

## Reliability assessment of mandibular range of motion of the Research Diagnostic Criteria of Temporomandibular Disorders – Polish Version

### Ocena rzetelności zakresu ruchów żuchwy polskiej wersji kwestionariusza osobowego Badawczych Kryteriów Diagnostycznych Zaburzeń Czynnościowych Układu Ruchowego Narządu Żucia

Magdalena A. Osiewicz<sup>1</sup>, Jolanta E. Loster<sup>2</sup>, Aneta Wieczorek<sup>2</sup>,  
Bartłomiej W. Loster<sup>3</sup>

<sup>1</sup> Zakład Stomatologii Zintegrowanej, Instytut Stomatologii, Wydział Lekarski, Uniwersytet Jagielloński Collegium Medicum, Kraków, Polska  
Department of Integrated Dentistry, Dental Institute, Faculty of Medicine, Jagiellonian University, Medical College, Cracow, Poland  
Head: dr hab. J. Pytko-Polończyk

<sup>2</sup> Katedra Protetyki Stomatologicznej, Instytut Stomatologii, Wydział Lekarski, Uniwersytet Jagielloński Collegium Medicum, Kraków, Polska  
Chair of Prosthodontics, Dental Institute, Faculty of Medicine, Jagiellonian University, Medical College, Cracow, Poland  
Head: dr hab. G. Wiśniewska

<sup>3</sup> Katedra Ortodoncji, Instytut Stomatologii, Wydział Lekarski, Uniwersytet Jagielloński Collegium Medicum, Kraków, Polska  
Chair of Orthodontics, Dental Institute, Faculty of Medicine, Jagiellonian University, Medical College, Cracow, Poland  
Head: prof. B.W. Loster

#### Abstract

**Introduction.** An important step in the implementation of the diagnostic criteria for scientific study is conducting reliability assessment of mandibular range of motion of the officially translated and culturally adapted Polish version of the RDC/TMD. **Materials and Methods.** A total of 123 adult patients who were referred for TMD consultation to the Dental Institute of Jagiellonian University in Cracow were invited to participate in the study. The patients were examined during two sessions with an interval of ten days by two examiners independently. The examination of the range of mandibular movements includes: vertical movements (i.e., unassisted opening without pain, maximum unassisted opening, maximum assisted opening), maximum horizontal movements to the left, to the right, and to the front. **Results.** For most measures, ICCs were larger than 0.75, which indicates excellent reliability. **Conclusion.** Reliability of mandibular range of motion of the Polish version of RDC/TMD is comparable with other world studies.

#### Streszczenie

**Wstęp.** Ważnym krokiem we wdrożeniu kryteriów diagnostycznych dla badań naukowych jest przeprowadzenie oceny wiarygodności zakresu ruchu żuchwy w przetłumaczonej i dostosowanej do polskich realiów wersji RDC/TMD. **Materiał i metody.** Łącznie 123 dorosłych pacjentów skierowanych na konsultację zaburzeń stawu skroniowo-żuchwowego do Instytutu Stomatologii, UJ w Krakowie zaproszono do uczestnictwa w badaniu. Pacjentów poddano badaniu w dwóch sesjach z odstępem dziesięciodniowym, które przeprowadziło dwóch niezależnych badaczy. **Badaniem objęto:** ruchy pionowe (niewspomagane odwodzenie bez bólu, maksymalne niewspomagane odwodzenie, maksymalne wspomagane odwodzenie), maksymalne ruchy poziome w lewo, w prawo i do przodu. **Wyniki.** Dla większości pomiarów, ICC były wyższe niż 0,75, co wskazuje na bardzo wysoką wiarygodność. **Wniosek.** Wiarygodność zakresu ruchu żuchwy wg. Polskiej wersji RDC/TMD jest porównywalna z innymi badaniami na świecie.

