

# The International Knee Documentation Committee (IKDC) Subjective Short Form: a validity and reliability study

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## Abstract

**Purpose** The purpose of the present research was to translate the original English version of International Knee Documentation Committee (IKDC) Subjective Short Form to Persian and to assess validity and reliability of it in Iranian patients with ACL injury.

**Method** The Persian version of the IKDC Subjective Short Form was administered to 145 patients including 111 men (76 %) and 34 women (24 %) with the clinical diagnosis of knee ACL tear that were referred to our Knee and Shoulder Center at Mashhad University of Medical Sciences, Mashhad, Iran. The Persian IKDC Subjective Short Form and Persian SF-36 questionnaire were completed by patients in the clinic before beginning any treatment intervention. Patients filled out the Persian IKDC 72 h again before receiving a major treatment; we were then able to use the test–retest method to calculate reliability.

**Results** The average age of the subjects was  $30.9 \pm 10.4$  years. The calculated ICC with 95 % confidence interval was 0.845. In this study, Cronbach's alpha

was 0.845. There were significant correlations between mean total score of the Persian IKDC and all items of the SF36 ( $P < 0.05$ ) except for MCS ( $P = 0.055$ ).

**Conclusion** Cronbach's alpha and correlation of IKDC Subjective Short Form and SF-36 demonstrated that the Persian version of IKDC has both strong reliability and validity. The Iranian version of IKDC has favourable validity and reliability and therefore can be used to assess Persian-speaking patients with cruciate ligament injuries.

**Level of evidence** Level II.

**Keywords** IKDC · Validity · Reliability · Persian Version · Iran · ACL · Persian

## Introduction

In order to better understand clinical disorders and develop a numeric comparison of the clinical outcome before and after conservative or surgical orthopaedic treatments, many clinical measures have been developed in the last two decades [9]. These instruments are used to assess patients' subjective symptoms, functions, emotions, and quality of life. Moreover, because of the increasing frequency of knee injuries caused by sport and motor vehicle accidents around the world, there is an urgent need for the standardization of clinical measures for knee disorders. Standardization and adaptation of clinical measures facilitate regional and multicenter clinical studies, allowing us to evaluate our treatments for effectiveness and compare results across nations. Hence, if a self-reported, clinical measure is to be used across cultures, the questionnaire should not only be translated well, but should also be culturally adapted to maintain its original content [3, 6, 7, 17, 18].

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In the 1980s, the International Knee Documentation Committee (IKDC) was founded to formulate and standardize a comprehensive knee questionnaire to assess clinical knee outcomes. The final version of the IKDC Subjective Knee Form was presented in 2001 [2]. The questionnaire covers clinical symptoms, function, and sport activity limitations due to knee impairment.

Since its presentation, the IKDC Subjective Short Form has been translated into different languages, and its validity and reliability have been tested globally [4, 9–11, 15, 16]. However, the IKDC Subjective Short Form has not been translated into Persian yet which is spoken in Iran, Tajikistan, Afghanistan, and other parts of Asia and the Middle East. The purpose of this study was to translate and culturally adapt the IKDC Subjective Short Form into Persian and to evaluate its validity and reliability within a Persian-speaking population of patients who were clinically diagnosed with a knee ligament injury.

## Materials and methods

Guidelines for cross-cultural adaptation and psychometric properties of self-reported clinical measures were presented by Guillemin et al. [5].

These guidelines are widely accepted and used by many clinicians and investigators around the world [5]. In addition, Beaton et al. [1] presented a comprehensive review on accepted guidelines by the American Academy of Orthopedic Surgeons (AAOS) for translation, cultural adaptation, and validation studies for orthopaedic clinical instruments.

In accordance with these guidelines, in this study, the original English version of the IKDC Subjective Short Form was translated into Persian by two professional English translators whose native language is Persian and two knee surgeons. Final drafts were then discussed in a committee that included the translators and research team. Then, the final Persian version of the IKDC Subjective Short Form was produced. This final draft was translated back into English by a native English-speaking translator (whose second language is Persian).

Minor differences between the forward and backward translations were corrected by the research team, and the final Persian version of the IKDC Subjective Short Form was developed.

