Self-reported Oral Parafunctions and Pain Intensity in Temporomandibular Disorder Patients

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Aim: *To examine the relationship between different types of self-reported oral parafunctions and pain intensity in patients with temporomandibular disorders (TMD).* ***Methods:*** *Two cohorts of TMD pain patients, 1 comprising 303 patients and the other comprising 226 patients, completed a 12-item oral parafunctions questionnaire as well as the Research Diagnostic Criteria Axis II questionnaire, which includes a characteristic pain intensity score (CPI). Relationships between oral parafunctions and CPI were examined; age and gender were controlled for. The effects of phrasing of the oral parafunction questions were also examined. For 1 cohort, the questions were directed at the mere occurrence of the parafunctions; in the other, the questions addressed the perceived stressfulness of parafunctional behavior to the jaw.* ***Results:*** *A principal component analysis of the responses to the questionnaires led to 3 factors (scales) in both cohorts: (1) a BRUX scale for bruxism activities; (2) a BITE scale for biting activities (eg, chewing gum, nails); and (3) a SOFT scale for soft tissue activities (eg, tongue, lips). Statistical significance was reached for 2 of the 6 relationships studied (P < .05), but with a very low explained variance (approximately 3.5%).* ***Conclusion:*** *No clinically relevant relationships were found between different types of self-reported oral parafunctions and TMD pain complaints.* J OROFAC PAIN 2006;20:31–35

Key words: bruxism, oral parafunctions, pain, self-report, temporomandibular disorders

In the Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD),[1] it is recommended that not only the physical component of TMD (Axis I) but also the psychological aspects (Axis II) be examined. Following this dual-axis approach, Axis II classifies the global severity of chronic pain conditions in terms of psychological and behavioral dysfunction. This axis includes a measure of pain intensity, viz, the characteristic pain intensity (CPI) scale.

In the RDC/TMD,[1] it is also recommended that data be collected about clinically important patient characteristics such as self-reported oral parafunctions. So far, studies on oral parafunctions have dealt primarily with bruxism, a movement disorder which is defined by the American Academy of Orofacial Pain as "diurnal or nocturnal parafunctional activity, including clenching, bracing, gnashing, and grinding of the teeth."[2] Bruxism is a common disorder that is commonly reported by approximately 6% to 20% of the general population.[3–6] In TMD populations, percentages as high as 67% and even 87.5% have been found.[7,8] These higher percentages in TMD populations as compared to the general population suggest a causal relationship between bruxism and TMD pain. Indeed, it would seem that the frequent and intensive masticatory muscle contractions that go with bruxism are stressful to the jaw and are thereby a major factor in the onset and maintenance of painful TMD.[9] However, evidence for such causality is still lacking.[10]

Oral parafunctions include not only bruxism but also a host of other oral activities that may be stressful to the jaw, such as nail biting and vacuum sucking with the tongue. It was recently suggested that further studies about the relationship between oral parafunctions and painful TMD should also include these other oral activities.[11] The aim of the present study, therefore, was to examine the relationship between different types of self-reported oral parafunctions and the intensity of the TMD pain complaints, taking into account factors such as age, gender, and the phrasing of the questions.

Materials and Methods

Participants in the present study were recruited from among the patients being referred to the clinics for Temporomandibular Disorders and Orofacial Pain of the Centre for Special Dental Care (Stichting voor Bijzondere Tandheelkunde) and the Academic Centre for Dentistry Amsterdam, The Netherlands. Patients from both clinics were referred by dentists from the Amsterdam area and followed the same insurance-dictated procedure. They were therefore treated as coming from the same TMD patient population. The dentists working at these clinics diagnosed all patients included in the study as TMD pain patients. The inclusion criteria for this study were a TMD diagnosis and a good understanding of the Dutch language.

Two different cohorts of TMD patients participated: a "frequency" cohort and a "stressfulness" cohort. The frequency cohort consisted of 226 consecutive TMD pain patients (88.5% women) ranging in age from 13 to 76 years, with a mean age ± SD of 38.5 ± 13.3 years. The stressfulness cohort included another 303 consecutive TMD patients (83.8% women). Their ages ranged from 14 to 83 years, with a mean age of 37.2 ± 14.2 years. The 2 cohorts did not differ significantly in age or gender.

