

# Coincidence and awareness of oral parafunctions in college students

H. Panek<sup>1</sup>, P. Nawrot<sup>1</sup>, M. Mazan<sup>1</sup>, B. Bielicka<sup>2</sup>, M. Sumińska<sup>1</sup> and R. Pomianowski<sup>1</sup>

<sup>1</sup>Department of Dental Prosthetics, Wrocław Medical University, Poland; <sup>2</sup>Department of Maxillofacial Orthopaedics and Orthodontics, Wrocław Medical University, Poland

**Objective:** The aim of the study was to determine the prevalence and awareness of particular types of oral parafunctions in young healthy students and any association with temporomandibular disorders (TMD). **Material and methods:** The study was performed in a randomly selected group of 303 healthy students (mean age 18.8 years) from the vocational technical school in Wrocław, Poland, who underwent a routine clinical examination and functional analysis of the mouth. On taking the history all subjects were asked about their awareness of various forms of parafunctional activity in their mouth. **Results:** Almost all subjects revealed various oral parafunctions such as: bruxism, nail and pen biting, chewing gum, and biting the mucosa of lip or cheek. These habits were present singly or as double, triple or even fourfold coincidences in a single person. The most frequent oral parafunctions were habitual gum chewing and bruxism. Subjects were very seldom aware of the last parafunction. TMDs were more prevalent in the presence of bruxism than in other oral parafunctions. **Conclusions:** The studied students revealed various types of oral parafunctions, however most of them were not aware of clenching and grinding their teeth.

**Key words:** bruxism, chewing gum, dental attrition, tooth wear, temporomandibular disorders, TMD, oral parafunctions

## Introduction

The term of oral parafunction was introduced to dental literature in 1950 by Drum (1969), who defined it as abnormal, fixed motor activities of the masticatory system differing qualitatively and quantitatively from normal functions of the system. According to definition by Gear (1997) oral parafunction consists of physiologically normal activation of voluntary skeletal muscles to produce behaviors that lack functional purpose and are potentially injurious. These behaviors, if they occur only occasionally, are not considered to be abnormal in any way; it is the chronic repetition of these behaviours that lead to tooth destruction (wear) and the acknowledgement of oral parafunctions.

There are various classification systems of oral parafunctions. According to van der Meulen *et al.* (2006) oral parafunctions may be divided into 3 scales: a BRUX scale for bruxism activities; a BITE scale for biting activities (eg. chewing gum, nails); and a SOFT scale for soft tissue activities (eg. tongue, lips). Oral parafunctions may be also classified as non-occlusal or occlusal (involving contact of opposing teeth) and including: biting of labial and buccal mucosa, involuntary tongue pushing, biting pencils, pens and nails as well as chewing gum, which has become popular especially among young people (Okeson, 1998; Rugh and Ohrbach, 1988). Winocur *et al.* (2001) remarked that the habit of chewing gum in adolescents may lead to increased symptoms of dysfunction within the temporomandibular joints, and, thus, if frequent, may be regarded as a form of oral parafunction. Non-occlusal parafunctions also include certain occupational habits,

like tailors holding needle and thread in their teeth. On the other hand, occlusal parafunctions involve contact of opposing teeth and may take a form of habitual clenching and/or grinding teeth. The most common and damaging for the masticatory system form of oral parafunction is bruxism. Increasingly the literature points to significant differences between diurnal (centric) and nocturnal (eccentric) forms of bruxism (Koyano *et al.*, 2008; Michelotti *et al.*, 2009). Diurnal bruxism consists in clenching teeth with a significant force in centric occlusion, while nocturnal bruxism manifests itself by involuntary grinding and sometimes clenching of teeth both in centric as well as in eccentric occlusion (Lavigne *et al.*, 2008; Manfredini and Lobbezoo, 2010). Recently it has been acknowledged that bruxism may be primary (idiopathic) or secondary (iatrogenic) (Marklund and Wänman, 2010; Okeson, 1998; Panek, 2002). Both forms may occur during sleep or wakefulness, but secondary bruxism may be associated with neurological and psychic pathologies, sleep disorders or accompany applied pharmacotherapy.

Many authors have stressed that oral parafunctions may be a risk factor for the development of temporomandibular disorders (Carlsson *et al.*, 2002; Marklund and Wänman, 2008; Wigdorowicz-Makowerowa *et al.*, 1979) or morphological injuries such as tooth wear or periodontal tissue overloading (Okeson, 1998, Panek, 2002), and thus, the studies on the prevalence of oral parafunctions may help identify associated signs and symptoms.

