Differences in Pain Perception in Children Reporting Joint and Orofacial Muscle Pain

Chaves TC*/ Martins Nagamine H **/ Mêlo de Sousa L ***/ Siriani de Oliveira A ****
Hallak Regalo SC *****/ Bevilaqua Grossi D******

Purpose: *To determine changes in orofacial pain perception in community-based children by assessing the pressure pain threshold (PPT) with an algometer and pain intensity by manual palpation (MP).* ***Methods:*** *A total of 100 children from the community aged 7 to 12 years were assessed. Thirty-eight children reported pain in the orofacial region. Of these children,10 reported joint pain (GJ), 12 reported joint and muscle pain(GJMM), 5 reported muscle pain (GMM), 11 reported pain during mastication(GMAST), and 62 reported no pain. An ANOVA (p<0.05) was used to determine the differences in pain intensity and PPT among groups.* ***Results:*** *Significantly higher pain intensity upon MP was observed for the temporalis muscle in the GJMM, GMAST and GJ groups compared to the remaining groups. The PPT values were significantly lower in the masseter, temporalis muscles, TMJ and thenar region in the GJMM group compared to the other groups.* ***Conclusion:*** *MP more accurately differentiated symptomatic subjects from symptom-free TMD subjects, and PPT values were more sensitive to the discrimination of pain in the orofacial sites assessed. In addition, the changes in perception at a larger number of sites among children reporting mixed pain may suggest the presence of a possible mechanism of central sensitization.*
Keywords: *Children, Temporomandibular Joint Disorders, Pain Measurement.*

INTRODUCTION

Pain is essentially a subjective experience. Attempts to define and measure pain are best seen in pragmatic terms; however, these terms aid research, evaluation and clinical assessment rather than providing objective evidence of pain or its intensity.[1] Self-reports are considered to be the “gold standard” for the assessment of pain in the literature.[2]

* Thaís Cristina Chaves, Ph.D, Professor, Department of Neurosciences and Behavioral Sciences, Ribeirão Preto School of Medicine Ribeirão Preto, University of São Paulo - USP
** Harumi Martins Nagamine,MS, Department of Biomechanics, Medicine and Rehabilitation, Ribeirão Preto School of Medicine Ribeirão Preto, University of São Paulo - USP
*** Letícia Mêlo de Sousa,MS, Department of Biomechanics, Medicine and Rehabilitation, Ribeirão Preto School of Medicine Ribeirão Preto, University of São Paulo - USP
**** Anamaria Siriani de Oliveira, Ph.D, Full Professor, Department of Biomechanics, Medicine and Rehabilitation, Ribeirão Preto School of Medicine, University of São Paulo - USP
***** Simone Cecilio Hallak Regalo, DDS, Ph.D, Full Professor, Department of Morphology, Stomatology and Physiology, Ribeirão Preto Dental School, University of São Paulo – USP
****** Débora Bevilaqua Grossi , Ph.D, Professor, Department of Biomechanics, Medicine and Rehabilitation, Ribeirão Preto School of Medicine, University of São Paulo – USP

Send all correspondence to: Thais Cristina Chaves, Department of Neurosciences and Behavioral Sciences - Faculty of Medicine of Ribeirão Preto - University of São Paulo, CEP: 14049-900 Ribeirão Preto (SP) Brazil

Phone: 005516 3602 44 13

E-mail: chavestc@fmrp.usp.br

Temporomandibular disorders (TMD) refer to a group of musculoskeletal conditions that involve the temporomandibular joint (TMJ), the masticatory muscles and related tissues.[3] These disorders can be described as chronic pain conditions when the pain persists longer than 3 months.[4] The Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD) have been widely used in the literature for the diagnosis of TMD.[4,5] One of the initial criteria for a TMD diagnosis is the spontaneous self-report of pain at masticatory sites.[4,5]

