MARTA CRISTINA DA SILVA GAMA

FINDINGS OF JAW FUNCTION AND PAIN IN TEMPOROMANDIBULAR DISORDER ASSOCIATED TO LOCALIZED AND WIDESPREAD PAIN

ACHADOS DE FUNÇÃO MANDIBULAR E DOR NA DISFUNÇÃO TEMPOROMANDIBULAR ASSOCIADA À DOR LOCALIZADA E GENERALIZADA

Piracicaba
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Universidade Estadual de Campinas

Faculdade de Odontologia de Piracicaba

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Este exemplar corresponde à versão final da tese defendida pela aluna Marta Cristina da Silva Gama e orientada pela Profa. Dra. Celia Marisa Rizzatti Barbosa.

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ABSTRACT

Temporomandibular Disorder (TMD) has been considered a heterogeneous musculoskeletal pain condition. Recently, the distinction between temporomandibular disorders with localized or generalized pain has been suggested. The present study aimed to review the current knowledge about clinical findings concerning jaw functional assessments in patients with TMD, and to evaluate jaw function and facial pain characteristics among subgroups of TMD patients, which were classified according to the presence of localized pain (LP) or widespread pain (WP). Two cross-sectional studies and a literature review were conducted, and a self-administered questionnaires and clinical examination procedures from the RDC/TMD were applied in populations from Brazil (BR) and United States or America (USA). Participants were classified as controls free of TMD complaints (BR=37, USA=2700), TMD/LP patients (BR=43, USA=463) and TMD/WP patients (BR=33, USA=569). These three groups were compared with respect to each measure of interest, which were obtained from the clinical assessment of facial pain and jaw function and from self-reported questions of facial pain, functional limitation and parafunctional habits. Add to clinical facial exam, body pain and the presence of bruxo-facets was assessed in USA population. The results suggest that TMD patients with WP have a more severe form of TMD than patients without WP. Patients with TMD differ substantially from controls with respect to all pain factors and almost all clinical variables. TMD patients with generalized pain reported significantly higher facial and body pain intensity and greater self-reported oral parafunctional activities, presented increased frequency of moderate/severe pain on palpation, higher pain-related disability, greater number of nonspecific orofacial symptoms, and greater emotional and communication limitation than the patients with localized pain. The patients with localized TMD presented higher incisal overlap and higher presence of bruxo-facets, demonstrating that local factors may contribute to localized TMD pain. As conclusion, TMD subgroups present distinct profiles which were more related with

pain presence than with jaw functional limitation. However, localized TMD pain seems to be more influenced by local factors such as malocclusion and tooth wear. More studies are needed for a better understanding of jaw function and pain in patients with different profiles of TMD.

Key words: Facial Pain; Physical examination; Temporomandibular Joint Dysfunction Syndrome; Chronic Pain; Fibromyalgia.

RESUMO

A Disfunção Temporomandibular (DTM) tem sido considerada uma condição de dor músculo-esquelética heterogênea. Recentemente, tem sido sugerida a distinção entre disfunção temporomandibular com dor localizada ou generalizada. O presente estudo teve como objetivo revisar o conhecimento atual sobre os achados clínicos relacionados com a avaliação clínica da função mandibular em pacientes com DTM, bem como avaliar a função mandibular e as características de dor facial entre subgrupos de pacientes com DTM, os quais foram classificados de acordo com a presença de dor localizada (DL) ou de dor generalizada (DG). Foram realizados dois estudos transversais e uma revisão da literatura. O questionário autoaplicável e os procedimentos de exame clínico do RDC / TMD foram aplicados em populações do Brasil (BR) e dos Estados Unidos da América (EUA). Os participantes foram classificados como controles sem queixas de DTM (BR=37, EUA=2,700), pacientes com DTM/DL (BR=43, EUA=463) e pacientes com DTM/DG (BR=33, EUA=569). Estes três grupos foram comparados em relação a cada medida de interesse, as quais foram obtidas a partir da avaliação clínica da dor facial e da função mandibular e de perguntas de auto-relato sobre dor facial, limitação funcional e hábitos parafuncionais. Além do exame clínico facial, a dor corporal e a presença de Bruxo-facetas também foram avaliadas na população dos EUA. Os resultados sugerem que os pacientes com DTM associada a DG apresentam uma forma mais grave de DTM do que pacientes com DL. Os pacientes com DTM diferem substancialmente dos controles com relação a todos os fatores de dor e quase todas as variáveis clínicas. Os pacientes com DTM com dor generalizada relataram significativamente maior intensidade de dor facial e corporal, mais auto-relato de atividades parafuncionais orais, apresentaram maior frequência de dor moderada a severa à palpação, maior incapacidade relacionada à dor, maior número de sintomas orofaciais inespecíficos e maior limitação emocional e de comunicação do que os pacientes com dor localizada. Os pacientes com dor localizada apresentaram maior

sobreposição incisal e maior presença de Bruxo-facetas, demonstrando que fatores locais podem contribuir para a dor na DTM localizada. Como conclusão, os subgrupos de DTM apresentam perfis distintos que foram mais relacionados com a presença de dor do que com limitação funcional mandibular. No entanto, a dor localizada da DTM parece ser mais influenciada por fatores locais, como a má oclusão e desgaste dentário. Mais estudos são necessários para uma melhor compreensão da função mandibular e dor em pacientes com diferentes perfis de DTM.

Palavras-chave: Dor Facial; Exame físico; Síndrome da Disfunção da Articulação Temporomandibular; Dor Crônica; Fibromialgia.

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DEDICATÓRIA

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LISTA DE ABREVIATURAS E SIGLAS

AAOP	*American Academy of Orofacial Pain*
IASP	*International Association for the Study of Pain*
OPPERA	*Orofacial Pain: Prospective Evaluation and Risk Assessment*
RDC/TMD	*Research Diagnostic Criteria for Temporomandibular Disorder*
SDM	Síndrome Dolorosa Miofascial
TMD	*Temporomandibular disorder*
TMJ	*Temporomandibular joint*

INTRODUÇÃO

A Disfunção temporomandibular (DTM) é um processo de doença multifatorial, considerado o distúrbio musculoesquelético mais comum que causa dor orofacial (1-3). Trata-se ainda de uma condição de dor crônica que compreende um conjunto de condições que afetam o sistema estomatognático, apresentando a dor facial como sua característica principal (4).

Os sintomas da DTM incluem diminuição da amplitude de movimento mandibular, dor nos músculos da mastigação, dor na articulação temporomandibular (ATM), ruídos articulares associados com a função, dor miofascial generalizada, e uma limitação funcional ou desvio da abertura da mandíbula (5).

As queixas de DTM também podem ser associadas com alguns problemas musculoesqueléticos generalizados, e até mesmo com somatização, ansiedade e depressão (5). Além disso, dor corporal generalizada crônica, idade e sexo do paciente parecem servir como um risco para a dor orofacial crónica (6). Sintomas orofaciais inespecíficos e hábitos parafuncionais orais também foram fortes preditores de incidência da DTM, o que reflete uma desregulação sistêmica em pacientes com DTM (7).

Atualmente, um modelo heurístico propõe que as DTMs sejam influenciadas mais diretamente por aflição psicológica e fenótipos de amplificação da dor, além de uma contribuição indireta vinda da regulação genética de mecanismos biológicos (8).

Um estudo prospectivo descobriu que os indivíduos que desenvolveram DTM relataram mais dor de cabeça, dor muscular ou dor, e outras dores que não foram observados nos indivíduos que não desenvolveram DTM (9).

A partir da prática clínica, é reconhecido que pacientes com DTM e dor orofacial compartilham muitas características clínicas ou sintomas em comum (10). Além disso, muitos estados de dor orofacial podem causar dor difusa, não específica, ou referida (11). Desse modo, relacionar a história com o exame clínico

e formular um diagnóstico diferencial inclusivo se torna uma tarefas crítica para os profissionais que trabalham na área orofacial (11).

De acordo com a *International Association for the Study of Pain* (IASP), a *Síndrome Dolorosa Miofascial (SDM)* é uma condição musculoesquelética caracterizada por dor local e referida percebida como profunda e dolorida, e pela presença de pontos-gatilho em qualquer região do organismo. Dessa forma, a musculatura mastigatória também pode ser acometida por esta síndrome, como ocorre na DTM miofascial.

Já a *Síndrome de Fibromialgia*, também conhecida como *Síndrome da dor miofascial difusa*, é uma síndrome de dor amplificada que representa o extremo do espectro de dor musculoesquelética crônica na população em geral. Apresentando como características principais a sensibilidade aumentada e a presença de dor espalhada pelo corpo (12-14)

Sinais e sintomas de DTM miofascial têm sido relatados em pacientes com Síndrome de Fibromialgia, sendo considerada atualmente a hipótese do envolvimento da região facial como parte da manifestação da Fibromialgia (15,16).

Da mesma forma, pacientes com DTM frequentemente apresentam dor em regiões extra-trigeminais do corpo (14,17,18). Além disso, a persistência de dor facial foi associada com as apresentações de dor generalizada e foi também significativamente maior do que nos casos com dor facial localizada (14). Mas só recentemente uma divisão em subgrupos de DTM foi sugerida de acordo com a presença de dor generalizada (12,19).

No entanto, ainda não está claro quando a DTM dever ser considerada uma condição de dor facial-regional, ou quando a DTM se trata de uma manifestação de outras síndromes de dor generalizada, como a Fibromialgia e a dor crônica generalizada (12,18). Apenas recentemente está sendo investigada a existência de mecanismos biológicos específicos, tais como a sensibilização central, que contribuem para a distinção entre a dor localizada e generalizada na DTM (12,16,19,20). Desse modo, mais investigações a respeito de subtipos de dor na DTM se fazem necessários. Além disso, ainda existem consideráveis

controvérsias entre os achados clínicos relacionados com a função mandibular na disfunção causada pela dor da DTM (12,21,22)

Uma maneira possível de identificar um subgrupo de pacientes com DTM com uma sensibilidade generalizada à dor aumentada e para diferenciá-lo de pacientes com DTM com uma queixa de dor mais localizada foi descrito usando investigação de pontos gatilhos, de acordo com os critérios diagnósticos para a fibromialgia (19).

Esta distinção entre dor localizada e generalizada na DTM é importante tanto para o diagnóstico do paciente quanto para uma compreensão adequada da etiologia e fisiopatologia da dor crônica (12). Além disso, desequilíbrios multissistêmicos de causas heterogêneas podem existir nos subgrupos dolorosos de DTM e abordagens distintas têm sido consideradas (22).

Vários fatores afetam o sistema mastigatório e a percepção da dor, quer como independente ou interagindo com influências causais (17). Além disso, a literatura considera que os efeitos da função mandibular e do movimento na dor são úteis para diferenciar a DTM de outros distúrbios de dor orofacial (21). No entanto, estas características não têm sido descritas considerando a divisão da DTM em subgrupos dolorosos.

O presente estudo teve como objetivo revisar o conhecimento atual sobre os achados clínicos relacionados com a avaliação clínica da função mandibular em pacientes com DTM, bem como avaliar e descrever a função mandibular e as características de dor facial entre subgrupos de pacientes com DTM, os quais foram classificados de acordo com a presença de dor localizada (DL) ou de dor generalizada (DG).

Esta dissertação está baseada na Resolução CCPG UNICAMP/002/06 que regulamenta o formato alternativo para teses de Mestrado e Doutorado e permite a inserção de artigo científico de autoria ou coautoria do candidato. Sendo assim, esta tese é composta de três artigos, apresentados em capítulos.

CAPÍTULO 1: Jaw functional assessment in patients with Temporomandibular disorder – A review of literature.

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ABSTRACT

The present study aimed to review the current knowledge about clinical findings concerning jaw functional assessments in patients with TMD. Full-text papers retrieved from Bireme: LILACS, MEDLINE, Biblioteca Cochrane, SciELO; Science Direct; and Pubmed electronic databasis were critically reviewed. The review covered literature from 2010 to 2014, and only relevant manuscripts were included. Hand search of the references completed the review. The RDC/TMD has been the most frequently diagnostic tool used for functional assessment of TMD patients. However, a more comprehensive examination is required for differential diagnosis in orofacial pain, so variables such as functional occlusion evaluation, cranial nerve assessment and body palpation need to be included for a more comprehensive TMD examination. In general, the most common TMD diagnosis was related to myofascial pain and a higher prevalence of female gender have been reported. Some clinical variables have shown to be important factors for the development of TMD, as mandibular instability, self-reported bruxism and history of joint noises, greater numbers of tender points in the neck and the body, pain during jaw opening and to palpation of mastigatory sites. Most clinical studies reported the diagnostic classification of TMD patients, while functional findings have not been much

explored. According to the few clinical studies found, patients with TMD presented reduced mobility and less pain-free opening, reported pain with maximum unassisted opening and noises in the joint, and also presented pain to palpation in masticatory and bodily sites.

Descriptors: Facial pain; Temporomandibular Joint Dysfunction Syndrome; Physical Examination; Diagnosis, Differential.

INTRODUCTION

Temporomandibular disorder (TMD) is a multifactorial disease process considered the most common musculoskeletal disorder that causes orofacial pain (1-3). Symptoms of TMD include decreased mandibular range of motion, pain in the muscles of mastication, temporomandibular joint (TMJ) pain, associated joint noise with function, generalized myofascial pain, and a functional limitation or deviation of the jaw opening (1).

TMD complaints can also be associated with some generalized musculoskeletal problems and even somatization, anxiety, and depression (4). Furthermore, chronic widespread body pain, patient sex and age appear to serve as risk for chronic orofacial pain (5). Also, nonspecific orofacial symptoms and oral parafunctions were strong predictors of TMD incidence, which reflect a systemic dysregulation in TMD patients (6).

It is recognized from clinical practice that TMD and orofacial pain patients share many common clinical features or symptoms (7). Moreover, many orofacial pain conditions can cause diffuse, non-specific, or referred pain (8)**.** Thereby, correlating the history with the clinical examination and formulating an inclusive differential diagnosis becomes critical tasks by professionals in orofacial area (8).