#### KEYWORDS:

mandibular range of motion, TMD, reliability, ICC

#### HASŁA INDEKSOWE:

zakres ruchu żuchwy, dysfunkcja stawu skroniowo-żuchwowego, wiarygodność, ICC



## Introduction

Temporomandibular disorder (TMD) is a collective term that embraces a number of clinical problems that involve the masticatory muscles, the temporomandibular joint (TMJ), and the associated structures.<sup>1</sup> There are three essential features that are often called the “classic triad” of symptoms of TMD.<sup>1,2</sup> Patients suffering from TMD most commonly reported pain in the temporomandibular region or in the masticatory muscles, and the pain is typically associated with chewing and other jaw functions. TMJ sounds are the second common symptoms of TMD. The third most frequently reported symptom is limitation in the mandibular range of motion, which is an important guideline in making a correct diagnosis according to the Research Diagnostic Criteria of Temporomandibular Disorders (RDC/TMD).<sup>3</sup>

The RDC/TMD is the most commonly used diagnostic system in scientific studies on TMD.<sup>4</sup> The official Polish translation of RDC/TMD criteria was published in 2008.<sup>5,6</sup> Translations were formally made using the so-called translating procedures and back-translating. They have been culturally adapted and accepted by an international scientific consortium involved in defining standards for diagnosis and treatment in the field of TMD (International Consortium for RDC/TMD-based Research).<sup>7</sup> According to the RDC/TMD, the mandibular range of motion includes: unassisted opening without pain, maximum unassisted opening, maximum assisted opening, laterotrusion to the right and to the left, and protrusion. Reduced values of mandibular movements testify to prove the existence of an ongoing pathology in terms of TMJ or masticatory muscles, and are part of guidelines for the diagnosis RDC/TMD criteria.

Multiple studies have demonstrated an acceptable inter-observer reliability of mandibular range of motion.<sup>4,8-12</sup> An important step in the implementation of the diagnostic criteria for scientific study is conducting reliability assessment of mandibular range of motion of the officially translated and culturally adapted Polish version of the RDC/TMD.

## Materials and methods

### Participants

A total of 123 adult patients, 24 men and 99 women, who were referred for TMD consultation to the Dental Institute of Jagiellonian University in Cracow, Poland, between May 2011 and January 2012, were invited to participate in the study conducted by the study coordinator. They were all examined to see if they would meet the following criteria: 1) willingness to participate in the study, after giving a written consent, 2) one or multiple clinically confirmed subtypes of TMD, 3) no systemic disease possibly influencing TMD (eg., fibromyalgia, hypothyroidism, lupus erythematosus, scleroderma, Parkinson's disease, lyme disease, dystonia), 4) no other orofacial disorders (eg., neuropathic pain, tension-type headache, autonomic cephalalgias, migraines, psychogenic pain, myositis, infections, injuries), 5) 18 years of age and older, 6) good understanding of the Polish language.

Fifteen patients did not fulfill the inclusion criteria of the study. Seven of these patients suffered from endodontic pain, while eight of them did not report any pain complaints in the orofacial region but were referred to the Dental Institute because of limited mandibular movement or bruxism. Ten patients failed to return for the second examination. Thus, a total of 98 patients participated in the study.

The study was conducted according to the principles of the Helsinki Declaration and approved by the Bioethics Committee of the Jagiellonian University No. KBRT/90/B/2010.

### Study design

The patients were examined during two sessions with an interval of ten days. During the first session, the patients were examined by one examiner (i.e., the study coordinator), and during the second session by two examiners independently (i.e., the study coordinator and a second specialist).

During both sessions, the TMD examination included the completion of the RDC/TMD questionnaire and the performance of the standard examination tests according to the RDC/TMD guidelines.<sup>3,5</sup> The participants were instructed not



**Table 1.** Mandibular Range of Motion variables: Descriptive Statistics and INTRA ICCs Single Measures

Variable	n	Range of motion (mm)			
		Mean	SD	Min-Max	ICC
Unassisted opening without pain	98	42.3	10.4	15-62	0.95
Maximum unassisted opening	98	45.6	7.9	24-62	0.96
Maximum assisted opening	98	49.8	6.8	30-64	0.96
Laterotrusion	196	10.5	2.3	3-16	0.79
Protrusion	98	5.3	1.9	0-10	0.85

**Table 2.** Mandibular Range of Motion variables: Descriptive Statistics and INTER ICCs Single Measures

Variable	n	Range of motion (mm)			
		Mean	SD	Min-Max	ICC
Unassisted opening without pain	98	39.7	10.3	15-60	0.70
Maximum unassisted opening	98	45.0	15.9	26-62	0.92
Maximum assisted opening	98	48.6	7.1	30-64	0.97
Laterotrusion	196	10.4	2.3	4-16	0.81
Protrusion	98	5.1	1.8	1-10	0.88

to provide the examiners with any information regarding their backgrounds or complaints during the second session. Between the two sessions, the patients did not receive any treatment.

