Time trends over a 30-year period in the prevalence of symptoms indicative of TMD in the general population: a preliminary report.

A. ANASTASSAKI KÖHLER, B. ROLANDER, O. NORDERYD

The Institute for Postgraduate Dental Education, Jönköping, Sweden.

Objectives: TMD-related symptoms are common in the population. Previous research has indicated an overall increase in the prevalence of symptoms among Swedish adults over a 20-year period of time. The present survey aims to investigate probable changes in the prevalence of symptoms indicative of TMD in a Swedish population during the past decade and to study possible time trends over a 30-year period.

Methods: Repeated cross-sectional population-based investigations were performed in Jönköping, Sweden in 1983, 1993, 2003 and 2013. Independent samples of around 100 randomly selected individuals in groups aged 10, 15, 20, 30, 40, 50, 60 and 70 years participated in each study. Participants were examined by means of a questionnaire and an interview in relation to the presence of symptoms indicative of TMD.

Results: Preliminary results show an increase in the prevalence of some symptoms during the past decade, especially frequent headache and tiredness in the jaws. A remarkably increased prevalence figure for frequent headache in 20-year-olds observed in 2003 remained stable in the 2013 examination. Women more often reported pain symptoms than did men.

Conclusions: Time trends towards an increase in the prevalence of some TMD-related symptoms in the general population during the period 1983-2013 have been noted.
Signs of craniomandibular disorders in upper string players.

I. PEROZ¹, C. FRANKE¹, I. SCHEFFER², A. STEINMETZ³,⁴

¹Department of Prosthodontics, Gerontology and Craniomandibular Function, Charité – Universitätsmedizin Berlin, Berlin, Germany; ²Department of General and Visceral Surgery, Helios Kliniken Schwerin, Schwerin, Germany; ³Department of Orthopaedics, Traumatology and Physical Medicine, Martin-Luther-University Halle-Wittenberg, Halle, Germany; ⁴Institute of Musicians’ Medicine, Department of Manual Medicine and Pain Medicine, Sana Kliniken Sommerfeld, Kremmen, Germany.

Objectives: Up to 80% of professional musicians are affected by playing-related musculoskeletal disorders and 74-80% show signs of craniomandibular disorders (CMD). The aim of this study was to examine the prevalence of signs of CMD in upper string players compared to a control group.

Methods: Using the anamnestic question about “presence of facial pain” according to Reissman et al. 2009 (1), upper string players were distinguished into groups with and without CMD-complaints (PwC/PwoC, n = 20 each). These groups were examined using RDC/TMD and Hospital Anxiety and Depression Scale (HADS). The results were compared to those of a control group of non-musicians (Co, n = 20). The three groups had been matched according to gender and age (12 females, 8 males, average age: 42.8 years). The PwC/PwoC stated a playing time of 6.0h/5.2h per day respectively and had an average professional experience of 18.2/18.7 years. Muscle pain was estimated by the number of painful muscle sites during palpation and by the sum score of the stated pain intensity (no = 0, mild = 1, moderate = 2, severe = 3) during muscle palpation.

Results: 70% of PwC reported pain in chewing muscles, 20% pain in the region of the temporomandibular joints, and 10% in both regions. In PwC, 13 out of 16 tested chewing muscle sites were painful during palpation whereas in PwoC and Co only 8 muscles sites were painful. The pain intensity during muscle palpation was significantly higher (p ≤ 0.05) in PwC compared with PwoC and Co. The pain intensity on extraoral palpation was 2.4 times higher in the chewing muscles, 3.0 times higher in the head stabilizing muscles and 6.5 times higher in the joint region in PwC than in PwoC and Co. There were no differences between the groups in the prevalence of joint noises or HADS. No side preponderance could be found.

Conclusions: In upper strings players with complaints signs of CMD were significantly more frequent than in those without complaint or in non-musicians.

Signs and symptoms of craniomandibular disorders in children and adolescents with unilateral posterior crossbite.

V. PSARRAS, I. KONTOS, A. TSOLAKIS, B. DROUKAS, M. TZAKIS

Orofacial Pain Clinic of the National & Kapodistrian University of Athens, Greece.

Posterior crossbite is thought to have an impact on the function of the masticatory system.

Objectives: The aims of this investigation were to study the prevalence of signs and symptoms of Craniomandibular disorders (CMD) and headaches in a group of children and adolescents with unilateral posterior crossbites (UPC) seeking orthodontic treatment and to compare the results with results from children and adolescents with other orthodontic anomalies (OOA).

Methods: Two groups of 60, age and gender matched, children and adolescents participated in this study. A detailed interview, in combination with a questionnaire, was used to record the frequency and the location of CMD symptoms. Specific questions were also used to estimate the presence and knowledge of oral parafunctional habits as bruxism and clenching and also of headaches. All subjects were also examined clinically, by the same examiner, to evaluate the signs and symptoms of CMD.

Results: Approximately 50% of all subjects, in both groups, reported the presence of various parafunctional habits, with bruxism the most common finding. Fifteen percent of the subjects in the UPC and 13% of the subjects in the OOA group reported headaches. The clinical examination for signs of CMD revealed that 30% of children with UPC and 42% of children with OOA had symptoms during palpation of the stomatognathic system in, at least one of the craniofacial muscles. Thirty five percent of the children with UPC and 50% of the children with OOA reported tenderness during the palpation of their temporomandibular joints. Finally, a statistically significant difference (P<0.01) was recorded in the prevalence of clicking sounds (20% vs 7%, in the UPC and OOA groups, respectively).

