

## **RELIABILITY OF THE ARABIC VERSION OF WESTERN ONTARIO ROTATOR CUFF INDEX FOR PATIENTS WITH ROTATOR CUFF DISEASE**

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### **ABSTRACT**

The Western Ontario Rotator Cuff Index (WORC) is a Questionnaire designed to assess the impact of rotator cuff (RC) disorders on the general quality of life of patients. The purpose of this study was to test the reliability of the Arabic version of the WORC Index in Egyptian patients with rotator cuff disorders. Overall, 210 patients with RC disorders were involved in this study. The recruiting patients finished all two rounds of the Arabic WORC within one week. Cronbach's alpha ( $\alpha$ ) and intra class correlation coefficients (ICC) were used to assess internal consistency and test-retest reliability respectively. The Arabic version of the WORC demonstrated excellent internal consistency, with a Cronbach's alpha ( $\alpha$ ) coefficient of 0.971 for the overall scale. The total scores of the WORC exhibited high test-retest reliability, with an intra class correlation coefficient (ICC) value of 0.893. The Arabic version of the Western Ontario Rotator Cuff (WORC) Index is a reliable measurement tool for assessing health-related quality of life in Arabic-speaking patients with rotator cuff disorders.

**Key Words:** WORC, Reliability, rotator cuff disorders.

### **INTRODUCTION**

The shoulder joint is the most mobile joint in the human body but sacrifices stability as a result. The rotator cuff muscles, glenoid labrum, and glenohumeral (GH) ligaments provide most of the joint's stabilization but are prone to natural degeneration and fatigue with age, sports, or work (**Cassou *et al.*, 2002 and Page, 2011**).

Disorders of the rotator cuff (RC) are widely regarded as the most common cause of shoulder pain (**Chaudhury *et al.*, 2010**). Rotator Cuff Tendons (RCTs) are a substantial source of disability in adulthood, and they are connected with chronic pain, weakness, and upper extremity dysfunction (**Gartsman *et al.*, 1998**).

Rotator cuff disorders have a significant impact on quality of life, including disrupted activities of daily living (ADL), disturbed sleep patterns, and an adverse effect on employment and recreation. According to patient-reported outcomes, rotator cuff dysfunction is related with a deterioration in an individual's health state like that seen in significant medical disorders such as congestive heart failure, acute myocardial

infarction, diabetes mellitus, and clinical depression (**Gartsman *et al.*, 1998**).

The majority of the disorders that physicians treat on a daily basis have no effect on a patient's length or quantity of life. Rather, they have an impact on the patient's quality of life. All illnesses have a significant impact on patients' quality of life but not on their length of life. As a result, when evaluating the relative efficacies of current treatments, it only makes sense to take into account the measurement of health-related quality of life (**Kirkley *et al.*, 2003 a**).

The Rotator Cuff Quality-of-Life Measure (RC-QOL) and the Western Ontario Rotator Cuff Index (WORC) are disease-specific quality-of-life evaluation instruments for patients with rotator cuff disease. We chose to translate and evaluate the WORC because it was designed for patients with rotator cuff disorders and had a well-documented methodology that included item generation and reduction, scaling and weighting, pretesting, reliability, and validation testing (**Kirkley *et al.*, 2003 b**).

The psychometric testing phase is used to validate the newly translated, adapted, and cross-validated instrument's initial full psychometric properties using a sample of the target population of interest. It is strongly advised to use at least ten participants per item of the instrument scale in this phase (**Sousa, and Rojjanasrirat, 2011**).

Reliability focuses on the extent to which test scores demonstrate consistency, dependability, and repeatability, while also aiming to minimize measurement error. Reliability will be assessed by assessing reproducibility (test/retest) and internal consistency (IC). Reproducibility is the extent to which similar findings from the questionnaire are acquired through different administrations. The questionnaire will be administered twice with a week gap between both administrations. Internal consistency demonstrates the degree to which the items in a subscale are correlated in order to assess homogeneity (**Martínez-Cano *et al.*, 2018**).

