

**RESEARCH ARTICLE**

# Psychometric Properties of the Persian Version of the Patient Rated Wrist Evaluation

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## Abstract

**Background:** The patient-rated wrist evaluation (PRWE) score is one of the most common clinical instruments used as an outcome measurement tool for distal radius fractures and other upper extremity conditions. The purpose of this study was to translate the PRWE into its Persian version and to evaluate its validity and reliability in patients with upper extremity conditions.

**Methods:** One hundred and fourthly one adult patients with upper extremity conditions participated in this ethical board approved study from August 2015 to May 2016. After translating the original version of the PRWE into Persian, all patients filled out the PRWE in addition to the VAS (Visual analogue scale) and DASH questionnaires. For evaluating reliability, after three days the researchers called back some of the patients who did not receive treatment or any changes in symptoms and asked them to complete the PRWE retest (104 patients).

**Results:** Cronbach's alpha was calculated as high as 0.934, implying very reliable internal consistency. After each item deletion, the Cronbach's alpha was still constant (range: 0.926 to 0.936). Intraclass correlation coefficient was 0.952 and this showed excellent test-retest reliability. The correlation coefficient between the PRWE and DASH scores was strong. Multivariable analysis showed an association between the PRWE and years educated.

**Conclusion:** Our study has shown that the Persian version of the PRWE is valid and reliable for patients with upper extremity conditions.

**Keywords:** Hand Surgery, Iran, Persian, PRWE, Psychometric properties, Translation, Validation, Wrist

## Introduction

In today's orthopedic surgery, outcome measures play an important role in assessment of patients' conditions before and after treatment. Outcome measures are classified according to their subjective or objective-based questions: patient reported (subjective) outcome measures (i.e. Mayo Wrist score, Quick-DASH or Oxford Elbow Score) or physician reported (objective) outcome measures (1, 2). Also, outcome measures can classify as general health questionnaires (i.e. SF-36, SF-12) or region specific ones (i.e. SPADI, MHOQ) (3, 4).

The Patient Reported Wrist Evaluation (PRWE) is

region specific questionnaire with 15 items designed to measure wrist pain and disability in activities of daily living. It was developed by MacDermid in 1998 for clinical assessment and is used for specific wrist problems such as distal radius or scaphoid fractures (5). Although a large number of upper extremity outcome measures are available such as the Disabilities of the Arm, Shoulder and Hand (DASH), the Short Form (36) Health Survey (SF-36), and the PRWE, the latter questionnaire seems to be the most compatible patient-related questionnaire for wrist conditions. The PRWE is shorter and simpler to complete than other general

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questionnaires (6-8).

To overcome language barriers and achieve standardized measures in assessment of patients it is logical to validate standard outcome questionnaires according to language and cultural issues of index population (9-11).

The aim of this study was to translate and validate the original version of the PRWE into Persian for many reasons. First, a unique measuring instrument is necessary in prevalent diseases like upper extremity conditions. Second, using the most responsive assessment tool can lead to choosing the most useful treatment. Finally, Farsi is spoken in some countries such as Iran, Afghanistan, and Tajikistan in addition to regions around Persian Gulf, Iraq, and Pakistan.

### Materials and Methods

We conducted the study in 3 phases. In phase 1, translation and cultural adaptation was done according to guidelines provided by Beaton and Guilmán (12). In phase 2, a pilot study performed to pretest the acceptability and difficulties in understanding the translated items. In phase 3, we administered the final version of the Persian PRWE to patients admitted at our hand clinic.

### Patient Reported Wrist Evaluation

PRWE consists of 2 subscales: Pain subscales with 5 items rated from 0-50 (0-10 for each item) and Function subscale with 10 items which are further divided into 2 sections (6 and 4 items for specific and usual activities, respectively). The score of functional subscale differs from 0-50 (0-5 for each item) (8). The PRWE total score scale is from zero to 100 and the higher score implies a higher degree of pain and disability (13).

