

Temporomandibular Disorders in Children and Adolescents: Reliability of a Questionnaire, Clinical Examination, and Diagnosis

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Recently developed Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD) have been shown to be reliable for diagnosing and assessing TMD in U.S. and Swedish adult populations; however, few studies have focused on clinical examination methods and diagnostic criteria for use with children and adolescents. The present study used a sample of 50 Swedish children and adolescents, aged 12 to 18 years, to evaluate usefulness and reliability of existing and specially developed measures and methods for assessing and diagnosing TMD in youth. Subjects underwent repeated clinical exams by two calibrated examiners to assess signs and symptoms per the RDC/TMD, and they responded to a specially developed self-administered questionnaire that addressed location and frequency of TMD-related pain and symptoms, jaw function, effect of pain on daily activities, and use of pain medications. Interexaminer and intraexaminer reliability was assessed for clinical examination, questionnaire items, and diagnosis. Reliability values ranged from acceptable to excellent for the RDC/TMD clinical exam and questionnaire, and from good to excellent reliability for measuring virtually all modified clinical parameters of TMD assessed in these young patients.

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Epidemiologic studies have shown that temporomandibular disorders (TMD) may be common in children and adolescents.¹⁻⁴ However, investigators have found considerable variation in the prevalence of signs and symptoms of TMD.⁵ In several of the studies on youth, the clinical examination methods and questionnaires were similar to those used with adults. However, it is reasonable to suggest that there are at least some important differences between adults and children or adolescents in how TMD manifests itself. Biologically, the structures of a child's masticatory system, eg, temporomandibular joint (TMJ), muscles, and teeth, are undergoing differential patterns of growth and development. Levels of cognitive awareness, comprehension, and ability to cope with different situations vary with age.⁶ Also, children of certain ages may exhibit a desire to please according to what they believe adult expectations to be.⁷ Thus, a child's behavior and reactions in a clinical situation might differ from those of an adult, making interpretation of the clinical examination and interview less reliable, and hence less valid.

Prerequisites for obtaining reliable clinical diagnoses that are comparable across studies include reliable clinical measures, use of standardized examination methods, and criteria for identifying children and adolescents with TMD. Several studies have investigated the reliability of clinical TMD examinations.⁸⁻¹³ Only two studies, however, have been performed in children and adolescents, one analyzing interrater reliability,⁸ the other intrarater reliability.¹⁴ The importance of calibrating TMD clinical examiners has been pointed out as vital to improving reliability of clinical examination findings.¹²

Several studies have recommended that the clinical TMD examination¹⁵⁻¹⁷ and the oral interview/self-administered questionnaire^{5,15,18,19} prepared for adults should be adjusted for children. However, few studies have actually evaluated the reliability of modified questionnaires²⁰ and clinical examinations in a young population.^{8,14}

Recently developed Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD)²¹ use a dual-axis classification system that allows a physical diagnosis to be placed on one axis (Axis I), and coordinated with an assessment of TMD-related parafunctional behaviors, psychologic distress, and psychosocial dysfunction on a second axis (Axis II). The RDC/TMD has been found to be reliable and clinically useful for adult populations in a variety of clinical settings in the United States and Sweden^{22,23}; however, it has not yet been assessed for use with children and adolescents.

The aim of the present study was to evaluate, in a sample of Swedish children and adolescents, the reliability of available and specially developed clinical measures for assessing physical findings, pain, psychosocial function, and TMD diagnosis. This study focused on children and adolescents aged 12 to 18 years, since the limited data available indicate that the prevalence of TMD is more common in this age group than in younger children.²⁴⁻²⁶

Materials and Methods

Subjects

Fifty individuals, 19 boys (mean age 14.7 ± 1.8) and 31 girls (mean age 15.2 ± 1.9), participated in the study. Overall, mean age was 15.0 ± 1.9 years and ranged from 12 to 18 years. Thirty of the subjects were patients from the TMD unit in Linköping, Sweden. The others were recall patients from the Ryd public dental clinic in Linköping. The patients were randomly selected from the two clinics' patient rosters. The majority

(77%) of the TMD patients were female, reflecting the same gender trends as in adult clinical TMD populations.

