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ORIGINAL ARTICLE

Reliability Assessment of the Examination of the Sounds in the Temporomandibular Joints in a Polish Patient Population

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ABSTRACT

Temporomandibular joints (TMJs) sounds are a common phenomenon in individuals with and without temporomandibular disorders (TMD). According to the Research Diagnostic Criteria of Temporomandibular Disorders (RDC/TMD), there are the following two distinguished types of sound: click and crepitation. The implementation of diagnostic criteria in studies should be accompanied by a reliability assessment of these criteria. **Objective**: This study aimed to assess the intra- and inter-observer reliability of joint sounds examination, using the officially translated and culturally adapted Polish version of the RDC/TMD. **Methods:** Ninety-eight (n = 98) consecutive adult patients were examined during two clinical sessions by two independent examiners, based on the RDC/TMD examination. **Results:** The intra-observer reliability of clicking and crepitation examination was generally excellent, with fair-to-good intraclass correlation coefficient in case of crepitation during lateral movement in the same direction as the crepitation. The inter-observer reliability of clicking and crepitation was excellent; however, it was fair-to-good for clicking and crepitation during lateral movement in the same direction as the click. **Conclusion:** The intra-observer and inter-observer reliability of the officially translated and culturally adapted Polish version of the RDC/TMD is similar to that of examinations conducted worldwide. Therefore, the use of this examination protocol is justified in Poland.

Key words: temporomandibular disorders, temporomandibular joint, reliability, sounds, RDC/TMD

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INTRODUCTION

Temporomandibular Disorders (TMDs) concern the masticatory muscles, temporomandibular joints, and the surrounding tissue.[1-3] The most common symptom of TMD is pain (only toothache is more commonly reported by patients as a type of pain in the face region).[4] Other symptoms of TMD include limited opening, deviating mandible movements, and sounds in the temporomandibular joint (TMJ), such as clicking and/or crepitation during mandibular motion. These three main symptoms (pain, reduced mobility, and acoustic symptoms) are called the "classic triad" of TMD.

The diagnosis of this disorder type is usually based on an interview and clinical examination, performed as per the diagnostic criteria of the Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD) and the updated version of the Diagnostic Criteria for TMD (DC TMD), the global standard for the diagnosis of this disorder type.[5-7]

According to these criteria, there are two distinguished types of sounds. The first is the so-called "pop" or "click", meaning a brief sound, with a clear start and end. The second type, the "crepitation", is a continuous

sound (therefore, completely different from a popping sound), noticeable longer during the mandibular movement. It can be described as the sound of bone rubbing against bone or stone against stone.[5,6] The implementation of diagnostic criteria in studies should be accompanied by a reliability assessment of the criteria.

OBJECTIVE

This study aimed to assess the intra- and inter-observer reliability of the examination of joint sounds, using the officially translated and culturally adapted Polish version of the RDC/TMD.

METHODS

Study Material

Total 123 adult patients, including 24 men and 99 women who were referred for consultation of TMD to the University Dental Clinic (UDC) in Krakow, Poland, were invited to participate in the project. Patients who provided written consent for project participation, had a clinical confirmed diagnosis as per the officially translated and culturally adapted Polish version of RDC/TMD, and were aged ≥ 18 years were enrolled in the study.

The study was performed as per the recommendations of the Helsinki Convention, and the research was approved by the Institutional Review Board of the Jagiellonian University (No. KBET/90/B/2010).

Examination

As part of the project, each patient underwent two diagnostic visits with a 10-day time interval. During the first session, the patients were examined by one examiner (i.e. study coordinator). During the second session, two examiners (the study coordinator and a second specialist) independently examined the patient. The study coordinator was trained by a calibrated RDC/TMD examiner within the framework of a 3-year specialty program in TMD and Orofacial Pain at the Department of Oral Kinesiology, Academic Centre for Dentistry Amsterdam (ACTA). Before the study, the second examiner was trained by the study coordinator regarding the execution of the RDC/TMD examination. Five TMD patients were selected for the training sessions; none was included in the final study sample. During both the sessions, the TMD clinical examination included completing the RDC/TMD questionnaire and conducting standard examination tests according to the RDC/TMD guidelines.[5-8] Participants were instructed not to provide the examiners with any information during the second session. Patients were not treated in the time period between the two sessions.