### Translation

Cross-cultural adaptation of the PRWE was conducted using forward-backward translation method (12). First, two independent native Persian translators (one orthopedic surgeon and one English teacher) with a good command of English, translated the original version of the PRWE into Persian. After merging the two questionnaires, a native English interpreter who was not aware of original PRWE, back-translated the merged questionnaire into English. Then authors and translators confirmed its concordance with the original format. There were only minor discrepancies [Figure 1].

### Pilot Study

To pretest the questionnaire, 20 patients tested the comprehensiveness of the final version to identify any ambiguity. There was not any difficulty in understanding the items.

### Sample size

To calculate the sample size, we used the correlation between PRWE and DASH scores. With two tailed  $\alpha=0.05$  and considering the medium effect size for correlation ( $P=0.3$ ), a sample size of 134 patients will provide 95% power. Accounting for the potential for a few incomplete or invalid questionnaires, we planned to enroll 141

patients.

### Patients

One hundred and forty one adult patients with upper extremity conditions participated in this study from August 2015 to May 2016. The study received Institutional Review Board (IRB) approval from Mashhad University of Medical Sciences before enrolment and patients consented verbally to participate in the study. The inclusion criteria were: age more than 18 with an upper extremity condition, Persian fluency and having been admitted to the hand clinic of our hospital.

On the first visit, all 141 patients filled out the Persian PRWE in addition to the Persian VAS (Visual analogue scale) and Persian DASH questionnaires. At the last stage of study to evaluating test-retest reliability, after 3 days the researchers called back 104 patients who did not receive treatment and asked them to complete the Persian PRWE again.

### Statistical analysis

Reliability and construct validity was performed using SPSS version 16 and the significance level of *P-value* was set at  $<0.05$ .

### Construct validity

Construct validity is the way in which the measuring instrument evaluates what it claims by testing its correlation with already validated measuring instruments which demonstrate that they are all measuring what they are supposed to measure (14). Construct validity was assessed by testing the Persian PRWE against the Persian DASH and VAS questionnaires. Depending on the score distribution, Spearman and Pearson's correlations were used to calculate the correlation.

### Reliability testing

Reliability is measurement of the stability of results or the degree of agreement between different raters. If results are similar under the same conditions, the test is said to be reliable (15). To test reliability, several tests are required. The first method to check the reliability is calculation of internal consistency. Internal consistency of tests was measured by the Cronbach's test that considers the coefficient alpha. Cronbach's alpha investigates reliability by estimating an item by the item's internal consistency. By deletion of each item, correlation between scores of remained items and total score calculated. The limit point of the Cronbach's alpha is often designated as 0.7 or 0.75 (16).

The intraclass correlation coefficient (ICC) is another method to check the reliability in validation studies. It is used for measuring reproducibility of results (17). For evaluating reproducibility, test-retest study performed by randomly inviting 104 patients to fill out the Persian PRWE questionnaire again 3 days later. Range of ICC differs from 0.00 to 1.00 and values closer to 1 are considered as a higher correlation (8).

### Demographics

Demographic characteristics of patients are shown in

Table 1. Demographic Characteristics of Patients (n=141)		
Sex, No (%)	Male	71 (50.4)
	Female	70 (49.6)
Age, Mean (SD), ( Years)		34.1 (14.4)
Education, Mean (SD), ( Years)		9.97 (4.18)
Diagnosis, No (%)	CTS	31 (21.8)
	Trauma	55 (39.6)
	Nerve injury	21 (14.9)
	Congenital anomalies	3 (2.00)
	Others (Trigger thumb, Keinbock, Ganglion cyst...)	31 (21.8)
Marital status, No (%)	Single	39 (27.9)
	Married	101 (71.4)
	Divorced	1 (0.700)
Affected side, No (%)	Left	58 (41.1)
	Right	62 (43.9)
	Both	21 (15)
Interval between condition occurrence and visit, mean (SD), (Months)		24.8 ( 61.9)
Smoking, No (%)	Yes	10 (7.2)
	No	131 (92.8)
Addiction, No (%)	Yes	6 (4.30)
	No	135 (95.7)
DASH score, mean (SD)		32.4 (13.9)
VAS score, mean (SD)		8.21 (5.84)
PRWE (test), mean (SD)		70.4 (41.2)
PRWE (retest), mean (SD)		71.8 (47.6)
Past medical history, No (%)	Hyperthyroidism	1 (0.700)
	Hypertension	6 (4.30)
	Diabetes mellitus	3 (2.10)
	Rheumatoid arthritis	2 (1.40)
	Others	5 (3.50)

