

## Original Article

# Translation and Cross-cultural Adaptation of the Hip Disability and Osteoarthritis Score into Persian Language: Reassessment of Validity and Reliability

### Abstract

**Background:** This study aimed Persian translation and validation of the hip disability and osteoarthritis outcome score (HOOS) questionnaire. **Methods:** The study was carried out in two phases. First, we translated the HOOS according to acceptable guidelines. We assessed HOOS content convergent validity on 203 hip osteoarthritis patients using SF-36. Internal consistency was tested using Cronbach's alpha coefficient if each item removed and intraclass correlation coefficient (ICC) for the assessment of test-retest reproducibility. **Results:** Patients had mean (standard deviation) age of 39 (17). Test-retest ICC in whole was 0.95 ( $P = 0.014$ ) showing excellent reliability. ICC was 0.92 for the "pain" subscale ( $P = 0.02$ ), 0.81 for the "symptom" subscale ( $P = 0.002$ ), 0.81 for the "function of daily living (FDL)" ( $P = 0.022$ ), 0.88 for the "function of sports and recreational activities" ( $P = 0.006$ ), but it was 0.62 ( $P = 0.1$ ) for the "quality of life (QOL)." Cronbach's alpha was 0.92, 0.73, 0.97, 0.86, 0.80, and 0.80 for the pain, symptom, FDL, function of sports, QOL, and stiffness, respectively, showing good to excellent internal consistency. Having SF-36 for the assessment of convergent validity, there was a strong correlation between total HOOS score and the physical component summary domain of SF-36 ( $r = 0.64$ ,  $P = 0.0001$ ), whereas the correlation with the mental component summary domain was weak ( $r = 0.16$ ,  $P = 0.04$ ). **Conclusions:** The Persian version of the HOOS questionnaire is a valid (regarding physical not mental aspects) and reliable assessment tool in patients with hip osteoarthritis.

**Keywords:** Hip osteoarthritis, outcome score, questionnaires, translation

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### Introduction

Hip is a large weight bearing synovial joint having a great effect on gait kinematics and thus having a major impact on the quality of life (QOL). We routinely measure health related QOL with the SF-36 questionnaire. Recently, there is a trend toward region specific health-related QOL including Manchester-Oxford foot questionnaire for foot problems, disabilities of the arm shoulder and hand for upper extremity problems, and Western Ontario and McMaster Universities arthritis index (WOMAC) for knee osteoarthritis.

WOMAC is the most widely used, valid, reliable, and responsive patient-reported outcome measure for osteoarthritis of the knee and hip.<sup>[1,2]</sup> It is especially applicable in the elderly population, and the estimated normative values are different from middle aged.<sup>[3]</sup>

The hip disability and osteoarthritis outcome score (HOOS) is a patient-based expansion

of the WOMAC for hip osteoarthritis.<sup>[4]</sup> This scoring system is useful for young and active individuals as well as elderly patients with hip osteoarthritis.

The HOOS is a 40-item patient reported disease-specific QOL measurement tool comprised of six domains that include all 24 items of WOMAC with some additional items. In the pain domain, it includes the five questions of WOMAC and five more added questions. In the function of daily living and stiffness domains, it only includes WOMAC items. There are also three new domains in the HOOS including sports and recreational activity (four items), QOL (four items), and symptoms (three items). Indeed, the last three domains are the extension of stiffness domain. Each item is scored between 0 and 4, and each subscale is calculated independently. Scores are transformed to a normalized zero to 100 scaling system.<sup>[5]</sup>

The original HOOS scaling system has been validated, and its responsiveness has been

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confirmed in patients with hip osteoarthritis in relation to medical and surgical treatments and recently in arthroscopic hip surgeries.<sup>[6]</sup> HOOS has also been translated and validated in German, Lithuanian, Swedish, Dutch, French, Korean, Japanese, Chinese, and Portuguese languages.<sup>[7-10]</sup> There are many similarities in the Iranian life style with Europeans and Americans. However there still remains several differences in bathing, eating, and recreational activities throughout the life styles. The aim of this study was to translate and cross culturally adapt the Persian HOOS with further testing its reliability and validity among Persian speaking population.

## Methods

The institutional review board approved this study, which was divided into two parts; first, we translated the HOOS measuring instrument to Persian language with respect to suitable cultural adaptation. Then assessment of validity and reliability was performed in hip osteoarthritis patients if they were signed the consent form.

### Translation process

#### First translation

Translation and cross-cultural adaptation process performed according to Guillemin *et al.* guidelines published in 1993 and 2000.<sup>[11,12]</sup> Three independent translations were produced by two orthopedic surgeons and an expert bilingual translator (Persian as the first language) that all of them were aware of the objective of the study.