The IKDC Subjective Short Form encompasses three domains, including knee symptoms, sport and daily activities, and knee function (current and prior to injury). It consists of 18 items: seven symptom-related questions, one question related to sports participation, nine questions related to daily activities, and one question related to current knee function. Response options vary for each item. Question 6 dichotomizes the response into yes/no;

questions 1, 4, 5, 7, 8, and 9 use the 5-point Likert scales; and questions 2, 3, and 10 use the 11-point numerical rating scales. The sum of all 18 questions makes a final IKDC score between 0 and 100 [14].

## Patients

The Persian IKDC Subjective Short Form was completed by 145 patients, including 111 men and 34 women who had a clinical diagnosis of knee ACL tear and were referred to our Knee and Shoulder Center at Mashhad University of Medical Sciences between February 2011 and December 2011. All of the patients signed a consent form to participate in the study. Inclusion criteria consisted of patients with isolated ACL tear, being able to read and write, and being a native Persian speaker.

The Persian IKDC Subjective Short Form, along with the Persian SF-36 health status questionnaire, was filled out by all of the participants. The SF-36 health-related survey is a clinical outcome instrument for the assessment of quality of life and health status. Since its development in the 1980s, it has been translated into many languages and cultures around the world including Persian [12, 13]. The SF-36 measures health-related quality of life on eight multi-item dimensions, including physical functioning, role physical, bodily pain, social functioning, role emotional, vitality, and mental and general health.

In present study, all of the patients were able to read and write and so were able to complete the questionnaire, but were assisted if any difficulties in understanding the items arose. After 3 days, 50 patients were randomly selected to fill out the IKDC Subjective Short Form and send it back to our centre by mail. Meanwhile, this retest group did not receive any major treatment such as arthroscopy or reconstructive surgery during those 3 days.

## Validity

Construct validity refers to the degree of correlation of a questionnaire with the measure, where its validity has already been tested and is theoretically predicted to correlate. Construct validation was calculated using Pearson's correlation coefficients between the 18-item IKDC Subjective Short Form and the Persian version SF-36. The eight dimensions of Persian SF-36 were used to evaluate the validity of the Persian IKDC version.

## Reliability

Reliability assesses the degree to which test scores are consistent from one test administration to the next. To quantify reproducibility of a measure, test-retest reliability,

the interclass correlation coefficient (ICC), and internal consistency were calculated.

Hence, to examine internal consistency or reproducibility of the responses to the items, we randomly asked 50 participants out of the 145 with ACL tear to once again fill out the Persian IKDC Subjective Short Form 3 days later. This test–retest reliability was evaluated by using the interclass correlation coefficient. For the assessment of internal consistency, Cronbach’s alpha was used. The study was approved by the Ethical Research Committee of the Mashhad University of Medical Sciences in 2011 (MUMS Project #89531).

#### Statistical analysis

At first, we collected information from all of the patients, and then, the data were entered into SPSS version 11.5 software (SPSS Inc., Chicago, IL, USA). For demographic information, we performed descriptive statistics. To calculate validity, we performed correlation using the Pearson’s correlation coefficient between the SF-36 and IKDC Subjective Short Form.

In order to assess reliability, we calculated the Cronbach’s alpha for testing internal consistency and ICC for examining test–retest reproducibility.

## Results

The Persian version of the IKDC Subjective Knee Form and the SF-36 form were completed by patients with knee ligament (ACL) injury. One hundred and forty-five patients participated in the study. The male-to-female ratio was 111 (76 %) to 34 (24 %). The median (range) age of the subjects was 30.9 (14, 65).

The cause of trauma in all of the patients was sport injury. Demographic characteristics of the patients are summarized in Table 1.

All patients commented that the translated questionnaire was clear and easy to answer. Completing the questionnaires took on average  $12 \pm 5$  min for the patients.

**Table 1** Characteristics of 145 patients of the study

Age	
Mean (SD)	30.9 (10.4)
Gender <i>N</i> (%)	
Male	111 (76.6 %)
Female	34 (23.4 %)
Education <i>N</i> (%)	
Primary school	42 (35.3 %)
High school and up	103 (64.7 %)

## Reliability

In the present study, Cronbach’s alpha was 0.845 (while considering that Cronbach’s alpha based on standardized items is 0.915); therefore, the Persian version of the IKDC Subjective Short Form in terms of reliability is favourable.