DASH: Disabilities of the Arm, Shoulder and Hand  
VAS: Visual analogue scale  
PRWE: Patient Rated Wrist Evaluation

[Table 1]; 50.4% of patients were men and 49.6% were women with a mean age of 34.1 years. The affected

right hand showed a higher rate with 43.9% of patients, followed by the left hand with 41.1% and 15% in both hands. The majority of patients who were included in our study were non-smokers and non-addicts. Duration between injury and the first visit was estimated at 24.8 months. The mean scores of the DASH and VAS were 32.4 and 8.21, respectively.

## Results

Internal consistency and test-retest reliability of the Persian PRWE are shown in Table 2. Cronbach's alpha was calculated as high as 0.934, implying excellent reliability. After each item deletion, the Cronbach's alpha was still constant (range: 0.926 to 0.936) as shown in Table 3. Intraclass correlation coefficient was 0.952 and this showed excellent test-retest reliability. The correlation coefficient between the PRWE and DASH scores was 0.841, indicating a strong correlation, and between the PRWE and VAS score was 0.544 [Table 4].

Multivariable analysis showed an association between the PRWE and years educated  $P < 0.034$  [Table 5]. Levels of education may affect wrist disabilities through occupation, as more manual jobs are practical and sometimes requires less education. Also, having a higher education may lead to a higher patient's collaboration due to social-economic issues (18).

## Discussion

The goal of our study was to assess the reliability and construct validity of the Persian PRWE in patients with upper extremity conditions. According to above mentioned study Persian PRWE has excellent reliability and good validity compared to already validated Persian DASH and VAS scores.

Nowadays different types of hand and wrist disorders have been known such as carpal tunnel syndrome, arthritis, tenosynovitis, and traumatic events like distal radius fracture which is among the most common types of fracture (19, 20). Treatment and surgical outcome of all mentioned disorders need to be evaluate by a reliable instrument, especially distal radius fracture in which treatment have been a struggle as there are many treatment options such as using internal fixation, external fixation, and casting alone (21, 22). One of the useful instrument is PRWE which has been recognized as an ideal questionnaire considering its proficiency to evaluate the outcome of treatment in addition to its uncomplicated content. Consequently, it has been translated into several languages; however, there is no Persian translated version [Table 6] (5, 8, 23-25).

The translated versions of the PRWE are available in several languages including Brazilian, Finnish,

Table 2. Internal consistency and test- retest reliability of the Persian PRWE

	Cronbach's Alpha	Interclass Correlation (ICC)	95% Confidence Interval		P-value
			Lower Bound	Upper bound	
PRWE	0.934	0.952	0.929	0.968	<0.001

**Table 3. Statistics analysis after item deletion**

Questions numbers	Mean score	Standard Deviation	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Q 1	2.45	2.99	0.403	0.936
Q 2	4.81	3.74	0.504	0.934
Q 3	6.33	3.67	0.704	0.929
Q 4	6.11	3.58	0.528	0.933
Q 5	4.61	3.16	0.495	0.934
Q 6	4.05	3.88	0.776	0.927
Q 7	5.42	4.06	0.734	0.928
Q 8	4.00	3.99	0.703	0.929
Q 9	4.49	4.06	0.737	0.928
Q 10	5.67	4.10	0.757	0.927
Q 11	3.55	3.84	0.670	0.930
Q 12	4.00	3.69	0.772	0.927
Q 13	4.85	3.97	0.799	0.926
Q 14	4.79	4.01	0.782	0.926
Q 15	5.18	4.09	0.664	0.930

Danish, Korean, German, Chinese, Japanese, Swedish, and Turkish [Table 6] (7, 8, 23-30). Although some of the mentioned translated versions of the PRWE were adapted cross-culturally, our Persian version received no

**Table 4. Construct validity expressed by Spearman's Correlation between Persian PRWE and VAS, Pearson's Correlation**

	VAS	DASH
<b>PRWE</b>		
Correlation	0.544	0.841
<i>P-value</i>	<0.001	<0.001

such modifications (8, 23, 25, 28).