The investigation was conducted so that the youngsters could answer the questionnaire under minimal duress. A nurse was available to facilitate clarification and to check the questionnaire for completeness and legibility. The study was approved by the local Ethics Committee, and parents of all patients provided informed written consent.

Design

All 50 subjects were examined by two operators in randomized sequence to assess interexaminer reliability. One week after the initial examination, all patients were seen again by one operator to measure intraexaminer reliability. Operator 1 (TL) had previously been calibrated in examination methods and use of RDC/TMD at the Department of Oral Medicine, University of Washington, Seattle. Operator 2 underwent a 40-hour calibration and training in examination methods and measures, provided by Operator 1, prior to the start of the study.

A self-report questionnaire (see below) was completed by all subjects prior to the initial clinical examination and was repeated prior to the second clinical examination 1 week later.

Clinical Examination. The RDC/TMD involves the clinical assessment of the following signs and symptoms:

Pain Site. To determine whether the present pain was ipsilateral to pain provoked by clinical examination of the masticatory muscles and during jaw function.

Mandibular Range of Motion (mm) and Associated Pain. Jaw-opening patterns. Corrected and uncorrected deviations in jaw excursions during vertical jaw opening.

Vertical range of motion of the mandible. Extent of unassisted opening without pain, maximum unassisted opening, and maximum assisted opening.

Mandibular excursive movements. Extent of lateral and protrusive jaw excursions.

Temporomandibular Joint Sounds. Palpation of the TMJ for clicking, grating, and crepitus joint sounds during vertical, lateral, and protrusive jaw excursions.

Muscle and Joint Palpation for Tenderness. Bilateral palpation of extraoral and intraoral masticatory and related muscles ($n = 20$ sites), and bilateral palpation of the TMJ ($n = 4$ joint sites). Muscle and joint palpations were performed according to the general instructions for

RDC/TMD with one modification—patients were asked to use the following scale after each palpation: 0 = pressure but no pain, 1 = slight pain, 2 = severe pain.

Pressure Pain Threshold. Thresholds for pressure pain applied to the masticatory muscles by a calibrated pressure algometer are not part of the standard RDC/TMD clinical assessment. They were included as part of the clinical examination for all subjects. Reliability of this method for assessing pain in masticatory muscles in children and adolescents is also reported.

The pain pressure algometer (Somadec Sale AB, Horby, Sweden) consists of an acrylic handle attached to a pressure-sensitive strain gauge situated at the tip, which is connected to a power supply. Pressure was applied to masticatory muscles with a constant rate of $50 \text{ Kpa} \times \text{sec}^{-1}$ on a 0.5 cm^2 contact area. Subjects relayed a signal via a push-button as soon as the pressure sensation became painful. The mean of two successive measurements at the following three anatomic locations was used to determine the individual pressure pain threshold (PPT): the anterior temporal muscle, the TMJ, and the masseter insertion. The instrument has been found to be reliable in previous studies.^{27,28}

Self-Administered Questionnaire. A self-administered questionnaire suitable for Swedish children and adolescents was developed to assess self-reported pain and associated symptoms of TMD. The questionnaire was pretested and then revised using a separate sample of 24 school-children, aged 12 years, who remained naive as to its ultimate purpose. The purpose of this pretesting was to determine minimal vocabulary level and clarity of questions and format for use with children and adolescents aged 12 to 18 years. In their classroom setting and with the help of the classroom teacher, these children were asked to comment on the clarity of the questions and the organization of the questionnaire. Adjustments to content and format were made in accordance with ongoing feedback and eventual consensus among the children, their teacher, and the examiner. All children were able to respond easily to the questions in the format used in the present study.