Manual palpation (MP) is widely used for the clinical assessment of TMD. Despite its limitations,[6] this method is recommended by TMD diagnostic criteria, such as theRDC/TMD.[5] However, the use of MP alone may be unreliable in community-based children. Previous studies have shown moderate and weak reproducibility of MP in non-patient children.[7]

Thus, the results of these previous studies may suggest that the combined use of MP with more objective techniques, such as algometry, could lead to more accurate TMD assessment in children. Algometry is used to obtain the Pressure Pain Threshold (PPT), which is defined as the minimum force applied with an algometer that induces pain.[8] In contrast to MP in which the pain assessment is expressed on a nominal or ordinal scale, pressure algometry provides objective values for the representation of pain.[9] In addition, the latter procedure permits the application of controlled pressure to an area at controlled velocity and direction.[9]

The use of a diagnostic tool such as the RDC/TMD may be of low application for the monitoring of community cases in epidemiological studies due to its low sensitivity (percentage of people with the disorders that are correctly identified as having the condition). The use of self-report techniques seems to be a valuable option, and the combination of pain reports and pain assessments may provide substantial information about the severity of subclinical symptoms.

Table 1. Reproducibility of the questions and percentage of positive responses in the groups divided according to main complaint.

Sample characterization		GWP (n=62)	GJ (n=10)	GJMM (n=12)	GMM (n=5)	GMAST (n=11)
Age (years)		9.05±1.29	9.10±1.20	9.67±1.23	9.00±1.58	9.45±1.13
Number of girls		22	8	7	2	7
Number of boys		40	3	5	3	4
Questions	**K values (n=30)**	**Percentage % (number of subjects)**				
1. Pain during mastication	0.63	0	30 (n=3)	67 (n=8)	20 (n=1)	100 (n=11)
2. Headache	0.89	79 (n=49)	70 (n=7)	83(n=10)	80 (n=4)	64 (n=7)
3. Cervical pain	0.78	15 (n=9)	70 (n=7)	50 (n=6)	60 (n=3)	55 (n=6)
4. Pain in theTMJand/ ormasticatory muscles	0.86	0	100 (n=10)	100 (n=12)	100 (n=5)	0
5. TMJ clicking	0.86	23 (n=14)	70 (n=7)	58 (n=7)	20 (n=1)	36 (n=4)
6. Parafunction	0.85	42 (n=68)	80 (n=8)	75 (n=9)	100 (n=5)	82 (n=9)

Legend: children who reported pain only in the TMJ (GJ), children who reported pain in the TMJ and masticatory muscles (GJMM), children who reported pain only in the masticatory muscles (GMM), children with pain during mastication (GMAST), and children without pain (GWP).
K : kappa test concordance values

TMD is a condition commonly observed in adults. However, studies have reported information about the presence of TMD signs and symptoms in adolescence and childhood,[10,11] and there are numerous reports of such complaints by children.[11-13] The TMD symptoms and the need for treatment seem to increase from childhood to adolescence,[12,14] and from adolescence to adulthood.[15] Thus, it is important to assess the presence of TMD signs in pediatric populations.

The aim of the present study was to assess changes in pain perception in community-based children with different orofacial pain reports using algometry and manual palpation to assess pressure pain threshold and pain intensity, respectively.

MATERIAL AND METHOD

The study was conducted on 100 children (54 boys and 46 girls) 7 to 12 years old (9.06 ± 1.20 years) from a local public school selected at random by drawing lots from the total number of 600 children enrolled in the school.

We included the first 100 children whose parents/guardians responded to a questionnaire about pain related to TMD and who satisfied the inclusion/exclusion criteria of the study. Using a significance level of 0.05 (two-sided), the sample size was calculated to achieve 95% power and detect the standardized effect size of 0.55 as analyzed by two-way ANOVA. The sample size calculation showed that 55 subjects were necessary (total sample). The power analysis considered the mean values and standard deviations of pressure pain threshold of the anterior temporalis, as Conti *et al* [16] demonstrated better values of sensitivity, ROC curves and the likelihood ratio to differentiate TMD patients from non-patients using this approach.