Conclusions: Under the limitations of this study, the results revealed that mild signs and/or symptoms of CMD are common in children and adolescents with unilateral posterior crossbite, as they were recorded in at least 50% of the subjects. The prevalence of signs and symptoms of CMD was similar in both groups of subjects and the only statistically significant difference was recorded for the clicking sounds in the group of subjects with unilateral posterior crossbite.
A comparison of two different clinical examinations of TMD regarding diagnosis and need of treatment.

CH. MEJERSJÖ, O. BERTILSSON

Orofacial Pain Clinic, Institute of Odontology, Göteborg, Sweden.

Objectives: To test a short examination of the temporomandibular system and compare it with the examination of Diagnostic Criteria for Temporomandibular Disorders in respect of diagnosis and estimated need for treatment.

Methods: Fifty patients referred to the Orofacial Pain Clinic, Göteborg, were, on their first visit to the clinic, invited to participate in the study and examined with two different manuals for clinical examinations: (i) according to the DC/TMD; and (ii) with a new short examination which included three yes/no questions, one or two maximal opening excursions under close observation and palpation of the anterior temporal and masseter muscles extraorally and the TMJ laterally. The examinations were performed with a five minute break in between, and without knowledge of the reason for the referral. Half the group had the short examination first and half had the DC/TMD examination first. One examiner undertook the short examination for all patients and the other examiner the DC/TMD examination. The results of the examination and diagnosis were noted directly in a specific protocol for each examination, and each examiner gave an overall estimation of the patient's need for treatment (0-3).

Results: Preliminary results show a good agreement with Cohen’s Kappa of 0.69 for the estimated need for treatment. Myalgia, disc displacement and headache attributed to TMD were diagnosed with good agreement, while less good agreement was found for tenderness to palpation of the TMJ and crepitation, symptoms found more with the DC/TMD examination.

Conclusions: The short examination of the temporomandibular system tested had a good agreement with the clinical examination according to DC/TMD regarding the diagnosis and the estimated need for treatment.
Condylar erosion in patients with chronic temporomandibular joint arthralgia: a cone beam computed tomography study.

D. SCHNABL ¹, L. HUPP², O. STEINMASSL², R. STIGLER², A. RUDISCH³, R. EMSHOFF ²

¹Department of Restorative and Prosthetic Dentistry; ²University Clinic of Oral and Maxillofacial Surgery; ³University Clinic of Radiology, Medical University of Innsbruck, Innsbruck, Austria.

Objectives: The objective of this study was to assess the association between temporomandibular joint (TMJ) condylar erosion and chronic TMJ arthralgia.

Methods: Based upon a sample size estimation, this case–control study involved 198 subjects, aged 16–73, recruited in routine clinical practice; 99 cases (chronic TMJ arthralgia patients with a mean pain duration of 16.4 months) and 99 controls (asymptomatic subjects without a history of orofacial pain). The study was performed in accordance with the guidelines of the local ethical committee. The clinical diagnosis of arthralgia was made according to the Research Diagnostic Criteria for temporomandibular disorders (RDC/TMD). Cone beam computed tomography (CBCT) images were evaluated with regard to the presence or absence of erosive osseous changes of the TMJ condyle. A logistic regression analysis was used to assess the association between chronic TMJ arthralgia and condylar erosion, adjusting for age, gender, the number of missing posterior teeth, and the number of dental quadrants with missing posterior teeth.

Results: TMJ condylar erosion was found in 59.6 % of the cases and 21.2% of the controls. The crude odds ratio for erosive osseous changes was 5.25 (95%, CI 2.81 to 9.83, P < .001). The odds ratio adjusted for age, gender, the number of missing posterior teeth, and the number of quadrants with missing posterior teeth was 5.43 (95%, CI 2.57 to 11.48, P < .001).

Conclusions: The study provides evidence of an association between TMJ condylar erosion and chronic TMJ arthralgia.
The effect of supervised exercise on localized TMD pain and TMD pain associated with generalized pain.

B. HÄGGMAN-HENRIKSON\textsuperscript{1,2}, B. WIESINGER\textsuperscript{1}, A. WÄNMAN\textsuperscript{1}

\textsuperscript{1}Department of Odontology/Clinical Oral Physiology, Umeå University; \textsuperscript{2}Department of Orofacial pain and Jaw function, Malmö University, Sweden.

Objectives: The aim was to evaluate the effect of supervised exercise in patients with localized temporomandibular disorder (TMD) pain and TMD associated with generalized pain.

Methods: Consecutive patients with localized TMD pain (n=101; 82 women and 19 men, mean age 42 yrs) and TMD associated with generalized pain (n=52; 48 women and 4 men, mean age 42 yrs) referred to the Department of Clinical Oral Physiology, Umeå, participated in the study. The patients underwent a structured supervised training programme based on ten sessions over a period of about 10 weeks. The programme included relaxation, coordination and resistance training of the jaw and the neck/shoulders. The outcome was evaluated by the endurance time during jaw opening against resistance, ratings of jaw pain intensity on the Numerical Rating Scale (NRS), and by the symptoms’ influence on daily activities as measured on a 7-point rating scale.