Previous studies on various translated versions of the PRWE have shown an excellent internal consistency and reproducibility (7, 8, 23-26). In our study, the Cronbach's alpha was 0.934 and intraclass correlation coefficient was 0.952, indicating the excellent reliability of our study.

Many studies have used different questionnaires such as the SF-36, DASH, Quick-DASH, and VAS to measure construct validity (7, 8, 25, 28, 29). In our study, construct validity was determined comparing the PRWE with the VAS and DASH questionnaires. The correlation coefficient between the PRWE and DASH scores and the PRWE and VAS score were 0.841 and 0.544, respectively. One study showed the same results as our study regarding moderate correlation between the PRWE and VAS, although moderate correlation was between the function subscale of the PRWE and VAS and not the pain subscale (25). As the VAS scale uses the subjective method to evaluate the quality of a variable, it might obtain inaccurate results. However, the VAS has been recognized as the most sensitive tool for pain

**Table 5. Multivariable analysis of factor affecting Persian PRWE**

Variables	Beta	<i>P-value</i>	Standard Error	95 % confidence interval	
				Upper	Lower
Education years	0.199	0.024	0.860	0.258	3.66

**Table 6. Results of PRWE validation by different languages**

Authors	Language	Cronbach's alpha	The intraclass correlation coefficient (ICC)
da Silva Rodrigues et al. (8)	Brazilian	> 0.85	> 0.90
Sandelin et al. (23)	Finnish	0.976	0.992
Schonnemann et al. (24)	Danish	0.94	0.88
Kim et al. (25)	Korean	0.94	0.96
Hemelaers et al. (28)	German	0.89	0.94
Wah et al. (29)	Chinese	0.78 - 0.95	-
Imaeda et al. (7)	Japanese	0.95	0.92
Mellstrand Navarro et al. (30)	Swedish	0.97	0.93
Ozturk et al. (26)	Turkish	0.88	-

evaluation (31-33).

In multivariable analysis, we found that the PRWE score was affected only by education level. The higher education levels may affect wrist disabilities due to less manual jobs as well as better collaboration for treatment (18).

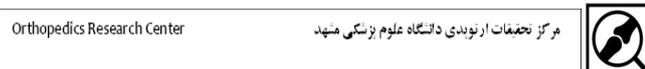
There were some limitations in our study. This study was performed in only two medical centers and hence they cannot represent all the Persian population. Also, we administer a non-comprehensive questionnaire like VAS to assess construct validity. Although there has been good correlation between pain subscales and VAS score.

Our study has shown that the Persian version of the PRWE is valid and reliable for patients with upper extremity disabilities.

The authors report no conflict of interest concerning the

materials or methods used in this study or the findings specified in this paper.

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### PATIENT RATED WRIST/HAND EVALUATION (PRWE)

نام و نام خانوادگی: تاریخ:

سوال های زیر به ما کمک خواهند کرد تا بفهمیم شما در هفته گذشته به چه میزان دست و یا مچ دست آسیب دیده ی تان برای شما مشکل ایجاد کرده است. شما باید متوسط علایم ایجاد شده در دست و یا مچ دست خود را که در طی هفته گذشته وجود داشته است، از 10-0 امتیاز دهی کنید. لطفاً به تمام سوالات پاسخ دهید. اگر هر کدام از فعالیت های ذکر شده را در هفته پیش انجام نداده اید، لطفاً میزان دشواری یا درد مورد انتظار در آن فعالیت را برای خود برآورد کنید. اگر شما فعالیت ذکر شده را اصلاً تاکنون انجام نداده اید، میتواند به سوال پاسخ نداده و آن را خالی رها کنید.