The inclusion criteria were as follows: children with no history of traumatic injury to the face, with the ability to understand the procedure, in good general health, who were available and willing to attend the scheduled sessions. Children wearing orthodontic braces, with systemic diseases and with any type of acute pain detected during evaluation were excluded. All the children were systematically followed by dentists at the public school; children who had caries, underwent dental treatment, had poor dentition and other oral problems related to pain were excluded from the initial sample.

The children were assessed for the presence of orofacial pain related to TMD based on the reply to two questions extracted from an anamnestic questionnaire.[17,18] The Fonseca anamnestic questionnaire is composed of 10 questions about temporomandibular pain. This questionnaire classifies volunteers according to the severity of TMD signs and symptoms. The psychometric properties of this tool were demonstrated previously with good reliability and internal consistency levels.[19] In this way, the question about TMJ originally presented in the anamnestic questionnaire was detailed and included pain in masticatory muscles and the presence of pain in the last month. The questions were as follows: *“Do you have pain in your Temporomandibular Joints (TMJ)? Do you have pain in masticatory muscles? Or both? Has it occurred in the last month?”*

For the question about pain during mastication, the original version of the questionnaire was maintained; only the information about the presence of pain in the last month was added. To facilitate understanding, these anatomical locations were pointed out on the child’s face during administration of the instrument. Three box options were added to the printed version of the questionnaire, and the interviewer marked the box with the site of pain mentioned by each child (TMJ/masticatory muscles/pain during mastication). Only children who reported pain in the last month were recruited for the pain groups of this study. The questionnaire had been previously administered to a group of 30 children and was administered again one week later to the same group by a single trained examiner. The reproducibility values of some questions of the instrument are listed in Table 1. The choice to apply that question to select children was based on previous publications[14] that demonstrated acceptable levels of reliability (kappa: 0.83) and of both sensitivity and specificity (values higher than 0.83).The interviewer who applied the questionnaire was blind to the composition of the groups.

Thirty-eight children reported pain in the TMJ, in the masticatory muscle or during functional use in the last month, and 62 reported

Table2. Mean values (±SD), median (Med) and range (M: minimal and Max: maximal) values of pain intensity related to MP of the masticatory muscles and TMJ in five groups classified according to pain complaint: children who reported pain only in the TMJ (GJ), children who reported pain in the TMJ and masticatory muscles (GJMM), children who reported pain only in the masticatory muscles (GMM), children with pain during mastication (GMAST), and children without pain (GWP).