The clinical examination of sounds in the temporomandibular joint was performed as per a specific standard and commands addressed to the patient. The patient informed the examining doctor about the presence or absence of sounds in the joint. If the sounds were present, the person conducting the examination would record the type of sound. The examiner had to determine whether the patient could hear the sound(s), the type of sound(s) and on which side of the head the sounds were present. He asked the following questions: "Have you noticed the sounds in the right or left joint, or in both temporomandibular joints?" If the patient answered "yes", the next question was asked, "What sounds do your joints make and on which side do you hear these sounds?" During the examination, the doctor placed his/her left index finger on the right TMJ and his/her right index finger on the left TMJ and used a minimum pressure of < 1 lb. The tip of the index finger was directed anterior from the earlobe. The patient slowly opened his/her mouth as wide as possible, even if it was painful. Each time the patient closed his/her mouth, he/she was required to bring the teeth completely together in maximum intercuspation. The examining doctor gave the following command: "While I have my fingers over your joint, I would like you to slowly open as wide as you can, even if it is painful, and then slowly close until your back teeth are completely together". The patient opened and closed his/her mouth three times. Based on that, the examiner determined whether the sounds were present. He then assessed each joint separately. The patient repeated the opening and closing motions three times, while the examiner assessed the sounds first in one joint and then in the other.

Statistical analyses

The incidence of sound in the joints was calculated based on the data collected during the first and second patient examination. In order to facilitate result interpretation, the sounds were combined into primary variables. The presence of click and/or crepitation or the absence of any sound was thus detected. The fine and coarse crepitations were dichotomized into crepitation.

The degree of compliance was calculated using the intraclass correlation coefficient (ICC). ICC was used to analyze dichotomized measurements according to John's recommendations.[9,10] The results were interpreted in accordance with Fleiss's recommendations: ICC < 0.4 = poor reliability, 0.4 ≤ ICC ≤ 0.75 = fair-to-good reliability, and ICC > 0.75 = excellent reliability. In addition, the compliance of the assessments was calculated.

RESULTS

Fifteen patients did not meet the inclusion criteria. Seven of these patients experienced endodontic pain,

Table 1. Joint sounds clicking: frequency, intra-rater ICCs, and examiner agreement

Variables	Frequency of the first observation	Frequency of the second observation	ICC	Agreement between examiner pairs (%)
Clicking during opening	36	37	0.89	95
Clicking during closing	37	38	0.93	96
Clicking during laterotrusion (contralateral side)	26	24	0.84	91
Clicking during laterotrusion (ipsilateral side)	5	4	0.88	93
Clicking during protrusion	27	29	0.80	99
Eliminated click*	30	31	0.93	96

*reciprocal click eliminated on protrusion opening; n = 98

Table 2. Joint sounds clicking: frequency, inter-rater ICCs, and examiner agreement

Variables	Frequency of the second measurement of the first observer	Frequency of the second observer	ICC	Agreement between examiner pairs (%)
Clicking during opening	37	34	0.84	95
Clicking during closing	38	31	0.80	91
Clicking during laterotrusion (contralateral side)	24	21	0.91	97
Clicking during laterotrusion (ipsilateral side)	4	6	0.58	96
Clicking during protrusion	29	26	0.87	95
Eliminated click*	31	28	0.82	94

Table 3. Joint sounds crepitation: frequency, intra-rater ICCs, and examiner agreement

Variables	Frequency of the first observation	Frequency of the second observation	ICC	Agreement between examiner pairs (%)
Crepitation during opening	26	24	0.89	95
Crepitation during closing	22	19	0.78	92
Crepitation during laterotrusion (contralateral side)	8	9	0.93	99
Crepitation during laterotrusion (ipsilateral side)	2	4	0.66	98
Crepitation during protrusion	13	11	0.90	97

Table 4. Joint sounds crepitation: frequency, inter-rater ICCs, and examiner agreement

Variable	Frequency of the second measurement of the first observer	Frequency of the second observer	ICC	Agreement between examiner pairs (%)
Crepitation during opening	24	24	0.94	98
Crepitation during closing	19	21	0.93	98
Crepitation during laterotrusion (contralateral side)	9	9	0.75	95
Crepitation during laterotrusion (ipsilateral side)	4	4	0.74	98
Crepitation during protrusion	11	9	0.89	98

and eight did not report any pain, but were referred to the UDC due to limited mandibular movement or bruxism. Ten patients did not return for the second examination. Thus, 98 patients were included in the study. Their mean age was 32.0 (± 13.5) years, and the ratio of women to men was 83:15.

