



## **Routine Assessment of Patient Index Data 3 (RAPID3) is a Valid Index for Routine Care in Patients with Osteoarthritis**

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### **Authors' contributions**

*This work was carried out in collaboration between all authors. Author AL designed the study, performed the statistical analysis and wrote the first draft of the manuscript. Author MS wrote the protocol, managed the analyses of the study and managed the literature searches. All authors read and approved the final manuscript.*

**Research Article**

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### **ABSTRACT**

**Objective:** To compare Routine Assessment of Patient Index Data 3 (RAPID3) on a Multidimensional Health Assessment Questionnaire (MDHAQ) with the Western Ontario and Mc-Master Universities Osteoarthritis Index (WOMAC) in patients with knee or hip osteoarthritis and to evaluate its reliability.

**Methods:** 678 patients with hip or knee osteoarthritis were assessed in daily practice clinical care during 2009-2013. Patients completed an MDHAQ and so a RAPID3 was calculated (physical function, pain, patient global estimate). Pain, stiffness, and physical functions using the standard WOMAC indices for hip and knee osteoarthritis were assessed too; correlation between WOMAC total scores and RAPID3 scores were estimated with Spearman's rho. Furthermore a linear regression model was developed with a coefficient of determination  $R^2$ . Finally we evaluated validity and reliability of this index to evaluate that RAPID3 is not inferior to WOMAC.

**Results:** RAPID3 and WOMAC were correlated significantly, with a global correlation Spearman' rho index of 0.84 ( $P < 0.01$ ). Computing analysis for diagnosis the correlation index was 0.83 for hip osteoarthritis ( $p < 0.01$ ) and 0.87 for knee osteoarthritis.

**Conclusion:** RAPID3 scores provide similar quantitative information to WOMAC in patients with hip or knee osteoarthritis.

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## **1. INTRODUCTION**

Osteoarthritis (OA) is the most common form of arthritis in the world and it can affect every joint but primarily knee, hip hand and spine. OA is a chronic condition associated with pain and reduction in physical function.

The disease-specific questionnaire Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) is the most widely used instrument to evaluate symptomatology and function in patients with hip or knee OA. It's self-administered and covers three dimensions: pain (5 items), stiffness (2 items), and physical function (17 items). It's reliable and sensitive to changes in the health status of patients but it's time expensive and it has low feasibility in daily clinical practice given the fact that most of the patients with OA are elderly and with several co-pathologies, adding a complex self-administered questionnaire cause extra burden both time and cognitive with decreasing of quality of the overall response [1-5].

Aim of the current study was to establish if the RAPID 3 (Routine Assessment of Patient Index Data), a self-report questionnaire based on a Multidimensional Health Assessment Questionnaire (MDHAQ) validated primarily in patients with Rheumatoid Arthritis, it's related to WOMAC index scores in patients with hip or knee osteoarthritis [6] and evaluating its validity (the degree to which an instrument measures the characteristic being investigated) and reliability (the extent to which a test measurement or device produces the same results with different investigators, observers, or administration of the test over time

## **2. MATERIALS AND METHODS**

### **2.1 Questionnaires**

#### **2.1.1 MDHAQ and RAPID3**

The multidimensional health assessment questionnaire (MDHAQ) has been developed in patients care with rheumatoid arthritis but has been useful clinically also in patients with other rheumatic diseases. It's available for free download at [www.mdhaq.org](http://www.mdhaq.org) [7-9]. RAPID3 is a patient reported outcome (PRO), related to MDHAQ, that uses the three core set criteria evaluated by the patient, namely, physical function, pain, and the overall disease assessment. Physical function is assessed for 10 activities, of which eight are the simplified activities in the MDHAQ and two are complex activities. Each activity is scored from 0 to 3, and the sum of the scores (range, 0–30) is computed and divided by 10 to obtain a score that can range from 0 to 10.

#### **2.1.2 WOMAC**

The WOMAC index self-questionnaire is a widely used outcome measure for lower extremity OA, and has demonstrated reliability and validity in the context of knee and hip OA. It consists of 24 items divided into 3 subscales: Pain (5 items): during walking, using stairs, in bed, sitting or lying, and standing. Stiffness (2 items): after first waking and later in the day. Physical Function (17 items): stair use, rising from sitting, standing, bending, walking, getting in / out of a car, shopping, putting on / taking off socks, rising from bed, lying in bed, getting

in / out of bath, sitting, getting on / off toilet, heavy household duties, light household duties. In this study we used the 0-100mm Visual Analogue Scale (VAS) version of the WOMAC [10].