Sites	GJ (n=10)			GJMM (12)			GMM (n=5)			GMAST (n=11)			GWP (n=62)		
	Mean ± SD	Med	Range M/Max	Mean ± SD	Med	Range M/Max	Mean ± SD	Med	Range M/Max	Mean ± SD	Med	Range M/Max	Mean ± SD	Med	Range M/Max
Right side															
MO	3.80 ± 3.33	3	0/10	5.00 ± 2.49	4	2/10	0.00 ± 0.00*	0	0/6	3.64 ± 3.20	2	0/8	2.71 ± 2.81	2	0/10
MB	3.60 ± 2.95	3	0/8	5.50 ± 3.21	6	0/10	1.60 ± 2.61*	6	0/8	3.82 ± 2.60	2	0/8	3.06 ± 2.87	2	0/10
MI	4.40 ± 2.95	5	0/8	4.83 ± 4.13	4	0/10	4.00 ± 3.74	6	0/6	3.27 ± 2.57	2	0/8	3.03 ± 2.85	2	0/10
TA	2.20 ± 2.57	2	0/8	4.50 ± 2.84*	6	0/8	1.20 ± 2.68	0	0/6	3.27 ± 2.24*	4.	0/8	1.97 ± 2.22	2	0/8
TM	1.40 ± 1.90	1	0/6	3.83 ± 1.34*	4	2/6	1.60 ± 3.58	0	0/8	2.18 ± 2.44*	2	0/8	1.71 ± 1.95	2	0/6
TP	1.00 ± 1.14	0	0/4	2.50 ± 1.93	2	0/6	1.20 ± 2.68	6	0/6	2.18 ± 2.09	2	0/6	1.32 ± 1.81	0	0/6
TMJ l	3.00 ± 3.68	2	0/10	2.50 ± 2.58	2	0/8	0.40 ± 0.89	0	0/2	1.45 ± 1.81	0	0/4	1.55 ± 2.03	1	0/8
TMJ p	1.40 ± 1.35	2	0/4	2.17 ± 2.76	1	0/8	0.40 ± 0.89	0	0/6	1.82 ± 2.44	2	0/8	1.61 ± 2.37	1	0/10
MP	2.20 ± 2.74	1	0/6	2.33 ± 2.06	2	0/6	1.20 ± 2.68	0	0/8	1.45 ± 2.21	0	0/6	0.97 ± 1.48	0	0/6
LP	4.40 ± 3.37	4	0/10	6.33 ± 2.23	6	2/10	5.20 ± 2.68	6	0/10	4.91 ± 3.02	4	0/10	3.55 ± 3.35	2	0/10
SR	2.00 ± 2.67	0	0/6	2.50 ± 1.93	2	0/6	2.40 ± 3.58	4	2/8	1.82 ± 2.09	2	0/6	1.52 ± 2.01	0	0/8
TT	5.80 ± 3.58	5	0/10	7.33 ± 2.46*	7	2/10	5.20 ± 4.15	0	0/2	4.91 ± 3.14	4	0/10	3.74 ± 3.08	4	0/10
Left Side															
MO	3.60 ± 2.63	4	0/8	4.50 ± 2.11	4	2/8	0.40 ± 0.89*	0	0/2	4.00 ± 3.22	4	0/10	3.39 ± 2.93	2	0/8
MB	4.20 ± 2.90	4	0/8	4.83 ± 3.13	5	0/10	0.40 ± 0.89*	0	0/2	4.18 ± 3.28	4	0/8	3.45 ± 3.20	4	0/10
MI	3.60 ± 2.63	4	0/8	4.67 ± 3.34	4	0/10	1.20 ± 2.68*	0	0/6	3.82 ± 2.60	4	0/8	3.39 ± 3.09	3	0/10
TA	2.20 ± 2.39	2	0/6	3.17 ± 3.35	2	0/8	1.20 ± 2.68	0	0/8	1.64 ± 2.16	0	0/6	2.29 ± 2.71	2	0/8
TM	2.40 ± 2.63	2	0/6	3.50 ± 2.71	4	0/8	1.60 ± 3.58	0	0/2	2.18 ± 2.27	2	0/6	1.61 ± 2.17	0	0/10
TP	1.40 ± 1.65	1	0/4	3.17 ± 2.33	3	0/8	0.40 ± 0.89	0	0/2	2.00 ± 2.53	2	0/8	1.23 ± 2.03	0	0/10
TMJ l	2.40 ± 1.60	0	0/10	2.67 ± 2.31	3	0/6	1.60 ± 2.19	0	0/4	1.27 ± 2.24	0	0/6	1.29 ± 2.18	0	0/8
TMJ p	1.60 ± 2.07	1	0/10	2.17 ± 2.48	2	0/8	0.80 ± 1.79	2	0/4	1.45 ± 1.81	2	0/6	1.39 ± 2.39	0	0/10
MP	1.00 ± 1.94	0	0/6	2.83 ± 2.17	3	0/6	0.80 ± 1.79	2	0/4	1.27 ± 2.05	0	0/6	1.23 ± 1.96	0	0/8
LP	5.40 ± 3.27	5	0/10	6.50 ± 2.28	7	2/10	4.40 ± 3.58	4	0/8	4.18 ± 2.60	4	0/8	3.81 ± 3.52	2	0/10
SR	2.60 ± 2.50	3	0/6	2.50 ± 1.93	2	0/6	2.00 ± 2.00	4	0/8	2.36 ± 1.75	2	0/4	1.19 ± 1.72	0	0/6
TT	6.40 ± 3.50*	7	0/10	6.50 ± 2.71*	6	2/10	4.40 ± 3.58	0	0/4	5.45 ± 2.54	6	2/10	3.45 ± 3.14	2	0/10