The participants' responses to a 12-item oral parafunctions questionnaire, completed by the participants within 2 or 3 weeks after they were diagnosed with TMD, were collected. After several rounds of TMD expert consultations and pretesting, a satisfactory level of face (content) validity was achieved for this questionnaire. Slightly different ways of phrasing of the questions were used in each of the 2 cohorts. In the frequency cohort, the questions were directed at the mere occurrence of the 12 oral parafunctions. In the stressfulness cohort, the questions were formulated in terms of the perceived stressfulness of the parafunctions to the jaw. For nocturnal clenching, for example, patients in the frequency cohort were asked, "How often do you clench your teeth during sleep?" Those in the stressfulness cohort were asked "How often are the joints and muscles of your jaw stressed by clenching your teeth during sleep?" For both formulations, answers could be given on an ordinal 5-point Likert-type scale, where 0 = never, 1 = sometimes, 2 = regularly, 3 = often, and 4 = always.

In addition, patients in both cohorts also completed a Dutch version of the RDC Axis II questionnaire.[12] Axis II of the RDC/TMD is based on a combination of both pain intensity and pain-related disability. For the purpose of this study, only the CPI score was used. The CPI consists of the average score of 3 pain intensity questions (worst pain, average pain, and pain at this moment). Each of these is scored on an 11-point numerical scale from 0 (no pain) to 10 (pain as bad as could be). The scores are multiplied by 10; thus, CPI score ranges from 0 to 100.[1]

To facilitate the statistical analysis and its subsequent interpretation, the 12 oral parafunctions items were reduced to related sets of items (scales) by the use of a principal component analysis (PCA) with varimax rotation[13] for both cohorts separately. The resulting scales were then used for the final statistical analysis. To assess possible relations between oral parafunctions and CPI scores, multiple regression analyses were conducted in both cohorts, controlling for age and gender. For all analyses, the SPSS 10.0.7 package was used. Probability levels of $P < .05$ were considered statistically significant.

Results

With regard to the 12 oral parafunctions items, the PCA initially extracted 4 sets of items (scales or components) with an eigenvalue higher than 1 in both cohorts. Together these scales explained 63.3% of the variance in the items in the frequency cohort and 61.7% of the variance in the stressfulness cohort. However, 2 scales turned out to be hard to interpret and had only 2 factor loadings higher than 0.40. Therefore, a second PCA

Table 1 Oral Parafunctions and Their Factor Loadings on the 3 Oral Parafunctions Scales in the Frequency and Stressfulness Cohorts

Oral parafunctions	Frequency cohort			Stressfulness cohort		
	BRUX	BITE	SOFT	BRUX	BITE	SOFT
BRUX scale						
Nocturnal clenching	**0.664**	–0.086	0.287	**0.848**	–0.038	0.055
Nocturnal grinding	**0.722**	0.236	–0.086	**0.683**	0.181	0.009
Diurnal clenching	**0.556**	–0.257	0.389	**0.758**	–0.014	0.248
Diurnal grinding	**0.611**	–0.020	0.015	**0.435**	0.272	0.249
BITE scale						
Nail biting	–0.068	**0.679**	0.180	–0.009	**0.764**	0.132
Biting on pens	0.055	**0.750**	0.096	0.029	**0.770**	0.110
Chewing gum	–0.042	**0.522**	–0.087	0.221	**0.538**	–0.006
SOFT scale						
Vacuum sucking with tongue	0.116	0.037	**0.783**	0.101	–0.087	**0.771**
Playing/pushing with tongue	0.209	–0.035	**0.736**	0.151	0.026	**0.790**
Lip biting	0.259	**0.434**	0.375	0.181	0.240	**0.564**
Sucking on lips and cheeks	0.227	0.339	**0.665**	0.150	0.066	**0.785**
Playing with dental appliance or denture	–0.270	–0.104	**0.545**	–0.075	0.287	**0.495**

The highest factor loading for each scale is indicated in bold.

was conducted in which 3 scales were forcedly extracted. The resulting scales were interpretable (Table 1). The first scale included the clenching and grinding items, and was called the “bruxism” scale (BRUX). The second scale included biting and chewing activities and was called the “bite” scale (BITE). The third scale included tongue, lip, and cheek activities, and was called the “soft tissues” scale (SOFT). In the frequency cohort, the cumulative percentages of variance, accounted for by the scales, were 24.1% (BRUX scale), 38.1% (BRUX + BITE scales), and 49.5% (BRUX + BITE + SOFT scales); respective values in the stressfulness cohort were 27.9%, 40.9%, and 53.3%. The item “lip biting” had its highest loading on the BITE scale in the “frequency” cohort but on the SOFT scale in the stressfulness cohort. In the frequency cohort, however, the difference for this item between loading on the SOFT and BITE scales was small; thus, for further statistical analysis, this item was included in the SOFT scale in both cohorts. Reliability analysis indicated a reasonable internal consistency for the 3 scales, taking into account the small number of items per scale: the Cronbach’s α values were 0.60, 0.50, and 0.68 for the frequency cohort and 0.68, 0.57, and 0.75 for the stressfulness cohort, respectively.