## **2.2 Patients**

Were eligible patients referring and regularly treated to our Rheumatology Unit for symptomatic knee or hip osteoarthritis (VAS pain > 50 on a visual scale 0-100mm) according to the ACR (American College of Rheumatology) criteria and with stage 2 or 3 osteoarthritis according to the Kellgren-Lawrence radiographic criteria [11]. Patients with other rheumatologic co-pathologies were excluded, particularly patients with Rheumatoid Arthritis or Spondyloarthropathy. If therapies for OA were being taken, the subject must be on a stable dose for at least 3 months prior the enrollment. Patients were clinically evaluated individually by an experienced rheumatologist and were asked to complete the self-report questionnaires (the original version of the WOMAC for hip or knee osteoarthritis and the RAPID3). There was no specific order in which the tests were completed; rather, each participant selected the order.

## **2.3 Statistical Analysis**

Pairwise Spearman's rho correlation coefficient was determined between the RAPID3 and WOMAC scores in the whole population and in the two subgroups hip and knee OA. The correlation coefficient can range from -1 to +1; a positive value indicates a proportional relationship between the two variables, a value of 1 indicates a perfect correlation, a value of 0 indicates no correlation, and a negative value indicates an inversely proportional relationship between the two variables. We assessed reliability using Cronbach's alpha coefficient (a coefficient over 0.70 was considered acceptable [12]. Eta squared was calculated to estimate the degree of association and to establish the proportion of variance explained by the variables. Finally, a linear regression model has been developed between WOMAC values and other variables collected to confirm that RAPID3 values are predictive of WOMAC values. All statistical analyses were performed with SPSS for Windows statistical software, version 14.