* Difference compared to the remaining groups, ANOVA two-way ($p<0.05$)- Duncan post hoc test (MO, MB and MI: masseter origin, belly and insertion; TA, TM and TP: Anterior, middle and posterior portions of the temporalis muscle; TMJl and TMJp: Temporomandibular joint, lateral and posterior portions; MP: Medial pterygoid, LP: lateral pterygoid, SR: Submandibular region; TT: temporalis tendon)

Table 3. Mean values (± SD) of PPT (kg/cm²) of the masticatory muscles and TMJ in the volunteers divided into five groups according to the initial site of pain complaint: children who reported pain only in the TMJ (GJ), children who reported pain in the TMJ and masticatory muscles (GJMM), children who reported pain only in the masticatory muscles (GMM), children with pain during mastication (GMAST), and children without pain (GWP).

Sites	GJ(n=10)	GJMM(n=12)	GMM(n=5)	GMAST(n=11)	GWP(n=62)
Right side					
MB	1.995 ± 0.424	1.509 ± 0.168*	2.001 ± 0.476	1.763 ± 0.534	1.749 ± 0.446
MI	1.774 ± 0.400	1.524 ± 0.191*	2.052 ± 0.439	1.779 ± 0.685	1.778 ± 0.410
TA	2.347 ± 0.453	1.721 ± 0.318*	2.562 ± 0.546	2.129 ± 0.672	2.173 ± 0.505
TM	2.620 ± 0.578	2.130 ± 0.263*	2.811 ± 0.356	2.578 ± 0.894	2.448 ± 0.681
TP	3.038 ± 0.921	2.219 ± 0.457*	2.951 ± 0.390	2.774 ± 0.971	2.718 ± 0.750
TMJ	2.020 ± 0.429	1.630 ± 0.367*	2.099 ± 0.449	1.952 ± 0.602	1.937 ± 0.425
TR	4.323 ± 1.364	3.420 ± 0.902*	4.301 ± 0.636	4.020 ± 1.551	4.011 ± 0.947
Left side					
MB	1.744 ± 0.329	1.439 ± 0.332*	1.919 ± 0.402	1.831 ± 0.614	1.807 ± 0.388
MI	1.875 ± 0.389	1.592 ± 0.460 *	2.064 ± 0.443	1.894 ± 0.562	1.849 ± 0.384
TA	2.384 ± 0.524	1.887 ± 0.444*	2.395 ± 0.408	2.372 ± 0.788	2.314 ± 0.550
TM	2.758 ± 0.739	1.991 ± 0.378*	2.576 ± 0.503	2.354 ± 0.868	2.521 ± 0.713
TP	2.939 ± 0.858	2.280 ± 0.545	2.904 ± 0.496	2.518 ± 0.762	2.708 ± 0.826
TMJ	2.120 ± 0.442	1.707 ± 0.328*	2.061 ± 0.298	2.386 ± 1.500	1.995 ± 0.406

* ANOVA (p<0.05)- Duncan post hoc. MO, MB and MI: masseter origin, belly and insertion; TA, TM and TP: Anterior, middle and posterior portions of the temporalis muscle; TMJ: Temporomandibular joint, lateral pole, TR: Thenar region

no pain (GWP). Ten of the 38 children specifically reported joint pain (group with joint pain, GJ), 12 reported mixed pain (group with joint and muscle pain, GJMM), 5 reported muscle pain (group with pain in the masticatory muscles, GMM) and 11 reported pain during functional use (mastication) (group with pain during mastication, GMAST). The characteristics of the groups are listed in Table 1.