For both cohorts, the mean scores (ie, the sum of the responses on the constituent 5-point [0–4] Likert-type scales divided by the number of constituent items of an oral parafunction scale) and standard deviations of the 3 oral parafunctions scales are shown in Table 2. The results of the multiple regression analyses, which examined the relationship between CPI and the scores on the BRUX, BITE, and SOFT scales, while controlling for age and gender, are shown in Table 3. No statistically significant relationships were found between the scores on the BRUX scale and CPI. In the frequency cohort, a significant negative relationship was found between BITE scale and CPI scores ($P = .010$), resulting in an explained variance of biting activities of approximately 3.5%. In the stressfulness cohort, a positive relationship was found between the scores on the SOFT scale and CPI ($P = .013$), with an explained variance of soft tissue activities of about 2%.

Discussion

Despite the fact that in the present study, 2 of the 6 relationships between the oral parafunctions scale scores and the CPI scores were statistically significant, the explained variance in CPI (up to 3.5%) by the involved oral activities was very small, and no clinically relevant relationships were found between the different types of self-reported

Table 2 Scores (mean ± SD) for the Oral Parafunction Scales for the 2 Cohorts

Scale	Frequency cohort	Stressfulness cohort
BRUX	1.32 ± 0.90	1.40 ± 1.00
BITE	0.60 ± 0.69	0.82 ± 0.86
SOFT	0.94 ± 0.82	0.68 ± 0.81

Table 3 Results of the Multiple Regression Analyses, with CPI as the Dependent Variable and the Oral Parafunctions Scales as Independent Variables, Controlling for Age and Gender

	Frequency cohort		Stressfulness cohort	
Scale	Standardized β	*P*	Standardized β	*P*
BRUX	0.008	.908	0.070	.226
BITE	–0.187	.010*	–0.046	.449
SOFT	–0.037	.583	0.144	.013*

*Indicates statistically significant relationship between CPI and oral parafunctions scale.
Standardized β is a correlation measure.

oral parafunctions and TMD pain complaints. This conclusion is independent of age, gender, and differences in phrasing of the questions in the 12-item oral parafunctions questionnaires.

The most commonly studied oral parafunction is bruxism. In studies on bruxism, several objective measures have been used, such as those obtained with electromyography (which can be used for the study of both bruxism during wakefulness and sleep-related bruxism) and polysomnography (which is the current gold standard for the study of sleep-related bruxism).[7] However, these instrumental techniques are not without methodological difficulties.[6,14] In addition, they are costly and time consuming, which limits their applicability mainly to the research setting and small study samples.[7] The use of questionnaires may therefore be a good alternative for the establishment of the presence or absence of bruxism as well as other oral parafunctions in the study of large groups of patients. However, self-report measures of oral parafunctions have been criticized for the possibility that patients are not able to observe and report their own activities accurately.[6,15] The oral parafunctions in the present study were assessed by means of self-reported, and thus subjective, questionnaire data. Because of the aforementioned problems with self-reported data, the results of this study must therefore be interpreted with caution.

In the present study, attention was also paid to the possible effects of the phrasing of the questions in the questionnaires. In the frequency cohort, the actual presence or absence of the different oral parafunctions was asked for; in the stressfulness cohort, the questions were focused on perceived stressfulness. The fact that no clinically meaningful differences were found between the 2 cohorts suggests that if a patient is aware of the presence of an oral parafunction, this activity is experienced as being stressful to the jaw at the same time. Possibly, spontaneous awareness of an oral parafunction (ie, awareness not resulting from a report by a dental practitioner or a partner) mostly occurs if it gives rise to some kind of discomfort.

The lack of significant relationships between bruxism and TMD pain supports the opinion of Lobbezoo and Lavigne[10] that if a causal relation is at all present between TMD pain intensity and bruxism, it is probably only small. Likewise, the results of some polysomnographic studies in which jaw pain was related to a decrease in the number of bruxism events during sleep rather than an increase[16–18] are in line with the present findings, because 1 of the statistically significant relationships in the present study, viz, the relationship between biting activities and CPI, was negative. As an explanation, it was speculated that jaw motor activity is reduced in the presence of pain to protect the masticatory system against further damage (pain-adaptation model).[19] On the other hand, the fact that several recent studies did find positive relations between oral parafunctions and TMD[8,11,20] stresses the need for more prospective, longitudinal epidemiologic and clinical/experimental studies to establish or refute cause-and-effect relationships between oral parafunctions and TMD pain.

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