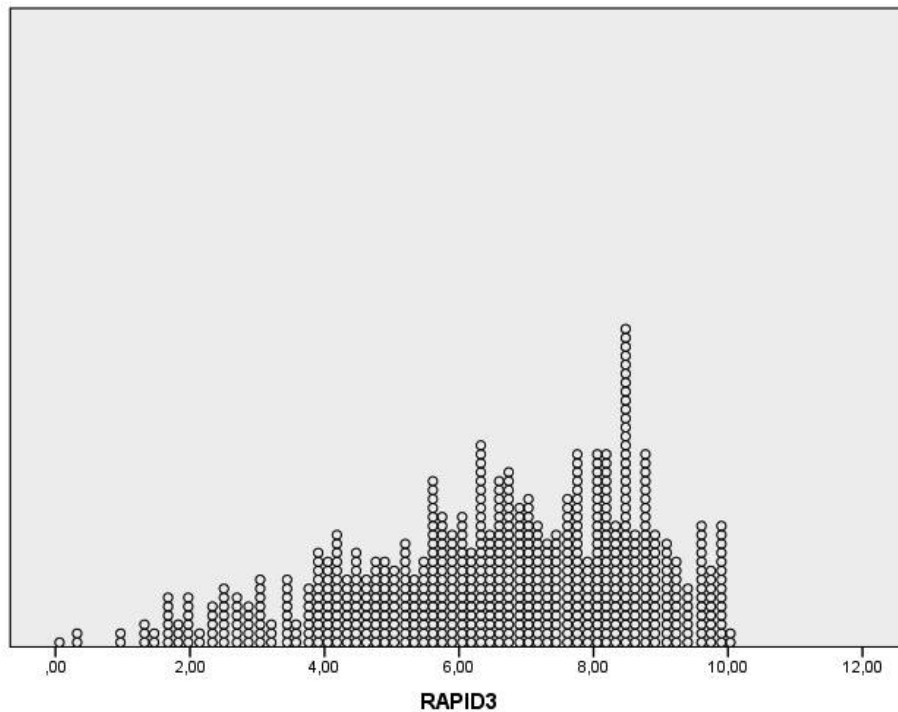
## **3. RESULTS**

We enrolled 678 patients (females 532, males 146; 396 with knee osteoarthritis and 282 with hip osteoarthritis). Mean age 53±7.5 years old. Principal comorbidities (%): kidney diseases 5.1%, stroke 3.2%, diabetes 18.3%, thyroid disease 11.5%. RAPID 3 mean value was 6.4±2 in patients with hip OA and 6.8±1.3 in patients with knee OA (Table1). Kurtosis -0.340 ±0.187, skewness -0.557 ±0.09. The ceiling/floor effect, % of responses that are coded at the maximum/minimum value, ranged <10% (Fig. 1). WOMAC total score was 66.4±23.2 in patients with hip OA and 65.8±32.4 in patients with knee OA. Significant (P< 0.01) correlations were found between the RAPID3 and the WOMAC both in patients with hip and knee OA, Spearman's rho index was 0.83 and 0.87 respectively. Cronbach's alpha coefficient was 0.88 for the WOMAC score and 0.78 for the RAPID3, which was superior to the minimum value of 0.70. Subsequently we used a General Linear Model (GLM) to estimate the proportion of variation of WOMAC explained by RAPID 3 (effect size): calculated eta squared was 0.85 (P=0.001) (Fig. 2). Reliability analysis was assessed by coefficients of IntraClass Correlation (ICC between mean values of WOMAC and RAPID3 0.714 in the whole population, F test with P= 0.001; 0.689 in the hip OA subpopulation, F

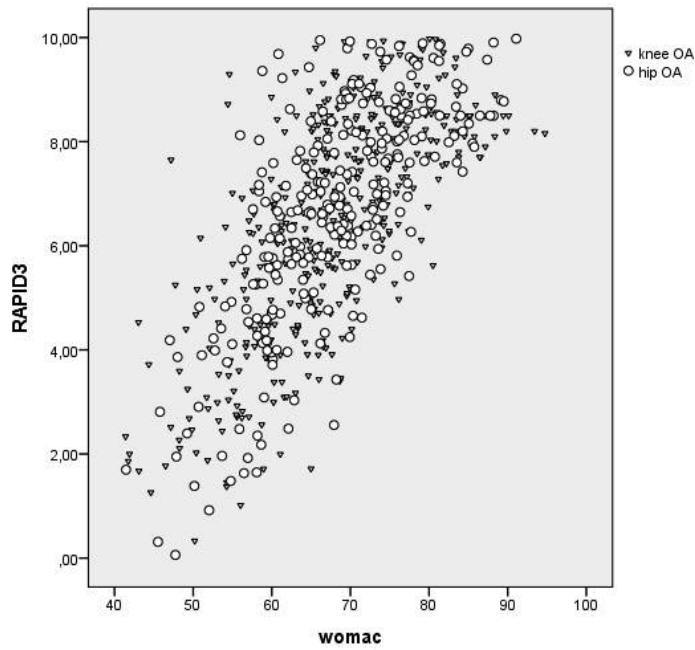
test with  $P = 0.001$ ; 0.733 in the knee OA subpopulation, F test with  $P = 0.001$ ). The same statistics were assessed also between total RAPID3 score and the WOMAC score of each of the three subscales (pain, stiffness and physical functioning) obtaining significant values of effect size and reliability. Finally a linear regression model stepwise showed a correlation index  $R^2$  of 0.75 between WOMAC and RAPID3 values (Fig. 3). No significant difference ( $P=0.1$ ) was found in these statistics between knee and hip OA subpopulations.

**Table 1. WOMAC and RAPID3 mean values±SD in groups with OA or HIP osteoarthritis**

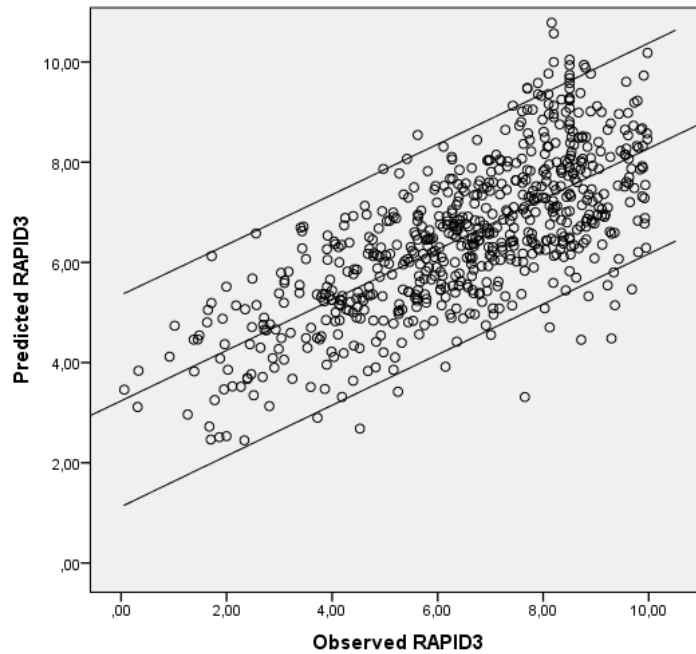
	Hip OA	Knee OA	Total
F/M	215/67	317/79	532/146
Mean age	51±8.2	61.7±0.6	53±7.5
WOMAC mean value ±SD	66.4±23.2	65.8±32.4	68.3±12.2
RAPID3 mean value ±SD	6.4±1.3	6.8±1.3	6.5±1.4