The children were randomly selected according to the return of the signed consent letter. The study was approved by the Research Ethics Committee of the University Hospital, Faculty of Medicine of Ribeirão Preto (HCFMRP-USP).

Procedures

Localization, palpation and demarcation of the anatomical points of the masticatory system

Algometry and MP procedures were performed by two examiners who were previously trained for 15 hours. The two examiners involved in the collection of PPT and MP data were blind to the presence or absence of reported pain. The reproducibility and steps of both procedures were described previously.[7,20] Fair and moderate levels of MP reliability and moderate/excellent levels for algometry were observed for a sample of children aged 7 to 12 years extracted from the same community of the children from this study.

Specific anatomical sites were bilaterally located and demarcated according to the guidelines of the Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD)[4] to obtain PPT values and pain intensity related to MP. The anatomical points have been described in previous publications.[7, 20]

Manual Palpation

MP was always performed using the index finger.[7] The subjects were instructed to relax, with the mandible in the resting position, with no contact between the teeth and with the muscles also relaxed.

The MP procedure was performed by two previously trained examiners (examiners 2 and 3). The examiners were trained to use an algometer and to apply pressure levels between 0.5 and 1.0 kg/cm² for palpation of the intraoral structures and TMJ and between 1.5 and 2.0 kg/cm² for palpation of the remaining structures.[20] Therefore, a pressure of approximately 0.7 kg was applied for MP of the intraoral structures and TMJ, and a pressure of 1.5 kg was applied for MP of the extra-oral structures. After pressure application, the subject graded his/her pain perception on a faces pain scale.

The faces pain scale used to grade intensity was adapted from the scale proposed by Wong and Baker[21] that contains 6 categories. The scale consists of 6 faces representing different grades of pain intensity, which were previously explained to the children.

The children were instructed to identify the face that "best represented their pain". Only for statistical purposes, numerical values were attributed to the sequence of faces, as suggested by Wong and Baker21, but these values were not attributed to the faces during the assessment procedure. Thus, the following values were used in a sequential order from right to left for the 6 faces pain categories: 0 – no pain or perception of pressure only, 2 –a little pain, 4 - a little more pain, 6 –more or less pain, 8 –very painful, and 10 – very painful or the maximum pain possible.

Before the experimental procedure, the children were encouraged to point to the "face" corresponding to "0" whenever they were in doubt as to the perception of pain or pressure, as MP should not necessarily result in pain.

Algometry

Pressure algometry was performed by two previously trained examiners. A constant pressure rate of approximately 0.5 kg/cm²/s was applied with the correct positioning of the metal tip of the device perpendicular to the anatomical surfaces evaluated. A digital metronome (model A-30, Korg®, Tokyo, Kantõ, Japan) with a determined frequency of 1 Hz was used in all evaluations by both examiners to provide a sound feedback and standardized velocity of application of the compression force. For the compression assays, a digital dynamometer (model DDK-10, Kratos®, São Paulo, São Paulo, Brazil) was adapted for the determination of pressure algometry.[18] The measuring interval of the device ranges from 0 to 10 kg, with a precision of 0.001 kg. A rubber disk measuring 1.0 cm2 in area was adapted to the metal tip of the device to avoid damage to the surfaces evaluated.[20]

The entire procedure was first explained in detail to the children, who were instructed about the difference in the perception of pressure and perception of the beginning of pain. To permit the children to familiarize themselves with the technique, the device was first applied to the thenar region of the right hand of the examiner and then to the same region of each child.[22] The children were instructed to report the exact beginning of pain perception. PPT values were obtained with three consecutive bilateral measurements performed at 5 minute intervals for the re-evaluation of each structure.[23] The sequence of site evaluation was randomized.