Results: After the training programme, there was a significant increase in the endurance time for both groups for the jaw opening against resistance task (P<0.001). Compared to the group with localized pain, the generalized pain patients had a lower capacity both at baseline (P<0.001) and after training (P<0.036). Reported jaw pain intensity was lower after the training programme (NRS 3.0) compared to baseline (NRS 3.9; P<0.001) although there were no significant differences between the general and the local pain groups. The influence of pain on daily activities decreased after exercise (2.5) compared to baseline (3.3; P<0.001), with higher scores for the general pain group before (3.6 vs. 3.1; P=0.029) but not after (2.6 vs. 2.4; P=0.380) training.

Conclusions: The results indicate that supervised exercise can increase capacity and reduce pain in patients with TMD. The improvement was similar in the general and the local pain groups, although the group with generalized pain had an overall lower capacity. These findings suggest that activation of the jaw motor system with exercise has a similar effect in patients with localized TMD pain and TMD associated with generalized pain.
Application of a barometer for assessment of oral functions: Donders space.

Y. YAMADA1,2, K. HIRAKI1,2, R. ISHIDA1, T. SUGIYAMA1, M. OGAWA1, M. HASEGAWA3, M. KUROSE3

1Dept. of Dysphagia Rehab and Community Dental Care, and 2Dept. of Social Dentistry, Tokyo Dental College; 3Div. of Oral Physiology, Graduate School of Medical and Dental Sciences, Niigata University, Japan.

Objectives: We have developed a barometer, which can measure atmospheric pressure in a small space with a 3-msec sampling interval, to assess oral and pharyngeal functions. The aim of the present study was to use this barometer to measure the negative oral pressure during rest and during swallowing in Donders space.

Methods: Five young volunteers participated. Changes in pressure were detected by a small sensor (5 x 3 x 1.5 mm), which was placed on the posterior mid line of the hard palate and was connected to a microprocessor system with fine wires. Subjects were asked to sit in a chair in a relaxed upright position without head support. Recordings were started just before the subjects closed their lips. They were asked to swallow saliva and to keep the apposition for 10-sec. The recording was ended when the subjects were asked to open their mouth. Calibration signals were recorded before and after each of these recordings. Three recordings were performed for each subject during swallowing and during rest. In one record, video-fluorography was undertaken simultaneously. The mean of means and SEM were obtained for all the subjects.

Results: Pressure in Donders space dropped slightly after the lips were closed. When saliva was swallowed, the pressure showed transient alternations, i.e., it increased more than 10 kPa from atmospheric pressure, then decreased below atmospheric pressure by 5 kPa and quickly returned to near zero such that the pressure in the Donders was below atmospheric pressure by 0.805 ± 0.494 kPa (mean of means ± SEM).

Conclusions: The results of this study confirmed the result of Faigenbelum (Dent Prac, 16: 214-216, 1966), in that there was a negative oral pressure in Donders space at rest. New findings showed large alternations in pressure during swallowing reflecting soft palate movements.
Distance between the retruded contact position and the maximal intercuspal position in young adults.

A. NOHRE-SOLVANG¹, A.-M. SKARSVÅG¹, M. E. BERGE¹, A. JOHANSSON¹, G. E. CARLSSON²

¹Department of Clinical Dentistry – Prosthodontics, Faculty of Medicine and Dentistry, University of Bergen, Bergen, Norway; ²Department of Prosthetic Dentistry/Dental Materials Science, The Sahlgrenska Academy, University of Gothenburg, Göteborg, Sweden.

Objectives: The relationship between the retruded contact position (RCP) and the maximal intercuspal position (MIP) has received considerable interest in the dental literature, but there are still unanswered questions. The aims were to establish a method for accurate measurement of the distance between RCP and MIP in a group of healthy young adults and to analyse the relationship between RCP-MIP distances and some other variables.

Methods: RCP was recorded in 79 healthy subjects (56 women and 23 men, aged 20 – 30 years), using both operator and patient guidance of the mandible. The horizontal and vertical distances between these positions and MIP, as well as overjet and overbite, were measured with precision apparatus.

Results: The measurement error was small. There were significant differences between positions recorded with operator and patient guidance. Mean overjet and overbite were 3.42 mm and 2.85 mm, respectively. The means of the horizontal and vertical (operator-guided) RCP-MIP distances were 0.84 and 0.72 mm, respectively; the range was 0 to 2.5 mm. There were no significant differences for the horizontal RCP-MIP distance between subjects with Angle Classes I and II, nor between those with and without previous orthodontic treatment. There was no sex difference for the means of the measurements.

Conclusions: The method used showed high precision. The operator-guided RCP resulted in a more posterior mandibular position than the patient-guided RCP. The horizontal RCP-MIP distance was not significantly associated with overjet, nor did it differ between subjects with Angle Class I or II.
Static balancing behaviour of the mandible.

D. HELLMANN ¹, NN. GIANNAKOPOULOS ¹, F. BRÜSTLE ¹, S. TEREBESI ¹, HJ. SCHINDLER ¹, ²

¹ Department of Prosthodontics, Dental School, University of Heidelberg, Heidelberg, Germany; ² Research Group Biomechanics, Institute for Mechanics, Karlsruhe Institute of Technology (KIT), Karlsruhe, Germany.

Objectives: Fundamental treatment options, particularly with regard to reconstructive dentistry, are based on the assumption of idealized symmetric positioning of the mandible and of symmetric activation of the homonymous masticatory muscles during bilateral biting with a natural dentition. However unilateral functional demands during chewing, and the biomechanical needs of differently developed anatomical geometry of the craniomandibular system, do not support this hypothesis. Aim: The purpose of this study was to examine the balancing behaviour of the mandible among healthy volunteers.