The present study aimed to review the current knowledge regarding clinical findings concerning jaw functional assessments in patients with TMD. A literature survey from Bireme: LILACS, MEDLINE, Biblioteca Cochrane, SciELO; Science Direct; and Pubmed electronic databasis was carried out with the

combination of terms: “Facial pain”; “Temporomandibular Joint Dysfunction Syndrome”; “Physical Examination”; and “Diagnosis, Differential”.

The review covered literature from 2010 to February 2014 and a hand search of the references completed the review. A total of 19 papers were selected according to application and relevance of the research topic.

DIFFERENTIAL DIAGNOSIS

Orofacial pain disorders are a common experience in the population and have a large range in pain intensity with a commensurate, also has profound sociologic effects and impact on quality of life (5,9).

There are many types of pain conditions that produce orofacial pain. According to the *American Academy of Orofacial Pain* (AAOP) classification, TMD is one of the possible causes of orofacial pain, standing among many others as Intracranial pain disorders, Primary headache disorders (neurovascular disorders), Neurogenic pain disorders, Intraoral pain disorders and Pain related to anatomically associated structures (7). Also, Referred pain, Cervical pain and Psychogenic pain (Psychiatric and mental illness) can be considerate (8).

Furthermore, duration can be an important factor in maintaining a potential diagnosis, as acute and chronic pain can lead the clinician in a different direction to determine the underlying etiology (8)**.** And the diagnosis and management of many chronic orofacial pain conditions has been greatly hampered by confusion in determining etiologies from the temporomandibular joint versus myofascial sources (5)**.**

Considering pain assessment in a broader way, it is also important to differentiate somatic and neuropathic pain. Somatic pain always results from stimulation of nociceptors, because of tissue injury, such as inflammation. While neuropathic pain is considered pain that is initiated or caused by primary lesion or dysfunction in the nervous system (9). Occasionally, pain also may present a psychogenic origin, which is often unconscious, involuntary, and is related to mental illness or psychiatric disorders (9).

As signs and symptoms associated with TMD are a common source of chronic pain complaints in the head and orofacial structures (4), it is critical that the treating dentist or physician accomplish the correct diagnosis and find the cause of the patient's chronic facial pain/TMD so that the correct treatment will be rendered (2).

Therefore, for differential diagnosis, a proper clinical assessment including a comprehensive head and neck and dental physical examination, neurologic testing, range of motion studies, laboratory evaluation, and perhaps consultations with other health care providers must be performed (9).

CLINICAL ASSESSMENT IN TMD

Clinical characteristics represent signs or symptoms of either subclinical or overt TMD and are antecedent risk factors that increase the likelihood of a healthy person developing the condition (10). And, when including TMD as a potential diagnosis, a thorough facial pain examination can usually elicit whether pain is related to the joint, muscles, or a combination of both (8).

Profiling the clinical presentations of patients can be useful for better understanding the behavior of TMD and for providing appropriate treatment planning (7). The key components in a thorough facial/TMJ examination that clinicians must perform include the following: Chief complaint, History of present illness, Patient's medical and dental histories, and Findings of the clinical examination (2).

The primary signs and symptoms associated with TMD originate from the masticatory structures and, therefore, are associated with jaw function (4). Thereby, assessing mandibular function represents a crucial clinical management, and when a patient's pain complaint is not influenced by jaw function, other sources of orofacial pain should be suspected (4).

TMD patients often report pain in the preauricular areas, face, or temples. Reports of pain during mouth opening or chewing are common. TMJ sounds are also frequent complaints and maybe described as clicking, popping,

grating, or crepitus. In many instances, the joint sounds are not accompanied by pain or dysfunction, and are merely a nuisance to the patient (4).

In general, TMD can be divided into articular and nonarticular disorders (1). Articular disorders (internal derangement) can be divided into inflammatory and noninflammatory arthropathies, as rheumatoid arthritis and osteoarthritis respectively, including or not disc displacement. The most nonarticular disorders present as myofascial pain focused to the muscles of mastication, while other nonarticular disorders include chronic conditions, such as fibromyalgia, muscle strain, and myopathies (1). The etiology of myofascial pain is related to no history of recent trauma, subjective pain in muscles with function, pain reproduced on palpation, trigger points and pain referral (11).

Muscular impairment is usually reproducible upon palpation or resistance against active muscle movement. Joint impairment (eg, disc displacement with or without reduction, capsulitis, synovitis, arthritis, or retrodiscitis) can also be detected through similar measures, and with the use of radiographs if necessary (8).

Myofascial pain and dysfunction is theorized to arise from clenching, bruxism, or other parafunctional habits, resulting in masticatory musculature strain, spasm, pain, and functional limitation. Emotional stress also predisposes to clenching and bruxism, which contributes to myofascial pain (1).

Clinical studies on myofascial pain or TMD were considerably improved by the development of the Research Diagnostic Criteria for Temporomandibular Disorder (RDC/TMD), which highlighted the need for developing standardized diagnostic methods and definitions (5).

The RDC/TMD provide researchers and clinicians diagnosing, and classifying the most common subtypes of TMD: muscle disorders (group I); disc displacement (group II); and arthralgia, osteoarthritis, or osteoarthrosis (group III) (3). However, distinguishing TMD pain from that of other pain conditions, which may have associated referred pain, hyperalgesia, allodynia and central

sensitization presenting in the masticatory region is difficult using the RDC/TMD (12).

In addition to facial pain, patients with TMD frequently report multiple bodily pain conditions outside of the orofacial region, and TMD subjects with widespread pain (WP) presented with reduced pressure pain thresholds in both cranial and extracranial regions compared to TMD subjects without WP (13). And it is noteworthy that, if a patient has generalized muscle pain, such as fibromyalgia and chronic widespread pain, and/or arthritis, for exemple, the TMD could be the manifestation of this underlying cause of systemic pain (8).

Among sociodemographic and clinical characteristics, measures of general health status, experimental pain sensitivity, autonomic function, and psychological distress phenotypic, the most important predictors of first-onset TMD in the Orofacial Pain: Prospective Evaluation and Risk Assessment (OPPERA) study included comorbid pain conditions, preexisting pain, and somatic awareness (16). And a multiple physiological and psychological regulatory domains (from sensory, autonomic, inflammatory, and psychological domains) also may contribute to the pathophysiology of pain in TMD and other bodily pain conditions (15).

Therefore, performing a differentiation between localized and generalized pain in TMD is important both for patient diagnosis and for proper understanding of the etiology and pathophysiology of chronic pain (14) as for the management of TMD patients (13).

FUNCTIONAL FINDINGS IN TMD

According to this review, only seven articles reported clinical findings. In order to update the knowledge regarding functional assessment in TMD, the main results are presented in **Table 1** and **Table 2**.

Most studies reported the diagnostic classification of TMD patients, while functional findings have not been much explored, thus there is lack of such data in recent literature. Furthermore, bodily pain presence associated with TMD is beginning to be assessed in the most recent clinical studies. Thereby, the need for

more investigations of physical features of patients with TMD, even with different profiles, as presenting generalized pain associated, is recommended.

The RDC has been the most frequently diagnostic tool used for functional assessment of TMD patients. However, the RDC axis I does not cover all aspects necessary for a complete differential diagnosis. Thereby, other variables such as functional occlusion evaluation, cranial nerve assessment and body palpation need to be included in the examination.

Some clinical variables have shown to be important factors for the development of TMD, as mandibular instability, self-reported bruxism and history of TMJ noises, greater numbers of tender points in both the neck and the body, pain during jaw opening and to palpation of mastigatory sites, which must be carefully observed and monitored by the clinician.

In general, the most common TMD diagnosis was related to myofascial pain and a higher prevalence of female gender have been reported. According to the clinical studies, patients with TMD showed reduced mobility, less pain-free opening, reported pain with maximum unassisted opening, reported noises in the joint and pain to palpation in masticatory and bodily sites.

CONCLUSION

Functional findings have not been much explored in the current literature. According to a few clinical studies found, patients with TMD presented reduced mobility and less pain-free opening, reported pain with maximum unassisted opening and noises in the joint, and also presented pain to palpation in masticatory and bodily sites.

As the appropriate TMD treatment planning depends on a correct diagnosis, a more thorough facial pain examination is required, and variables such as functional occlusion evaluation, cranial nerve assessment and body palpation need to be included for a comprehensive TMD examination.

Table 1: Functional findings in TMD of articles that reported clinical findings.

Study's author and design	*Site of study*	*Sample data*	*Clinical assesment*	*Clinical findings*
Marklund & Wänman, 2010 (17) *Prospective cohort study.*	Sweden	280 dental students Men (n= 98), Women (n=182)	**Self-reported questionnaire** A questionnaire focusing on the presence and frequency of TMJ symptoms, jaw muscle symptoms, headaches (site-specific), and impaired jaw mobility was filled out at yearly intervals before clinical examination. Also included perceived tooth contact patterns at jaw closing and awareness of bruxism (tooth grinding and/or clenching). **Clinical examination** • Palpation of the TMJ and 16 jaw muscle sites, • Static loading of the TMJ for 30 s (TMJ load pain), • Static tooth clenching for 30 s (clench symptoms), • Registration of reproducible TMJ sounds during jaw opening/closing movements, • Evaluation of maximal mandibular range of movement, • Registration of morphological relations between upper and lower jaws • Functional occlusal contact patterns. • Mandibular stability in the intercuspal position (ICP) was registered if the molar teeth could keep a firm grip on a foil during moderate clenching. • Mandibular instability in the ICP was accordingly registered if the teeth could not keep a firm grip on the foil. • Contact in eccentric positions was registered at 3 and 9 mm lateral excursion.	The analyses between cases and controls revealed that self-reported bruxism and crossbite, respectively increased the risk of the incidence and duration of TMJ signs or symptoms. Female gender was a risk indicator of developing and maintaining myofascial pain. Signs of mandibular instability increased the risk of long-standing TMD signs and symptoms. Percentage distribution of baseline variables for all participants included in the 2-year prospective study (see **Table 2**).

Study's author and design	*Site of study*	*Sample data*	*Clinical assesment*	*Clinical findings*
Sipilä et al., 2011 (18) *Retrospective clinical study*	Finland	N= 6227 subjects Men (n = 2824) Women (n = 3403) Age≥ 30 years	**Functional Assessment:** • Maximum mouth opening, • Auscultation of TMJ noises, • Palpation of the TMJ and 2 masticatory muscles (temporalis anterior and masseter superficialis). **Self-reported musculoskeletal pain in other areas (during the preceding month):** • Neck, • Shoulders, • Back, • Joints	<u>*Proportion among subjects*</u> Mouth opening <40 mm in 8.9 % TMJ crepitation in 7.8 % TMJ clicking in 15.5 % TMJ pain on palpation in 3.8 % Masticatory muscle pain on palpation in 13.6 % Neck pain in 33.6 % Shoulder pain in 32.0 % Back pain in 33.2 % Pain in joints in 47.0 %
Manfredini et al., 2011 (3) *Systematic review*	Italy, Israel, China, USA, Brazil, Sweden, Germany and Finland.	3,463 subjects Men (n=553), Women (n=1,836) Unspecified gender (n= 1,074) Mean age ranging from 30.2 to 39.4 years.	**Axis I RDC/TMD** Used to ascertain the diagnoses distribution.	<u>*Frequency of axis I diagnosis*</u> Muscle disorders were diagnosed in about one-half of the TMD patients, being the commonest diagnosis. Disc displacements and inflammatory degenerative disorders were diagnosed in 41.1% and 30.1% of community populations, disc displacement with reduction was the commonest diagnosis, confirming the doubtful pathologic significance of that condition, but a comparison with data gathered on patient samples was prevented by the nonhomogeneity of age and gender distribution between clinical and community cases.

Study's author and design	*Site of study*	*Sample data*	*Clinical assesment*	*Clinical findings*
Ohrbach et al., 2011 (10) *Case-control study*	USA	1,633 controls and 185 cases with chronic, painful TMD Mean age ranging from 18 to 44 years.	**Physical examination:** **Axis I RDC/TMD** • Pain report during six jaw movements (pain-free opening, maximum unassisted opening, maximum assisted opening, left lateral excursion. right lateral excursion and protrusion). • Vertical range of motion, including vertical incisal overlap (pain-free opening, maximum unassisted opening and maximum assisted opening). • Joint sounds from the TMJ during opening and closing. • Reports of pain in response to palpation: temporalis, masseter, lateral pterygoid, submandibular, and TMJ. **Tooth Wear:** Wear of the edges of the teeth, as generally found with bruxism, were assessed from the incisor, cuspid, and premolar teeth. **Neck palpation** Upper, middle, and lower areas of the sternocleidomastoid muscle; upper, mid, and lower splenius capitus; and upper semispinalis capitus. **Body palpation** Middle part of upper belly of trapezius, supraspinatus, second rib, lateral epicondyle, medial gluteus, greater trochanter, and medial knee. **Clinical Status by Self-Report:** Pain and Disability (with the GCPS classification); Factors that modify jaw pain, Orofacial Symptoms and TMJ Clicking and Locking (with the CPSQ questionnaire); Limitations in Using the Jaw (with the Jaw Functional Limitation Scale - JFLS).	TMD cases exhibited significantly less mobility compared to controls. Mean pain-free opening was 12 mm less in TMD cases compared to controls, and for maximum unassisted opening the mean difference was 6 mm. TMD cases were far more likely to report pain with maximum unassisted opening. Around 60% of TMD cases and 30% of controls reported noises in either TMJ. TMD cases registered a mean of 6 neck muscle sites painful to palpation while controls registered a mean of 1.2 sites. TMD cases also registered a mean of 7.4 body sites painful to palpation while controls registered a mean of 2.1 body sites.