The aim of the study was to determine the prevalence of particular types of oral parafunctions, the awareness of them among young people and any association with temporomandibular disorders.

## Material and methods

Subjects were a randomly selected group of students from the Vocational Technical School Group Nr 2 in Wrocław between September 2005 and February 2006. The inclusion criterion was an age of 18 years or more so they had completed their period of growth and oral development. The exclusion criteria were: more than one missing posterior tooth (excluding third molars), the presence of dental prostheses, use of medications with possible effects on motor behaviour (e.g. neuroleptics or antidepressants), alcohol abuse and ongoing orthodontic or endodontic treatment.

The study was approved by the Bioethics in Research Committee at Wrocław Medical University, students were informed about the aims and design of the study and gave their written consent.

During history taking and routine dental examination information was gathered concerning various forms of oral parafunctions and the subjects' awareness of performing those activities. The following yes/no questions were asked: Would you say that you bite pens, pencils or nails?; Would you say that you bite your mucosa of cheeks or lips?; Would you say that you clench your teeth during a daytime?; Would you say that anyone has heard your grinding teeth at night?; and, Would you say that you chew two or more refreshing gums during the day? Affirmative responses were taken as evidence of subjectively reported biting of foreign bodies not connected with a normal eating, such as biting pens, pencils or nails; biting labial or buccal mucosa; diurnal bruxism (tooth clenching); nocturnal bruxism (tooth grinding); habit of chewing gum.

In the clinical examination the masticatory muscles tenderness and pain were evaluated. The masseter, temporal, lateral pterygoid and medial pterygoid muscles were digitally palpated in the manner detailed by Okeson (1998). Attention was paid to signs associated with biting lips and cheeks, biting nails, chewing gum as well as to signs pointing to bruxism such as: distinct, isolated attrition of enamel and dentin on the incisal edges and tooth cusps referred to as wear facets, occurring in centric occlusion or beyond the functional range of the mandibular movements (i.e. more than 2mm eccentric occlusal excursions of the mandible to the maxilla), petechiae or scarry thickening of the oral mucosa (linea alba) at the level of occlusal surface of lateral teeth, teeth impressions on the lips and/or tongue, hypertrophy of the masseter muscles. Tooth-wear was recorded using the index by Panek (2002) as a measure of the bruxism damage to dental tissues (see Table 1). Also, erosion/abrasion of natural teeth caused by foreign bodies was recorded. Temporomandibular joints (TMJs) were also examined. Five cardinal signs were taken into account to diagnose TMD: patient report and clinical (objective) confirmation of  $\geq 1$  of: 1, abnormal and/or painful movements of jaw; 2, pain on TMJ palpation; 3, pain on jaw muscle palpation (tenderness); 4, TMJ noises (clicking or crepitation); 5, skeletal asymmetry of the face.

The three examiners were trained and calibrated in the clinical examination by an experienced observer (HP) and two others were standardised in history taking. Those conducting clinical examinations were unaware of the

history taken. Level of agreement between the calibrated clinical examiners was high, as it was checked in earlier pilot examination performed on a group of patients with TMD and severe bruxism.

Data were processed using STATISTICA 6 (StatSoft, USA). The chi-square test was used for statistical analyses and  $p$ -value  $< 0.05$  was interpreted as statistically significant.

## Results

Of the 454 students, 303 met the criteria for inclusion in the study. All these were male, mean age 18.8 years (range 18-22), and none refused to participate.

From data collected by student report and by clinical examination there were just 16 (5%) without oral parafunctions. Among the identified oral parafunctions a habit of chewing refreshing gum was the most frequently reported (89%), however, it was not objectively confirmed, because we registered no erosive or abrasive signs, which might be attributed to this parafunction. In the group of students reporting biting foreign bodies (41%), we noted a slight abrasion of hard dental tissues specific to this parafunction in only 59% of the 125 cases. All reported cases of biting labial or buccal mucosa (88, 29%) were objectively confirmed in the clinical examination. Awareness of bruxism was rather low: among 135 subjects with clinically registered symptoms 24 (18%) were aware. There were no positive responses to the question on nocturnal bruxism. Just 24 subjects (18%) reported diurnal bruxism in the history, and they were found to have this parafunction on the clinical examination. On the other hand, another 111 students who did not self-report bruxism had signs of tooth wear pointing to this parafunction (Table 1).