The mean calculated ICC value was 0.845 ( $P < 0.001$ , with a 95 % confidence interval). The upper and lower value of ICC was 0.91 and 0.75, respectively.

Correlation between the questions of the Persian IKDC in the test–retest was 0.77 ( $P = 0.000$ ), which demonstrates significant correlation and strong reliability and reproducibility.

## Average scores of the items in the Persian IKDC Subjective Short Form

The results showed that the range of summed scores of the Persian IKDC Subjective Short Form was 24–92. Mean score (and SD) of individual questions of the Persian IKDC Subjective Short Form is summarized in Table 2.

## Validity

Correlation between the Persian IKDC Subjective Short Form questions and the eight dimensions of the Persian SF-36 items show that there was a strong correlation between

**Table 2** Average scores of 18 items in the Persian IKDC Subjective Short Form

Questions	Mean (SD)
Q1	2.90 (0.933)
Q2	7.22 (3.363)
Q3	5.90 (2.733)
Q4	1.76 (1.088)
Q5	2.52 (1.173)
Q6	0.46 (0.50)
Q7	2.54 (1.19)
Q8	2.78 (0.87)
Q9.A	1.83 (1.08)
Q9.B	1.77 (1.13)
Q9.C	2.84 (1.24)
Q9.D	2.56 (1.36)
Q9.E	2.53 (1.32)
Q9.F	0.979 (1.01)
Q9.G	2.31 (1.45)
Q9.H	3.19(1.10)
Q9.I	2.22 (1.38)
Q10.A	8.40 (2.62)
Q10.B	4.61 (2.67)
Total	39.9 (18.1)

the majority of questions in the IKDC Subjective Short Form and eight dimensions of the Persian SF-36 (Table 3).

To calculate the validity of this questionnaire, we calculated the correlation between the Persian IKDC and the Persian SF-36. The results show that there was significant correlation between different items of the SF-36, including PF, RP, BP, GH, VT, SF, PCS ( $P < 0.00$ ), RE ( $P = 0.045$ ), MH ( $P = 0.018$ ), and MCS ( $P = 0.055$ ), and the total score of the IKDC Subjective Short Form.

By reviewing the validity of this questionnaire, the results show that most of the items together have significant differences.

## Discussion

The final version of the IKDC Subjective Short Form was published in 2001 for the English-speaking population to evaluate patients clinically diagnosed with a variety of

**Table 3** Correlation between mean total score of the Persian IKDC and eight items of the Persian SF-36

	Mean (SD)	Correlation with IKDC Subjective Knee Form
IKDC Subjective Knee Form	39.9 (18.1)	–
SF-36 (PF)	50.6 (25)	$R = 0.522^{**}$ $P < 0.00$
SF-36 (RP)	19.3 (29.2)	$R = 0.391^{**}$ $P < 0.00$
SF-36 (BP)	42.1 (24.1)	$R = 0.679^{**}$ $P < 0.00$
SF-36 (GH)	59.9 (19.6)	$R = 0.336^{**}$ $P < 0.00$
SF-36 (VT)	58.7 (20.9)	$R = 0.402^{**}$ $P < 0.00$
SF-36 (SF)	63.7 (25.9)	$R = 0.385^{**}$ $P < 0.00$
SF-36 (RE)	63.7 (25.9)	$R = 0.167^{*}$ $P = 0.045$
SF-36 (MH)	45.9 (45.4)	$R = 0.196^{*}$ $P = 0.018$
SF-36 (PCS)	34.4 (9.1)	$R = 0.626^{**}$ $P < 0.00$
SF-36 (MCS)	47.4 (11.8)	$R = 0.159$ $P = 0.055$

PF Physical function, RP role physical, BP bodily pain, GH general health, VT vitality, SF social function, RE role emotional, MH mental health, PCS physical composite score, MCS mental composites score, SD standard deviation, R Pearson's correlation coefficient

\* Correlation is significant at the 0.05 level (two-tailed)

\*\* Correlation is significant at the 0.01 level (two-tailed)

knee injuries [2]. Although the IKDC has been translated and culturally adapted into other languages, it has yet to be done for Persian, and so this is the first study to translate it into Persian and evaluate its validity and reliability.