			<u>Self-Reported Putative Etiologic Factors</u> Lifetime History of Regional Trauma (with the CPSQ questionnaire); Parafunctional Behaviors (with the Oral Behaviors Checklist – OBC).	
Study's author and design	***Site of study***	***Sample data***	***Clinical assesment***	***Clinical findings***
Manfredini et al., 2012 (19) *Retrospective clinical study*	Italy	462 TMD patients Men (n=95) Women (n=367) Mean age 39.2 years [range 18-81]	**Axis I RDC/TMD** Used to ascertain the diagnoses distribution. **Axis II RDC/TMD** Levels of depression and somatization were evaluated by the use of dedicated Symptoms Checklist-90 (SCL-90) items, whereas the Graded Chronic Pain Scale (GCPS) was used to rate pain-related impairment.	<u>*Frequency of axis I diagnosis*</u> Muscle disorders, disk displacements, and other joint disorders were diagnosed respectively in 56.4%, 42.0%, and 57.5% of patients. Disk displacements were more frequently diagnosed in the younger-aged, other joint disorders in the older-aged, and muscle disorders in the middle-aged subjects About half of patients (48.7%) received RDC/TMD diagnoses of more than 1 group. *Sixty percent of patients had depression symptoms, 76.6% had somatization, and 21.8% presented high levels of pain-related impairment.*
Machado et al., 2012 (7) *Retrospective clinical study*	Brazil	357 TMD patients Men (n=47) Women (n=310) Mean age 31.9 years [range 11-70]	**Physical examination** • Cranial nerve functioning, • Cervical movement pain or limitation, • Palpation of masticatory and cervical muscles, • Functional examination of the masticatory muscles with muscle stimulation tests, • Evaluation of the range of mandibular motion. Additional exams and sectional images of the TMJ were requested and performed when needed. The American Academy of Orofacial Pain (AAOP) guidelines and diagnostic criteria were adopted as	<u>*Frequency of AAOP diagnosis*</u> The most common diagnosis was localized masticatory muscle pain (LMP) in 125 patients (35.0%), followed by disc displacement without reduction (DDWOR) in 104 patients (29.1%). The prevalence of the patients' symptomatic profiles were 10.1% for chronic facial pain, 35.0% for acute muscle pain, 21.0% for acute articular pain and 33.9% for non-painful articular impairment.

			diagnosis.	
Study's author and design	***Site of study***	***Sample data***	***Clinical assesment***	***Clinical findings***
Ohrbach et al, 2013 (6) *Prospective cohort study*	USA	2,737 people. Mean age ranging from 18 to 44 years.	**Same protocol of OPPERA studies (Ohrbach et al., 2011).** Physical examination: • Axis I RDC/TMD • Tooth Wear • Neck palpation • Body palpation Clinical Status by Self-Report Self-Reported Putative Etiologic Factors	Those reporting symptoms were examined and 260 people were identified with first-onset TMD. The cohort of 2,737 initially TMD-free people was followed for a total of 7,404 person-years (median = 2.8 years/person), during which time 260 people developed first-onset TMD, yielding an annual incidence rate of 3.5%. Parafunctional oral behavior summary scores and injury due to prolonged opening in the fully adjusted model was predictive of first-onset TMD. The 119 TMD-free people at baseline who reported more than 3 nonspecific orofacial symptoms had more than twice the incidence of TMD as people with <3 such symptoms. None of the examiner-assessed measures of jaw mobility (jaw opening) was a significant predictor of TMD incidence. People with pain during jaw opening had approximately 50% greater incidence of TMD compared to people who reported no pain during such procedures Self-reported history of TMJ noises and pain during palpation of the masticatory muscles and TM joints was a significant predictor of TMD Greater numbers of palpation tender points in both the neck and the body were associated with greater incidence of TMD.

Table 2. Percentage distribution of baseline variables, according study of **Marklund & Wänman (2010).**

Baseline variable (n=280)	%
Gender Male	35
Female	65
Age group ≤21 years	57
>21 years	43
Parafunctions Tooth clenching	39
Tooth grinding	25
Bruxism = reported tooth grinding and/or clenching.	49
Sagittal occlusion Neutro-occlusion	87
Dist-occlusion	10
Mesio-occlusion	3
Vertical occlusion Normal overbite	75
Open bite	7
Edge-to-edge bite	4
Deep bite	14
Transversal occlusion Normal bite	89
Crossbite unilateral	8
Crossbite bilateral	2
Scissors bite	0.4
Malocclusion Any divergence from normal occlusion	35
Overjet ≥5 mm	12
Occlusion in RCP Unilateral contact	62
Bilateral contact	38
Lateral slide in centric ≥1 mm	8
Eccentric occlusion MI at 3 or 9 mm lateral	33
excursion	25
Symptoms of TMD* Any TMD symptom	46
Signs of TMD Any TMD sign	

*Symptoms reported to occur once a week or more often.

MI = mediotrusive side interference.

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CAPÍTULO 2: Clinical findings and pain symptoms of temporomandibular disorder associated to localized and widespread pain.

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ABSTRACT

Aim: This study aimed to evaluate jaw function and facial pain characteristics among subgroups of Temporomandibular Disorder (TMD) patients, which were classified according to the presence of localized pain (LP) or widespread pain (WP). **Methods**: A cross-sectional study was conducted and a self-administered questionnaire and clinical examination procedures from the RDC/TMD were applied. Participants were classified as controls free of TMD complaints (n=37), TMD/LP patients (n=43) and TMD/WP patients (n=33). These three groups were compared with respect to each measure of interest. **Results:**

The TMD/LP group differed from controls with respect to most clinical measurements and presented significantly higher values ($p \leq 0.0001$) of self-reported facial pain. Moreover, TMD/LP patients reported higher levels of jaw activity limitation ($p<0.0001$), joint noises ($p<0.0001$) and parafunctional habits ($p<0.002$) than controls. TMD/LP patients presented greater overbite than TMD/WP patients ($p<0.04$) and controls ($p<0.04$). However, measurements of facial palpation showed that the TMD/WP group reported a higher number of painful sites ($p<0.0001$), increased frequency of moderate/severe pain ($p<0.05$), and higher disability points ($p<0.05$) than the TMD/LP group. **Conclusion:** TMD patients differ substantially from healthy controls. TMD/WP patients reported higher levels of muscle and joint pain and slightly higher pain-related disability than TMD/LP patients. TMD/LP patients presented higher vertical incisal overlap than TMD/WP, but jaw mobility, presence of joint noises and recurrent pain characteristic did not differ between TMD subgroups.

Keywords: Facial Pain; Examination; Temporomandibular Disorders; Widespread pain; Chronic Pain.

INTRODUCTION

Temporomandibular disorder (TMD) is a chronic pain condition defined as clinical problems involving the masticatory musculature, the temporomandibular joints (TMJs), or associated orofacial structures, exhibiting pain as primary characteristic (1-3). In addition, limitations in jaw function and/or clicking and popping sounds in the TMJs are other signs and symptoms that are commonly present (4,5).

In contrast, fibromyalgia is a pain-amplification syndrome that represents the extreme end of the spectrum of chronic musculoskeletal pain in the general population (6). The cause of the heightened pain sensitivity presented in these patients is unknown, but is likely to involve abnormalities in peripheral and central sensory neural processing associated with peripheral tissue abnormalities (6,7). Widespread pain is also a typical characteristic that may be related to

pathological changes in central pain processing rather than the presence of a primary muscle disease (7,8).

Signs and symptoms of myofascial TMD pain have been reported in patients with Fibromyalgia syndrome, and the hypothesis that facial pain may be a characteristic of fibromyalgia has been considered (9,10). Similarly, patients with TMD frequently describe pain in extra-trigeminal body regions (1,8,11). TMD is also associated with central sensitivity, (12) and the correlation between body pain and facial pain among TMD patients is widely accepted (8,13-15). Several studies report that individuals with chronic TMD have greater sensitivity to experimental pain than healthy controls (16,17). Furthermore, increased pain sensitivity in TMD patients was observed for the same stimuli as fibromyalgia patients (8).

Enhanced pain sensitivity is a possible risk factor for first-onset of TMD (7,13,17). A prospective cohort study with 397 subjects showed that widespread pain was a risk factor for development of TMD pain among women who did not have pain at baseline (11), although no association between pain sensitivity and first-onset of TMD was found in the OPPERA (Orofacial Pain: Prospective Evaluation and Risk Assessment) project, which had a much larger sample size (18). Another prospective study found that subjects who developed TMD reported more headaches, muscle soreness/pain, and other pains that were not observed in the subjects who did not develop TMD (15).

However, it is not clear whether TMD should be regarded as a regional pain condition, or whether TMD is a manifestation of other widespread pain syndromes such as fibromyalgia and chronic widespread pain (7,10). Recently the association between specific biological mechanisms, such as central sensitization, and the distinction between localized and generalized pain in TMD has been investigated (7,10,13,16). Thus, more investigation on TMD subtypes is needed. Furthermore, considerable controversy still exists with respect to clinical findings related to jaw function and TMD (1,4,19). Thus, the aim of this study was to compare clinical measures of jaw function and facial pain characteristics between pain-free controls and TMD patients with either localized or widespread pain.

MATERIALS AND METHODS

Study Setting and Participants

This cross-sectional study used advertisements, emails, flyers and word-of-mouth to recruit women who had chronic TMD with localized pain (TMD/LP), chronic TMD with widespread pain (TMD/WP) and healthy control. The participants were recruited between Jun 2009 to Mar 2012 from the clinic of the Piracicaba Dental School/UNICAMP (University of Campinas) and the communities surrounding the school.

A total of 113 female subjects met the inclusion and exclusion criteria and consented to participate in this study. After evaluation by self-report questionnaires and a clinical examination, the volunteers were classified as healthy controls (n=37, mean age=51.6 ± 12.1), localized myofascial TMD (n=43, mean age=26.7 ± 9.0) and TMD with widespread pain (n=33, mean age=53.3 ± 9.3).

The inclusion criteria were female gender, comprehensive Portuguese reading ability and not pregnant or nursing. The exclusion criteria were the presence of systemic diseases, polyarthritis, exposure to macro facial trauma, dislocated joints, using orthodontic braces, dental pain, and the presence of sinusitis, ear infections, cancer or hormonal disorders.

TMD patients were classified as having widespread pain (TMD/WP) when the palpation of 18 body sites elicited pain at diagonally opposite quadrants of the body (i.e., above and below the waist, on both the left and right sides) (7). Three pounds of digital palpation pressure were applied bilaterally for 2 seconds to each site by calibrated examiners. At each location, a response of pain to palpation was recorded (13).

The classification of myofascial TMD was based on the Research Diagnostic Criteria for Temporomandibular Disorder (RDC/TMD) (20). The TMD cases without widespread pain were classified as having localized pain. Chronic pain for the cases was defined as orofacial pain present for at least 6 months. Control subjects had neither TMD nor widespread pain classification.

Ethical Conduct of Research with Humans

The present study was reviewed and approved by The Ethics Committee for Research (institutional review board) of the Piracicaba Dental School - University of Campinas, under protocol number 103/2009. All participants provided informed, signed consent to participate in the study.

Study Measures

This study assessed pain and jaw function characteristics in TMD cases (with and without widespread pain) and healthy controls. These data were collected using self-administered instruments and clinical examination procedures from the RDC/TMD questionnaire (Q) and exam (E).

Clinical measures of jaw function

Examiners were calibrated according to RDC/TMD specifications (20). Clinical measures were collected using the physical assessments in the RDC/TMD exam (E4, E8 and E9) to assess jaw mobility, TMJ noises and palpation pain. The ranges of mouth opening (mm) were obtained during unassisted opening without pain, maximum unassisted opening and maximum assisted opening. The vertical incisal overlap was considered when collecting these measures, which was evaluated separately.

The number of extraoral sites (muscles and joints) with tender to palpation was rated bilaterally using an ordinal summary measure of a 20-item checklist. The sites included temporalis (posterior), temporalis (middle), temporalis (anterior), masseter (superior), masseter (middle), masseter (inferior), posterior mandibular region, submandibular region, joint lateral pole and joint posterior attachment. The number of muscles and joints with moderate or severe pain upon palpation was also evaluated, as well as the presence of joint sounds during jaw opening and closing.

Self-reported pain measures

Self-Reported pain measures were obtained from the RDC/TMD exam (E1) and questionnaire (Q4a, Q4b, Q5, Q8, Q19). Specifically, the number of sides

of the face with pain (unilateral or bilateral), years with facial pain and pain frequency characteristics (persistent or recurrent) were evaluated. Moreover, the Characteristic Pain Intensity (CPI), Disability Points (DP) and Graded Chronic Pain Scale (GCPS) were calculated as previously described in the literature (20)**.**

Self-reported functional factors

Participants reported the number of jaw activity limitations (Q19) as well as the following symptoms: jaw locking or catching (Q14a), jaw clicking or popping (Q15a) and parafunctional behaviors, such as jaw clenching or grinding (Q15b), nightime tooth grinding (Q15c) and daytime tooth clenching (Q15d).

Statistical Methods

For each variable of interest, the mean value of the variable (and the associated standard error) was calculated for each of the three groups (controls, TMD/LP, and TMD/WP). For continuous variables, the null hypothesis of no mean difference between the three groups was evaluated using ANOVA. The control and TMD/LP groups were compared using t-tests, as were the TMD/LP and TMD/WP groups. For dichotomous variables, Fisher's exact test was used to compare the groups rather than ANOVA and t-tests. All statistical analysis was performed using R version 3.0.1, and a significance level of 5% was considered.

RESULTS

The variation among the three TMD subgroups and the clinical assessments are shown in **Table 1**. The control group shows significant differences compared to the localized TMD group for most parameters measured with the exception of maximum unassisted opening, maximum opening with assistance and presence of joint noises. In particular, patients with localized TMD had a lower level of mouth opening without pain and higher levels of overbite and palpation pain for both muscle and joint sites. The TMD/WP subgroup showed higher levels of palpation pain compared to the TMD/LP subgroup and slightly higher levels of overbite. Jaw range of motion values and the presence of joint noises did not differ between the TMD subgroups.