The final questionnaire used in the present study was administered twice, once by each examiner; it consisted of 17 questions and 3 pain scales organized to assess frequency and location of TMD-related pain, jaw function, parafunctional habits, and jaw disability, together with a medications-use measure, as follows:

1. Nine questions inquired into the frequency of symptoms, eg, headache; pain in the temporal regions; pain in the face, the jaws, or the jaw joints; pain when opening wide or chewing; discomfort when opening wide or chewing; clicking or popping when opening or closing the mouth or when chewing; grating or grinding noises when opening or closing during chewing; tiredness or stiffness in the face or jaws; restricted mouth opening (was able to open wider before). The frequencies were reported on a 5-point scale: never, 1 to 2 times a month, once a week, several times a week, or daily.
2. Six dichotomous (yes/no) questions inquired into jaw function, parafunction, and aspects of treatment: Have you ever had your jaw lock or catch so that it will not open all the way? Have you been told or have you noticed that you grind your teeth or clench your jaws? Have you had a recent injury to your face or jaw? Do you have migraine? Have you had or are you receiving orthodontic treatment? Would you like to have treatment for your headache or facial pain?
3. Two questions required patients to report duration and interference associated with TMD-related pain: How long have you had pain in the face, TMJ, or jaws (number of months)? How many days in the last month have you been home from school as a result of pain in the face, TMJ, or jaws (number of days)?
4. A measure of pain intensity using a visual analogue scale (VAS) anchored with the terms *no pain* and *worst pain imaginable* was used to record the patient's pain intensity.²⁹
5. Behavioral rating scale (BRS). The 6-point BRS was used to measure the effect of the pain on patients' daily activities: 0 = no pain; 1 = pain, I am only aware of it if I pay attention to it; 2 = pain, but I can ignore it at times; 3 = pain, I can't ignore it but I can do my usual activities; 4 = pain, it's difficult to concentrate, I can only do easy activities; 5 = pain, such that I can't do anything. The development of this scale followed methods and rationale reported by Blanchard and Andrasik.³⁰
6. Pain medication. A 6-point scale previously developed by Carlsson et al³¹ was used to measure the frequency of pain medication use: daily; 3 to 4 times a week; 1 to 2 times a week; once in a while; every month; and never or almost never.

Classification. The RDC/TMD groups together the most common forms of TMD into three Axis I diagnostic categories and allows multiple diagnoses to be made for a given patient. The RDC/TMD Axis I diagnostic categories used in the present study are essentially as initially developed,²¹ with two relatively minor exceptions:

Group I: Muscle Disorders

- a. Myofascial pain
- b. No Group I diagnosis

Group II: Disc Displacements

- a. Disc displacement with reduction
- b. Disc displacement without reduction, with limited opening
- c. Disc displacement without reduction, without limited opening
- d. No Group II diagnosis

Group III: Arthralgia, Arthritis, Arthrosis

- a. Arthralgia
- b. Osteoarthritis of the TMJ
- c. Osteoarthrosis of the TMJ
- d. No Group III diagnosis

Since many studies have shown that the clinical range of mandibular motion of 12- to 18-year-olds is not significantly less than that for adults,^{15,16,25,32} the recommended cutoff points in the range of motion in the RDC/TMD have not been changed for the RDC/TMD diagnosis of disc displacements with reduction. Also, no differentiation was made between myofascial pain with or without limited opening, which the RDC/TMD keeps separate. In the present study of children and adolescents, either RDC/TMD Group I diagnosis was recorded as myofascial pain.

Reliability Analyses. The two most commonly accepted methods for assessing interexaminer and intraexaminer reliability were used in this study.¹² When the questionnaire or clinical examination variable could be measured on a continuous scale, such as for the assessment of vertical range of motion or PPT, reliability was assessed by computing the intraclass correlation coefficient (ICC). ICC is a variance ratio statistic that quantifies the proportion of variance in measurements that could be attributed to differences between examiners contrasted to differences among subjects. When applied to assessing the reliability of clinical examiners, ICC = 1 indicates that the variance in measurements is the result of differences among subjects and that examiners agree perfectly in the measurements each one obtained; that is, the exam-

Table 1 Reliability (Kappa) for Self-Reported Frequency of Pain and Symptoms for the Response Category "Once a Week or More"

