COMPARISON OF DIAGNOSTIC CRITERIA FOR TEMPOROMANDIBULAR DISORDERS DC/TMD AND RESEARCH DIAGNOSTIC CRITERIA FOR TEMPOROMANDIBULAR DISORDERS RDC/TMD IN EVALUATION OF TEMPOROMANDIBULAR DISORDERS – A LITERATURE REVIEW

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PORÓWNANIE KLASYFIKACJI DC/TMD ORAZ RDC/TMD W OCENIE ZABURZEŃ CZYNNOŚCIOWYCH UKŁADU RUCHOWEGO NARZĄDU ŻUCIA – PRZEGLĄD PIŚMIENNICTWA

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SUMMARY
Introduction
Temporomandibular disorders (TMD) affect 5% to 12% of population and are the second most common reason for musculoskeletal disorders causing pain and disability. Pain-related TMD has a negative impact on daily activities, psychosocial functioning and quality of life. It is important to find reliable diagnostic methods. None of the available diagnostic methods are perfect, but researchers constantly work on obtaining better and more accessible criteria.

Aim
The purpose of this article is to compare DC/TMD to RDC/TMD classification in order to demonstrate diagnostic classifications as a part of the ongoing process depending on increasing knowledge.

Material and methods
Literature review of PubMed database was conducted. Search was mostly limited to the last ten years and to authors of the described diagnostic criteria, as they represent the new approach to the etiology of

STRESZCZENIE
Wstęp
Zaburzenia czynnościowe układu ruchowego narządu żucia dotyczą 5–12% społeczeństwa i są drugą najczęstszą przyczyną zaburzeń mięśniowo-szkieletowych powodujących ból i niesprawność. Związane z bólem zaburzenia stawów skroniowo-żuchwowych mają negatywny wpływ na codzienne czynności, funkcjonowanie społeczne i jakość życia. Ważne jest znalezienie skutecznych metod diagnostycznych. Żadne z dostępnych metod diagnostycznych nie są idealne, ale grupy naukowców cały czas pracują nad stworzeniem lepszych i bardziej przystępnych kryteriów.

Cel
Celem niniejszego artykułu jest porównanie obu klasyfikacji DC/TMD z RDC/TMD w celu ukazania klasyfikacji diagnostycznych jako części ciągle toczącego się procesu zależnego od postępu nauki.

Materiał i metody
Dokonano przeglądu piśmiennictwa z użyciem bazy PubMed. Poszukiwania zostały zawężone głównie do ostatnich dziesięciu lat oraz do autorów opisywanych kryteriów diagnostycznych, ponieważ reprezentują

TMD – multidimensional biopsychosocial model. Key words used were temporomandibular disorders, DC/TMD, RDC/TMD.

Results
The main differences between both classifications are: greater validity and reliability of DC/TMD, new diagnoses and simplifying of examination procedures.

Conclusions
1. RDC/TMD are considered by authors as the first step in introducing reliable and valid DC/TMD. Diagnostic criteria should be permanently improved following progression of knowledge.

2. DC/TMD are the only evidence-based TMD diagnostic criteria which should be widely used to allow standardization.

oni nowe podejście do etiologii zaburzeń skroniowo-żuchwowych – wielowymiarowy model biopsychospołeczny. Wyszukiwane hasła to zaburzenia stawu skroniowo-żuchwowego, DC/TMD, RDC/TMD.

Wyniki
Główne różnice pomiędzy obiema klasyfikacjami to: większa rzetelność i trafność DC/TMD, nowe diagnozy oraz uproszczenie procedur badawczych.

Wnioski
1. RDC/TMD są uważane przez twórców niniejszych kryteriów za pierwszy krok do wprowadzenia rzetelnych i trafnych DC/TMD. Kryteria diagnostyczne powinny być cały czas ulepszane, podążając za wzrastającą wiedzą.
2. DC/TMD to jedyne oparte na dowodach kryteria diagnostyczne zaburzeń stawów skroniowo-żuchwowych, które powinny być szeroko stosowane w celu umożliwienia standaryzacji.