#### Back-translations

Back-translation was done by three independent bilingual translators that one of them was England-native. All of the back-translators were blinded to objectives of the study.

#### Committee review

A committee consists of four orthopedic surgeons and an English language expert compared to source and these three final versions. They could correct errors in first translations and improve cross-cultural adaptation. In the committee, conceptual, experiential, and idiomatic equivalence were considered more important than semantic equivalence.

#### Pretesting

We used a probe technique for the checking of the face validity before final approval of translation. We handed translated version of HOOS to 20 patients in foot and ankle outpatient clinic. We checked whether all patients could understand each item. For this purpose, the answer to an item is sufficient. However for checking the probability of misunderstanding, a probe question was asked after each item answering: "what do you mean?"

### Psychometric assessment

In the second part of the study, we assessed psychometric properties of the new Persian version of HOOS for 203 hip

osteoarthritic patients in the orthopedic outpatient clinic of Ghaem hospital (Mashhad, Iran) seeking surgical treatment.

The inclusion criteria for filling the questionnaire were all primary hip osteoarthritis patients according to the American College of Rheumatology in 1991 that were seeking a therapeutic surgical procedure aged more than 40 years old.<sup>[13]</sup> The exclusion criteria were the existence of any other complaint or even osteoarthritis sign or symptom in any other joint that is a major problem for the patient.<sup>[9]</sup>

The eligible cases in the outpatient setting were given Persian version of HOOS and SF36.

SF36 is a general health-related patient reported questionnaire that its feasibility and psychometric characteristic has been proved and has been translated and validated to the Persian language.<sup>[14]</sup> This valuable measurement mean is used routinely as a standard questionnaire for validation of other health related QOL measurements. It is composed of 36 items, 8 component (physical functioning, role physical, role emotional, social functioning, mental health, energy, general health, and pain) and two extra domains (physical component summary [PCS] and mental component summary [MCS]).<sup>[15,16]</sup>

In data analysis first, for determining the feasibility, the percentage of responses, floor and ceiling effect were assessed. Floor and ceiling effects happen when more than 15% of responses are the lowest and the highest score.<sup>[17]</sup>

### Reliability

For assessing reproducibility and reliability of responses and reducing intra- and inter-observer errors we used test-retest reliability. For 20 patients, the HOOS questionnaire was filled 1 week later for the second time. Responses in each subscale were assessed using intra-class correlation coefficient (ICC) with 95% confidential interval [CI]. We considered excellent reliability in each domain if ICC gets >0.8.<sup>[18]</sup>

#### Internal consistency

For assessing the correlation between items in each subscale and in between all subscales as a whole, we measured internal consistency using the Cronbach's alpha with 95% (95% CIs). We considered coefficients equal or >0.7 as good correlation.<sup>[19]</sup>

#### Construct validity

For assessing the construct validity of a translated version of a validated questionnaire, we used SF-36 as a previously validated questionnaire with similar goals. For this purpose, we could determine convergent validity between similar scales in these two questionnaires using nonparametric Spearman correlation coefficient. With a significance level of two-tailed  $P < 0.05$  coefficient amounts that were >0.6 were considered strong convergent and amounts <0.4 were considered to have weak meaningful correlation.<sup>[16]</sup>

**Table 1: Patients characteristics (n=203)**

Demographic data	N (%) unless stated
Age, mean (SD)	39.2 (16.9)
Sex, n (%)	
Male	130 (64)
Female	73 (36)
Career, n (%)	
Heavy worker	73 (35.96)
Employee	18 (8.86)
Jobless	19 (9.35)
Housekeeper	35 (17.2)
Retired	9 (4.43)
Missed data	49 (24.1)
Education, n (%)	
School	100 (49.26)
Graduate	24 (11.82)
Postgraduate	30 (14.77)
Missed data	49 (24.15)
Involved side, n (%)	
Right	60 (29.55)
Left	59 (29.06)
Bilateral	21 (10.34)
Missed data	63 (31.03)

SD=Standard deviation

**Table 2: Distribution of scores for the Hip Disability and Osteoarthritis outcome Score subscales**

	Mean (SD)	Range	Percentage at floor	Percentage at ceiling
Symptom	53.27 (24.3)	0-100	0.03	0.01
Pain	50.47 (24.16)	0-100	0.02	0.3
Function of daily living	48.96 (24.52)	0-100	0.02	0
Function sport	33.46 (29.52)	0-100	0.03	0.18
QOL	40.45 (21.81)	0-100	0.01	0
Total	48.3 (21.45)	4.40-100	0	0