Methods: Twenty test subjects developed different bite forces on a hydrostatic measurement system. Data were compared with identical bite forces in natural intercuspation. Mandibular positions were recorded in maximum intercuspation (IC) and during balancing tasks by means of a kinematic measurement system (Zebris JMA). The spatial deviations from IC of the condyles, first molars, and incisal point were measured during controlled submaximal bite forces. Simultaneously, the electromyographic activities (EMG) of the masseter and temporalis were recorded bilaterally and this also served as force feedback in IC. We hypothesized that symmetrical force development, characterized by largely identical values of the spatial shift of the mandible bilaterally and by symmetric EMG activity of the homonymous muscles, should result under the “autobalancing” test conditions.

Results: Spatial displacements of the condyles and the EMG activity of the homonymous muscles differed significantly (p < 0.05) between both sides. In contrast, the distances between antagonistic molars were almost identical.

Conclusions: These results support the hypothesis that, during jaw-closing movements, occlusion is precisely controlled by the neuromuscular system. In contrast, the degrees of freedom of the temporomandibular joints and the jaw muscles serve as control variables enabling the primary objective function to be achieved, i.e. an interference-free route to intercuspation.
TMD diagnostic group differences in TMJ disc energy densities.

L.M. GALLO1, L.R. IWASAKI2, Y.M. GONZALEZ3, H. LIU2, D.B. MARX4, J.C. NICKEL2

1University of Zurich, Switzerland; 2University of Missouri-Kansas City MO, USA; 3University at Buffalo NY; USA; 4University of Nebraska-Lincoln NE, USA.

Objectives: The aim of this study was to compare the energy densities (mJ/mm³) in TMJs of different TMD diagnostic groups, since fatigue of the disc may involve mechanical wear due to strains and stresses imposed on the fibrocartilage matrix.

Methods: 44 women and 24 men (average age 33.1 years) were selected after giving informed consent in accordance with the local Institutional Review Board. Diagnostic Criteria for TMD, MRI and cone beam CT imaging were used to group subjects according to the presence of both myofascial pain and bilateral disc displacement (n = 16), only disc displacement without pain (n = 16), or as controls (n = 36). Numerical modeling was used to determine TMJ compressive loads (Fnormal). Dynamic stereometry was used to characterize individual-specific stress-field dynamics data during 10 symmetrical jaw closing cycles. The data were used to estimate tractional forces (Ftraction). Energy densities were then calculated as W/Q (W = work done or mechanical energy input = tractional force × distance of stress-field translation, Q = volume of cartilage).

Results: The mean energy density ± SE for the group with pain and disc displacement was 12.7±1.5 mJ/mm³; ANOVA followed by Tukey-Kramer post-hoc tests showed this to be significantly greater (all adjusted p<0.04) than for the group without pain (7.4±1.4) or the controls (5.8±0.9). Energy densities in the group without pain and in the controls were not significantly different.

Conclusions: Diagnostic group differences in mechanical energy densities suggest that mechanical work may be a mechanism of cartilage fatigue unique to subjects with pain and disc displacement.

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Influence of jaw relation changes on masseter motor unit recruitment behaviour.

N.N. GIANNAKOPOULOS, S. TEREBESI, D. HELLMANN, HJ. SCHINDLER

Department of Prosthodontics, University Hospital of Heidelberg, Germany.

Objectives: Previous studies have shown that changes in force direction induce reorganisation of localized motor unit (MU) task groups in the masseter. The goal of this experimental study was to investigate the influence of small changes in the vertical and horizontal jaw relation on the recruitment behaviour of masseter MUs in discrete muscle subvolumes.

Methods: Twenty healthy subjects (10 female) were involved in the study (mean age: 24.7±2.5 years). An intraoral force-measuring system enabled the subjects to perform feedback-controlled submaximal bite-force tasks in three different vertical and horizontal jaw relations. The electromyographic (EMG) activity of the right masseter was registered with intramuscular bipolar wire electrodes in three different muscle regions. The level of the submaximal bite force was determined individually, in order to get distinguishable MU action potentials without major interferences. In addition, the EMG activity was recorded in intercuspation under identical loading conditions controlled by EMG feedback. EMG activity was recorded with a sampling frequency of 20 kHz and the MUs were identified by means of appropriate software (EMGLab). Mean values of the rectified EMG signals were also calculated for each task and each recording site.

Results: The decomposed MUs were organised in localised task groups with significantly different (p<0.001) jaw-relation-specific recruitment behaviour. The mean rectified EMG activity from the different recording sites also showed significant (p<0.01) differences between different tasks.

Conclusions: This study provides evidence that small changes in jaw relationship caused by prosthodontic or intraoral splint treatment, modify the recruitment behaviour of MUs in small masseter subvolumes.
Functional integration between the jaw and neck motor systems in children - a pilot study.

C. ÖSTERLUND¹, B. HägGMAN-HENRIKSON¹,²

¹Department of Odontology/Clinical Oral Physiology, Umeå University; ²Department of Orofacial Pain and Jaw function, Malmö University, Sweden.

Objectives: The aims were to investigate the functional integration between the jaw and neck motor systems during jaw function in children and to evaluate differences in jaw and head movement patterns between children and adults.