Introduction
Temporomandibular joint (TMJ) and muscle disorders are considered the most common cause of the facial pain. They affect 5% to 12% of population and are the second most common reason for musculoskeletal disorders causing pain and disability (NIDCR 2016). Pain-related TMD affects the well-being of the patient and it has a negative impact on daily activities, psychosocial functioning and quality of life (Schiffmann *et al.* 2014). Chronic pain is associated with depression and susceptibility to drug abuse (Porter-Moffitt *et al.* 2006). Pain caused by TMD has the same or greater impact on psychosocial functioning as are headache or back pain. According to

Dworkin, TMD should be conceptualized as a chronic pain condition. Prevalence of TMD pain in population is decreasing with age in both genders (Dworkin 1994). The peak of 12% occurs in women in the child-bearing years and drops to 4% or less after the age of 65 years (Von Korff 1988). It is expected that half to two-thirds of patients with TMD will seek treatment (NIDCR 2016). To meet these needs it is important to find reliable diagnostic methods. None of the available diagnostic methods are perfect, but researchers constantly work on obtaining better and more accessible criteria.

Classifications related to temporomandibular disorders evaluated from biomedical

model emphasizes pathobiologic condition of TMJ to a multidimensional biopsychosocial model. A change in the perception of the causes of TMD entails different methods of treatment – non-invasive and reversible (Ohrbach et Dworkin 2016, Osiewicz *et al.* 2010). The greatest progress in the development of TMD classifications occurred in the past two decades.

A new dual-axis Diagnostic Criteria for Temporomandibular Disorders (DC/TMD) were developed in 2013 as a response to the need to find clear, simple, reliable and valid operational definitions for the history, examination and imaging procedures not only in order to give a proper clinical diagnosis but also in the scientific purposes (Schiffmann *et al.* 2014). Before the introduction of DC/TMD, the most common classification was The Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD) used since its introduction in 1992 by Dworkin (Dworkin *et al.* 1992).

Aim
The purpose of this article is to compare both classifications, DC/TMD and RDC/TMD.

Material and methods
Literature review has been performed with the use of PubMed database. The search has been mostly limited to the last ten years and to authors of the described diagnostic criteria, as they represent the new approach to the etiology of TMD – multidimensional biopsychosocial model. More than four hundred results were found. Among them, sixteen publications were chosen which best suited to the selected issues.

Results
Both classifications – RDC/TMD and DC/TMD consist of two axis. Axis I – includes standard diagnostic criteria for the most common TMDs and is based on clinical and radiographic assessment and axis II which assesses behavioral factors, psychologic status and pain-related disability (Schiffman and Ohrbach 2016).

RDC/TMD, so far regarded as a gold standard in the diagnostics of TMD, since its introduction had been considered by the authors as a step to implement new classification which would be more valid and useful. The need for a change stemmed from the insufficient validity of Axis I despite the fact that diagnostic algorithms of RDC/TMD Axis I were considered reliable. Axis II components were rated as valid and reliable. In turn, DC/TMD is an evidence-based system with greater validity for clinical use (Schiffman *et al.* 2014; Ohrbach et Dworkin 2016). The reliability of a diagnosis is the measure of its consistency when it is performed on the same subject by multiple examiners (inter-rater reliability), or when a single examiner performs the diagnostic protocol repeatedly on the same subject (intra-rater). Validity of an assessment is its accuracy (Look *et al.* 2010).

Axis I of DC/TMD has a valid diagnostic criteria for differentiating between the most common pain-related TMD (sensitivity ≥ 0.86, specificity ≥ 0.98) and one intra-articular disorder – disk displacement without reduction with limited opening (sensitivity of 0.80 and specificity of 0.97) Diagnostic criteria for other intra-articular disorders lack adequate validity for clinical diagnoses and can be used only for screening purposes to establish preliminary diagnoses of disk displacement or degenerative joint disease. (Schiffman *et al.* 2014, Schiffman et Ohrbach 2016).

New Axis II preserves part of the original screening instruments enriched with instruments to assess jaw function, behavioral and psychosocial factors (Table 1, 2). When compared to Axis II in RDC/TMD it was simplified (Schiffman *et al.* 2014). For screening purposes are recommended 5 Axis II questionnaires (Table 1) – they are treated as tools for routine assessment

of psychosocial and behavioral factors that may affect patients' response for treatment (Schiffman et Ohrbach 2016).

Discussion

RDC/TMD consist of two components: Axis I showing clinical and radiographic

Table 1. Recommended Axis II DC/TMD Protocol (Adopted from: Schiffman 2014).

Standard usage		Instrument
Screening	Complete	
x	x	Pain drawing
x	x	Graded chronic pain scale version 2.0
x		Jaw functional limitations scale – 8-item
	x	Jaw functional limitations scale – 20-item
x		Patient Health Questionnaire-4 (PHQ-4)
	x	Patient Health Questionnaire-9 (PHQ-9)
	x	Generalized Anxiety Disorders-7 (GAD-7)
	x	Patient Health Questionnaire-15 (PHQ-15)
x	x	Oral Behaviors Checklist (OBC)

Table 2. Comparison of Axis II assessment of RDC/TMD and DC/TMD (Adopted from: Ohrbach et Dworkin 2016).