**Fig. 1. Score distribution of RAPID3 in the whole population**



**Fig. 2. Scatter plot between observed RAPID3 and WOMAC values in the Knee and Hip OA subgroups**



**Fig. 3. Regression model to show the relationship between the clinically observed RAPID3 values and the predicted RAPID3 values based on WOMAC values (ordinary least squares method)**

#### **4. DISCUSSION**

Quantitative measurement has advanced treatment of many diseases, including rheumatic disease as Rheumatoid Arthritis and Osteoarthritis, to recognize severe long-term outcomes and to improve outcomes in clinical trials [2,3,7]. However, most measures used in clinical trials and other research, such as formal joint counts or patient questionnaires have not been incorporated into routine care to help guide clinical decisions. A primary explanation for the absence of quantitative clinical measurement in usual rheumatology care involves the difficulty of collecting and scoring complex measures and indices in busy clinical settings. Measures and indices designed for research differ from measures designed for usual care and are time expensive. Although the original version of the WOMAC has been used extensively in research to assess patients' subjective opinions of their functional disability and is estimated to take about 5 to 10 minutes to complete [4], clinical experience suggests that in the case of elderly patients, it often takes longer to complete, and the questions may require further explanation. The multidimensional health assessment questionnaire (MDHAQ) has been developed in usual patient care [6]. Although reported primarily in RA, the MDHAQ has been useful clinically in patients with all rheumatic diseases. Routine completion of an MDHAQ by every patient at every visit in the infrastructure of standard rheumatology care allows quantitative monitoring of clinical status effectively, with minimal work on the part of the physician and the staff. RAPID3 is a simple composite index of physical function pain and patient global status estimate each scored 0-10 for a total of 30. Calculation of RAPID3 is time sparing, requiring 5-10 seconds. In clinical care RAPID3 is compiled from an MDHAQ with 10 activities to score physical function and two 21-circle VAS scores for pain and patient global estimate. In patients with rheumatoid arthritis RAPID3 is significantly related to widely used composite indices DAS28 (disease activity score 28 joints count) and CDAI (Clinical disease activity index) with a kappa agreement index of 0.34 and 0.55 respectively, as stated by Pincus T et al. [6] Up to date there's not literature about the use of RAPID3 in patients with OA. In our study we found a strong correlation between RAPID3 and WOMAC in patients with either hip and knee OA, confirmed by a linear regression model developed using all variables collected. RAPID3 provide informative quantitative data for patient status from one visit to the next comparable to other self-reported questionnaire as WOMAC in a time sparing manner.

# RAPID 3

## ROUTINE ASSESSMENT OF PATIENT INDEX DATA

The RAPID3 includes a subset of core variables found in the Multi-dimensional HAQ (MD-HAQ). Page 1 of the MD-HAQ, shown here, includes an assessment of physical function (section 1), a patient global assessment (PGA) for pain (section 2), and a PGA for global health (section 3). RAPID3 scores are quickly tallied by adding subsets of the MD-HAQ as follows:

1. PLEASE CHECK THE ONE BEST ANSWER FOR YOUR ABILITIES AT THIS TIME:				
OVER THE LAST WEEK, WERE YOU ABLE TO:	WITHOUT ANY DIFFICULTY	WITH SOME DIFFICULTY	WITH MUCH DIFFICULTY	UNABLE TO DO
a. Dress yourself, including tying shoelaces and doing buttons?	___ 0	___ 1	___ 2	___ 3
b. Get in and out of bed?	___ 0	___ 1	___ 2	___ 3
c. Lift a full cup or glass to your mouth?	___ 0	___ 1	___ 2	___ 3
d. Walk outdoors on flat ground?	___ 0	___ 1	___ 2	___ 3
e. Wash and dry your entire body?	___ 0	___ 1	___ 2	___ 3
f. Bend down to pick up clothing from the floor?	___ 0	___ 1	___ 2	___ 3
g. Turn regular faucets on and off?	___ 0	___ 1	___ 2	___ 3
h. Get in and out of a car, bus, train, or airplane?	___ 0	___ 1	___ 2	___ 3
i. Walk two miles or three kilometers, if you wish?	___ 0	___ 1	___ 2	___ 3
j. Participate in recreational activities and sports as you would like, if you wish?	___ 0	___ 1	___ 2	___ 3
k. Get a good night's sleep?	___ 0	___ 1.1	___ 2.2	___ 3.3
l. Deal with feelings of anxiety or being nervous?	___ 0	___ 1.1	___ 2.2	___ 3.3
m. Deal with feelings of depression or feeling blue?	___ 0	___ 1.1	___ 2.2	___ 3.3