The examination of the range of mandibular movements includes: vertical movements (i.e., unassisted opening without pain, maximum unassisted opening, maximum assisted opening), maximum horizontal movements to the left, to the right, and to the front. RDC/TMD examination was performed according to the general instructions for RDC/TMD.

Based on clinical measurements obtained from the clinical survey, the RDC/TMD diagnostic system is divided into three groups: (I) muscle disorders, (II) disc displacements, and (III) arthralgia, osteoarthritis and osteoarthrosis.

**Group I:** Muscle disorders – There are two subgroups of muscle disorders: IA Myofascial

pain: pain of muscle origin, including a complaint of pain as well as pain associated with localized areas of tenderness to palpation in the muscle; and IB Myofascial pain with limited opening: which is the same as IA except that it also requires limited movement and stiffness of the muscle during stretching in the presence of myofascial pain.

**Group II:** Disc displacements – There are three subgroups in this category: IIA Disc displacement with reduction: the disc is displaced from its position between the condyle and the fossa to an anterior and medial or lateral position, but reduces during full opening; IIB Disc displacement without reduction with limited mouth opening: a condition in which the disc is displaced from its normal position between the condyle and the fossa to an anterior and medial or lateral position, associated with limited mandibular opening; and IIC Disc displacement without reduction, without limited



opening: a condition in which the disc is displaced from its normal position between the condyle and the fossa to an anterior and medial or lateral position, not associated with limited opening.

**Group III:** Arthralgia, osteoarthritis, osteoarthrosis – Also in this group, three subgroups can be distinguished: IIIA Arthralgia: pain and tenderness in the joint capsule and/or the synovial lining of the TMJ; IIIB Osteoarthritis: pain and tenderness in the joint capsule and/or the synovial lining of the TMJ, coarse crepitus in the TMJ and/or tomograms showing pathology in the TMJ; and IIIC Osteoarthrosis: coarse crepitus in the TMJ and/or tomograms showing pathology in the TMJ.

Unassisted opening without pain of less than 40 mm is part of the myofascial pain with limited opening. Maximum unassisted opening  $\leq 35$  mm is part of the diagnosis for disc displacement without reduction, with limited opening  $> 35$  mm is part of the diagnosis for disc displacement without reduction, without limited opening. Maximum assisted opening of 5 mm or more, greater than pain-free unassisted opening, is included in the diagnosis of myofascial pain with limited opening or disc displacement without reduction, without limited opening. However, if passive stretch increases opening by 4 mm or less over maximum unassisted opening it is part of the diagnosis for disc displacement without reduction, with limited opening. Contra-lateral excursion  $< 7$  mm is part of the diagnosis for disc displacement without reduction, with limited opening  $\geq 7$  mm disc displacement without reduction, without limited opening.<sup>3</sup>

### Statistical analysis

Intra-examiner and inter-examiner reliability of unassisted opening without pain, maximum unassisted opening, maximum assisted opening, horizontal movements to the left, to the right, and to the front were assessed by calculating intraclass correlation coefficients (ICCs) with absolute agreement. ICCs were used for continuous variables, following the recommendations of *John MT*.<sup>10</sup> ICC values were interpreted according to *Fleiss JL*:<sup>13</sup> ICC  $< 0.4$  = poor reliability,  $0.4 \leq$  ICC  $\geq 0.75$  = fair to good reliability and

ICC  $\geq 0.75$  = excellent reliability. For all continuous measures mean, standard deviation, and range were calculated.

### Results

The mandibular range of motion variables are presented in Table 1. For most of these measures, ICCs were larger than 0.75, which indicates excellent reliability. Only for unassisted opening without pain, the inter-rater reliability ICC value could be considered as fair to good.