SD=Standard deviation, QOL=Quality of life

### Statistical analysis

We used previous Korean validation study for this questionnaire in hip osteoarthritis patients for sample size calculation. In the Korean version, they used 75 cases, 25 of them filled the retest forms. In the present study, we had 205 arthritic patients. Statistical analysis was performed using SPSS version 21.0 for Mac (SPSS, Chicago, IL, USA), and  $P < 0.05$  was considered statistically significant. Internal consistency was measured using Cronbach's alpha coefficient with or without deleting each subscale. Cronbach's alpha coefficient of 0.7 and more was considered satisfactory. Reliability was also tested by measuring ICC between test and retest with 2–14 days interval. Test-retest reliability measures the robustness of the results in the repeated filling. The interval was selected to be long enough so that the patient could not recall the previous answers. Furthermore, the interval should not be too long in that a treatment changes the condition.

**Table 3: Average functional score of patients with hip osteoarthritis (n=203)**

	Mean (SD)	Range (minimum–maximum)
HOOS, test	48.30 (21.45)	4.4-100
HOOS, retest	73.1 (19.99)	52.6-98.7
VAS	5.31 (31.56)	0-10
SF-36		
PCS	34.61 (9.50)	14.1-59.4
Physical functioning	44.39 (27.19)	0-100
Role physical	27.76 (33.69)	0-100
Bodily pain	42.59 (27.65)	0-100
General health	54.23 (21.18)	5-100
MCS	44.39 (11.61)	0-75.5
Vitality	56.5 (21.68)	0-100
Social functioning	56.98 (2.98)	0-100
Role emotional	40.7 (41.3)	0-100
Mental health	60.10 (21.25)	0-100

PCS=Physical component summary, MCS=Mental component summary, HOOS=Hip Disability and Osteoarthritis outcome Score, VAS=Visual analog scale, SF=Short form, SD=Standard deviation

**Table 4: Construct validity expressed by Spearman's rho correlation coefficient between Hip Disability and Osteoarthritis outcome Score and subscales of the Short form-36**

	HOOS	
	r	P
SF-36		
PCS	0.639**	0.000
Physical functioning	0.573**	0.000
Role physical	0.351**	0.000
Bodily pain	0.631**	0.000
General health	0.351**	0.000
MCS	0.164*	0.042
Vitality	0.210**	0.006
Social functioning	0.403**	0.000
Role emotional	0.271**	0.001
Mental health	0.241**	0.002

PCS=Physical component summary, MCS=Mental component summary, HOOS=Hip Disability and Osteoarthritis outcome Score, SF=Short form, \* Correlation is significant at the 0.05 level (two-tailed), \*\* Correlation is significant at the 0.01 level (two-tailed)

We assessed content validity by measuring the strength and direction of the association between SF-36 and the Persian version of the HOOS using Spearman's correlation coefficient.<sup>[20,21]</sup>

### Results

#### Translation

for translation process, there were little changes needed on pure semantic translation because in all items there were enough transcultural equalities. In pretesting assessment of new version that was carried out on 20-clinic outpatient,

all patients with at least primary educational skills answered all questions, and all answers to probe questions were acceptable (Please find the Persian version in the Appendix).

For psychometric assessment of new version of HOOS, a total of 203 patients from the outpatient clinic were recruited. All patients had long-standing hip osteoarthritis seeking a surgical treatment option. Table 1 represents characteristics of patients included for psychometric assessment. In Table 2, function of sport shows 18% floor effect. The floor and ceiling effects were <3% in other subscales.

We can see average HOOS, VAS, and SF-36 in Table 3. Construct validity is shown in Tables 4 and 5.

Table 6 depicts internal consistency and test-retest reliability of new version of HOOS. Cronbach's alpha ranged from 0.81 to 0.95 showed good to excellent internal consistency between items of each subscale ( $P < 0.05$ ) except for the QOL subscale that results were not meaningful ( $P = 0.1$ ).

## Discussion

The aim of this study was to translate and cross-cultural adapt the HOOS questionnaire to Persian language and to test the validity, reliability, and internal consistency of this new version in osteoarthritic hip patients. The new change

was combining stiffness (just two items) with symptom subscale.

Hip osteoarthritis is a common and rapidly ingrowing disorder in between Iranian population that is becoming older for years ahead. For assessing QOL of these patients, we need to have a strong measuring means. As HOOS questionnaire is a strong and well-done measurement score regarding hip osteoarthritis and some other hip problems and until now is validated in several societies. Lee translated and culturally adapted it according to the same guideline in patients with hip osteoarthritis. Satoh in 2013 validated this questionnaire in Japanese patients with the same problem. Ornetti *et al.* did the same process for French society in 2010.<sup>[8-10,22,23]</sup>

The results of validity showed a statistically meaningful correlation between HOOS questionnaire and SF36 ( $P < 0.05$ ). Spearman's Rho correlation coefficient between HOOS as a whole and PCS domain was strong ( $r = 0.639$ ), although this correlation with MCS is not good ( $r = 0.164$ ,  $P = 0.04$ ).