Assessment of:	Instrument	
	RDC/TMD	DC/TMD
Pain intensity	Graded Chronic Pain Scale	Graded Chronic Pain Scale 2.0
Pain locations	x	Pain drawing
Pain-related disability	Graded Chronic Pain Scale	Graded Chronic Pain Scale 2.0
Functional limitation of jaw	Checklist	Jaw Functional Limitation Scale
Depression	Modified Symptom Checklist-90 subscales (SCL-90)	PHQ-9
Anxiety	x	GAD-7
Physical symptoms	SCL-90 subscale	PHQ-15
Parafunction	x	Oral Behaviors Checklist

With new classification, also emerged new diagnosis. Some of them was eliminated because of lack of utility – myofascial pain with limited opening. The taxonomy was expanded – headache attributed to TMD (HATMD), subluxation and disk displacement with reduction with intermittent locking were added. Muscle pain previously classified as myofascial pain and myofasial pain with limited opening in DC/TMD is divided into 3 subgroups: myalgia, local myalgia, myofascial pain with referral (Peck *et al.* 2015, Schiffman *et al.* 2014, Svensson *et al.* 2015)

assessment and reflecting physical status, and axis II which evaluates psychological status and pain-related disability. Axis I is a standardized series of diagnostic tests based on clinical signs and symptoms. It involves a physical evaluation which leads to TMD diagnosis. Radiographic imaging is used to differentiate between diagnoses in group II and III (Look *et al.* 2010, Sanders *et al.* 2016). In RDC/TMD Axis I diagnoses there are three diagnostic groups with eight subdiagnoses. Group I muscle disorders with possible subgroups: Ia myofascial pain and Ib myofascial pain with limited opening. Group II disc displacement with subgroups: IIa disc displacement

with reduction, IIb disc displacement without reduction with limited mouth opening, and IIc disc displacement without reduction, without limited opening. Group III arthralgia, osteoarthritis, and osteoarthrosis (OA) with subgroups: IIIa arthralgia with pain and tenderness in the joint capsule and/or the synovial lining of the temporomandibular joint (TMJ), IIIb osteoarthritis with pain and tenderness in the joint capsule and/or the synovial lining of the TMJ and coarse crepitus in the TMJ, and IIIc osteoarthrosis with coarse crepitus in the TMJ and/or tomograms showing pathology in the TMJ (Dworkin 1992).

In the study conducted by Look *et al.* reliability of panoramic radiographs for the diagnostics was poor (k = 0.16) but improved to k = 0.71 with Computed Tomography (CT). Magnetic Resonance Imaging (MRI), showing fair reliability with diagnosing hard tissues (k = 0.47) and an excellent one for soft tissues (disc displacement with reduction: k = 0.78 and disc displacement without reduction k = 0.94). The sensitivity of a diagnostic instrument is the probability that it will show a positive test result when the disorder is present. Its specificity is the probability of a negative result when the disorder is absent. Panoramic radiography had very low sensitivity of 0.26 for OA, but excellent specificity at 0.99. MRI imaging showed sensitivity of 0.59 for OA with specificity of 0.98 (Look 2010).

Axis II of RDC/TMD comprises self-report measures assessing psychosocial factors commonly seen in patients with TMD and includes three components: a graded chronic pain scale, measures of depression, and the number of non-specific physical symptoms (Dworkin *et al.* 1992, 1994, Sanders *et al.* 2016).

Axis I assessment of DC/TMD consist of TMD pain screener, symptom questionnaire, DC/TMD demographics, pain related interview, and examiner commands and clinical examination form. This valid and reliable 6-item questionnaire is used to assess the most frequent pain-related TMD. Axis I questionnaire assesses the report of pain and factors that may affect the pain such as: jaw movement, function and parafunction. The TMD Pain Screener is recommended for routine screening to detect patients who have pain-related TMD and in need of treatment or who are at risk of exacerbating their pre-existing pain during dental procedures. The symptom questionnaire enables to collect information about pain or headache location. For pain-related TMDs it is located in jaw or temple area and is modified with jaw movement, function, parafunction. Clinical examination, by using provocation test, should evoke "familiar pain" or "familiar headache" – familiar to the pain previously described by patient. During examination a patient should be sitting with position of the jaws in one of three static jaw postures: comfort position, maximal intercuspal position, and the third where the jaw is held on the end of the movement range. During palpation of indicated muscles, finger pressure should be calibrated with algometer. Methods of conducting patient examination were described in details in the Clinical Protocol which is a component of DC/TMD (Ohrbach *et al.* 2013, Gonzalez *et al.* 2011, Schiffman et Ohrbach 2016).