The variation among the three TMD subgroups and the self-reported pain measures is shown in **Table 2**. TMD patients had higher levels of self-reported pain than TMD-free controls for all measures other than persistent pain. However, there were no significant differences between the TMD/LP and the TMD/WP groups with respect to the self-reported pain measures with the possible exception of disability points and GCPS grade (p=0.45 and p=0.059, respectively). The variation among the three TMD subgroups and jaw function limitation and parafunctional habits is shown in **Table 3**. TMD patients reported greater jaw function limitation and greater numbers of parafunctional habits than TMD-free controls. No differences were observed between the TMD/LP and TMD/WP groups.

DISCUSSION

Our results show that cases with TMD differ substantially from controls with respect to all pain factors and almost all clinical variables assessed. TMD patients also presented greater jaw functional limitation, greater numbers of parafunctional habits, and a greater number of painful masticatory sites, which is in agreement with previous research (1)**.** Furthermore, the unassisted month opening without pain was lower in TMD patients. This can be explained by local factors, such as muscle pain, muscle spasms, joint pain and/or displacement of the joint disc that are commonly described as causes of restricted mandibular mobility (20,21).

However, the maximum assisted and unassisted opening did not differ between TMD cases and controls. However, this may be the result of low power in the present study due to a limited sample size, since larger studies have found differences between TMD cases and TMD-free controls with respect to these variables (1). Similarly, pain and restricted movement in the neck area has been associated with decreased range of jaw opening (14). Likewise, although we did not observe an association between TMJ joint sounds and TMD case status, such differences have been observed in larger cohorts (1). Thus, future studies with

larger sample sizes are needed to evaluate the association between pain and jaw opening range/joint noises.

The only clinical difference observed between the TMD/LP and TMD/WP subtypes was higher incisal overlap in the TMD/LP patients, demonstrating that occlusal factors may contribute to localized TMD pain. This finding is consistent with a previous study showing that patients with regional myofascial facial pain (MFP) and fibromyalgia did not differ from one other with respect to the clinical examination during MFP treatment (22). Similarly, a 2-year prospective observational study indicated that self-reported bruxism and variations in dental occlusion (crossbite) were linked to the incidence and persistence of TMJ signs and symptoms to a higher extent than to myofascial pain (23). However, these results should be interpreted cautiously given that the effect size in our sample was small and the "significant" difference may be due to chance.

Although we observed a difference between TMD cases and TMD-free controls with respect to self-reported sleep bruxism, this result should also be interpreted cautiously. A systematic review showed that studies using self-report to evaluate sleep bruxism generally showed a positive association between bruxism and TMD pain whereas studies that used more reliable methods (such as polysomnography) to diagnose bruxism generally showed no association with TMD symptoms (21). Moreover, a recent study found that TMD patients were more likely to self-report sleep bruxism than TMD-free controls even though polysomnography revealed that the TMD-free group actually had higher levels of sleep bruxism than the group with TMD (24), indicating that self-reported sleep bruxism is an unreliable measure that patients with orofacial pain are more likely to (incorrectly) self-report sleep bruxism. Thus, the fact that self-reported sleep bruxism was more common among patients with chronic TMD in the present study does not imply that sleep bruxism is a risk factor for TMD.

TMD/WP patients also had a higher prevalence of moderate/severe pain on palpation in both joints and muscles sites, which illustrates the lower pain threshold of these patients (7,13,16,17). This is consistent with the hypothesis that

central sensitization is involved with the etiology of TMD (10,25). Widespread pain has been previously associated with the intensity and duration of pain symptoms (25). The intensity and duration of pain were not related to the presence of widespread pain in this study, although that may be due to lack of power. Also, TMD/WP patients presented higher pain impairment than the TMD/LP, which is consistent with the idea that pain is the main attribute that distinguishes one TMD subgroup from the other (13,16). This is consistent with previous research showing that widespread pain is highly associated with the risk of developing pain-related disability (11,15).

The presence of bilateral facial pain was observed in both TMD/LP and TMD/WP patients, which reinforces the idea that pain assessment in the facial area is not sufficient for diagnosing generalized pain. This suggests that a more comprehensive pain assessment of TMD patients is necessary for classification, diagnosis, and appropriate treatment of TMD patients (13).

Study limitations

The modest sample size of the present study means that our power to detect differences between the three groups was limited. The fact that no significant differences were observed between the TMD/LP and TMD/WP groups with respect to most measures in the study may be due to insufficient power. In addition, only a few clinical assessments of jaw function were performed, and the study sample limited to females, which limits the generalizability of our findings. Furthermore, this was a cross-sectional study, so it cannot be determined if the variables considered in this study are causes or consequences of TMD. Although case-control studies can identify variables associated with TMD and its subgroups, they cannot address questions of causality (17).

CONCLUSIONS

Patients with TMD differ substantially from controls with respect to all pain factors and almost all clinical variables. In addition, TMD/WP patients had a higher number of facial pain sites, increased frequency of moderate/severe pain on

palpation and higher pain-related disability than TMD/LP patients. TMD/LP patients presented higher vertical incisal overlap than TMD/WP, but jaw mobility, presence of joint noises and recurrent pain characteristic did not differ between TMD subgroups.

Table 1. Association between the TMD subgroups and clinical assessments.

	Control		TMD/LP		TMD/WP		P-value		
	Mean	SE	Mean	SE	Mean	SE	Overall*	Control vs. TMD/LP§	TMD vs. TMD/WP¶
Unassisted opening without pain|mm	45.00	0.86	40.51	1.25	41.18	1.47	0.0203	0.0014	0.7297
Maximum unassisted opening|mm	48.00	0.85	48.37	1.01	45.33	1.63	0.1529	0.4513	0.1187
Maximum assisted opening|mm	50.78	0.81	49.81	0.95	49.06	1.50	0.5537	0.2673	0.6723
Vertical incisal overlap|mm	1.54	0.27	2.58	0.23	1.80	0.28	0.0113	0.0360	0.0346
Muscles with pain	2.00	0.55	8.67	0.40	11.94	0.60	0.0000	0.0000	0.0000
Muscles with moderate/severe pain	0.68	0.29	4.42	0.51	7.36	0.73	0.0000	0.0000	0.0016
Joints with pain	0.32	0.10	1.30	0.18	2.45	0.26	0.0000	0.0000	0.0005
Joints with moderate/severe pain	0.03	0.03	0.53	0.15	1.18	0.27	0.0001	0.0000	0.0422
Presence of joint sounds	45.9%	8.2%	58.1%	7.5%	36.4%	8.4%	0.1674	0.8425	0.0687

* *Tests the null hypothesis of no mean difference across all three groups*

§ Tests the null hypothesis of no mean difference between the control and TMD/LP groups

¶ Tests the null hypothesis of no mean difference between the TMD/LP and TMD/WP groups

Table 2. Association between the TMD subgroups and self-reported pain measures.

	Control		TMD/LP		TMD/WP		P-value		
	Mean	SE	Mean	SE	Mean	SE	Overall*	Control vs. TMD/LP§	TMD vs. TMD/WP¶
Sides of face with pain	0.05	0.05	1.88	0.05	1.79	0.10	0.0000	0.0000	0.4111
Years with facial pain	0.00	0.00	5.23	0.74	4.72	0.95	0.0000	0.0000	0.6777
Worst facial pain (0-10)	0.00	0.00	7.14	0.34	7.97	0.39	0.0000	0.0000	0.1125
RDC CPI	0.00	0.00	54.56	3.06	57.76	3.87	0.0000	0.0000	0.5191
RDC DP	0.03	0.03	0.53	0.15	1.27	0.33	0.0001	0.0000	0.0450
RDC GCPS	0.00	0.00	1.67	0.09	2.03	0.16	0.0000	0.0000	0.0593
Persistent pain	0.0%	0.0%	2.3%	2.3%	12.1%	5.7%	0.0350	0.1705	0.1602
Recurrent pain	0.0%	0.0%	97.7%	2.3%	100.0%	0.0%	0.0000	0.0000	1.0000

* *Tests the null hypothesis of no mean difference across all three groups*

§ Tests the null hypothesis of no mean difference between the control and TMD/LP groups

¶ Tests the null hypothesis of no mean difference between the TMD/LP and TMD/WP groups

Table 3. Association between the TMD subgroups and jaw function limitation/parafunctional habits.

	Control		TMD/LP		TMD/WP		P-value		
	Mean	SE	Mean	SE	Mean	SE	Overall*	Control vs. TMD/LP§	TMD vs. TMD/WP¶
Jaw activity limitation	0.24	0.24	2.63	0.32	2.64	0.41	0.0000	0.0000	0.9870
Jaw lock or catch	2.7%	2.7%	34.9%	7.3%	36.4%	8.4%	0.0002	0.0001	1.0000
Jaw click or pop	35.1%	7.8%	76.7%	6.4%	60.6%	8.5%	0.0008	0.0006	0.1410
Jaw grating/grinding	8.1%	4.5%	51.2%	7.6%	27.3%	7.8%	0.0001	0.0004	0.0588
Nightime tooth grinding	21.6%	6.8%	58.1%	7.5%	48.5%	8.7%	0.0029	0.0012	0.4882
Daytime tooth clenching	27.0%	7.3%	69.8%	7.0%	60.6%	8.5%	0.0004	0.0001	0.4686

* *Tests the null hypothesis of no mean difference across all three groups*

§ Tests the null hypothesis of no mean difference between the control and TMD/LP groups

¶ Tests the null hypothesis of no mean difference between the TMD/LP and TMD/WP groups

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CAPÍTULO 3: Features of pain and jaw function in temporomandibular disorder pain subgroups: a cross sectional study.

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ABSTRACT

Recently, the distinction between temporomandibular disorders (TMD) with localized or generalized pain was suggested. Once pain and function can be related, impairments in jaw function and pain could be also useful for characterize TMD subgroups and contributes to clinical management of patients. The aim of this study was to compare TMD subgroups, classified according to the presence or absence of widespread palpation tenderness (WPT), in order to evaluate pain and jaw function characteristics. To do so, we used a cross-sectional design, investigating 2700 TMD-free controls, 463 localized TMD and 569 TMD with WPT, through self-report questionnaires constituted of Comprehensive Pain and Symptom Questionnaire, Jaw Functional Limitation Scale and Oral Behaviors Checklist, and the clinical examination which included range of jaw opening; facial,

neck and body sites palpation; temporomandibular joint noises evaluation and tooth wear examination. Our results show that although TMD with WPT presents higher pain impairment than localized TMD, only few differences on jaw function were observed, as emotional and communication limitation and impairment on pain-free opening. We can conclude that TMD subgroups present distinct profiles that were more related with pain presence than with jaw functional limitation. Moreover joint commitments were not different between TMD subgroups. However, localized TMD pain seems to be more influenced by local factors such as malocclusion and tooth wear.

INTRODUCTION

Temporomandibular disorder (TMD) was characterized by pain in the masticatory and related muscles of the head and neck, pain in the temporomandibular joint and associated hard and soft tissues, limitations in jaw function, and/or clicking and popping sounds in the temporomandibular joint.[5]

Currently, a heuristic model proposes that TMD are influenced most proximally by psychological distress and pain amplification phenotypes and a distal contribution comes from genetic regulation of biological mechanisms.[13]

A prospective study found that subjects who developed TMD reported more headaches, muscle soreness or pain, and other pains that were not observed in the subjects who did not develop TMD. [12]

Many studies with TMD patients have also reported concomitant bodily pain conditions in addition to facial pain. [4, 10, 11] Furthermore, the persistence of facial pain was associated with widespread pain presentations and it was also significantly greater than in cases with localized facial pain.[20] But only recently a division in TMD subgroups has been suggested according to widespread pain.[16, 19]

This distinction between localized and generalized pain in TMD is important both for patient diagnosis and for proper understanding of the etiology and pathophysiology of chronic pain.[19] Furthermore, heterogeneous multisystem

dysregulations may exist in painful TMD subgroups and distinct approaches have been considered. [3]

A possible way to identify a subgroup of TMD patients with generalized increased evoked pain sensitivity and to differentiate it from TMD patients with a more localized pain complaint was described using tender point investigation according to the diagnostic criteria for fibromyalgia.[16] Other study showed potential for clinical classification of chronic pain based on distinct molecular profiles and genetic background.[13]

Multiple factors affect the masticatory system and pain perception, either as independent or interacting causal influences.[15] Moreover, literature considers that effects of jaw function and movement influence on pain are useful for differentiating TMD from other orofacial pain disorders.[1] However, these characteristics already have not been described considering TMD subgroups division.

The aim of this study was to compare TMD subgroups, classified according to the presence or absence of widespread palpation tenderness, in order to evaluate pain and jaw function characteristics.

METHODS

Study design

This was a cross-sectional study that evaluated subjects from the Orofacial Pain Prospective Evaluation and Risk Assessment (OPPERA) baseline case-control study. Here we investigated TMD-free controls and TMD cases, which were divided according to pain condition in two subgroups: TMD with widespread palpation tenderness and localized TMD in order to characterize TMD subgroups according to pain and jaw function.

Setting

As previously described,[19] the OPPERA baseline case-control study used advertisements, emails, flyers and word-of-mouth to recruit people who had

chronic TMD (cases) and people who did not (controls). Chronic pain for the cases was defined as pain present for at least 6 months.

The participants were recruited between May 2006 and November 2008 from communities in and around academic health centers at four US study sites: Chapel Hill, NC; Baltimore, MD; Buffalo, NY and Gainesville, FL.

The OPPERA study was reviewed and approved by institutional review boards at each of the 4 study sites and at the data coordinator center, Battelle Memorial Institute.