Methods: Jaw and head movements were recorded with an optoelectronic 3D recording system in eight healthy 6-year old children and eight healthy young adults (mean age 25 years). The participants performed two jaw motor tasks: paced continuous jaw opening-closing, and self-paced chewing on chewing gum (V6). The movement variables were: i) the ratio between head and jaw movement amplitudes; and ii) the intra-individual cycle-to-cycle variability expressed as a coefficient of variation (CV).

Results: Head movements were present during jaw activities in both children and adults. There were no significant differences between children and adults in the mean ratios between the head and jaw movement amplitudes for jaw opening-closing (30% vs. 24%), or chewing (17% vs. 10%). Compared to adults, children showed larger intra-individual variation in movement cycles for both jaw and head movements. Thus, during jaw opening-closing, children showed higher variability in movement amplitudes compared to adults for both the jaw (CV=0.14 vs. 0.04; P=0.0003), and the head (CV=0.59 vs. 0.32; P=0.0019). During chewing, children showed higher variability in movement amplitudes compared to adults for the jaw (CV=0.30 vs. 0.18; P=0.004).

Conclusions: The results show similarities in jaw-neck motor behaviour between children and adults indicating that a functional integration between the jaw and neck motor systems is established early in life. The results also indicate some differences, with more variability in the movement patterns for children, which may be interpreted as immature motor programming of jaw actions in children.
Sex-related differences in jaw-neck motor strategy following induced masseter muscle pain.

B. WIESINGER¹, B. HÄGGMAN-HENRIKSON¹², F. HELLSTRÖM³, A. WÄNMAN¹

¹Department of Odontology, Clinical Oral Physiology, Umeå University; ²Department of Orofacial pain and Jaw function, Malmö University; ³Centre for Musculoskeletal Research, University of Gävle, Sweden.

Objectives: The aim of the study was to investigate whether there are sex-related differences in integrated jaw-neck motor behavior during jaw opening-closing following induced masseter muscle pain.

Methods: Healthy students (22 women, 16 men) performed continuous jaw opening-closing movements to a target position, defined as 75% of the individual maximum jaw opening. Each subject performed two control trials without pain and two trials with induced masseter muscle pain. Experimental muscle pain was induced unilaterally by injection of 0.2 ml, 5.8% hypertonic saline into the masseter muscle. Simultaneous movements of the lower jaw and the head were registered with a three-dimensional optoelectronic recording system.

Results: There were no significant sex-related differences in respect of the analyzed movement outcomes, except that jaw movement amplitudes were smaller in women during induced pain (P=0.045). The jaw movement amplitudes did not differ between the control and pain trials (men P=0.079, women P=0.808). In the control trial, both men (P=0.030) and women (P=0.001) showed a significant undershoot of the jaw opening in relation to the target position. In the pain trial, men reached the target, whereas women still had an undershoot (P=0.036). The head movement amplitudes were significantly larger during the pain trial, compared to the control trial for both men (P=0.008) and women (P<0.0005). The ratio between the amplitudes of head and jaw movements was larger in the pain trials for men (P=0.006) and women (P=0.001).

Conclusions: For both men and women, the proportional involvement of the neck motor system increased during jaw movements in induced pain, indicating an altered strategy for jaw-neck motor control.
Is there a genetic predisposition for the neural and glial cell changes that underlie trigeminal neuropathic pain?

B. J. SESSLE, P. CHERKAS, V. VARATHAN

Department of Oral Physiology, Faculty of Dentistry, University of Toronto, Toronto, Canada.

Objectives: The mechanisms underlying the great variability between individuals in the development and maintenance of neuropathic pain following trigeminal nerve injury are unclear. Since a genetic predisposition has been suggested, this study aimed to test if there are differences between two genetically different mouse strains in the nociceptive behaviour and neural and non-neural (glial) cell changes in the medullary dorsal horn (MDH) produced by trigeminal nerve injury.

Methods: Behavioural withdrawal thresholds (MWTs) to facial mechanical stimulation were determined before and after infraorbital nerve transection (IONX) in adult A/J and C57BL/6 male mice and in control mice not receiving IONX. Post-operatively, the MDH was either removed and treated immunohistochemically to label MDH astroglia and microglia or the activity of nociceptive MDH neurons was recorded electrophysiologically for evidence of trigeminal central sensitisation (reflected as increases in neuronal mechanoreceptive field size and responses to mechanical stimuli and reduced mechanical activation threshold) in IONX mice compared to control mice (N=6 / group).

Results: MWTs were significantly (p<0.05, ANOVA) decreased in both strains, with a peak around post-operative day 5 after IONX, but the decrease was significantly longer in A/J mice in which it lasted up to post-operative day 49. Following IONX there were also significant post-operative strain differences in the magnitude and duration of MDH central sensitisation and in the increase that occurred in MDH glial cell labelling.

Conclusions: These findings suggest that genetic factors contribute to the individual variation in the manifestation of neuropathic pain following trigeminal nerve injury.
Oral appliance therapy versus nasal CPAP in obstructive sleep apnea: a randomized, placebo-controlled trial on psychological distress.

G. AARAB¹, M. NIKOLOPOULOU¹, J. AHLBERG², M. W. HEYMANS³, H. L. HAMBURGER⁴, J. DE LANGE⁵, F. LOBBEZOO¹

¹Dept. of Oral Kinesiology, Academic Centre for Dentistry Amsterdam (ACTA), University of Amsterdam and VU University Amsterdam, MOVE Research Institute Amsterdam, Amsterdam, The Netherlands; ²Dept. of Stomatognathic Physiology and Prosthetic Dentistry, Institute of Dentistry, University of Helsinki, Finland; ³Dept. of Epidemiology and Biostatistics, VU University Medical Center Amsterdam, The Netherlands; ⁴Dept. of Clinical Neurophysiology and Center for Sleep-Wake Disorders, Slotervaart Medical Center, Amsterdam, The Netherlands; ⁵Dept. of Oral and Maxillofacial Surgery of the Academic Medical Centre of the University of Amsterdam and Academic Centre of Dentistry Amsterdam (ACTA), The Netherlands.