Statistical Analysis

The weighted Kappa test was used to determine the degree of reproducibility of the questions of the questionnaire, for which the following coefficients of agreement are used: $k < 0$ = very poor, $0 < k < 0.20$ =poor, $0.21 < k < 0.40$ = mild, $0.41 < k < 0.60$ = moderate, $0.61 < k < 0.80$ = good, and $0.81 < k < 1.00$ = excellent.[24]

Two-way ANOVA ($p<0.05$) and the Duncan *post hoc* test were used to determine differences in PPT values and pain intensity related to MP between the study groups (group reporting pain in the TMJ - GJ, group reporting pain in the TMJ and masticatory muscles - GJMM, group reporting pain in the masticatory muscles– GMM, and group without pain - GWP).

RESULTS

Group comparisons revealed significantly higher pain intensity during MP for the anterior and middle (right side) temporalis muscle in the GJMM and GMAST groups, in the temporalis tendon (bilateral) in the GJMM group, and only on the left side in the GJ group compared to the remaining groups (Table 2). In the GMM group, pain intensity was bilaterally reduced in the origin and belly of the masseter muscle and masseter insertion only on the left side (Table 2).

Significantly lower PPT values were also detected for the three regions of the masseter muscle (bilateral), anterior temporalis and middle (bilateral), posterior temporalis (right), and TMJ bilaterally in the GJMM group compared to the other groups (Table 3). In addition, PPT was reduced in the thenar region of the GJMM group compared to the other groups (Table 3).

DISCUSSION

The present results may be summarized as follows: a) when the children were divided into groups according to their specific pain complaint (joint, muscle, mixed or functional complaint), the MP revealed a significant difference for the temporalis muscle of children who reported mixed pain, joint pain and pain during function; b) PPT values were reduced for most sites evaluated in the group with mixed pain compared to the other groups; c) only the group with a complaint of mixed pain showed reduced PPT in the extracephalic site (thenar area).

In studies on community children, the method of diagnostic definition is one of the major challenges for researchers. The use of diagnostic tools may be more appropriate; however, self-reported pain must be considered as the gold standard for pain diagnosis.[2] Nevertheless, good reproducibility was detected for the questions used for screening. Few studies in the literature involving children have used reproducible or valid tools.[25] In the present study, we detected a good level of reproducibility for the report of joint and muscle pain and for the report of pain during function (kappa: 0.86 and 0.63). One of the few studies that reported these values was that of Nilsson *et al,*[14] who reported good levels of reproducibility and validity when asking a question about the report of orofacial pain in a study on adolescents. Considering the good levels of reproducibility of the pain reports obtained in the present study, the method of case definition used here proved to be adequate for the monitoring of orofacial pain reports in community children.

A similar frequency of headache reports was verified in all the groups considered, suggesting that it is a common report also in non-TMD children. Moreover, headaches and TMD could be considered comorbidities,[26] as the exclusion of individuals with headaches could also exclude individuals with TMD. TMJ clicking was more frequently reported by the joint pain groups (GJ and GJMM) compared to the others, and pain during mastication was more commonly observed in the groups with TMD muscle pain. On the other hand, cervical pain and parafunctional habits were more frequently mentioned by the TMD groups compared to the control group. Le Resche *et al* [10] described a greater prevalence of back pain in adolescents who reported orofacial pain, while Hirsch *et al* [27] could not verify an association between incisal tooth wear and self-reported TMD pain in children.