In this study, the validity and reliability of the IKDC Subjective Short Form were tested using a sample of 145 patients. The ICC value of 0.845 and Cronbach's alpha of 0.84 confirm reliability and correlation between the total summed score of the Persian IKDC Subjective Short Form and the mean score of the eight dimensions of the SF-36 confirms validity of the Persian IKDC Subjective Short Form. Hence, the findings of this study support strong validity and reliability of the Persian IKDC Subjective Short Form in Iranian patients with ACL injury. Therefore, the researchers of this study conclude that this clinical measure is suitable to assess patients with knee injuries in Persian-speaking regions of the world.

Currently, with increased interest for multicenter and international clinical studies, a need for culturally equivalent, adapted, and validated outcome measures is clear. In addition, the use of culturally validated clinical scoring measurements in the studies from different countries makes clinical met-analysis reviews possible with minimal reporting bias. The translation and validation process of the Iranian (Persian) IKDC Subjective Short Form performed in the current study can maintain the characteristics of validity and reliability found in its original English version.

We achieved a strong correlation between the Persian IKDC Subjective Knee Form and the Persian SF-36 scores, and this further supports its validity. Table 4 summarizes

**Table 4** Correlations between eight domains of the SF-36 and different versions of the IKDC Subjective Short Form (9, 11 and 12)

Short form-36	Iranian version	Original version	Thai version	Italian version
Sf-36 (PF)	$R = 0.522^{**}$	0.63	0.75	0.67
Sf-36 (RP)	$R = 0.391^{**}$	0.47	0.37	0.56
Sf-36 (BP)	$R = 0.679^{**}$	0.64	0.76	0.75
Sf-36 (GH)	$R = 0.336^{**}$	0.30	0.21	0.26
Sf-36 (VT)	$R = 0.402^{**}$	0.39	0.29	0.36
Sf-36 (SF)	$R = 0.385^{**}$	0.47	0.22	0.58
Sf-36 (RE)	$R = 0.167^{*}$	0.26	0.34	0.44
Sf-36 (MH)	$R = 0.196^{*}$	0.25	0.29	0.65
	$P = 0.018$			
Sf-36 (PCS)	$R = 0.626^{**}$	0.66	0.63	0.60
Sf-36 (MCS)	$R = 0.159$	0.16	0.34	0.40

PF Physical function, RP role physical, BP bodily pain, GH general health, VT vitality, SF social function, RE role emotional, MH mental health, PCS physical composite score, MCS mental composites score, SD standard deviation, R Pearson's correlation coefficient

\* Correlation is significant at the 0.05 level (two-tailed)

\*\* Correlation is significant at the 0.01 level (two-tailed)

correlations between the eight dimensions of the SF-36 and original English transcript and different versions of the IKDC Subjective Short Form.

Using Cronbach's alpha, the reliability shows validity similar to that of its original form and to the Italian, Thai, Brazilian, Chinese, and Korean versions [4, 8, 10, 11, 15].

In summary, Cronbach's alpha in Brazilian, Italian, Chinese, and this study was 0.928, 0.91, 0.97, and 0.845, respectively. According to Guillemin et al., a value of more than 0.7 indicates excellent reliability [5].

The ICC value of 0.845 and Cronbach's alpha of 0.84 confirms reliability, reproducibility, and consistency of the Persian IKDC Subjective Short Form.

Concurrent validity means that questions of a questionnaire are compatible with measures in the same area in another questionnaire. This comparison showed that there is a high correlation coefficient between the majority of items of the Persian SF-36 and the Persian IKDC Subjective Short Form.

There are a few limitations in our study such as only patients with an ACL injury were included, while we are faced with many patients with PCL or multi-ligament injuries, we have randomly done retests in only 50 patients. These limitations can be improved by future investigations.

However, our promising results in assessing the reliability and validity of the Persian IKDC Subjective Short Form permit the use of this measure to evaluate Persian-speaking patient populations with knee ligament injury for both clinical and research purposes.

## Conclusion

The Persian version of the IKDC has good validity and reliability; therefore, the Persian version of the IKDC Subjective Short Form can be used for the assessment of Persian-speaking patients with knee ligament injuries.

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**Conflict of interest** The authors declare no conflict of interest.

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