Participants

The OPPERA baseline case-control data contains 1034 subjects with chronic TMD and 3235 TMD-free subjects. The study criteria for all study participants were: aged 18 to 44 years; fluent in English; negative responses to each of 10 question regarding significant medical conditions; no history of facial injury or surgery; not receiving orthodontic treatment; not pregnant or nursing.

All study participants verbally agreed to screening interview done by telephone, and they provided informed, signed consent for all OPPERA study procedures.

The classification of TMD was based on the Research Diagnostic Criteria for Temporomandibular Disorder.[6] Widespread palpation tenderness (WPT) were assessed to reflect generalized pressure pain sensitivity and patients were classified with WPT when the palpation of 18 body sites elicited pain at diagonally opposite quadrants of the body (ie, above and below the waist, on both the left and right sides).[3] The patients without WPT were classified as localized TMD. Control subjects had neither TMD nor widespread pain classification.[19]

Variables

This study assessed pain and oral function in TMD cases (with and without widespread palpation tenderness) and healthy control. These data were collected using self-administered instruments and calibrated clinical examination

procedures. All procedures of this study have been described previously[15] and we summarized our measurement procedures.

The self-administered instruments constituted of Comprehensive Pain and Symptom Questionnaire (CPSQ), which included the Graded Chronic Pain Scale (GCPS), Jaw Functional Limitation Scale (JFLS) and Oral Behaviors Checklist (OBC). And the clinical examination included range of jaw opening; facial, neck and body sites palpation; temporomandibular joint (TMJ) noises evaluation and tooth wear examination.

Self-administered instruments:

Comprehensive Pain and Symptom Questionnaire (CPSQ)

Variables related to self-report of pain on face (Q 9-15, not 12A) and body (Q 42-48, not 45) were evaluated according characteristic pain intensity, pain-related activity interference and classification on chronic pain grade. This 0-4 scale was considered for GCPS evaluation, according following: 0 = no pain; 1 = low pain intensity and low pain-related disability; 2 = high pain intensity and low pain-related disability; 2,5 = high pain intensity and high activity interference; 3 = moderate pain-related disability; and 4 = severe pain-related disability.

Participants also reported the number of days that their efficiency had been reduced to less than 50% (Q 12A). Likewise, the count of nonspecific orofacial symptoms was evaluated, as irritable bowel syndrome, insomnia, acid reflux and depression (Q 49).

Moreover, questions about factors that modify jaw pain were rated with the ordinal summary measure of a 5-item checklist (Q8), that consider: 1) Opening mouth or moving jaw forward or to the side, 2) Chewing hard or tough food, 3) Jaw habits such as holding teeth together, clenching/grinding teeth, or chewing gum, 4) Resting the jaw and 5) Other jaw activities such as talking, kissing, or yawning.

History of some conditions related to jaw injury, orthodontic procedures, TMD noises and jaw mobility were also assessed from CPSQ questionnaire (Q 17-

19, 21, 25, 27, 30 and 33-35), as presence of grind teeth or clench jaw while sleeping (Q 16) and jaw pain in the morning (Q 16A).

Jaw Functional Limitation Scale (JFLS):

Measurement of jaw limitation was obtained with the 20-item JFLS, across 3 domains: mastication, vertical jaw mobility, and verbal and emotional expression. A total score was computed from 3 subscales.[15]

Oral Behaviors Checklist (OBC):

The OBC consist of 21 questions assessing parafunctional habits frequency, such as clenching the teeth or bracing the jaw. An ordinal summary measure was computed based on adding the coded, ordinal responses to each of the 21 activities according frequency from score 0 (none of the time) to score 4 (4-7 nights/ week).

Clinical examination:

The clinical examination included the RDC/TMD protocol content beyond other clinical observations.

Range of jaw opening

Vertical range of motion (mm), including vertical incisal overlap, was measured with a ruler for conditions of Pain-free jaw opening, maximal unassisted jaw opening and maximal assisted jaw opening that were assessed as well as presence and location of pain.[15] In addition, the completion of the last measure was assessed as “terminated” or “unterminated”.

Palpation on face, neck and body sites:

Bilateral palpation was performed after examiners calibration. On face, the muscles of mastication and TMJ were palpated. On neck at the following locations: upper, middle, and lower areas of the sternocleidomastoid muscle; upper, mid, and lower splenius capitus; and upper semispinalis capitus. And the body was examined following locations: middle part of upper belly of trapezius, supraspinatus, second rib, lateral epicondyle, medial gluteus, greater trochanter,

and medial knee. The presence of at least one tenderness palpation for each facial site evaluated was computed. And the number of sites tender to palpation was assigned on a 0-14 scale for neck and body.

Evaluation of TMJ noises

Joint noises (click, crepitus) from TMJ were detected and recorded during opening and during closing.

Tooth wear examination

The presence of bruxo-facets was assessed in 3 locations: incisors and the cuspids/bicuspids on each side. If clear contact of at least 2 mm in length was evident between opposing tooth edges, wear was recorded as positive. The presence of at least one wear location was computed.

Statistical Methods

Analysis measuring variation of each variable among groups and comparison between TMD subgroups and healthy controls were computed, with adjustment for study-site as well as age, sex, and race/ethnicity.

For continuous variables, the null hypothesis of no mean difference between the three groups was evaluated using ANOVA. The control and TMD/LP groups were compared using t-tests, as were the TMD/LP and TMD/WP groups. For dichotomous variables, Fisher's exact test was used to compare the groups rather than ANOVA and t-tests. All statistical analysis was performed using R version 3.0.1, and a significance level of 5% was considered.

RESULTS

Here we investigated 2700 TMD-free controls, 463 localized TMD and 569 TMD cases with WPT. Among 3235 controls, 535 TMD-free controls with WPT were excluded from this analysis, as were 2 TMD cases with missing palpation data. Sociodemographic characteristics of OPPERA participants were previously described.

The comparison between groups shows that controls differ from both TMD subgroups across all variables assessed in the present study, except for history of orthodontic procedures in which controls do not differ from TMD with WPT group (**table 1**).

Although the CPSQ history of jaw conditions was not different between TMD subgroups (**table 1**), TMD cases were different from one another for many evaluations of pain and function.

The self-report of pain intensity, pain interference and chronic pain grade (GCPS) were higher in TMD with WPT, as non-specific orofacial symptoms and the number of days with efficiency dropped because of facial pain. On the other hand, none difference between TMD subgroups was found observing the number of jaw activities that modified facial pain (**table 2**).

TMD subgroups presented jaw function limitations, that were evaluated by self-report, but only the emotional and communication limitation was more affected in TMD with WPT (**table 3**).

Although we observed that self-report of parafunctional habits was more often in TMD with WPT, the presence of bruxo-facets was higher in localized TMD (**table 4**). Moreover, joint noises on palpation (click, crepitus) from TMJ were not different between them (**table 5**).

Other clinical measurements showed that localized TMD ranked between TMD with WPT and controls when compared the number of palpation tender sites of neck and body, as well as when analyzed the presence of palpation tenderness on facial sites (**table 5**).

Furthermore, TMD with WPT patients presented more impairment on pain-free opening than localized TMD, and they had more locations with pain on unassisted and on assisted (unterminated) opening. However, on maximal opening range, TMD cases did not differ from one another, regardless of unassisted or assisted jaw opening (**table 6**).

DISCUSSION

The main purpose of the present study was to characterize TMD subgroups according to oral function and pain. Thereby we have found that despite TMD with WPT presents higher pain impairment than localized TMD, only a few differences on jaw function were observed.

Overall, pain assessments performed in this study show that TMD with WPT subgroup presents higher impairment than localized TMD, which represents the main clinical finding that distinguishes one another subgroup.[3] However, the presence of more bodily pain even in localized TMD than control must be considered for differential diagnosis.

Pain could be related with functional disorders.[17] A retrospective study found more self-pain during opening mouth and chewing, as restricted jaw movement in comorbid patients with myofascial pain on face and fibromyalgia than regional patients with myofascial pain on face only.[18] However, we did not observed the coexistence of pain self-report and considerable jaw function limitation in TMD with WPT patients.

Despite presenting major limitation on active pain-free opening, TMD patients with WPT are able to open maximally and unassisted mouth as much as patients with localized TMD. This finding demonstrates jaw functional limitation more related with pain presence than with joint limitation.

Furthermore, no difference from both self-report and TMJ noises on palpation was found between TMD subgroups, which highlights that TMD patients with WPT do not present a relevant joint functional impairment compared to localized TMD patients.

Another interesting point is that only emotional and communication jaw function limitation was more affected in TMD with WPT, which can be explained by an enhanced psychological distress common in these subjects.[8] Parafunctional and overuse behaviors are also common among TMD cases.[15] However, we found that self-report of parafunction and presence of bruxo-facets in TMD with WPT are

conflicting, more likely due to numerous physical symptoms reported by these patients (somatization).[21]

The higher count of nonspecific orofacial symptoms found in TMD with WPT is in agreement with a distinct profile in this subgroup. Moreover, jaw activities (e.g. resting the jaw and chewing hard tough food) did not worse pain on TMD subgroups perception, what may indicate that others no-localized factors contributes more to localized facial pain.

Although mechanical influences were considered a potential cause of joint overload, muscle damage and facial pain in TMD patients,[2, 14] our findings show that mechanical factor (e.g. clenching and grinding) does not seem to be related with pain intensity on TMD with WPT subgroup.

On the other hand, differences in history of orthodontic procedures between localized TMD and control suggest the role of mechanical factors in this subgroup pathophysiology. But, considering a heuristic model,[13] it is known that many others risk factors (e.g. physiological distress and pain amplification) are associated with elevated risk of first-onset and persistence of TMD.

Ongoing masticatory muscle pain is also effective in inducing central sensitization, and this effect may in part explain the unusual pain referral patterns associated with this type of pain.[2] Regarding this, our findings showed higher tenderness to palpation for both TMD subgroups compared to control, which have been described as central sensitization involvement in TMD patients.[7, 9]

Furthermore, the higher presence of facial, neck and body palpation tenderness in TMD with WPT added with pain at diagonally opposite quadrants of the body could indicate generalized hyperalgesia in these patients.

Limitations and clinical implications

This was a cross-sectional study that prevented temporal conclusions from being drawn and the analyses consider each measure independently of other clinical measures. In addition, just a few clinical assessments of jaw function were performed.

Given the significant differences presented between TMD subgroups, an assessment considering the presence/absence of WPT contributes on better understanding of clinics characteristics and on treatment planning of TMD patients. In this regard, a treatment focused on central pain influencing drugs and interdisciplinary therapy concepts for TMD patients with WPT have been suggested and would produce greater benefit than localized treatments.[16, 19]

CONCLUSION

TMD subgroups present distinct profiles which were more related with pain presence than with jaw functional limitation. Moreover joint commitments were not different between subgroups. However, localized TMD pain seems to be more influenced by local factors such as malocclusion and tooth wear.

Table 1. Variation between TMD subgroups and healthy controls in CPSQ History of some jaw conditions

History of some conditions	Control			TMD-WPT			TMD+WPT			P value			
	Mean	SE	n	Mean	SE	n	Mean	SE	n	overall	control vs. TMD-WPT	control vs. TMD+WPT	TMD-WPT vs. TMD+WPT
Lifetime History of external injury to jaw	7,4%	0,5%	2557	23,6%	2,4%	318	26,6%	2,2%	402	0,0000	0,0000	0,0000	0,2050
Jaw injury due to yawning	3,1%	0,3%	2694	21,0%	1,9%	463	20,7%	1,7%	569	0,0000	0,0000	0,0000	0,7357
Jaw injury due to prolonged opening	2,5%	0,3%	2694	15,8%	1,7%	463	19,5%	1,7%	569	0,0000	0,0000	0,0000	0,0730
Ever had orthodontic procedures*	42,2%	1,0%	2681	54,6%	2,3%	456	54,4%	2,1%	568	0,0336	0,0132	0,1932	0,2955
TMJ noises in last month	17,8%	0,7%	2659	90,2%	1,4%	447	90,2%	1,3%	560	0,0000	0,0000	0,0000	0,8494
pain with TMJ noises in last month	1,7%	0,3%	2644	74,9%	2,0%	451	77,9%	1,8%	556	0,0000	0,0000	0,0000	0,0911
TMJ noises before last month	19,3%	0,8%	2664	89,5%	1,4%	448	89,9%	1,3%	555	0,0000	0,0000	0,0000	0,8188
In last month, could not open mouth wide	2,4%	0,3%	2672	44,8%	2,3%	458	41,9%	2,1%	566	0,0000	0,0000	0,0000	0,2973
Prior to one month ago, could not open your mouth wide	6,4%	0,5%	2671	54,9%	2,3%	457	50,5%	2,1%	568	0,0000	0,0000	0,0000	0,0537
In the last month, could not close jaw	1,8%	0,3%	2666	32,4%	2,2%	457	33,3%	2,0%	562	0,0000	0,0000	0,0000	0,4752
Prior to one month ago, could not close jaw	4,2%	0,4%	2679	36,9%	2,3%	458	39,3%	2,1%	563	0,0000	0,0000	0,0000	0,5693

** Highlighting the differences between control and localized TMD*

Table 2. Variation between TMD subgroups and healthy controls in CPSQ variables related to self-report of pain on face and body