Questions	Kappa
Do you have a headache?	0.78
Do you have pain in the temple regions?	0.84
Do you have pain in the facial area, the jaws, or the jaw joint?	0.92
Do you have pain when you open your mouth wide (eg, yawn) or when chewing?	0.81
Do you have discomfort when you open wide or chew?	0.81
Does your jaw click or pop when you open or close your mouth when chewing?	0.91
Does your jaw make a grating or grinding noise when it opens or closes when chewing?	0.89
Does your jaw or face ache or feel stiff?	0.87
Do you have a restricted opening of your mouth?	0.87

iners show perfect reliability, and can therefore be considered completely interchangeable. When ICC = 0, the variance observed is due solely to differences in measurements between examiners, that is, there is no reliability between examiners when they both gather clinical measurements on the same patient. As a rule of thumb, ICCs above 0.90 are considered excellent, 0.80 to 0.89 are very good, 0.70 to 0.79 are acceptable, and below 0.70 are not acceptable. To assess whether the different examiners exerted an influence on responses to the questionnaire, the intrarater and interrater reliability for self-report measures are also reported.

The Kappa statistic (Cohen's Kappa, κ) was computed to assess reliability when variables such as palpation of muscles or joints for pain were measured with a categorical rating scale (eg, yes/no). Kappa adjusts for the likelihood of agreement by chance, especially when the likelihood of occurrence is high, such as frequently happens when many masticatory muscles can be expected to be pain-free. Kappa values above 0.8 are considered excellent, from 0.6 to 0.8 good, 0.4 to 0.6 marginally acceptable, and below 0.4 not acceptable.

Results

Self-Report Questionnaire

High levels of reliability were found for all the variables assessed for the reported symptoms, with Kappa values in the range of 0.78 to 0.92 (Table 1). Of the patients participating, 84% who

Table 2 Reliability of Clinical Examination Self-Report Measures (Kappa)

	Reliability	
	Inter-examiner	Intra-examiner
Pain site (right vs left)	0.82	0.83
Pain area (muscle, TMJ, both)	0.72	0.67
Pain on jaw movement	0.83	0.70

Table 3 Reliability (ICC) for Measurements of Range of Motion

	Reliability	
	Inter-examiner	Intra-examiner
Vertical dimension (mm)		
Unassisted opening without pain	0.94	0.90
Maximum unassisted opening	0.98	0.97
Maximum assisted opening	0.98	0.96
Jaw excursions		
Lateral excursions (mm)	0.67	0.74
Protruded movement (mm)	0.30	0.85
Jaw-opening pattern (Kappa)	0.56	0.76

perceived a subjective need for treatment reported pain once a week or more. The reliability of self-reported frequency of pain and symptoms associated with jaw function is shown in Table 1 for the response category "once a week or more."

The reliability of self-reported pain intensity (VAS) and behavior rating (BRS) exhibited highly acceptable levels of reliability, with ICC values ranging from 0.86 to 0.93 for pain in the face and temples. Only moderate reliability was found for self-reported analgesic consumption for face and temple pain ($\kappa = 0.49$ and 0.60 , respectively), although percent agreement for the repeated administration of this item is consistently around 95%; the apparent discrepancy of only moderate reliability as assessed by Kappa and high percent agreement is owing to the fact that many children did not take any pain medication at all and more than two thirds reported using analgesics less than once a month in the time period of this inquiry.

By contrast, items such as reported days of school absence due to pain yielded $\kappa = 1.00$ and 100% agreement for the response categories "0 days" absent versus "one or more days" absent. The perceived need for treatment (yes/no) was

reported with high reliability and high percent agreement of 92%, with Kappas ranging from 0.81 to 0.92. Similarly, good to excellent reliability was shown for the following questions: Have you ever had your jaw lock or catch so that it won't open all the way? ($\kappa = 1.0$); Have you noticed that you grind your teeth or clench your jaw? ($\kappa = 0.83$); Have you had a recent injury to your face or jaw? ($\kappa = 0.65$); Do you have migraines? ($\kappa = 0.91$); Would you like to have treatment for your pain in the face, jaws, or jaw joint? ($\kappa = 0.92$).

Clinical Examination

The clinical TMD examination was performed according to RDC/TMD guidelines. One of the examiners was blinded to the clinical status of the patients, although this did not seem to modify reliability findings reported below.