Table 1 presents the intra- observer reliability results of the examination of clicking conducted by a single observer. For all the variants of clicking presence during the movement of the mandible, the reliability was excellent.

Table 2 shows the inter-observer reliability results of the examination. For most of the clicking variants during mandibular movements, the reliability was excellent. Only in case of clicking during lateral movement in the same direction as the click, the ICC was determined to be fair-to-good.

Table 3 presents the intra-observer reliability results of the examination conducted by a single observer for crepitation. For most of the crepitation variants during mandibular movements, the reliability was excellent. In case of crepitation during lateral movement in the same direction as the crepitation, the ICC was determined to be fair-to-good.

Moreover, Table 4 shows the reliability results of the examination for crepitation conducted by two observers. As in the case of clicks, in most variants of crepitation during mandibular movements, the reliability was determined to be excellent. In case of crepitation during lateral movement in the same direction as the crepitation, the ICC was determined to have fair-to-good reliability.

DISCUSSION

Joint sounds are a common phenomenon in people with and without TMD.[11,12] There are several types of sounds produced in the joint. The two most common types of sounds in 40% of adults are those due to joint hypermobility and disk displacement without locking; those due to disc displacement are the most common.[13, 14] Joint disorders can be diagnosed during clinical examination, with magnetic resonance imaging (MRI)[15], or with the help of a device that records mandibular motions. MRI is considered the gold standard in the diagnosis of these disorders. Nevertheless, this method is expensive and difficult to access. In addition, due to the anatomical structure of the joint, the spatial arrangement of its components causes problems in interpretation.[16] Therefore, a clinical examination is the most commonly used diagnostic method in everyday clinical practice and for large- scale studies.[17]

The intra-observer reliability in this study for clicking and crepitation in all the mandibular movements, that is, during opening, closing, lateral movement in the opposite direction, lateral movement in the direction of sound, and protrusion, can be assessed as excellent and is consistent with a previous report.[18] The inter-observer reliability of the examination for clicking and crepitation can be assessed as excellent for all movements except one. Lateral movement toward the sound is characterized to have fair-to-good reliability. In other studies, the inter-observer reliability of the examinations for the majority of clicks in the mandibular movements can be described as excellent. Only clicking during lateral movement in the direction opposite to sound achieves lower reliability in examinations than reported in this study.[19] In addition, in other studies, the frequency of lateral click in the direction of the sound was too low to determine reliability. However, in our study, it was possible to determine the ICC at an acceptable level.

The lower ICC level, determining the result of the inter-observer reliability of examination, compared to the reliability assessment for one observer, may result from difficulties in measuring it. The incidence of clicking during the second examination was observed by the first observer in 4 patients, while the second examiner observed them in 6 patients. In this project, the incidence of clicking was higher than in others, probably because of a false-positive diagnosis because of the overlapping sound from the opposite side in the event of clicking in both the joints. The rare incidence of clicks during lateral movement toward the site of click origin is attributable to the anatomical structure of the joint. The shorter the condyle movement, less likely the clicking. There are certain limitations of this study that might have affected the outcomes of this investigation.

The 10-day interval between the two assessments may have introduced evaluation bias due to the natural course of symptoms. However, there are no evidence-based recommendations on the topic, and such compromise time span between the clinical evaluation sessions was chosen to reduce memories of the first assessment and, consequently, to limit blinding bias. Moreover, the adoption of the updated RDC/TMD and a bigger sample size are recommended to further increase the strength of similar data for cross-cultural comparison.

CONCLUSION

It can be concluded that the intra-observer and inter-observer reliability of the officially translated and culturally adapted Polish version of the RDC/TMD for clinical examination of sounds in the TMJs is similar to that of examinations conducted worldwide; therefore, the use of this examination is justified in Poland.

CONFLICT OF INTERESTS

The study protocol was approved by the local ethical committee. The authors declare they received no funding for this investigation. The authors declare they have no conflict of interests.

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