Self-report of pain on face and body	Control			TMD-WPT			TMD+WPT			P value			
	Mean	SE	N	Mean	SE	n	Mean	SE	n	overall	control vs. TMD-WPT	control vs. TMD+WPT	TMD-WPT vs. TMD+WPT
In past 6 months, number of days efficiency dropped below 50%*	4,30	1,19	364	27,22	2,21	449	30,58	2,05	555	0,0000	0,0000	0,0000	0,0412
Count of nonspecific orofacial symptoms*	0,36	0,02	2697	4,71	0,06	462	4,85	0,05	563	0,0000	0,0000	0,0000	0,0117
Facial characteristic pain intensity*	2,24	0,17	2670	54,16	0,90	461	55,95	0,84	561	0,0000	0,0000	0,0000	0,0083
Facial pain interference*	0,68	0,10	2669	21,16	1,07	457	25,48	1,03	557	0,0000	0,0000	0,0000	0,0000
Facial GCPS*	0,11	0,01	2646	1,91	0,05	453	2,04	0,04	553	0,0000	0,0000	0,0000	0,0001
Body characteristic pain intensity*	0,58	0,10	2442	22,04	1,43	441	34,94	1,39	558	0,0000	0,0000	0,0000	0,0000
Body pain interference*	2,87	0,23	2640	14,24	1,14	443	26,43	1,32	560	0,0000	0,0000	0,0000	0,0000
Body GCPS*	0,05	0,01	2441	0,72	0,06	439	1,42	0,07	555	0,0000	0,0000	0,0000	0,0000
No. of activities that modified facial pain last month	1,99	0,18	81	3,31	0,06	448	3,26	0,06	547	0,0000	0,0000	0,0000	0,5111

** Highlighting the differences between TMD subgroups*

Table 3. Variation between TMD subgroups and healthy controls on self-related Jaw functional limitation

Jaw functional limitation	Control			TMD-WPT			TMD+WPT			P value			
	Mean	SE	N	Mean	SE	n	Mean	SE	n	overall	control vs. TMD-WPT	control vs. TMD+WPT	TMD-WPT vs. TMD+WPT
JFLS Chewing Limitation | (0-10 scale)	0,29	0,02	2315	2,58	0,09	387	2,50	0,08	483	0,0000	0,0000	0,0000	0,7624
JFLS Opening Limitation | (0-10 scale)	0,19	0,02	2558	2,77	0,10	422	2,75	0,09	526	0,0000	0,0000	0,0000	0,8394
JFLS Emotional and Communication Limitation | (0-10 scale)*	0,14	0,01	2493	1,04	0,08	385	1,21	0,08	474	0,0000	0,0000	0,0000	0,0035
JFLS Combined Global Measure | (0-10 scale)	0,15	0,01	2177	2,11	0,09	327	2,05	0,08	393	0,0000	0,0000	0,0000	0,7983

** Highlighting the differences between TMD subgroups*

Table 4. Variation between TMD subgroups and healthy controls on parafunctional habits frequency

	Control			TMD-WPT			TMD+WPT			P value			
	Mean	SE	N	Mean	SE	n	Mean	SE	n	overall	control vs. TMD-WPT	control vs. TMD+WPT	TMD-WPT vs. TMD+WPT
CPSQ Q16. Grind teeth or clench jaw while sleeping*	23,4%	0,8%	2689	71,4%	2,1%	458	78,8%	1,7%	566	0,0000	0,0000	0,0000	0,0163
CPSQ Q16A. Jaw pain in the morning*	8,0%	0,5%	2664	79,3%	1,9%	455	87,6%	1,4%	564	0,0000	0,0000	0,0000	0,0002
Sum of 21 OBC responses*	19,46	0,18	2566	30,95	0,51	434	34,71	0,47	541	0,0000	0,0000	0,0000	0,0000
Presence of bruxo-facets*	88,1%	0,6%	2655	98,0%	0,7%	452	92,8%	1,1%	552	0,0000	0,0000	0,0004	0,0044

** Highlighting the differences between TMD subgroups*

Table 5. Variation between TMD subgroups and healthy controls in Clinical Palpation sites

Palpation sites	Control			TMD-WPT			TMD+WPT			P value			
	Mean	SE	N	Mean	SE	n	Mean	SE	n	overall	control vs. TMD-WPT	control vs. TMD+WPT	TMD-WPT vs. TMD+WPT
TMJ palpation noises: right	30,3%	0,9%	2674	40,6%	2,3%	458	46,8%	2,1%	566	0,0000	0,0004	0,0000	0,1830
TMJ palpation noises: left	31,3%	0,9%	2674	47,2%	2,3%	458	53,0%	2,1%	566	0,0000	0,0000	0,0000	0,9275
Palpation tenderness: right temporalis*	18,9%	0,8%	2700	67,1%	2,2%	462	88,9%	1,3%	569	0,0000	0,0000	0,0000	0,0000
Palpation tenderness: left temporalis*	23,0%	0,8%	2700	88,3%	1,5%	462	96,3%	0,8%	569	0,0000	0,0000	0,0000	0,0000
Palpation tenderness: right masseter*	10,2%	0,6%	2700	39,4%	2,3%	462	62,2%	2,0%	569	0,0000	0,0000	0,0000	0,0000
Palpation tenderness: left masseter*	14,2%	0,7%	2696	42,0%	2,3%	455	68,1%	2,0%	558	0,0000	0,0000	0,0000	0,0000
Palpation tenderness: right mandibular*	6,1%	0,5%	2700	46,0%	2,3%	463	68,8%	1,9%	568	0,0000	0,0000	0,0000	0,0000
Palpation tenderness: left mandibular*	14,3%	0,7%	2700	70,2%	2,1%	463	90,5%	1,2%	569	0,0000	0,0000	0,0000	0,0000
Palpation tenderness: right lat. pterygoid*	17,9%	0,7%	2700	81,8%	1,8%	462	95,3%	0,9%	569	0,0000	0,0000	0,0000	0,0000
Palpation tenderness: left lat. pterygoid*	9,3%	0,6%	2700	38,9%	2,3%	463	69,1%	1,9%	569	0,0000	0,0000	0,0000	0,0000
Palpation tenderness: right TM joint*	13,0%	0,6%	2695	40,2%	2,3%	455	65,6%	2,0%	558	0,0000	0,0000	0,0000	0,0000
Palpation tenderness: left TM joint*	7,0%	0,5%	2700	44,5%	2,3%	463	75,5%	1,8%	567	0,0000	0,0000	0,0000	0,0000
# of neck sites tender to palpation|0-14*	0,63	0,03	2699	2,74	0,14	462	6,99	0,18	565	0,0000	0,0000	0,0000	0,0000
# of body sites tender to palpation|0-14*	1,24	0,04	2700	2,73	0,11	463	8,74	0,13	569	0,0000	0,0000	0,0000	0,0000

** Highlighting the differences between TMD subgroups*

Table 6. Comparison of mandibular range of motion and associated pain between the control group, TMD-WPT group, and TMD+WPT group

Mandibular range of motion and associated pain	Control			TMD-WPT			TMD+WPT			P value			
	Mean	SE	N	Mean	SE	n	Mean	SE	n	overall	control vs. TMD-WPT	control vs. TMD+WPT	TMD-WPT vs. TMD+WPT
Pain-free opening (mm)	48.21	0.15	2670	36.13	0.52	460	32.89	0.48	567	<0.0001	<0.0001	<0.0001	<0.0001
Maximum unassisted opening (mm)	53.76	0.14	2670	47.19	0.44	459	46.28	0.38	567	<0.0001	<0.0001	<0.0001	0.6443
Maximum assisted opening (unterminated) (mm)	56.27	0.16	2146	51.91	0.46	345	51.76	0.40	420	<0.0001	<0.0001	<0.0001	0.1450
Maximum assisted opening (terminated) (mm)	56.73	0.33	510	51.39	0.96	106	50.17	0.69	145	<0.0001	0.0001	<0.0001	0.7089
Pain associated with max. unassisted opening	33.0%	0.9%	2613	84.5%	1.7%	438	90.3%	1.3%	549	<0.0001	<0.0001	<0.0001	0.0018
Pain associated with max. assisted opening (unterminated)	30.3%	1.0%	2097	80.3%	2.2%	335	87.1%	1.6%	412	<0.0001	<0.0001	<0.0001	0.0022
Pain associated with max. assisted opening (terminated)	77.4%	1.9%	505	94.0%	2.4%	100	97.1%	1.4%	137	<0.0001	<0.0001	<0.0001	0.3229

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CONCLUSÃO

- Dada à complexidade necessária para o diagnóstico diferencial em dor orofacial, e devido ao fato de que um plano de tratamento bem sucedido depende de um diagnóstico correto, um exame clínico mais abrangente da DTM se faz necessário. Variáveis como a avaliação funcional da oclusão, avaliação dos nervos cranianos e palpação corporal devem ser adicionados ao exame do RDC / TMD.

- Os pacientes com DTM diferem substancialmente dos controles com relação a todos os fatores de dor e quase todas as variáveis clínicas.

- Os subgrupos de DTM, classificados de acordo com a presença de dor generalizada, apresentam perfis distintos que foram mais relacionados com a severidade da dor facial do que com limitações funcionais da mandíbula. Além disso, o comprometimento articular não foi diferente entre os subgrupos.

- Os pacientes com DTM associada à dor generalizada relataram maior intensidade de dor facial e no corpo; mais auto-relato de atividades parafuncionais orais; maior frequência de dor moderada a severa à palpação; maior incapacidade relacionada à dor; maior número de sintomas orofaciais inespecíficos; e maior limitação emocional e de comunicação do que os pacientes com dor localizada na face.

- Já os pacientes com DTM localizada apresentaram maior sobreposição incisal e maior presença de Bruxo-facetas no exame clínico, além de relatarem maior histórico de procedimentos ortodônticos, demonstrando a contribuição de fatores locais na dor localizada da DTM.

- Uma vez que os achados clínicos funcionais não têm sido muito explorados na literatura atual, mais estudos são necessários para uma maior

compreensão da relação entre função mandibular e dor em pacientes com diferentes perfis de DTM.

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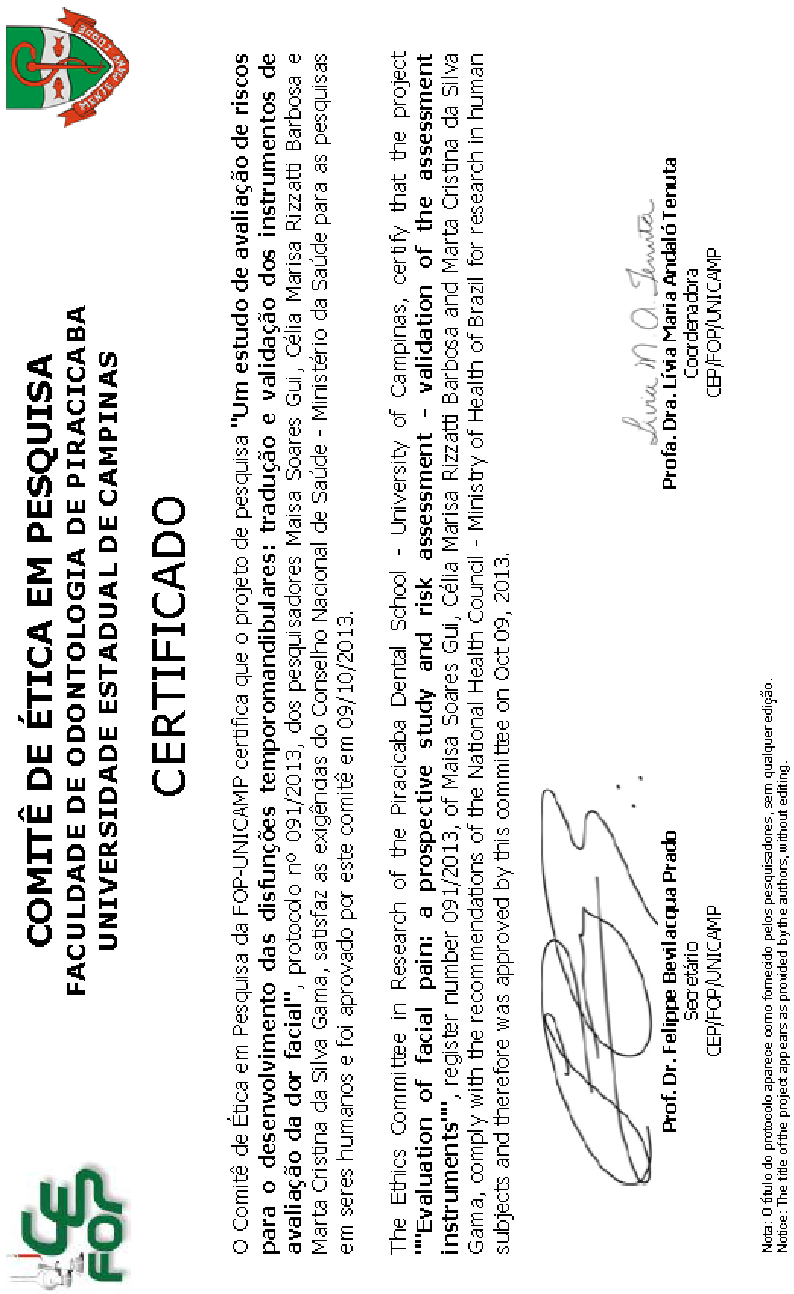
* De acordo com a norma da UNICAMP/FOP, baseadas na norma do Internacional Committee of Medical Journal Editors – Grupo de Vancouver. Abreviatura dos periódicos em conformidade com o Medline.

ANEXO 1

Certificado do Comitê de Ética em Pesquisa.



COMITÊ DE ÉTICA EM PESQUISA
FACULDADE DE ODONTOLOGIA DE PIRACICABA
UNIVERSIDADE ESTADUAL DE CAMPINAS

CERTIFICADO

O Comitê de Ética em Pesquisa da FOP-UNICAMP certifica que o projeto de pesquisa **"Um estudo de avaliação de riscos para o desenvolvimento das disfunções temporomandibulares: tradução e validação dos instrumentos de avaliação da dor facial"**, protocolo nº 091/2013, dos pesquisadores Maisa Soares Gui, Célia Marisa Rizzatti Barbosa e Marta Cristina da Silva Gama, satisfaz as exigências do Conselho Nacional de Saúde - Ministério da Saúde para as pesquisas em seres humanos e foi aprovado por este comitê em 09/10/2013.