Self-Report Measures

Interexaminer and intraexaminer reliability was assessed for ability to assess pain laterality (right versus left), pain areas (muscle, TMJ, or both), and self-reported pain on mandibular movement. These categorical variables were assessed using Kappa statistics, and the results, which are summarized in Table 2, indicate acceptable to excellent interexaminer and intraexaminer reliability for all of these items.

Range of Motion

The interexaminer and intraexaminer reliability for measurements of range of motion, which for the most part are continuous variables (measured in millimeters), was assessed with ICC, and these results are summarized in Table 3. All measures of vertical range of motion were associated with high reliability levels, while lateral and protrusive excursions tended to be associated with poor to moderate reliability, findings similar to those reported by Dworkin et al¹² with adult TMD patients. Patterns of jaw movement on vertical opening (eg, corrected and uncorrected deviations in vertical jaw opening pattern), a categorical variable, were associated with moderate interexaminer reliability and good intraexaminer reliability.

TMJ Sounds and Symptoms

The reliability for detecting TMJ joint sounds, reciprocal clicking, and pain on palpation of TMJ

ranged from acceptable to excellent, as shown in Table 4, using Kappa for these categorical variables. A statistically significant Spearman's correlation of 0.69 was found between clinical recordings by the examiners and patient reports for the presence of joint sounds ($P < .05$).

Masticatory Muscle Palpation Pain

Table 5 summarizes the Kappa statistics associated with interrater and intrarater reliability for measuring whether individual masticatory muscles were painful to standardized digital palpation. As Table 5 indicates, several of the muscle palpation sites were associated with moderate reliability of measurement for pain, while some also exhibited poor reliability (eg, the posterior mandibular region and the submandibular region). The reliability of summary scores for detecting the presence of pain in response to palpation of all 16 extraoral sites is also shown in Table 5, for both interexaminer and intraexaminer reliability assessment (ICC = 0.86 and 0.84, respectively). A similar estimate of reliability for the summary findings across all four intraoral muscle sites palpated for pain is also shown in Table 5 (ICC = 0.52 and 0.56, respectively). As can be seen, when continuous summary scores are used to determine the presence of muscle pain in extraoral and intraoral muscles, very good reliability is found for extraoral muscles, but only acceptable levels for intraoral muscle palpation.

Pressure Pain Threshold

When selected masticatory muscles sites were tested for pressure pain threshold using a continuous measure of force necessary to elicit pain in standardized sites,^{28,33} reliability was equivalent, for all practical purposes, to reliability for masticatory muscle pain when elicited by digital palpation using a standardized method. Acceptable intraexaminer and interexaminer reliability was exhibited at the temporalis (ICC = 0.68 and 0.52, respectively), masseter (ICC = 0.73 and 0.66, respectively), and the lateral pole of TMJ (ICC = 0.73 and 0.66, respectively). Summary palpation scores showed somewhat higher intraexaminer and interexaminer reliability (ICC = 0.78 for both aspects of examiner reliability).

RDC/TMD Diagnosis

When signs and symptoms measured during the clinical examination were combined according to RDC/TMD algorithms for diagnosing TMD, using

Table 4 Reliability (Kappa) for Detection of Sounds and Pain on Palpation of the TMJ

	Reliability	
	Inter-examiner	Intra-examiner
Joint sounds	0.79	0.88
Reciprocal click	0.75	0.90
Palpation of the lateral TMJ	0.80	0.63
Palpation of the posterior TMJ	0.70	0.70

Table 5 Reliability (Kappa) for Measurements of Palpation of Myofascial Pain

	Reliability	
	Inter-examiner	Intra-examiner
Extraoral palpation sites (Kappa)		
Temporalis posterior	0.45	0.65
Temporalis middle	0.58	0.42
Temporalis anterior	0.56	0.51
Masseter origin	0.47	0.44
Masseter body	0.69	0.43
Masseter insertion	0.58	0.57
Posterior mandibular region	0.24	0.22
Submandibular region	0.29	0.77
Intraoral sites (ICC)		
Lateral pterygoid area	0.40	0.52
Tendon of temporalis	0.45	0.29
Summary measures (ICC)		
Extraoral myofascial sites (n = 16)	0.86	0.84
Intraoral myofascial sites (n = 4)	0.52	0.56
TMJ (n = 4)	0.84	0.78