Introduction: Obstructive sleep apnea is associated with a high prevalence of symptoms of psychological distress, including depression and anxiety. Therefore, the aim of the present study was to compare the effects of a mandibular advancement device (MAD) with those of nasal Continuous Positive Airway Pressure (nCPAP) on psychological distress symptoms.

Methods: This study is part of a randomized placebo-controlled trial, in which different treatment effects of a titrated MAD are compared with those of nCPAP and an intra-oral placebo appliance in a parallel design. Sixty-four mild/moderate OSA patients (52.0 ± 9.6 years) were randomly assigned to these three parallel groups. All patients filled out the Dutch version of the Symptom Checklist-90-Revised (SCL-90-R) twice: once before treatment and once after six months of treatment. The SCL-90-R is a multidimensional symptom inventory designed to measure symptomatic psychological distress (e.g., depression and somatisation) over the past week. Linear mixed model analyses were performed to study differences between the groups for the different dimensions of the SCL-90-R over time.

Results: The three groups showed higher average values of psychological distress at baseline than the reported normal values for the Dutch population (P = 0.000-0.013). The baseline values of the different dimensions of the SCL-90-R did not differ significantly between the three groups (P = 0.305-0.987). The changes in the different dimensions from baseline to therapy evaluation were not significantly different between the three groups either (P = 0.175-0.950), while the pooled data of the three groups showed significant improvements over time in the dimensions “somatisation”, “insufficiency of thinking and acting”, “agoraphobia”, “anxiety”, “sleeping problems”, and “global severity index” (F = 4.14–16.73, P = 0.048–0.0002).

Conclusions: Within the limits of this study, it can be concluded that there is no significant difference between MAD and nCPAP in their beneficial effects on psychological distress symptoms. Placebo effects probably play an important role in the significant improvements of psychological distress symptoms with these therapies.
The effect of oral appliances on snoring and obstructive sleep apnea.

E. GOGOU, M. TZAKIS

Orofacial Pain Clinic, Dental School of National & Kapodistrian University of Athens, Greece (NKUAG).

Objective: The aim of this study was to investigate the possible effects of the use of oral appliances on patients with snoring and/or obstructive sleep apnea (OSA). An oral appliance (OA) is constructed to protrude and keep the mandible in a protruded position, in order to improve the patients’ respiratory function during sleep.

Methods: Twenty-eight OSA patients (20 male and 8 female with an age range between 25 and 60 years) were included in this study. All patients were evaluated in the Center of Sleep Disorders (Department of Critical Care and Pulmonary Services, Evangelismos Hospital, Medical School of the NKUAG). Their diagnosis was based on the baseline polysomnography (PSG) study, which was performed in the Center for Sleep Disorders. All patients were selected and referred to the Orofacial Pain Clinic of the Dental School of the NKUAG to receive treatment with an OA.

Results: The Apnea-Hypopnea Index (AHI) values improved in most cases after treatment as they decreased significantly to less than 10 (ten) AHI episodes per hour of sleep (p<0.005). In addition, the incidence and the loudness of snoring improved and all the patients obtained better oxygen blood saturation. After the eight-week treatment period, we did not observe complications in the function of the Stomatognathic System (p<0.05).

Conclusions: The results of the present study indicate that OSA patients experience improvement with the use of the mandibular advancement OA and that an OA can become an effective alternative treatment method for the management of OSA.
Correlation between rhythmic masticatory muscle activations and clinical signs and symptoms of sleep bruxism.

A. DEREGIBUS1,2, T. CASTROFLORIO1, A. MICHELOTTI3, I. DE GIORGI 2

1Department of Surgical Sciences, Specialization School of Orthodontics, Lingotto Dental School, University of Torino, Italy; 2 Department of Surgical Sciences, Gnathology Unit, Lingotto Dental School, University of Torino, Italy; 3Department of Neuroscience, Federico II University, Naples, Italy.

Objectives: The aim of this study was to investigate the correlation between rhythmic masticatory muscle activations (RMMAs) and clinical signs and symptoms of sleep bruxism (SB) according to the American Academy of Sleep Medicine (AASM) criteria.

Methods: The study was performed on 45 subjects (19 men and 26 women, mean age ± SD 28 ± 10.77 years) selected among patients referred to the Gnathology Unit of the Lingotto Dental School of the University of Torino. Subjects underwent a clinical examination according to the AASM criteria and an instrumental evaluation with a portable validated device for the diagnosis of SB (Bruxoff®, OTBioelettronica, Torino, Italy) in the patient's natural environment. In addition, muscular pain on palpation was recorded according to RDC/TMD. The Bruxoff analysis revealed 19 non-bruxers (7 men, 12 women, age 29.8 ± 10.4 years) and 26 bruxers (11 men, 15 women, age 28.1 ± 9.8 year). Different logistic regression models were built in order to measure the correlation between RMMAs and the clinical variables. McNemar’s test was used to analyze in which cases the clinical and the instrumental diagnoses were matched.