The Ethics Committee in Research of the Piracicaba Dental School - University of Campinas, certify that the project **""Evaluation of facial pain: a prospective study and risk assessment - validation of the assessment instruments""**, register number 091/2013, of Maisa Soares Gui, Célia Marisa Rizzatti Barbosa and Marta Cristina da Silva Gama, comply with the recommendations of the National Health Council - Ministry of Health of Brazil for research in human subjects and therefore was approved by this committee on Oct 09, 2013.

Prof. Dr. Felippe Bevilacqua Prado
Secretário
CEP/FOP/UNICAMP

Profa. Dra. Lívia Maria Andaló Tenuta
Coordenadora
CEP/FOP/UNICAMP

Nota: O título do protocolo aparece como fornecido pelos pesquisadores, sem qualquer edição.
Notice: The title of the project appears as provided by the authors, without editing.

ANEXO 2

Comprovante da submissão do Artigo 1.

SciELO Brazilian Oral Research

Main Menu / Author Dashboard

Preview

From: biblio.bor@sbpqo.org.br, secretaria2.bor@sbpqo.org.br

To: martacsgama@gmail.com

CC: martacsgama@gmail.com, rizzatti@unicamp.br

Subject: Brazilian Oral Research - Manuscript ID BOR-2014-0430

Body: 14-Oct-2014

Dear Ms. Gama:

Your manuscript entitled "Jaw functional assessment in patients with Temporomandibular disorder – A review of literature." has been successfully submitted online and is presently being given full consideration for publication in the Brazilian Oral Research.

Your manuscript ID is BOR-2014-0430.

Please mention the above manuscript ID in all future correspondence or when calling the office for questions. If there are any changes in your street address or e-mail address, please log in to ScholarOne Manuscripts at http://mc04.manuscriptcentral.com/bor-scielo and edit your user information as appropriate.

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Thank you for submitting your manuscript to the Brazilian Oral Research.

Sincerely,
Brazilian Oral Research Editorial Office

Date Sent: 14-Oct-2014

ANEXO 3

Comprovante da submissão do Artigo 2.

Journal of Oral and Facial Pain and Headache

Overview | Log out

Progress and review history
manuscript: 1475

Manuscript title: CLINICAL FINDINGS AND PAIN SYMPTOMS OF TEMPOROMANDIBULAR DISORDER ASSOCIATED TO LOCALIZED AND WIDESPREAD PAIN.
Manuscript type: Original Article
All Authors: Marta Cristina da Silva Gama, Maisa Soares Gui, Eric Bair, Celia Marisa Barbosa,
Keywords: Facial Pain; Examination; Temporomandibular Disorders; Widespread pain; Chronic Pain.

Submission number: **1**
Date Received: 2014-10-16
Status: **New Submission**

Weeks under review: 0
Requests sent: 0
Reviewers agreed: 0
Reviews completed: 0

Key

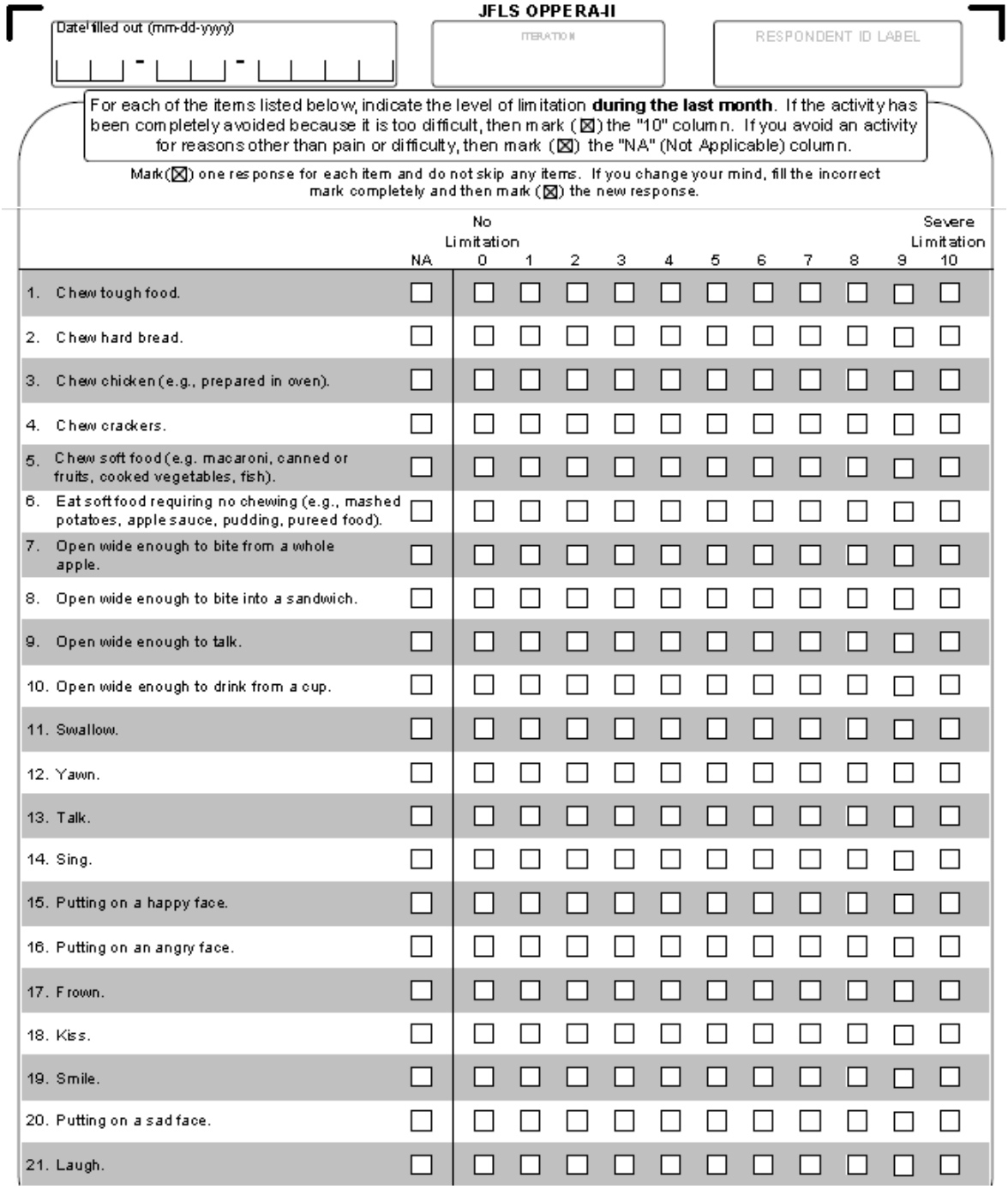
Manuscript review document(s)
Pdf manuscript review file not yet uploaded by the editorial office

Files associated with this submission:

See file | 2014-10-16 | Size: 69kB | Submitted

ANEXO 4

JFLS OPPERA



JFLS OPPERA-II

Date filled out (mm-dd-yyyy) ___-___-_____

ITERATION

RESPONDENT ID LABEL

For each of the items listed below, indicate the level of limitation **during the last month**. If the activity has been completely avoided because it is too difficult, then mark (☒) the "10" column. If you avoid an activity for reasons other than pain or difficulty, then mark (☒) the "NA" (Not Applicable) column.

Mark(☒) one response for each item and do not skip any items. If you change your mind, fill the incorrect mark completely and then mark (☒) the new response.

	NA	No Limitation 0	1	2	3	4	5	6	7	8	9	Severe Limitation 10
1. Chew tough food.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
2. Chew hard bread.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
3. Chew chicken (e.g., prepared in oven).	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
4. Chew crackers.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
5. Chew soft food (e.g. macaroni, canned or fruits, cooked vegetables, fish).	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
6. Eat soft food requiring no chewing (e.g., mashed potatoes, apple sauce, pudding, pureed food).	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
7. Open wide enough to bite from a whole apple.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
8. Open wide enough to bite into a sandwich.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
9. Open wide enough to talk.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
10. Open wide enough to drink from a cup.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
11. Swallow.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
12. Yawn.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
13. Talk.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
14. Sing.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
15. Putting on a happy face.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
16. Putting on an angry face.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
17. Frown.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
18. Kiss.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
19. Smile.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
20. Putting on a sad face.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
21. Laugh.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

ANEXO 5

OBC OPPERA

Date filled out (mm-dd-yyyy) _ _ - _ _ - _ _ _ _

OBC OPPERA

RESPONDENT ID LABEL

How often do you do each of the following activities, based on **the last month**? If the frequency of the activity varies, choose the higher option.

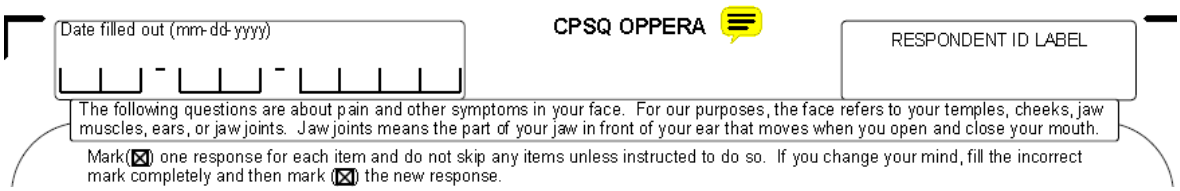
Mark(☒) one response for each item and do not skip any items. If you change your mind, fill the incorrect mark completely and then mark (☒) the new response.

Activities During Sleep	None of the time	< 1 Night / Month	1-3 Nights / Month	1-3 Nights / Week	4-7 Nights / Week
1. Clench or grind teeth **when asleep**, based on any information you may have.	☐	☐	☐	☐	☐
2. Sleep in a position that puts pressure on the jaw (for example, on stomach, on the side).	☐	☐	☐	☐	☐

Activities During Waking Hours	None of the time	A little of the time	Some of the time	Most of the time	All of the time
3. Grind teeth together **during waking hours.**	☐	☐	☐	☐	☐
4. Clench teeth together **during waking hours.**	☐	☐	☐	☐	☐
5. Press, touch, or hold teeth together other than while eating (that is, contact between upper and lower teeth).	☐	☐	☐	☐	☐
6. Hold, tighten, or tense muscles without clenching or bringing teeth together.	☐	☐	☐	☐	☐
7. Hold or jut jaw forward or to the side.	☐	☐	☐	☐	☐
8. Press tongue forcibly against teeth.	☐	☐	☐	☐	☐
9. Place tongue between teeth.	☐	☐	☐	☐	☐
10. Bite, chew, or play with your tongue, cheeks or lips.	☐	☐	☐	☐	☐
11. Hold jaw in rigid or tense position, such as to brace or protect the jaw.	☐	☐	☐	☐	☐
12. Hold between the teeth or bite objects such as hair, pipe, pencil, pens, fingers, fingernails, etc.	☐	☐	☐	☐	☐
13. Use chewing gum.	☐	☐	☐	☐	☐
14. Play musical instrument that involves use of mouth or jaw (for example, woodwinds, brass, string instruments).	☐	☐	☐	☐	☐
15. Lean with your hand on the jaw, such as cupping or resting the chin in the hand.	☐	☐	☐	☐	☐
16. Chew food on one side only.	☐	☐	☐	☐	☐
17. Eating between meals (that is, food that requires chewing).	☐	☐	☐	☐	☐
18. Sustained talking (for example, teaching, sales, customer service).	☐	☐	☐	☐	☐
19. Singing.	☐	☐	☐	☐	☐
20. Yawning.	☐	☐	☐	☐	☐
21. Hold telephone between your head and shoulders.	☐	☐	☐	☐	☐

ANEXO 6

CPSQ OPPERA



8. In the last month, did any of the following activities change your face or jaw muscle pain?
Please mark (☒) one response for each activity.

	Pain got worse	Pain did not change	Pain improved
A. Opening your mouth or moving your jaw forward or to the side	☐	☐	☐
B. Chewing hard or tough food	☐	☐	☐
C. Jaw habits such as holding teeth together, clenching/grinding teeth, or chewing gum	☐	☐	☐
D. Resting the jaw	☐	☐	☐
E. Other jaw activities such as talking, kissing, or yawning	☐	☐	☐

For the next three questions, please rate on a scale from 0 to 10, where 0 is "No pain" and 10 is "Pain as bad as it could be".	No Pain 0	1	2	3	4	5	6	7	8	9	Pain as bad as it could be 10
9. How would you rate your **facial** pain at the present time, that is **right now**?	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
10. **In the past 6 months**, how intense was your worst facial pain?	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
11. In the past 6 months, on the average, how intense was your facial pain?	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

12. Approximately how many days **in the past 6 months** have you been kept from your usual activities (work, school, or housework) because of **facial** pain?
If every day, please write in 180. ___ # of days

A. In the past 6 months, how many days has your efficiency dropped below 50% of what you consider "normal" for you because of **facial** pain?
If every day, please write in 180. ___ # of days

For the next three questions, please rate on a scale from 0 to 10, where 0 is "No interference" and 10 is "Unable to carry on any activities". In the past 6 months, how much has your **facial** pain interfered with your:	No interference 0	1	2	3	4	5	6	7	8	9	Unable to carry on any activities 10
13. daily activities?	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
14. ability to take part in recreational, social and family activities?	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
15. ability to work (including housework)?	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

	Yes	No
16. Have you been told, or do you notice, that you grind your teeth or clench your jaw while sleeping at night?	☐	☐
A. Does your jaw ache or feel stiff when you wake in the morning?	☐	☐

CPSQ OPPERA

RESPONDENT ID LABEL

Mark(☒) one response for each item and do not skip any items unless instructed to do so. If you change your mind, fill the incorrect mark completely and then mark (☒) the new response.

17. **In the last month**, did you have any of the following jaw joint noises on the **left side** of your face when you moved your jaw?

Left jaw joint:	**Yes**	**No**
A. Clicking, popping, or snapping noises	☐	☐
B. Crunching or grating noises	☐	☐
C. Other noises	☐	☐

If you selected no noises at all for your left jaw joint, skip to question 18.