Table 6 Reliability (Kappa) of RDC/TMD Diagnosis

Diagnosis	Reliability	
	Inter-examiner	Intra-examiner
Group I: Muscle disorders	0.83	0.76
Group II: Disc displacements	0.85	0.90
Group III: Arthralgia, arthritis, arthrosis	0.78	0.86

the clinical measurements from each examiner, good to excellent reliability was found for each of the RDC/TMD categories, as used in this study. Table 6 summarizes the Kappa values for Group I, myofascial pain; Group II, disc displacements; and Group III, arthralgia, arthritis, arthrosis.

Discussion

A history questionnaire and clinical examination to assess and diagnose TMD in children and adolescents ages 12 to 18, based on the dual-axis approach of the RDC/TMD, was developed. Results demonstrated that the diagnosis and assessment instrument as used in the present study with youth was associated with good interrater and intrarater reliability of both the Axis I (the biomedical or physical diagnosis axis, using RDC/TMD guidelines) and Axis II (the biobehavioral and psychosocial assessment axis, using a modified self-report measure suitable for adolescents) components of the clinical examination and assessment.

Epidemiologic investigations of children and adolescents have shown that signs and symptoms are usual, but reported frequency of occurrence varies from 6 to 68%.⁵ The variation among the studies reflects the lack of agreement in the definition of a diagnosis of TMD for youth, and a review of 40 relevant epidemiologic studies demonstrates the prevalences for eight TMD signs and symptoms⁴; using an unspecified criterion of "clinical relevance," reported frequencies of symptoms showed less variation among these studies (eg, pain in the face or jaws, mean = 3%; headache, mean = 9%). However, large variations in frequency of occurrence were still found for clinical TMD variables.⁴

Recommendations for development of standardized clinical measures have been suggested to improve reliability and, potentially, validity of the clinical examination.³ The RDC/TMD allows standardization and replication of the most common forms of muscle- and joint-related TMD.²¹ While the RDC/TMD criteria are based on a dual-axis system, several of the questions in Axis II were determined in pilot studies to be difficult to understand or inappropriate for children. Accordingly, the formal RDC/TMD Axis II was not included in the study but was replaced with a questionnaire containing questions covering several domains of interest incorporated into the RDC/TMD Axis II.

In our study of the reliability of a self-report questionnaire and clinical examination thought to be suitable for evaluating TMD signs and symptoms in persons aged 12 to 18 years, we found acceptable reliability for the questions concerning pain and TMD-related symptoms. The higher reliability values compared with other studies are most probably the result of a more specific definition of the time frame: "once a week or more."²⁰

Acceptable reliability was found for TMJ sounds, ie, clicking, popping, and grating, and for report of migraine. A significant correlation was also found between clinical recordings and subjective reports of TMJ sounds. This finding contradicts those of other studies, in which a poor correlation between the subject's report of TMJ sounds and the clinical examination was found³⁴ in this age group. An acceptable reproducibility for joint sounds was also found in another study involving TMD patients.³⁵ Meltzer and Hochstim³⁶ found that patients had a tendency to report symptoms of chronic illness more consistently when they had a diagnostic label from a physician. In the present study, 60% of these young patients had been treated previously or were currently undergoing treatment.

We also observed that the frequency of pain could be measured with acceptable reliability independent of the location—head, temples, or TMJ and face. Nielsen and Terp²⁰ found that self-report of headache occurring more than once a week exhibited higher reliability than a report of TMJ pain and pain in the temples. The higher reproducibility of headache was, according to the authors, related to the short time interval the subjects had to look back, compared with the two other pain sites, where no time limit was given. Several studies have shown that the memory for pain may be poor or at least highly variable,³⁷ which indicates that inquiry into a shorter time period for recall could improve reliability of the pain report. In our study, which used exactly the same question format as Andrasik et al³⁷ but applied it to orofacial pain, reliability levels were almost identical.