میزان درد	
با کشیدن دایره به دور مناسب ترین عدد از 0-10 میزان میانگین درد در هفته گذشته در دست و یا مچ دست خود را ارزیابی کنید. عدد صفر (0) به معنی نداشتن هیچ گونه درد و عدد 10 به معنی داشتن شدیدترین درد ممکن می باشد. (شدیدترین دردی که در زندگی خود تجربه کرده اید یا دردی که مانع انجام فعالیت های شما شده است)	10 9 8 7 6 5 4 3 2 1 0
درد خود را ارزیابی کنید	10 9 8 7 6 5 4 3 2 1 0
در حین استراحت	10 9 8 7 6 5 4 3 2 1 0
وقتی با دست و یا مچ دست حرکات مکرر و یا تکراری انجام می دهید	10 9 8 7 6 5 4 3 2 1 0
وقتی یک شی سنگین را بلند میکنید	10 9 8 7 6 5 4 3 2 1 0
وقتی که درد دست و یا مچ دست در شدیدترین حالت هست	10 9 8 7 6 5 4 3 2 1 0
هر چند وقت یکبار درد به سراغ شما می آید؟	هیچ وقت همیشه
	10 9 8 7 6 5 4 3 2 1 0

تعمیرد	
الف) فعالیت های خاص	
میزان دشواری که هنگام انجام هر یک از اعمال زیر تجربه میکنید با کشیدن دایره دور عددی که میزان این دشواری را طی هفته گذشته نشان می دهد ارزیابی کنید. عدد 0 به معنی تجربه هیچ گونه دشواری و عدد 10 به این معنی است که آن کار آن قدر دشوار بوده که شما به هیچ عنوان قادر به انجام آن نبودید.	
چرخاندن دستگیره در با دست آسیب دیده	بدون هیچ دشواری
پریدن گوشت یا چاقو با دست آسیب دیده	10 9 8 7 6 5 4 3 2 1 0
بستن دکمه های لباس با دست	10 9 8 7 6 5 4 3 2 1 0
استفاده از دست آسیب دیده برای بلند شدن از روی صندلی	10 9 8 7 6 5 4 3 2 1 0
حمل 5 کیلو بار توسط دست آسیب دیده	10 9 8 7 6 5 4 3 2 1 0
شستشوی خود در دست شویی با دست آسیب دیده	10 9 8 7 6 5 4 3 2 1 0
ب) فعالیت های معمول	
میزان دشواری که هنگام انجام فعالیت های معمول تجربه می کنید با کشیدن دایره دور عددی که میزان این دشواری را طی هفته گذشته نشان می دهد ارزیابی کنید. منظور از "فعالیت های معمول" فعالیت های است که شما قبل از ایجاد مشکل در دست و یا مچ دست خود آنها را انجام می دادید. عدد 0 به معنی وجود هیچ گونه دشواری و عدد 10 به این معنی است که فعالیت ذکر شده آن قدر دشوار بوده که شما قادر به انجام آن نبودید.	
انجام مرتبها و اعمال شخصی (لباس پوشیدن، شستشو)	10 9 8 7 6 5 4 3 2 1 0
کارهای خانه (تمیزکاری، گردگیری)	10 9 8 7 6 5 4 3 2 1 0
کار (حرفه یا کار روزانه شما)	10 9 8 7 6 5 4 3 2 1 0
فعالیت های تفریحی	10 9 8 7 6 5 4 3 2 1 0
ظاهر ( پاسخ به این سوال اختیاری است )	
ظاهر دست شما چقدر برایتان مهم است؟	تأخیدی به هیچ وجه
میزان ناراضایی خود را از ظاهر دست خود طی هفته گذشته	10 9 8 7 6 5 4 3 2 1 0
ارزیابی کنید	عدم ناراضایی ناراضایی کامل

اگر نکته ای دیگر وجود دارد لطفاً به آن اشاره کنید:

Figure 1. The patient rated wrist evaluation (PRWE).

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