1. a-j FN (0-10):

1=0.3 16=5.3  
2=0.7 17=5.7  
3=1.0 18=6.0  
4=1.3 19=6.3  
5=1.7 20=6.7  
6=2.0 21=7.0  
7=2.3 22=7.3  
8=2.7 23=7.7  
9=3.0 24=8.0  
10=3.3 25=8.3  
11=3.7 26=8.7  
12=4.0 27=9.0  
13=4.3 28=9.3  
14=4.7 29=9.7  
15=5.0 30=10

2. PN (0-10):

3. PTGE (0-10):

RAPID3 (0-30)

2. HOW MUCH PAIN HAVE YOU HAD BECAUSE OF YOUR CONDITION OVER THE PAST WEEK? PLEASE INDICATE BELOW HOW SEVERE YOUR PAIN HAS BEEN:																				
NO PAIN									PAIN AS BAD AS IT COULD BE											
●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●			
0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5	9.0	9.5	10

3. CONSIDERING ALL THE WAYS IN WHICH ILLNESS AND HEALTH CONDITIONS MAY AFFECT YOU AT THIS TIME, PLEASE INDICATE BELOW HOW YOU ARE DOING:																				
VERY WELL									VERY POORLY											
●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●			
0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5	9.0	9.5	10

<b>CONVERSION TABLE</b>	
Near Remission (NR): 1=0.3; 2=0.7; 3=1.0	High Severity (HS): 13=4.3; 14=4.7; 15=5.0; 16=5.3; 17=5.7; 18=6.0; 19=6.3; 20=6.7;
Low Severity (LS): 4=1.3; 5=1.7; 6=2.0	21=7.0; 22=7.3; 23=7.7; 24=8.0; 25=8.3; 26=8.7; 27=9.0; 28=9.3; 29=9.7; 30=10.0
Moderate Severity (MS): 7=2.3; 8=2.7; 9=3.0; 10=3.3; 11=3.7; 12=4.0	

### HOW TO CALCULATE RAPID 3 SCORES

- Ask the patient to complete questions 1, 2, and 3 while in the waiting room prior to his/her visit.
- For question 1, add up the scores in questions A-J only (questions K-M have been found to be informative, but are not scored formally). Use the formula in the box on the right to calculate the formal score (0-10). For example, a patient whose answers total 19 would score a 6.3. Enter this score as an evaluation of the patient's functional status (FN).
- For question 2, enter the raw score (0-10) in the box on the right as an evaluation of the patient's pain tolerance (PN).
- For question 3, enter the raw score (0-10) in the box on the right as an evaluation of the patient's global estimate (PTGE).
- Add the total score (0-30) from questions 1, 2, and 3 and enter them as the patient's RAPID 3 cumulative score. Use the final conversion table to simplify the patient's weighted RAPID 3 score. For example, a patient who scores 11 on the cumulative RAPID 3 scale would score a weighted 3.7. A patient who scores between 0-1.0 is defined as near remission (NR); 1.3-2.0 as low severity (LS); 2.3-4.0 as moderate severity (MS); and 4.3-10.0 as high severity (HS).

## **5. CONCLUSION**

In our study we found a strong correlation between RAPID3 and WOMAC in patients with either hip and knee OA. RAPID3 provide informative quantitative data for patient status from one visit to the next comparable to other self-reported questionnaire as WOMAC.

## **CONSENT**

All authors declare that written informed consent was obtained from the patients for collection and analysis of data of this study

## **ETHICAL APPROVAL**

All authors declare that this study have been examined and approved by the local ethics committee ethics and have therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki.

## **COMPETING INTERESTS**

Authors have declared that no competing interests exist.

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