response rate in the present study was 43% (53% for girls and 27% for boys). Some children did not wish to participate, and others may have neglected to give the questionnaire to their parents. The latter possibility is supported by the higher rate of response (more than 60%) among the younger age groups, whose parents are more likely to inspect the child's schoolbag for messages. Accordingly, data interpretation of the present study conclusions should be judicious until further studies are conducted. The study analysed a broad spectrum of data, and after Bonferroni correction most of the correlations lost its significance. Restricting the study and/or increasing the sample size could have achieved more significant values. Nevertheless, are of the opinion that the information collected by us can serve as a basis for future studies.

Conclusions and recommendations

1 Anamnestic and clinical findings of TMD are already common during childhood, but they usually present in a milder form than during adolescence.
2 Stressful life events in children may result in an increase in the performance of oral parafunctions, without necessarily being associated with an increase in temporomandibular symptomatology or bruxism.
3 Parafunctional habits during childhood are generally not associated with anamnestic and clinical findings of temporomandibular, contrary to the situation among adolescents.
4 There is a need for more research in this area.

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