### **METHODS:**

This study followed the guidelines of (**Sousa and Rojjanasrirat, 2011**) to test the reliability of the translated instrument. The research study aimed to test the reliability of the Arabic version of the Western Ontario Rotator Cuff (WORC) questionnaire. After approval of the ethical committee of the Faculty of Physical Therapy, Cairo University-Egypt (P.T.REC/012/003550). This study was conducted through the period from May 2021 to March 2023, the procedures of the present study were discussed thoroughly, and all the participants were asked to sign a written informed consent.

**Participants:**

210 patients with rotator cuff disorders were randomly selected to be included in the study.

**Inclusion criteria for patients:**

All patients referred with rotator cuff tendinopathy or rotator cuff partial tear by physician, Patients' testing was positive to two or more of the following provocative tests: Neer's test, Hawkins-Kennedy test, painful arc test, and the external rotation test (Infraspinatus testing). Also, Drop Arm Test, Empty Can Test, External Rotation Lag Sign, and Lift-Off Test. These tests assess the integrity and function of the rotator cuff tendons, patients that were able to read and write in Arabic, both gender with age range from 18 - 60 years old.

**Exclusive criteria for patients:**

Frozen shoulders, Arthritis of the shoulder, Shoulder instability. Traumatic or congenital anomalies, Malignancy or radiotherapy of shoulder, Full thickness tear of the rotator cuff, Cervical radiculopathy, and Patients with systemic diseases.

**Instrument:**

**The Western Ontario Rotator Cuff Index (WORC) :**

The Western Ontario Rotator Cuff Index (WORC) was made up of 21 items that reflect five domains pertinent to Health-related quality of life (HRQOL). There were six questions in the domain of physical symptoms, four in the domain of sports and recreation, four in the domain of work, four in the domain of lifestyle, and three in the domain of emotions. Each item was evaluated using a 100-mm visual analogue scale. The scores of 21 elements were summed together to give a total score ranging from 0 to 2100. The best or asymptomatic score was 0, and the worst or most symptomatic number was 2100. The score can be presented as a percentage of normal by subtracting the total from 2100, dividing by 2100, and multiplying by 100 to provide it in a more clinically useful format.

**procedures:**

To evaluate the reliability of the Arabic version of the WORC questionnaire, At the beginning of the study, the patients were provided with information about the purpose and goals of the research. After understanding the study's objectives, the patients were given the opportunity to agree to participate voluntarily.

Once the patients agreed to participate, their gender and age were recorded. This demographic information was collected to better understand the characteristics of the participants in the study. It was documented on the first day of their involvement, then the participants were required to complete the questionnaire at two different time points. Initially, they filled out the questionnaire. The patients were instructed to complete the questionnaire and they were informed that a follow-up assessment would be conducted in a separate setting within one week. To maintain accuracy and

integrity, the patients' responses to the questionnaire were entered into the study's database exactly as they provided them, without any alterations or modifications. This approach ensured that the data collected truly reflected the patients' own input and perspectives.

During the evaluation of the questionnaire, commonly used psychometric approaches were employed. These approaches helped to determine the reliability of the Arabic version of the WORC questionnaire. The most recommended and commonly used psychometric approaches in this step were:

**Internal Consistency Reliability:** The extent to which the items within the questionnaire were consistent, measured the same construct and measured how well the items in the questionnaire correlated with each other.

**Test-Retest Reliability:** The stability and consistency of the questionnaire over time were examined and the participants' responses to the questionnaire were assessed whether they remained consistent when administered on two different occasions.

**Statistical Analysis:**

Cronbach's alpha was used to measure the internal consistency reliability. Test-retest reliability was measured using intraclass correlation coefficient (ICC). The level of significance for all statistical tests was set at  $p < 0.05$ . Statistical analysis was conducted through the statistical package for social studies (SPSS) version 25 for windows (IBM SPSS, Chicago, IL, USA).

## RESULTS:

### Subject characteristics

210 subjects with rotator cuff disorders participated in this study. Their mean  $\pm$  SD age was  $35.43 \pm 11.67$  years. 130 (62%) of subjects were females and 80 (38%) were males. Subjects characteristics are presented in Table 1.