Results: Subjects with a prevalence of phasic contractions showed a significant association (p<0.05) with muscle fatigue on awakening, self-report facial pain and masseter hypertrophy. Subjects with a prevalence of tonic contractions showed a significant association (p<0.05) with higher muscular pain values on palpation and masseter hypertrophy. Subjects with a prevalence of mixed contraction showed a significant association (p<0.05) with higher muscular pain values on palpation.

Conclusions: The above clinical criteria, which were selected based on literature suggestions, do not correlate with an instrumental SB diagnosis. Indeed, none of them was significantly related to an instrumental diagnosis of ongoing SB, with the minor exception of a higher SB index in subjects with masseter hypertrophy.
The prevalence of tooth wear in the Dutch adult population.

P. WETSELAAR¹, J.H. VERMAIRE², C.M. VISSCHER¹, F. LOBBEZOO¹, A.A. SCHULLER²,³

¹Department of Oral Kinesiology, Academic Centre for Dentistry Amsterdam (ACTA), The Netherlands; ² TNO Life Style - Behavioral and Societal Sciences, Leiden, The Netherlands; ³ Center for Dentistry and Oral Hygiene, University Medical Center Groningen.

Objectives: To assess the prevalence of tooth wear, many studies have been undertaken on children, adolescents, and young adults. There are only a few studies that also incorporated older age groups. As part of a comprehensive investigation of the oral health of the general Dutch adult population, tooth wear was assessed in a large-scale dental survey.

Methods: A cross-sectional, descriptive, and analytic survey was conducted among 1,597 subjects in five age groups (25-34, 35-44, 45-54, 55-64, and 65-74 years). Tooth wear was measured with a 5-point ordinal occlusal/incisal grading scale (0=no wear; 1=wear confined to enamel; 2=wear <1/3 of crown height; 3=wear >1/3 but <2/3 of crown height; 4=wear >2/3 of crown height). Besides the stratified analysis for age groups using Kruskal-Wallis tests, stratified analyses were also conducted for gender and social classes using Mann Whitney U-tests.

Results: 13.1% of the population had one or more surfaces with a score >1. Older age groups showed higher tooth wear grades ($\chi^2=152.0$, $p<0.001$). Nevertheless, severe tooth wear was rare: only 5.2% of the total sample showed one or more tooth surfaces with a score of 3 or 4. Men showed more tooth wear than women ($Z=8.34$, $p<0.001$) and low-socioeconomic status (SES) participants showed higher tooth wear values than high-SES participants ($Z=3.97$, $p<0.001$).

Conclusions: Prevalence data show that tooth wear is a common condition in the Dutch adult population, although severe tooth wear is rare. A tendency was found for more tooth wear in men as compared to women, which increases with age and in persons with lower SES.
Influence of experimental DOMS on position sense of the jaw and occlusal sensitivity.

R. BUCCI$^{1,2}$, F. LOBBEZOO$^1$, A. MICHELOTTI$^2$, C. ORFANOU$^1$, M. KOUTRIS$^1$

$^1$Department of Oral Kinesiology, Academic Centre for Dentistry Amsterdam (ACTA), Amsterdam, Netherlands; $^2$Department of Neuroscience, Reproductive Sciences and Oral Sciences, Division of Orthodontics and Temporomandibular Disorders, University of Naples “Federico II”, Naples, Italy.

Objectives: To investigate the effects of delayed-onset muscular soreness (DOMS) on the physiology of the masticatory system, focusing on the position sense of the jaw (kinesthetic perception; KP) and on the occlusal sensitivity (OS).

Methods: Twelve pain-free participants (5 males, 7 females; mean±SD age=26.8±5.5 years) performed two series of jaw exercises, each consisting of six 5-min-long bouts of eccentric-concentric contractions of the masticatory muscles, with one-week in between. Self-reported muscle fatigue and pain, maximum mouth opening without pain (MMOwP), KP, and OS were recorded before, immediately after, 24h, 48h, and one week after each series. To record KP, participants bit with their anterior teeth in a random order on ten wooden plates (1-10mm thick; increment: 1mm), and were asked whether they felt it was thicker or thinner than a reference plate (5.5 mm thick). To record OS, participants bit with their molar teeth in a random order on a series of nine articulating papers (1-108μm thick; increment: 12μm) or no paper, and were asked whether they felt them or not. Data analysis was performed with ANOVA for repeated measurements.

Results: Fatigue significantly increased immediately after each exercise (P<0.001), while there were no significant changes in pain (P=0.161). MMOwP significantly decreased (P<0.001) 24h after each exercise. KP and OS remained unchanged throughout the whole experiment.

Conclusions: Experimentally induced DOMS does not influence both position sense of the jaw and occlusal sensitivity.
Phenomenology of the motor control of masticatory muscles in patients suffering from a minimal conscious state.

G. GRUBWIESER¹, B. PFAUSLER², E. SCHMUTZHARD², M. RASSE¹. I. GRUNERT¹

¹Depts. of Dentistry and Maxillofacial Surgery, Medical University of Innsbruck, Austria; ²Dept. of Neurology, NICU: Neurological Intensive Care Unit, Medical University of Innsbruck, Austria.

**Objectives:** The motor control of masticatory muscles is well documented in healthy humans but knowledge of the muscle activity patterns in patients suffering from unresponsive wakefulness syndrome (formerly persistent vegetative state) or minimal conscious state, is incomplete. Spastic symptoms such as non-functional grinding, bruxism and self-injury of oral structures and/or lips due to brainstem-disinhibition are common in these patients. We performed quantified surface EMG (s-EMG) studies to define patterns in the motor control of mastication and the development of spasticity during diminished consciousness.