We could see the best correlation between HOOS subscales and bodily pain of SF-36 ( $r = 0.63$ ,  $P < 0.0001$ ). PCS of SF-36 had acceptable meaningful correlation with all subscales of HOOS ( $P < 0.0001$ ,  $r > 0.4$ ).

**Table 5: Construct validity of Hip Disability and Osteoarthritis outcome Score subscales (correlations with short form-36 subscales)**

SF-36 subscale	HOOS									
	Symptoms		Pain		Function daily living		Function sport		QOL	
	Pearson correlation	Significant (two-tailed)	Pearson correlation	Significant (two-tailed)	Pearson correlation	Significant (two-tailed)	Pearson correlation	Significant (two-tailed)	Pearson correlation	Significant (two-tailed)
pf	0.393**	0	0.388**	0	0.487**	0	0.494**	0	0.367**	0
Rp	0.247**	0.001	0.191**	0.009	0.305**	0	0.295**	0	0.262**	0
bp	0.504**	0	0.531**	0	0.590**	0	0.431**	0	0.469**	0
gh	0.326**	0	0.320**	0	0.336**	0	0.198**	0.006	0.226**	0.002
vt	0.186**	0.009	0.218**	0.002	0.205**	0.004	0.211**	0.003	0.266**	0
sf	0.344**	0	0.354**	0	0.366**	0	0.235**	0.001	0.289**	0
re	0.183*	0.014	0.217**	0.003	0.277**	0	0.210**	0.005	0.212**	0.004

HOOS=Hip Disability and Osteoarthritis outcome Score, QOL=Quality of life, SF=Short form, \* Correlation is significant at the 0.05 level (two-tailed), \*\* Correlation is significant at the 0.01 level (two-tailed)

**Table 6: Internal consistency and test-retest reliability of the Persian version of the Hip Disability and Osteoarthritis outcome Score**

Domains of HOOS	Cronbach's alpha if item deleted	ICC			P
		ICC	95% CI		
			Lower bound	Upper bound	
Symptoms	0.81	0.810	0.068	0.960	0.021
Pain	0.92	0.920	0.980	12.900	0.002
Function daily living	0.81	0.810	0.500	0.960	0.022
Function sport	0.88	0.880	0.400	0.970	0.006
QOL	0.62	0.620	−0.860	0.920	0.100
Total HOOS	0.95	0.950	0.330	0.990	0.014

ICC=Intraclass correlation coefficient, CI=Confidence interval, QOL=Quality of life, HOOS=Hip Disability and Osteoarthritis outcome Score



Surprisingly, the function of daily living correlation was more than the association between pain scale of HOOS and bodily pain ( $r = 0.59$  vs.  $0.53$ ) of SF-36. This conflict was noted in Japanese translation first.<sup>[10]</sup> Other subscales of HOOS had a moderate correlation with PCS dimension of SF36, but weak association was obtained between MCS dimension and HOOS subscales that were mentioned before. We concluded that translated HOOS questionnaire can better address physical aspects of QOL in our patients.

Cronbach's alpha results show an acceptable internal consistency in all subscales of HOOS and when each item was deleted the consistency was not exceeded the total amount (0.98). The lowest internal consistency was seen in symptom domain and QOL, but still acceptable (0.806) we can see this lower internal consistency in QOL domain in Japanese version in comparison with other domains (0.78). In French version, internal consistency in Symptom domain was  $<0.7$ .<sup>[9]</sup> Assessing test-retest reliability using ICC showed good reproducibility with ICC  $>0.81$ . ICC for QOL is not acceptable compared with other studies in other languages. Maybe questions in this part are not a place of care and concern regarding society culture and overall level of activity ( $P = 0.1$ ). Total ICC showed a mean amount of 0.97 that relieves our concern about reproducibility.

This study has some limitations; the most prominent one is that some psychometric properties were not addressed in our study. We considered patients just before surgery without follow-up after that. Hence, we could not assess the responsiveness of this new version. The second limitation was that we included just hip osteoarthritis patients and not other common hip disorders. We recommend further investigation that addresses responsiveness of the HOOS and a separate study on other hip disorders such as pure labral injuries or congenital problems of the hip.

## Conclusions

Persian version of the HOOS questionnaire is a valid and reliable assessment tool in patients with hip osteoarthritis.

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## Conflicts of interest

There are no conflicts of interest.

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