**Table 1. General characteristics of the subjects.**

	Mean $\pm$ SD	Minimum	Maximum
Age (years)	35.43 $\pm$ 11.67	19	60
	N	%	
<b>Sex distribution</b>			
Females	130	62	
Males	80	38	
<b>Diagnosis</b>			
Rotator cuff tendonitis	126	60	
Partial tear	63	30	
Tendonitis with AC joint arthritis	21	10	
<b>Duration of disorders</b>			
3-5 months	55	26	
1 year	50	24	
More than 2 years	105	50	

**Reliability:****- Internal consistency of the Arabic version of WORC:**

Cronbach's alpha for the Arabic version of WORC was 0.971 that means it had excellent internal consistency.

**- Test-retest reliability of the Arabic version of WORC:**

The Arabic version of WORC questionnaire showed high test-retest reliability in all domains; ICC for total score was 0.893, with 95% CI 0.857-0.919). ICC for physical, sports/recreation, work, lifestyle, and emotions domains was 0.893, 0.867, 0.867, 0.848 and 0.868 respectively. (Table 2).

**Table 2. Test-retest reliability of WORC questionnaire:**

	ICC	(95% CI)		P value	SEM
		Lower bound	Upper bound		
Physical symptoms	0.893	0.859	0.918	0.001	7.998
Sports/recreation	0.867	0.824	0.899	0.001	8.976
Work	0.867	0.824	0.899	0.001	9.453
Lifestyle	0.848	0.800	0.884	0.001	10.022
Emotions	0.862	0.808	0.900	0.001	10.273
Total score	0.893	0.857	0.919	0.001	7.614

ICC, Inter class correlation coefficient value; CI, Confidence Interval; P value, Probability value; SEM, standard error of measurement.

**DISCUSSION**

This study was designed to test the reliability of the Arabic-language version of the Western Ontario Rotator Cuff Index (WORC) in patients with rotator cuff disorders.

This study was conducted in different outpatient clinics and involved 210 patients with rotator cuff problems.

The questionnaire in this study shows an excellent level of internal consistency as indicated by the Cronbach alpha values of 0.971. As a result, Internal consistency is of high degree in the WORC Arabic version.

The Cronbach's alpha coefficients of the other translated versions of the WORC ranged from: 0.78–0.95 in Japanese version, 0.872–0.954 in Chinese version, 0.85 to 0.92 in Persian version, 0.88 to 0.97 in Brazilian version, 0.70 to 0.95 in polish version, 0.97 in Swedish version, 0.92 in Turkish version, 0.91-0.95 in Dutch version, 0.94 in Danish version, 0.749 – 0.903 in Greek version, 0.96 in Spanish version and 0.98 in French-Canadian version (Lopes *et al.*, 2006 ; El *et al.*, 2006 ; Lopes *et al.*, 2008 ; Mousavi *et al.*, 2009 ; Witte *et al.*, 2012 ; Kawabata *et al.*, 2013 ; Wiertsema *et al.*, 2013 ; Wessel *et al.*, 2013 ; St-Pierre *et al.*, 2015 ; Zhaentan *et al.*, 2016 ; Wang *et al.*, 2017 ; Bejer *et al.*, 2018 ;

**Martínez-Cano et al., 2018 ; Brix et al., 2020 and Karanasios et al., 2023).**

So, the Cronbach alpha values of the Arabic version of the WORC Arabic questionnaire were found to be quite high similar to the other languages' versions. The results of current study revealed that the Arabic version of WORC had a high level of internal consistency.

The Arabic version of the WORC questionnaire has excellent feasibility because the questionnaire needed an average of  $11.67 \pm 1.20$  min to be answered in about 100% of all sheets. The Arabic version of WORC questionnaire has excellent internal consistency and excellent test-retest reliability as Cronbach's alpha equals 0.971.

The WORC was tested twice, once by the same tester (intra-rater reliability). At baseline and after a week. WORC demonstrated a high level of intra-rater dependability using the Intra-class Correlation Coefficient (ICC), which had a P-value of 0.001 and an ICC of 0.893.