Table 2 presents coincidences of the different types of oral parafunctions in one subject. Single parafunctions in a students is rare (~1%) with the exception of chewing gum, which was found in a fifth of the sample. The coincidence of 2 parafunctions was found in 41% of the subjects, of 3 parafunctions in 20%, and 9.6% had a coincidence of 4 parafunctions. The predominant oral parafunction was chewing gum, most commonly with bruxism, and this was found in 56 subjects (19%), and least commonly with cheek/lip biting, in 16 subjects (5%). All four oral parafunctions (chewing gum, bruxism, biting mucosa and biting foreign bodies) were diagnosed in 29 subjects (9.6%). A similar analysis of coincidence involving the second most prevalent oral parafunction,

**Table 1.** Prevalence of tooth wear in the students with clinically recognized bruxism

<i>Degree of tooth wear according to Panek index (2002)</i>	<i>Number of students (%)</i>
I Wear facets restricted to enamel	119 (39%)
II Localised enamel attrition with visible little islets of dentine	15 (5%)
III Visible larger surfaces of attrited dentine	1 (0.3%)
IV Attrition with shortening tooth height	-
Number of subjects with bruxism	135 (45%)

bruxism (but not gum chewing), involved only about 1% of the investigated subjects as did bruxism occurring in isolation (0.7%).

The prevalence of TMD in the presence of bruxism (66%) was significantly higher than in those with other oral parafunctions (53%) (Table 3).

### Discussion

Our study indicated that 95% of the students revealed various types of oral parafunctions such as: chewing refreshing gum (89%), bruxism (45%), nail and/or pen biting (41%), and biting the mucosa of lip or cheek (29%). These parafunctional habits were present as isolated (single) type or as double, triple or even fourfold coincidences in a single person. Similar prevalence of oral parafunctions in young populations was observed by other authors. Schiffman *et al.* (1992) demonstrated that the most common oral parafunction among students of nursing was chewing gum (87%), biting foreign bodies (72%), diurnal clenching of teeth (59%), biting nails (48%) and diurnal grinding of teeth (22%). Feteih (2006) investigating children aged 12-16 years found that among oral parafunctions lip/cheek biting was the most prevalent (41%), followed by nail biting (29%) and bruxism (7%).

On the other hand, Winocur *et al.* (2001), investigating 15-16 year-old girls revealed the habit of chewing gum in 62% of the subjects and demonstrated higher incidence of headaches and painful temporomandibular disorders (TMDs) in those chewing gum for more than 4 hours a day. This last finding indicated that chewing gum, although recommended by some authorities for a good oral health, may in excess be a potentially injurious and lead to TMD.

Our investigations revealed that the second most prevalent oral parafunction was bruxism, which was found in 45% of the students. The prevalence of this parafunction in adolescent and adult populations found by other authors was from 7% to 96% (Ciangolini *et al.*, 2001; Marklund and Wänman, 2008, 2010; Michelotti *et al.*, 2010; Panek, 2002; van der Meulen *et al.*, 2006; Wigdorowicz-Makowerowa *et al.*, 1979). This discrepancy of findings may result from various research criteria and cultural, socioeconomic or geographical diversity of investigated populations. Nevertheless, the majority of these authors consider bruxism the most destructive parafunction. Its consequences may include periodic hypersensitivity of teeth, headache, pain in the temporomandibular joints or masticatory muscles, as well as destruction of teeth and loss of aesthetic appearance of teeth. Bruxism often coincides with other oral parafunctions, enhancing their harmful effects on development and function, especially in adolescents. Köhler *et al.* (2009) in their epidemiological investigation of children and adolescents found that various types of oral parafunctions and clenching/grinding of teeth were often associated with TMD. Also Carlsson *et al.* (2002), Gavish *et al.* (2000) and Wigdorowicz-Makowerowa *et al.* (1979) pointed to increased risk of TMD in the presence of both occlusal and non-occlusal parafunctions. However, in our present study we found higher prevalence of TMD only in the presence of bruxism in comparison to other oral parafunctions. Contrary to these findings, van der Meulen *et al.* (2006) in a group of patients with TMD found no clinically relevant relationship between different types of oral parafunctions and TMD complaints. These diverse findings indicate a need for more comprehensive studies in this field.