### Discussion

Much discussion has been spent on inter-observer reliability of the RDC/TMD. A whole inter-observer reliability of mandibular range of motion was reported to be excellent giving a similar result as in the following study.<sup>8-12</sup> Lower reliability has been reported for unassisted opening without pain, the inter-rater reliability ICC value could be considered as fair to good. The probable difference in inter-rater reliability pertaining to unassisted opening without pain is caused by muscle mobilization resulting from a clinical examination by two observers on the same day. Additionally, this difference may result from difficulties in measuring this value by observers, since patients who feel pain are probably not able to abduct the mandible in a repeatable manner. As the value of the measurement of unassisted opening without pain is a part of RDC/TMD diagnosis, myofascial pain with limited opening being the diagnostic subtype may result in a lower index of occurrence. As far as the authors are concerned, this is the first study that investigated the intra-rater reliability of mandibular range of motion. Different variables for mandibular range of motion, namely unassisted opening without pain, maximum unassisted opening, maximum assisted opening, maximum horizontal movements to the left, to the right, as well as frontal intra-rater reliability were found to show excellent results.

### Conclusion

Reliability of mandibular range of motion of the Polish version of RDC/TMD is comparable with other studies in the world.



## References

1. De Leeuw R, editor: Orofacial Pain. Guidelines for Assessment, Diagnosis and Management. Chicago: Quintessence Publishing Co. Inc; 2008.
2. Derogatis LR, Lipman RS, Covi L: SCL-90: an outpatient psychiatric rating scale--preliminary report. Psychopharmacol Bull 1973; 9: 13-28.
3. Dworkin SF, LeResche L: Research diagnostic criteria for temporomandibular disorders: review, criteria, examinations and specifications, critique. J Craniomandib Disord 1992; 6: 301-355.
4. Look JO, John MT, Tai F, Huggins KH, Lenton PA, Truelove EL, et al.: The Research Diagnostic Criteria For Temporomandibular Disorders. II: reliability of Axis I diagnoses and selected clinical measures. J Orofac Pain 2010; 24: 25-34.
5. Osiewicz MA, Lobbezoo F, Loster BW, Wilkosz M, Naeije M, Ohrbach R: Badawcze Kryteria Diagnostyczne Zaburzeń Czynnościowych Układu Ruchowego Narządu Żucia BKD/ZCURNŻ – polska wersja dwuosowego systemu diagnostycznego ZCURNŻ. Prot Stomatol 2010; 60: 433-444.
6. Osiewicz MA, Lobbezoo F, Loster BW, Wilkosz M, Naeije M, Ohrbach R: Badawcze Kryteria Diagnostyczne Zaburzeń Czynnościowych Układu Ruchowego Narządu Żucia BKD/ZCURNŻ – polska wersja dwuosowego systemu diagnostycznego ZCURNŻ. Formularz BKD/ZCURNŻ. J Stoma 2013; 67: 576-649.
7. International Consortium for RDC/TMD – based Research. Available at: [www.rdc-tmdinternational.org](http://www.rdc-tmdinternational.org).
8. Dworkin SF, LeResche L, DeRouen T, Von Korff M: Assessing clinical signs of temporomandibular disorders: reliability of clinical examiners. J Prosthet Dent 1990; 63: 574-579.
9. Goulet JP, Clark GT, Flack VF, Liu C: The reproducibility of muscle and joint tenderness detection methods and maximum mandibular movement measurement of the temporomandibular system. J Orofac Pain 1998; 12: 17-26.
10. John MT, Zwijnenburg AJ: Interobserver variability in assessment of signs of TMD. Int J Prosthodont 2001; 14: 265-270.
11. John MT, Dworkin SF, Mancl LA: Reliability of clinical temporomandibular disorders diagnoses. Pain 2005; 118: 61-69.
12. Lobbezoo F, Selms MKA van, John MT, Huggins K, Ohrbach R, Visscher CM, Zaag J van der, et al.: Use of the Research Diagnostic Criteria for Temporomandibular Disorders for multinational research: Translation efforts and reliability assessments in The Netherlands. J Orofac Pain 2005; 19: 301-308.
13. Fleiss JL: The Design and Analysis of Clinical Experiments. New York: Wiley, 1986.

Address: 31-155 Kraków, ul. Montelupich 4  
Tel.: +4812 4245465  
e-mail: [magdalena.osiewicz@uj.edu.pl](mailto:magdalena.osiewicz@uj.edu.pl)

Received: 15<sup>th</sup> June 2016

Accepted: 23<sup>rd</sup> October 2016