The results of the current study came into agreement with the findings of the Japanese version which reported the ICC value of the total questionnaire score was 0.72–0.84 (**Kawabata et al., 2013**). The Chinese version which reported the ICC value of the total questionnaire score was 0.828–0.961 (**Wang et al., 2017**). The Persian version which reported the ICC value of the total questionnaire score was 0.88 - 0.94 (**Mousavi et al., 2009**). The Brazilian version which reported the ICC value of the total questionnaire score was 0.95 to 0.99 (**Lopes et al., 2006 & 2008**). The Polish version which reported the ICC value of the total questionnaire score was 0.99 (**Bejer et al., 2018**). The Swedish version which reported the ICC value of the total questionnaire score was 0.84 and 0.98 (**Zhaentan et al., 2016**). The Turkish version which reported the ICC value of the total questionnaire score was 0.96 and 0.98 (**El et al., 2006**). The Dutch version which reported the ICC value of the total questionnaire score was 0.85-0.94 (**Witte et al., 2012 ; Wiertsema et al., 2013 and Wessel et al., 2013**). The Spanish version which reported the ICC value of the total questionnaire score was 0.91-0.97 (**Martínez-Cano et al., 2018**). The Danish version which reported the ICC value of the total questionnaire score was 0.80 (**Brix et al., 2020**). The Norwegian version which reported the ICC value of the total questionnaire score was 0.84 (**Ekeberg et al., 2008**). The Greek version which reported the ICC value of the total questionnaire score was 0.942 (**Karanasios et al., 2023**). The French – Canadian which reported the ICC value of the total questionnaire score was 0.96 (**St-Pierre et al., 2015**).

Considering the ICC values, it was possible to say that the Arabic version of the WORC was stable over time.

Ceiling effect is considered to be present if the percentage of patients with the highest score is more than 15% while floor effect is

considered to be present if more than 15% of the patients achieve the lowest possible score as stated by **Lim *et al.*, (2015)**. In our study the response distributions for each domain showed that the response categories had no significant floor and ceiling effects. this suggests that the WORC is an appropriate tool for individuals with the full spectrum of disorders of Rotator cuff disorders.

Our results agree with the those reported by **Mousavi *et al.*, (2009)** ; **St-Pierre *et al.*, (2015)** ; **Wang *et al.*, (2017)** ; **(Bejer *et al.*, (2018)** ; **Brix *et al.*, (2020)** and **Karanasios *et al.*, (2023)**, concluded the absence of the floor and ceiling effects. Although the Swedish version had neither floor nor ceiling effects preoperatively, but all instruments had some ceiling effect postoperatively (**Zhaentan *et al.*, 2016**).

### CONCLUSION

In summary we proved that the Arabic-language version of WORC questionnaire has a statistically significant internal consistency and significant test- retest reliability with high reliability of WORC that's enough to assess Arabic patients with rotator cuff disorders.

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## موثوقية وثبات النسخة العربية من مؤشر الكفة المدورة في غرب أونتاريو

### للمرضى الذين يعانون من مرض الكفة المدورة

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مقياس ويسترن اونتوريو للعضلات الضامة الدائرية (WORC) هو استبيان مصمم لتقييم تأثير اضطرابات الكفة المدورة (RC) على الجودة العامة لحياة المرضى. كان الغرض من هذه الدراسة هو اختبار موثوقية النسخة العربية من مقياس WORC في المرضى المصريين الذين يعانون من اضطرابات الكفة المدورة. بشكل عام ، شارك 210 مريضاً يعانون من اضطرابات اضطرابات الكفة المدورة. في هذه الدراسة. أنهى المرضى المجندون جميع الجولتين من مقياس ويسترن اونتوريو للعضلات الضامة الدائرية (WORC) في غضون أسبوع واحد قمنا بحساب ألفا كرونباخ، ومعامل الارتباط داخل الطبقة (ICC) لتقييم الاتساق الداخلي وموثوقية الاختبار وإعادة الاختبار على التوالي.

أظهرت النسخة العربية من WORC اتساقاً داخلياً ممتازاً ، مع معامل ألفا كرونباخ ( $\alpha$ ) 0.971 للمقياس العام. أظهرت الدرجات الإجمالية لـ WORC موثوقية عالية في الاختبار وإعادة الاختبار ، مع قيمة معامل الارتباط داخل الطبقة البالغة 0.893. النسخة العربية من مقياس ويسترن اونتوريو للعضلات الضامة الدائرية (WORC) هي أداة قياس موثوقة لتقييم نوعية الحياة المتعلقة بالصحة لدى المرضى الناطقين باللغة العربية الذين يعانون من اضطرابات الكفة المدورة.