Several verbal and nonverbal pain scales for use with children have been developed and extensively evaluated.³⁸ Children over the age of 7 years have been found to be able to understand use of the VAS, and children over 9 years to be able to use and complete the BRS.³⁸ As an indicator of validity, the BRS was found to have a high degree of agreement when comparing parents' and children's pain ratings.³⁹ A good agreement in children has been found comparing pain ratings using VAS and behavioral and verbal measurements.⁴⁰ Our study showed that both scales exhibited acceptable reliability. This is in accordance with other studies that evaluated VAS or BRS in a young population.^{39,41}

The frequency of medicine consumption can vary considerably, from 1% to 10% in two different population-based studies of children and adolescents.^{20,42} In our study, 36% of the participants had used analgesics in the past month,

which may reflect a difference between TMD clinic samples and population-based studies. Only moderate reliability was found for this measure, which is somewhat lower than reports in other studies.²⁰ The difference might be caused by differences in methodology. In our study, a 6-point scale was used where others have used a dichotomized scale.

An important factor when assessing chronic pain behavior in adults relates to pain-related interference with ability to carry on activities of daily living, including attending to responsibilities at work, home, school, and socially. In our study, acceptable reliability was found for the variable measuring absence from school due to TMD. In epidemiologic studies, school absence has been reported at 0.4%.⁴² In our study with a sample of TMD and non-TMD patients, the reported absence rate of 4% due to TMD was clearly higher than the population norm.

High reliability for measurement of the range of motion in children and adolescents was found, which is in accordance with findings in other studies.^{8,9,12,14} Only a moderate reproducibility was found for jaw opening patterns, compared with other studies where good agreement was found.¹² The poor interreliability of protrusive excursions was due to a systematic difference in the measurement error between the operators for this variable. Eliminating this error would probably make the reliability acceptable, as has been shown in other studies.¹²

Detecting joint sounds was found to be associated with a higher reliability than results in other studies not using RDC/TMD criteria. One probable reason for this could be that in the RDC/TMD classification, the patient has to exhibit a reproducible click on two of three trials, which eliminates indistinct or temporary clicking sounds.¹²

Assessing pain location, pain on movement, and palpation of the TMJ was associated with high reliability levels. Similar agreement for pain on movement was reported by Carlsson et al.⁸ However, lower reliability for pain on function of the jaw has also been found.¹² A probable explanation is the difference in the examination, where in one study, pain on opening was observed, while pain on chewing and protruded movement was registered in the other study.

An acceptable reproducibility was found for palpation of the TMJ in our study and by others¹¹; however, poor to moderate values have also been reported.^{8,10,12} The reproducibility of muscle palpation was found to be consistently low. Intraoral sites had a lower agreement than most of the

extraoral sites, which is in accordance with another study.¹² The posterior mandibular and submandibular regions exhibited unacceptably low values and should be excluded in the standard examination in children and adolescents. The summary score of muscle palpation sites improved the reliability and exhibited results similar to those found in other studies.^{11,12,14}

An acceptable agreement between manual palpation and PPT has been reported.^{28,43} In the present study, a good interreliability and intrareliability of the PPT was found at three different locations (m. temporalis, TMJ, and m. masseter). This is in agreement with several other studies where the temporal and/or masseter muscle has been measured.^{27,28,44-47} In one study, a higher interexaminer reliability was reported for the PPT as compared with manual palpation in determining tenderness at extraoral sites.⁴⁶ Several factors can influence the PPT, eg, pressure rate and number of recordings.^{33,48} To improve the reliability, we recorded the mean of two consecutive measurements at a constant pressure rate ($\pm .25$ Kpa/second).