It should be noted that subjects are usually unaware of their bruxism as it often occurs during sleep. Our investigations showed that only 18% of those with clinically diagnosed bruxism were aware of it. Similar low self-awareness of bruxism was found by other studies: 27% of Sardinians (Melis and Abou-Atme, 2003) and

**Table 2.** Prevalence of coincidences of oral parafunctions in individuals

Coincidence of oral parafunctions in a subject N (%)	Type of oral parafunctions n (%)
Without parafunctions 16 (5%)	- 16 (5%)
Single parafunction 75 (25%)	G 64 (21%)
	B 2 (1%)
	F 4 (1%)
	M 5 (2%)
Double parafunctions 123 (41%)	GB 56 (19%)
	GF 44 (15%)
	GM 16 (5%)
	BM 4 (1%)
	BF 1 (<1%)
	FM 2 (1%)
Triple parafunctions 60 (20%)	GBF 28 (9%)
	GBM 15 (5%)
	GFM 17 (6%)
Fourfold parafunctions 29 (10%)	GBFM 29 (10%)

Key: G chewing gum; B bruxism; F biting pen, pencil or nails; M biting mucosa of cheeks or lips.

**Table 3.** Comparing the prevalence of TMD in subjects with and without specific types of oral parafunctions

Specific type of oral parafunction	TMD with specific oral parafunction <sup>^</sup> n/N (%)	TMD with other oral parafunctions <sup>^^</sup> n/(289-N) (%)	p*
Biting foreign bodies (pen, nails)	71 / 125 (57%)	99 / 164 (56%)	0.5417
Biting mucosa of lip or cheek	55 / 88 (63%)	115 / 201 (57%)	0.4008
Bruxism (clenching/grinding teeth)	89 / 135 (66%)	81 / 154 (53%)	<b>0.0216</b>
Chewing refreshing gums	155 / 269 (58%)	15 / 20 (75%)	0.1276

N Number of subjects with specific oral parafunction

n Number of those subjects (having a specific oral parafunction) with TMD

\* p-value while comparing TMD<sup>^</sup> vs TMD<sup>^^</sup> with  $\chi^2$  test

among adult Turks 46% regarding teeth clenching and 22% for grinding teeth (Nekora-Azak *et al.*, 2010). According to Lavigne and Montplaisir (1994) the subjectively reported prevalence of frequent sleep bruxism, with accompanying grinding sounds, reaches about 8% in the general population.

Finally, bruxism-related tooth wear was distinct from that made by other parafunctions (e.g. biting foreign bodies or nails). However, it is difficult to establish if these clinical signs were a result of earlier or ongoing parafunctional habits. Nevertheless, taking into account the prevalence of bruxism and the possibility of this parafunction being long-lasting, the necessity of regular clinical examinations of dental patients to look for early signs and symptoms of bruxism should be stressed. Such examinations may help prevent increasing both functional (i.e. masticatory muscle tiredness or pain symptoms in the muscle or TMJ region) and morphological consequences of this parafunction (Marklund and Wänman, 2010; Michelotti *et al.*, 2010). Panek (2002) in her earlier studies of Wrocław adult workers revealed severe tooth attrition in those with long-lasting bruxism and that the severity was age-related. Our present study also revealed a severe tooth attrition, which occurred in 5.3% of students with recognised bruxism. Further, the prevalence of TMD in the presence of bruxism was found to be higher than for other oral parafunctions.

The investigated students revealed various types of occlusal and non-occlusal parafunctions. These parafunctions occurred both, in isolated form as well as in double and triple arrangements, and even the coincidence of four parafunctions in the same person was observed. Most of the subjects were unaware of their bruxism. Introducing educational programs in college curricula may raise awareness of these oral parafunctions' harmful effects. Moreover, popularising prophylactic measures and advice concerning early therapy may be indicated to prevent the growth of both functional consequences and irreversible morphological damage to the mouth.

### Acknowledgement

This study was funded by the Ministerstwo Nauki i Szkolnictwa Wyższego (Ministry of Science and Higher Education, Poland).

### References

Carlsson, G.E., Egermark, I. and Magnusson, T. (2002): Predictors of signs and symptoms of temporomandibular disorders: a 20-year follow-up study from childhood to adulthood. *Acta Odontologica Scandinavica* **60**, 180-185.

Drum, W. (1969): *Parafunktionen und autodestruktionsprozesse*, pp7-32. Berlin: Quintessenz Verlag.