To establish a diagnosis, clinicians are provided with Diagnostic Decisions Trees and Diagnostic Criteria Table. The groups to which patients are assigned are: myalgia (local myalgia, myofascial pain including "spreading" pain being its clinical manifestation, myofascial pain with referral), arthralgia, headache attributed to TMD, joint disorders such as disk displacement with reduction, disk displacement with reduction with intermittent locking, disk displacement without reduction with limited opening, disk displacement without reduction without limited opening, degenerative joint disease, subluxation (Ohrbach *et al.* 2013).

In the DC/TMD myofascial pain with limited opening was eliminated because

of lack of clinical utility. Myofascial pain from RDC has been reorganized into two disorders: myalgia (subclass of muscle pain) and myofascial pain with referral (type of myalgia). In DC/TMD initially we could distinguish four muscle pain-related diagnoses: myalgia, local myalgia, myofascial pain with referral, and myofascial pain with spreading. Then, there were applied changes as "myofascial pain" was incorrectly stated as "myofascial pain with spreading". (Schiffman *et al.* 2014, Svensson *et al.* 2015). Other differences with RDC/TMD are the addition of HATMD, subluxation and disk displacement with reduction with intermittent locking. Inclusion of HATMD in the new diagnostic criteria suggest that myalgia and TMJ arthralgia are associated with headache. Finding of myofascial trigger point, where palpation evokes the familiar pain, suggest that headache dose not originate from intracranial structures but is attributed to TMD (Hara 2016). DC/TMD is used to evaluate the location of headache and pain modification with jaw movement and also to determine actions that induce or exacerbate headache during palpation of temporal muscle and extensive jaw movement (Schiffman 2014).

As there was a need to expand the taxonomy of the DC/TMD, special workgroup members debated which temporomandibular conditions should be included in the TMD taxonomy. In the document considered as an extension of the DC/TMD, 56 conditions were considered for possible inclusion. Finally, the list was reduced to 37, as 19 was omitted because of low priority. The expanded taxonomy classifies disorders as TMJ disorders, masticatory muscles disorders, headache disorders and disorders affecting associated structures. Workgroup members discussed extension of dual axis classification to 3-axis classification with axis III concerning biomedical markers which will enhance rendering physical diagnosis beyond the current use of signs and symptoms (Peck *et al.* 2015).

Improved diagnostic methods have led to better understanding of TMD prevalence and other characteristics in populations from different parts of the world (Ohrbach et Dworkin 2016).

In order to recognize patients with TMD, Lövgren *et al.* analyzed validity of three screening questions (3Q/TMD) in relation to the DC/TMD. The questions were as follow:
- Q1: do you have pain in your temple, face, jaw or jaw joint once a week or more?
- Q2: do you have pain once a week or more when you open your mouth or chew?
- Q3: does your jaw lock or become stuck once a week or more?

Based on their answers, patients were qualified as 3Q-positive (at least one positive answer) or 3Q-negative (who gave negative answers to all three questions). 3Q-positive patients were invited for clinical examination which included DC/TMD protocol. The study authors consider that 3Q/TMD is a simple, valid and cost-effective instrument for screening in a general population to determine patients in need of further TMD examination and treatment (Lövgren *et al.* 2016).

DC/TMD is the only evidence-based TMD diagnostic classification subjected to rigorous scientific investigation. Clinicians and researchers will benefit from full clinical implementation of the DC/TMD for consistency of diagnostic methods and clinical terms that allow standardization in reporting the measurements and criteria for diagnostic decision making (Ohrbach et Dworkin 2016). Application of common criteria will facilitate communication in science and medicine.

To sum up, the main differences between both classifications are: greater validity and reliability of DC/TMD, new diagnoses and simplifying of examination procedures.

Conclusions

1. RDC/TMD are considered as a first step in introducing DC/TMD. Diagnostic criteria should be permanently improved following increasing knowledge.
2. DC/TMD are the only evidence-based TMD diagnostic classification which should be widely used to allow standardization.
3. DC/TMD are not only reliable but also valid.

REFERENCES

Dworkin, S. F., LeResche, L. (1992) *'Research diagnostic criteria for temporomandibular disorders: review, criteria, examinations and specifications, critique.'* J Craniomandib Disord, 6, pp. 301–355.