	Yes	**No**
D. In the last month, when you had **left** jaw joint noises, did pain occur with the joint noise?	☐	☐

18. In the last month, did you have any of the following jaw joint noises on the **right side** of your face when you moved your jaw?

Right jaw joint:	**Yes**	**No**
A. Clicking, popping, or snapping noises	☐	☐
B. Crunching or grating noises	☐	☐
C. Other noises	☐	☐

If you selected no noises at all for your right jaw joint, skip to question 19.

	Yes	**No**
D. In the last month, when you had **right** jaw joint noises, did pain occur with the joint noise?	☐	☐

19. **Prior to a month ago**, did you have any of the following jaw joint noises in either or both of your jaw joints when you moved your jaw?

	Yes	**No**
A. Clicking, popping, or snapping noises	☐	☐
B. Crunching or grating noises	☐	☐
C. Other noises	☐	☐

	Yes	**No**
20. **In the last month**, did you avoid opening your mouth wide because of **pain**?	☐	☐
21. In the last month, regardless of pain, was there a time when you could **not** open your mouth wide even for a moment?	☐	☐

	Yes	**No**
25. Prior to one month ago, regardless of pain, was there a time when you could **not** open your mouth wide even for a moment?	☐	☐

If answered **"No"** to question 25 skip to question 27.

	Yes	**No**
26. Prior to one month ago, was the problem with opening your mouth wide due to **locking or catching** (that is, being stuck) in your jaw joint(s)?	☐	☐
27. **In the last month**, when you opened your mouth wide, did your jaw **lock or catch** even for a moment so that you **could not close it** from this wide open position?	☐	☐

If answered **"No"** to question 27 skip to question 30.

	Yes	**No**
28. In the last month, when your jaw locked or caught wide open, did you have to do something to get it to close including moving, pushing, or maneuvering it?	☐	☐

29. In the last month, what was the **longest** amount of time that your jaw locked or caught when you opened wide? Please mark (☒) only one response.

- ☐ Seconds to a minute
- ☐ Minutes to an hour
- ☐ Hours to a day
- ☐ Days to a week
- ☐ Longer than a week but not constant
- ☐ Constant

	Yes	**No**
30. **Prior to one month ago**, when you opened your mouth wide, did your jaw **lock or catch** even for a moment so that you **could not close it** from this wide open position?	☐	☐

CPSQ OPPERA

RESPONDENT ID LABEL

Mark(☒) one response for each item and do not skip any items unless instructed to do so. If you change your mind, fill the incorrect mark completely and then mark (☒) the new response.

33. **In your lifetime**, have you experienced any of the following? Mark (☒) all that apply.

- ☐ Widsom tooth extraction or other dental treatment
- ☐ Oral intubation (that is, general anesthesia with placement of a tube through your mouth)
- ☐ Significant bump to the jaw (including fall, blow, sports injury)
- ☐ Motor vehicle accident
- ☐ Accident resulting in whiplash
- ☐ Injury to your shoulder(s) or neck
- ☐ Other injury affecting the head. Please specify: _____
- ☐ None of the above

If you answered "none of the above" to question 33, skip to question 34.

33a. In your lifetime, did any of the preceding events cause injury to the jaw? ☐ Yes ☐ No ☐ Don't know

34. In your lifetime, have you been injured from either of the following. Mark (☒) all that apply.
- ☐ During yawning
- ☐ Prolonged mouth opening

35. Have you had orthodontic procedures (i.e., braces)? **Yes** ☐ **No** ☐

For the next three questions, please rate on a scale from 0 to 10, where 0 is "No interference" and 10 is "Unable to carry on any activities."
In the past 6 months, how much has your **other** pain interfered with your:

	No interference 0	1	2	3	4	5	6	7	8	9	Unable to carry on any activities 10
47. daily activities?	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
48. ability to take part in recreational, social and family activities?	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
49. ability to work (including housework)?	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

ANEXO 7

RDC/TMD – Axis II: Scoring protocol for Graded Chronic Pain

AXIS II: SCORING PROTOCOL FOR GRADED CHRONIC PAIN

ID# _____

Date: ___ ___ / ___ ___ / ___ ___

ANY TMD PAIN REPORTED IN THE PRIOR MONTH? (*History Questionnaire, Question 3*)

If NO, Graded Chronic Pain (GCP)= 0
If YES, Continue

CHARACTERISTIC PAIN INTENSITY (CPI): (*GCP Scale, Questions 7, 8, and 9*) Calculate as follows:

CPI = _____ (Question #7.) + _____ (Question #8.) + _____ (Question #9.) = _____ divided by 3 = _____ x 10 = ☐

DISABILITY POINTS:

Disability Days: (*GCP Scale, Question 10*)

Number of Disability Days = _____ (Question #10.)

0-6 days = **0** Disability Points
7-14 days = **1** Disability Point
15-30 days = **2** Disability Points
31+ days = **3** Disability Points

Disability Score: (*GCP Scale, Questions 11, 12, and 13*)

_____ (Question #11.) + _____ (Question #12.) + _____ (Question #13.) = _____

divided by 3 = _____

x 10 = _____.

Score of **0-29** = **0** Disability Points
Score of **30-49** = **1** Disability Point
Score of **50-69** = **2** Disability Points
Score of **70+** = **3** Disability Points

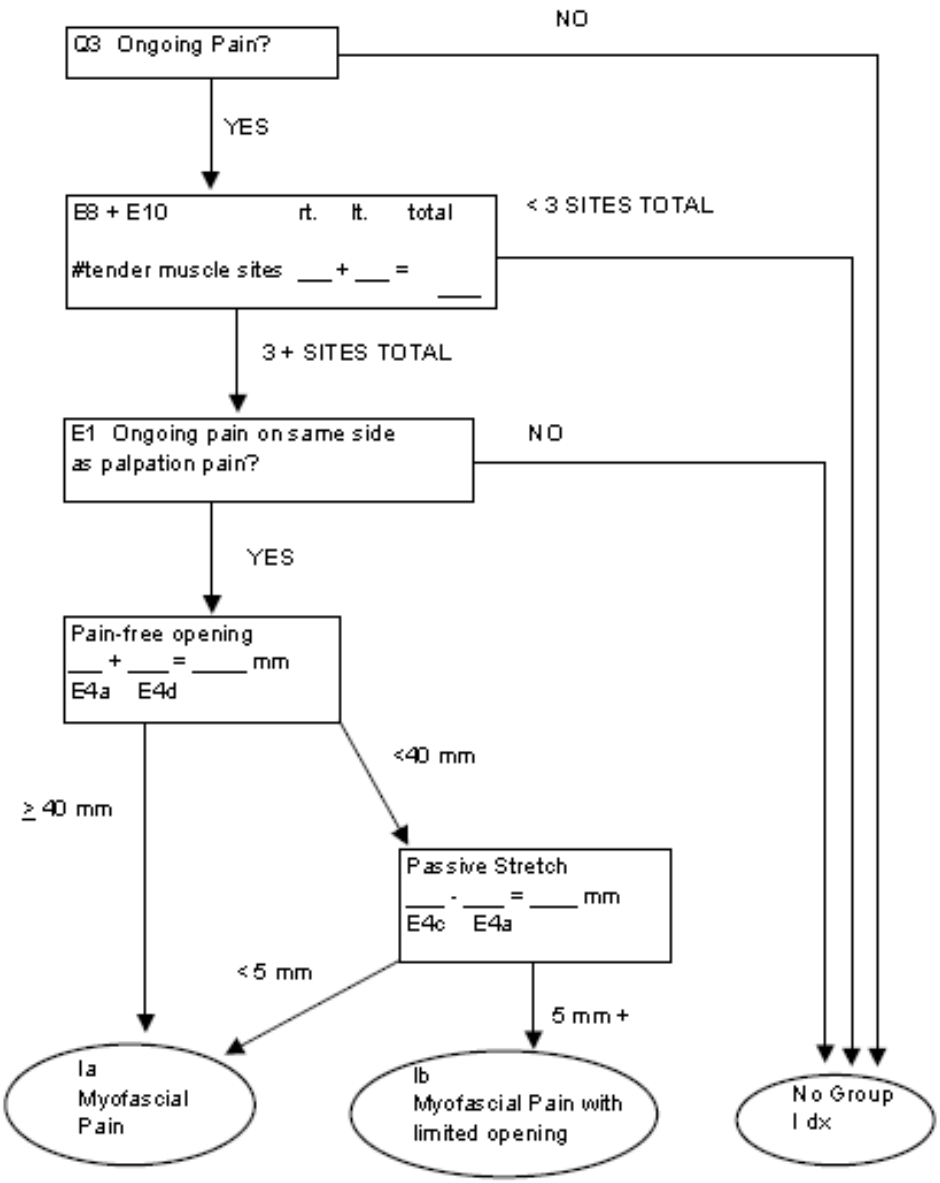
_____ (Points for Disability Days) + _____ (Points for Disability Score) = ☐ **(DISABILITY POINTS)**

CHRONIC PAIN GRADE CLASSIFICATION:

Grade 0	No TMD pain in prior 6 months
Low Disability	
Grade I *Low Intensity*	Characteristic Pain Intensity < 50, and less than 3 Disability Points
Grade II *High Intensity*	Characteristic Pain Intensity ≥ 50, and less than 3 Disability Points
High Disability	
Grade III *Moderately Limiting*	3 to 4 Disability Points, regardless of Characteristic Pain Intensity
Grade IV *Severely Limiting*	5 to 6 Disability Points regardless of Characteristic Pain Intensity

ANEXO 8

RDC/TMD – Myofascial pain diagnosis



ANEXO 9

RDC/TMD – Axis I: Clinical examination

RDC-TMD Clinical Examination

Name Date Examiner

I. Review History

Presence of facial pain	0 NONE	1 RIGHT	2 LEFT	3 BOTH					
Location of facial pain	Right	None	Muscle	Joint	Both	Left	None	Muscle	Joint	Both
		0	1	2	3		0	1	2	3

II. Opening pattern

				(5) Specify:
Straight	0	Left lateral deviation (uncorrected)	3	
Right lateral deviation (uncorrected)	1	Left corrected	4	
Right corrected	2	Other	5	

III. Vertical ROM

		Right side pain				Left side pain			
Incisor used: 8 9	mm	None	Muscle	Joint	Both	None	Muscle	Joint	Both
Pain-free opening	____								
Max unassisted opening	____	0	1	2	3	0	1	2	3
Max assisted opening		0	1	2	3	0	1	2	3

IV. Incisal relations

	mm	
Vertical overlap	____	
Horizontal distance	____	
Midline		mandibular midline is: R L relative to maxilla

V. Horizontal Excursions

		Right side pain				Left side pain			
	mm	None	Muscle	Joint	Both	None	Muscle	Joint	Both
Right lateral	____	0	1	2	3	0	1	2	3
Left lateral	____	0	1	2	3	0	1	2	3
Protrusive		0	1	2	3	0	1	2	3

VI. Joint sounds: open

(≥ 2 of 3 trials, by palpation with opening)	Noises				Location of click	Eliminate click		
	None	Click	Coarse crepitus	Fine crepitus	mm	No	Yes	N/A
Left: OPEN	0	1	1	1	____	0	1	2
Left: CLOSE	0	1	1	1	____	0	1	2
Right: OPEN	0	1	1	1	____	0	1	2
Right: CLOSE	0	1	1	1		0	1	2

Sounds: horizontal

(≥ 2 of 3 trials, on excursion)	Right sounds				Left sounds			
	None	Click	Coarse crepitus	Fine crepitus	None	Click	Coarse crepitus	Fine crepitus
Excursion right	0	1	1	1	0	1	1	1
Excursion left	0	1	1	1	0	1	1	1
Protrusion	0	1	1	1	0	1	1	1

VII. Muscle & joint pain with palpation									
		RIGHT				LEFT			
		RDC Protocol				RDC Protocol			
		no	mild	mod	sevr	no	mild	mod	sevr
Non-pain sites									
	Mastoid (lateral superior portion)	0	1	2	3	0	1	2	3
	Frontal (in-line with pupil, below hair)	0	1	2	3	0	1	2	3
	Vertex (1 cm lateral to cranial top)	0	1	2	3	0	1	2	3
Extra-oral & cervical muscles									
	Posterior temporalis (back of temple)	0	1	2	3	0	1	2	3
	Middle temporalis (middle of temple)	0	1	2	3	0	1	2	3
	Anterior temporalis (front of temple)	0	1	2	3	0	1	2	3
	Masseter-origin (cheek, under cheekbone)	0	1	2	3	0	1	2	3
	Masseter-body (cheek, side of face)	0	1	2	3	0	1	2	3
	Masseter-insertion (cheek, jaw-line)	0	1	2	3	0	1	2	3
	Post mandibular region (jaw, throat area)	0	1	2	3	0	1	2	3
	Submandibular region (under chin)	0	1	2	3	0	1	2	3
Joint pain									
	Lateral pole (outside)	0	1	2	3	0	1	2	3
	Posterior attachment (inside ear)	0	1	2	3	0	1	2	3
Intra-oral muscles									
	Lat pterygoid area (behind upper molars)	0	1	2	3	0	1	2	3
	Tendon of temporalis (tendon)	0	1	2	3	0	1	2	3

ANEXO 10

Declaração de não infringimento do direito autoral transferido às editoras.

De acordo com § único, do Artigo 2º da Informação CCPG/002/2013, segue declaração de não infringimento do direito autoral transferido às editoras, as quais os artigos foram submetidos:

Declaração

As cópias de artigos de minha autoria ou de minha coautoria, já publicados ou submetidos para publicação em revistas científicas ou anais de congressos sujeitos a arbitragem, que constam da minha Tese de Doutorado, **intitulada "Achados de função mandibular e dor na Disfunção Temporomandibular associada à dor localizada e generalizada."**, não infringem os dispositivos da Lei n.° 9.610/98, nem o direito autoral de qualquer editora.

Campinas, 10 de dezembro de 2014.

Autor RG n°: 32.786.620-2
Orientador RG n°: 7.654