Summary

Standardized diagnostic methods and valid diagnostic criteria are absolutely critical in defining and identifying subtypes of TMD. The validity of a diagnosis rests on the reliability of measuring clinical findings. Clinical examinations in medicine and dentistry are typically associated with poor reliability unless standardization and calibration procedures are used to insure reproducibility of clinical findings among different clinical examiners. In the present study with children and adolescents, good to excellent reliability was found for measuring virtually all essential clinical parameters of TMD. Interestingly, the interexaminer and intraexaminer reliability found for the self-administered questions with the time frame "once a week or more" yielded generally higher reliability than the clinical examination methods. Finally, our reliable examination methods allowed reliable (ie, reproducible) classification of the children and adolescents into subdiagnoses according to the RDC/TMD.

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Resumen

Desórdenes temporomandibulares en niños y adolescentes. Fiabilidad de un cuestionario, examen clínico y diagnóstico.

Las Normas de Diagnóstico Investigativo para los Desórdenes Temporomandibulares (NDI/DTM) desarrolladas recientemente han demostrado ser fiables para el diagnóstico y evaluación de los DTM en la población adulta de los Estados Unidos y Suecia; sin embargo, pocos estudios se han enfocado en métodos de examen clínico y normas de diagnóstico para uso en niños y adolescentes. El estudio presente utilizó una muestra de 50 niños y adolescentes suecos, entre los 12 y 18 años de edad, para evaluar la utilidad y fiabilidad de medidas y métodos presentes, desarrollados especialmente para evaluar y diagnosticar los DTM en los jóvenes. Los participantes fueron examinados clínicamente en varias ocasiones por dos personas calibradas para evaluar los signos y síntomas por medio de las NDI/DTM. Los participantes también respondieron un cuestionario auto-administrado que fue desarrollado especialmente, el cual se refería a la localización y frecuencia del dolor relacionado con la articulación temporomandibular (ATM), los síntomas, la función mandibular, el efecto del dolor en las actividades diarias y el uso de medicinas para el dolor. Se evaluó la fiabilidad entre y dentro de los examinadores en el examen clínico, lo mismo que los detalles del cuestionario y el diagnóstico. Los valores de fiabilidad variaron entre aceptables y excelentes en el caso de las NDI/DTM del examen clínico y el cuestionario. Además la fiabilidad varió de buena a excelente para medir virtualmente todos los parámetros clínicos modificados de la ATM evaluada en estos pacientes jóvenes.

Zusammenfassung

Temporomandibuläre Erkrankungen bei Kindern und Jugendlichen: Zuverlässigkeit eines Fragebogens, der klinischen Untersuchung und der Diagnose

Kürzlich entwickelte diagnostische Kriterien für temporomandibuläre Erkrankungen (RDC/TMD) wurden als zuverlässig für die Diagnose und die Beurteilung von TMD bei erwachsenen U.S. und schwedischen Populationen gezeigt; dagegen waren nur wenige Studien auf die klinischen Untersuchungsmethoden und die diagnostischen Kriterien für die Anwendung mit Kindern und Jugendlichen gerichtet. Die aktuelle Studie verwendete eine Auswahl von 50 schwedischen Kindern und Jugendlichen im Alter von 12 bis 18 Jahren, um die Nützlichkeit und Zuverlässigkeit von bestehenden und speziell entwickelten Messungen und Methoden zur Beurteilung und Diagnose von TMD in der Jugend herauszufinden. Die Personen unterliefen wiederholte klinische Untersuchungen durch zwei kalibrierte Untersucher, um Zeichen und Symptome für die RDC/TMD zu beurteilen, und sie beantworteten einen speziell entwickelten selbstverwalteten Fragebogen, welcher zu Lokalisation und Häufigkeit von TMD-verbundenem Schmerz und Symptomen, zur Kieferfunktion, zur Auswirkung des Schmerzes auf die täglichen Aktivitäten, sowie zur Anwendung von Schmerzmitteln gerichtet ist. Die Verlässlichkeit zwischen sowie innerhalb der Untersucher wurde für die klinische Untersuchung, die Punkte des Fragebogens und die Diagnosen beurteilt. Die Verlässlichkeitswerte reichten von akzeptabel bis ausgezeichnet für die klinische RDC/TMD-Untersuchung und den Fragebogen, und von gut bis ausgezeichnet für die Messungen praktisch aller modifizierter klinischer TMD-Parameter, welche bei diesen jungen Patienten beurteilt wurden.

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