Dworkin, S. F. (1994) *'Perspectives on the interaction of biological, psychological and social factors in tmd.'* J Am Dent Assoc, 125(7), pp. 856–863.

Gonzalez, Y.M., Schiffman, E., Gordon, S.M., Seago, B., Truelove, E.L., Slade, G., Ohrbach, R. (2011) *'Development of a brief and effective temporomandibular disorder pain screening questionnaire: reliability and validity.'* J Am Dent Assoc, 142(10), pp. 1183–91.

Hara, K., Shinozaki, T., Okada-Ogawa, A., Matsukawa, Y., Dezawa, K., Nakaya, Y., Chen, J.Y., Noma, N., Oka, S., Iwata, K., Imamura, Y. (2016) *'Headache attributed to temporomandibular disorders and masticatory myofascial pain.'* J Oral Sci, 58(2), pp. 195–204.

Look, J. O., Schiffman, E. L., Truelove, E. L., Ahmad, M. (2010) *'Reliability and Validity of Axis I of the Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD) with Proposed Revisions.'* J Oral Rehabil, 37(10), pp. 744–759.

Lövgren, A., Visscher, C.M., Häggman-Henrikson, B., Lobbezoo, F., Marklund, S., Wänman, A. (2016) *'Validity of three screening questions (3Q/TMD) in relation to the DC/TMD'* J Oral Rehebil, 43(10), pp. 729–736.

National Institute of Dental and Craniofacial Research. Facial Pain. http://www.nidcr.nih.gov/DataStatistics/FindDataByTopic/FacialPain/(accessed: 2.09.2016)

Ohrbach, R., Dworkin, S. F. (2016) *'The evolution of TMD Diagnosis: Past, Present, Future.'* J Dent Res, 95(10), pp. 1093–1101

Ohrbach, R., Gonzalez, Y., List, T., Michelotti, A., Schiffman, E. 'Diagnostic Criteria for Temporomandibular Disorders (DC/TMD) Clinical Examination Protocol: Version 02 June 2013'
www.rdc-tmdinternational.org

Accessed on 5.09.2016.

Osiewicz, M. A., Lobbezoo, F., Loster, B. W., Wilkosz, M., Naeije, M., Ohrbach, R. (2010) *'Badawcze kryteria diagnostyczne zaburzeń czynnościowych układu ruchowego narządu żucia BKD/ZCURNŻ – polska wersja dwuosiowego systemu diagnostycznego ZCURNŻ.'* Protet. Stoamtol., LX, 6, pp. 433–444.

Peck, C. C., Goulet, J.-P., Lobbezoo, F., Schiffman, E. L., Alstergren, P., Anderson, G. C., List, T. (2014). *'Expanding the Taxonomy of the Diagnostic Criteria for Temporomandibular Disorders (DC/TMD).'* Journal of Oral Rehabilitation, 41(1), pp. 2–23.

Porter-Moffitt, S., Gatchel, R. J., Robinson, R. C., Deschner, M., Posamentier, M., Polatin P, Lou L. (2006) *'Biopsychosocial profiles of different pain diagnostic groups.'* J Pain, 7(5), pp. 308–318.

Sanders, C., Liegey-Dougall, A., Haggard, R., Buschang, P., Karbowski, S., Riggs, R., Gatchel, R. J. (2016) *'Temporomandibular Disorder Diagnostic Groups Affect Outcomes Independently of Treatment in Patients at Risk for Developing Chronicity: A 2-Year Follow-Up Study.'* J Oral Facial Pain Headache, 30(3), pp. 187–202.

Schiffman, E., Ohrbach, R., Truelove, E., et al. (2014) *'Diagnostic Criteria for Temporomandibular Disorders (DC/TMD) for Clinical and Research Applications: Recommendations of the International RDC/TMD Consortium Network and Orofacial Pain Special Interest Group.'* J Oral Facial Pain Headache, 28(1), pp. 6–27.

Schiffman, E., Ohrbach, R. (2016) *'Executive summary of the Diagnostic Criteria for Temporomandibular Disorders for clinical and research applications.'* J Am Dent Assoc, 147(6), pp. 438–45.

Svensson, P, Michelotti, A., Lobbezoo, F., List, T. (2015) *'The many faces of persistent orofacial muscle pain.'* J Oral Facial Pain Headache, 29(2), pp. 207–8.

Von Korff, M., Dworkin, S. F., LeResche, L., Kruger, A. (1988) *'An epidemiologic comparison of pain complaints.'* Pain, 32, pp. 173–83.

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