**Methods:** Ten patients were assigned to the study prospectively after clinical evaluation and approval by the local ethics committee. Simultaneous EMG recordings were made using bipolar surface electrodes, from 8 masticatory muscles (bilaterally: anterior and posterior temporalis, masseter and sternocleidomastoid muscles). The mean s-EMG amplitudes were quantified by spectral analysis, normalized and presented as pattern related profiles. All patients underwent 2 recordings simultaneously with a clinical assessment, at an interval of 4 weeks.

**Results:** The results show that grinding and masticatory muscle activation can be assessed quantitatively in humans suffering from minimal conscious state. A quantitative evaluation of the development of spasticity of chewing muscles in these patients is possible and also mandatory in order to initiate specific and timely antispastic treatment.

**Conclusions:** The study shows that a quantitative analysis of the (rhythmic) patterns of masticatory muscle activation using s-EMG in patients suffering from minimal conscious state can assess the natural development of spasticity (and its clinical signs, such as grinding and bruxism). It therefore gives guidelines for the timing, initiation and, possibly, the type of an antispastic treatment, potentially avoiding deleterious secondary effects on the stomato-gnathic system. Moreover, the investigation shows evidence of the structural etiology of the rhythmic dysfunctional mastication: It seems plausible that a de-afferentiation of motor pontine and bulbar brain stem nuclei from inhibitory upstream control neurons and thereby the emergence of "pacemaker" activity of the involved motor nuclei is responsible for clinically-seen phenomena such as rhythmic grinding and mastication.
Inhibitory jaw reflexes following experimental overloading of the human jaw muscles.

M. KOUTRIS¹, KS. TÜRKER², JJ. van der WEIJDEN¹, MKA. van SELMS¹, F. LOBBEZOO¹

¹Department of Oral Kinesiology, Academic Centre for Dentistry Amsterdam (ACTA), MOVE Research Institute Amsterdam, University of Amsterdam and VU University Amsterdam, Amsterdam, The Netherlands; ²Koç University, School of Medicine, Istanbul, Turkey.

Objectives: The effect of overloading masticatory muscles on jaw-motor control is not yet clear. Therefore, the possible influence of eccentric and concentric exercises on an inhibitory jaw-reflex response in humans, was investigated.

Methods: Eleven participants (6 males, 5 females) performed 6, 5-min bouts of eccentric-concentric contractions. Before, immediately after, 24 hours, 48 hours and one week afterwards, visual analogue scale (VAS) scores for muscle fatigue and pain, maximum voluntary bite forces (MVBF), and inhibitory jaw reflexes were recorded. The inhibitory reflexes were provoked with the use of two custom-made surface stimulating electrodes that were placed 15 mm apart over the hairy skin of the upper lip on the right side. A total of 16 stimuli were delivered per session. Reflex data were analyzed with 2 different methods; the cumulative sum control chart (CUSUM) and the t-test.

Results: The mean reflex latency was 30.55±15.53 ms. Immediate and delayed masticatory muscle fatigue and pain were provoked. Furthermore, 24 hours after the exercise, MVBF tended to decrease (p=0.056) while the inhibitory jaw reflex increased in size (p<0.05), regardless of the analyzing method used.

Conclusions: Overloading of the masticatory muscles induces an increase in the size of the inhibitory jaw reflex. This alteration in motor control suggests an increased mobility of the jaw in the presence of jaw-muscle pain.
Differences in electromyographic parameters between gum chewers and controls.

W. NIEDERMEIER, E. SVIRIDENKO, S. HUGGER

Department of Prosthetic Dentistry, University of Cologne, Germany.

Objectives: The aim of this study was to assess EMG data in individuals who were well-exercised in chewing compared to normal chewers.

Methods: The study population consisted of 20 individuals with no symptoms of RDC or TMD (17 females and 3 males, mean age 28.9 yrs, 27.7 teeth), 10 of whom were classified as well-exercised (on the basis that they chewed gum for more than 1 hour a day) and another 10 of whom were classed as normal chewers who used their TM apparatus exclusively for the intake of food. A questionnaire ascertained the matching of both groups considering any other functional parameters. The activity of left and right masseter and temporal muscles was assessed using EMG measurements. To this end, maximum bite activity and muscle relaxation were determined 7 times each after chewing for 10 min as well as after a rest period of 5 min for the bite test, the subjects had to bite on cotton rolls with maximum force 3 times for 2 sec each and for the fatigue test, for 15 sec. Differences between groups were analysed statistically using non-parametric methods.

Results: The mean maximum bite EMG-activity was significantly increased (p<0.01) in exercised chewers compared to normal ones before and after the trials. For both groups, pronounced fatigue of masticatory muscles occurred after test chewing, and the fatigue index EMI (regression of the EMG power spectrum) was significantly more decreased (p<0.05) for normal as compared to exercised chewers. Moreover, the EMI for all the muscles studied dropped to minimum values at the end of the last measurement cycle compared to the beginning; in this respect, the EMI of normal chewers revealed significantly greater (p<0.05) decreases data compared to that of exercised chewers.

Conclusions: This study shows that exercised chewers exhibit not only higher EMG activity during the maximum bite test compared to normal chewers but also less EMG fatigue after intensive chewing for a period of 10 minutes.