Both techniques, MP for the assessment of pain perception and algometry for the assessment of PPT, were effective in detecting differences between children with a mixed pain complaint and community children with a single or no report of orofacial pain. These data can be explained by the fact that the larger number of sites involved in pain in the face led to an increase in peripheral inputs contributing to changes in the level of central sensitization to pain and thus to a lower pain threshold in the face. This aspect is confirmed by the reduced PPT in children with mixed pain even at extracephalic sites (thenar region). Some studies have suggested that patients with myofascial pain have more severe levels of pain and disability than patients with conditions affecting only the joints,[28,29] because the muscle pain could overlap the pain originating from the joint.[30] However, our results suggest a mechanism of summation of the pain with a consequent amplification of sensitization in community children with pain who did not seek treatment for TMD.

In this respect, one of the few studies found in the literature about the pain summation effect of multiple TMD diagnoses was that conducted by Bevilaqua-Grossi *et al,*[31] who observed an increase in skin pain threshold in adult patients with mixed TMD compared to patients with myofascial TMD. A prospective study on children demonstrated a greater risk of the onset of pain in the face associated with a report of another type of concomitant pain condition, with this risk increasing four-fold when the patient reported 2 or 3 additional associated pain conditions.[10] These results also suggest a summation effect of the different pain symptoms rather than an overlapping effect.

Among the techniques used in the present study, MP was found to be sensitive for the detection of differences in pain intensity for the temporalis muscle in the subgroups of pain (mixed pain, joint pain, and functional pain), whereas algometry detected differences at almost all sites assessed, but only for the mixed pain group. Thus, the algometry technique proved to be more effective for the assessment of pain perception in widespread orofacial pain, whereas MP was more effective in differentiating groups reporting some type of pain from the control group with no pain. It is important to emphasize that intraoral palpation sites can only be assessed by MP, which highlights the need to use both techniques for a complete assessment of orofacial pain. Moreover, instead of the differences verified for the temporalis tendon in the mixed TMD group, the palpation of intraoral sites is a controversial issue; a previous study reported a high sensitivity and lower specificity of the procedure, with a high risk of false-negative results.[16]

To the best of our knowledge, there are no studies on the differences in pain perception between community children with and without a positive report of TMD pain. One of the few studies conducted with children was at study by Metsahonkala *et al*;[32] however, in this case, the authors only assessed children with headaches compared to healthy controls and did not consider the presence or absence of TMD.

An interesting aspect to be considered relates to the reproducibility of both techniques for the assessment of masticatory structures in community children. Wahlund *et al* [33] demonstrated better reliability levels for MP than for algometry, but only assessed individuals with TMD. In a previous study, Chaves *et al* [7] detected better reliability levels for algometry than for MP among community children reporting orofacial pain or no pain related to TMD. Thus, these results suggest that the data obtained by algometry may be considered more reliable than manual palpation in children outside the clinical environment, despite the importance of using both techniques.

The assessment and monitoring of community individuals may play an important role in the prevention and early identification of new cases of a disorder. Dworkin *et al* [4] had already demonstrated that the techniques of evaluation of pain perception by pressure (specifically palpation) may be useful for the detection of differences between clinical cases, community cases and healthy individuals. These results suggest that community children with mixed pain symptoms, and therefore with changes in pain perception, may be more susceptible to the future development of TMD or to the need for specific care.

A limitation of the present study was the reduced number of children in the group reporting muscle pain (GMM), which may have contributed to the increased variability of these findings. This greater variability in the data of the group with muscle pain may have shifted the significance to the other group that reported muscle pain (group with mixed pain).

CONCLUSIONS

Pain intensity determined by MP demonstrates differences between the groups reporting pain in the masticatory structures and the group with no report of orofacial pain. However, PPT values were reduced for most of the sites assessed in the group reporting mixed pain compared to the remaining groups and also for the extracephalic region. In this way, MP had a greater sensitivity for the differentiation of symptomatic subjects from symptom-free subjects, and PPT values were more sensitive for the discrimination of pain at the orofacial sites assessed. These results demonstrate the presence of changes in pain perception among community children reporting different types of orofacial pain. In addition, the changes in perception at a larger number of sites among children reporting mixed pain may suggest the existence of a possible mechanism of central sensitization in this group of children.

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