Feteih, R.M. (2006): Signs and symptoms of temporomandibular disorders and oral parafunctions in urban Saudi Arabian adolescents: a research report. *Head & Face Medicine* **2**, 25.

Gavish, A., Halachami, M., Winokur, E. and Gazit, E. (2000): Oral habits and their association with sign and symptoms of temporomandibular disorders in adolescents girls. *Journal of Oral Rehabilitation* **27**, 22-32.

Gear, R.W. (1997): Neural Control of Oral Behavior and Its Impact on Occlusion. In: *Science and Practice of Occlusion*. Ed. McNeill, C. pp50-68. Chicago: Quintessence.

Köhler, A.A., Helkimo, A.N., Magnusson, T. and Hugoson, A. (2009): Prevalence of symptoms and signs indicative of temporomandibular disorders in children and adolescents. A cross-sectional epidemiological investigation covering two decades. *European Archives of Paediatric Dentistry* **10** Suppl 1, 16-25.

Koyano, K., Tsukiyama, Y., Ichiki, R. and Kuwata, T. (2008): Assessment of bruxism in the clinic. *Journal of Oral Rehabilitation* **35**, 495-508.

Lavigne, G.J. and Montplaisir, J.Y. (1994): Restless leg syndrome and sleep bruxism: prevalence and association among Canadians. *Sleep* **17**, 739-743.

Lavigne, G.J., Khoury, S., Abe, S., Yamaguchi, T. and Raphael, K. (2008): Bruxism physiology and pathology: an overview for clinicians. *Journal of Oral Rehabilitation* **35**, 476-494.

Manfredini, D. and Lobbezoo, F. (2010): Relationship between bruxism and temporomandibular disorders: a systematic review of literature from 1998 to 2008. *Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology & Endodontics* **109**, 26-50.

Marklund, S. and Wänman A. (2010): Risk factors associated with incidence and persistence of signs and symptoms of temporomandibular disorders. *Acta Odontologica Scandinavica* **68**, 289-299.

Marklund, S. and Wänman, A. (2008): Incidence and prevalence of myofascial pain in the jaw-face region. A one-year prospective study on dental students. *Acta Odontologica Scandinavica* **66**, 113-121.

Melis, M. and Abou-Atme, Y.S. (2003): Prevalence of bruxism awareness in a Sardinian population. *Cranio* **21**, 144-151.

Michelotti, A., Cioffi, I., Festa, P., Scala, G. and Farella, M. (2010): Oral parafunctions as risk factors for diagnostic TMD subgroups. *Journal of Oral Rehabilitation* **37**, 157-162.

Nekora-Azak, A., Yengin, E., Evlioglu, G., Ceyhan, A., Ocak, O. and Issever, H. (2010): Prevalence of bruxism awareness in Istanbul, Turkey. *Cranio* **28**, 122-127.

Okeson, J.P. (1998): *Management of Temporomandibular Disorders and Occlusion*, 4th edn. pp149-179. St.Louis: Mosby.

Panek, H. (2002): Intensity of bruxism by own index in patients with complete natural dentition. *Protetyka Stomatologiczna* **52**, 3-8.

Rugh, J. and Ohrbach, R. (1988): Occlusal parafunctions. In: *A textbook of Occlusion*. eds. Mohl, N.D., Zarb, G.A., Carlsson, G.F. and Rugh, J.D. pp249-261. Chicago: Quintessence.

Schiffman, E.L., Fricton, J.R. and Haley D. (1992): The relationship of occlusion, parafunctional habits and recent life events to mandibular dysfunction in a non-patients population. *Journal of Oral Rehabilitation* **19**, 201-206.

van der Meulen, M.J., Lobbezoo, F., Aartman, I.H. and Naeije, M. (2006): Self-reported oral parafunctions and pain intensity in temporomandibular disorder patients. *Journal of Orofacial Pain* **20**, 31-35.

Wigdorowicz-Makowerowa, N., Grodzki, C., Panek H., Maślanka, T. and Pałacha, A. (1979): Epidemiologic studies on prevalence and etiology of functional disturbances of the masticatory system. *Journal of Prosthetic Dentistry* **41**, 76-82.

Winokur, E., Gavish, A., Finkelshtein, T., Halachmi, M. and Gazit, E. (2001): Oral habits among adolescent girls and their association with symptoms of tempromandibular disorders. *Journal of Oral Rehabilitation* **28**, 624-629.