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Research Article

The Hip Osteoarthritis and Disability Score (HOOS)

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Abstract

Background: The Hip Osteoarthritis and disability Score (HOOS) is a widely used Patient- related Outcomes tool used to assess patient with hip pathologies.

Objectives: The main purpose of this study was to translate and culturally adapt the Arabic version of HOOS and proving the validity and reliability of this translated score.

Methods: 110 patients participated in this survey. The internal consistency tests were performed using Cronbach's alpha. Test-retest reliability (intra-correlation coefficient), convergent construct validity, convergent validity, floor & ceiling effects and responsiveness were also calculated. In order to measure the level of agreement, Bland-Altman Plot, forest Plots and ROC curve analysis are performed.

Results: Test reliability for the first testing situation - calculated using Cronbach's alpha - was 0.98 for the pain subscale, 0.98 for the stiffness, and 0.99 for the physical function subscale. For the second testing, reliability was 0.99, 0.97, and 0.99 (pain, stiffness, and physical function, respectively). This only proves that WOMAC is an instrument with good reliability. To test the reliability of HOOS, Cronbach's alpha was calculated. For each of the three testing occasions the reliability of each subscale was excellent – $\alpha 1 = 0.99$, $\alpha 2 = 0.99$, and $\alpha 3 = 0.99$. Intra-class correlation coefficients for each of the subscales was between 0.56 (Activity of daily living subscale) and 0.62 (Symptoms subscale), and this puts them all in a category of instruments with moderate reliability.

Conclusion: Overall, Arabic version of HOOS proved to be a good diagnostic tool for patients with hip problems, but it is important to pay extra attention about the differences in symptoms expressed in HOOS in comparison to WOMAC.

Keywords: Orthopaedic; Translation; Hip Osteoarthritis; Disability Score; HOOS Score

Abbreviations

HOOS: The Hip Osteoarthritis and Disability Score; WOMAC: The Western Ontari and Mcmaster Universities Osteoarthritis; OARSI: The Osteoarthritis Research Society International; ICC: Interclass Correlation Coefficient; SRM: Show Similar Responsiveness; OA: Osteoarthritis; ADL: Activity of Daily Living; PF: Physical Function; ROC: Receiver Operating Characteristic; AUC: Area Under the Curve; THA: Total Hip Arthroplasty.

Introduction

Osteoarthritis (OA) is a degenerative joint disease that leads to devastating disabilities which in turn can cause large socioeconomic burdens for healthcare providers [1,2]. The cause is believed to be due to multiple factors, mainly pro-inflammatory cytokines and biomechanical stresses around synovial joints [3]. Non-pharmacological modalities are the first line of treatment in OA, but as the disease progresses, the need for pain medications and surgery becomes inevitable [4]. Although advances in clinical and radiological assessments are robust, measuring the disability implications on patients remain a challenge [5,6]. For this reason, clinicians have developed patient related outcomes to help them with their management decisions. However, in 1998, the Hip Disability and Osteoarthritis Outcome Score (HOOS) were developed and has become a widely used tool in clinical practice [6]. Since the HOOS is an English tool, Arabic speaking countries are unable to use it. This study aims to establish the validity and reliability of the cross-cultural Arabic adaptation of the HOOS.

Materials

110 patients completed the Hip Disability and Ostheoarthritis Outcome Score questionnaire, and agreed to have their data analyzed for research purposes. The mean age of participants was 44.3 years, with a standard deviation of 15.4 years, implying that the majority of the sample was between 30 and 60 years of age. The youngest participant was 16, while the oldest was 76 years of age. IBM SPSS Statistics 21 was used for data analyses.

In order to estimate reliability of the questionnaire Cronbach's alpha was calculated, and since every patient completed the survey on three different occasions, Cronbach's alpha was calculated for each of the three test situations. Also, ICC (interclass correlation coefficient) was used to assess test-retest reliability.

Content validity was tested by examing the shape of data

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Table 1: Mean, standard Deviation, Change, ICC between different assessments of each subscale.

WOMAC subscales	WOMAC Score				Change*	ICC (95% CI)	Cronbach's alpha (95% CI)
	First assessment		Second assessment				
	Mean	SD	Mean	SD			
Pain	53.22	15.9	63.17	18.85	9.95	0.581 (0.234 - 0.760)	0.735 (0.379 - 0.864)
Stiffness	53.38	16.87	63.55	18.5	10.17	0.593 (0.230 - 0.772)	0.745 (0.375 - 0.872)
Physical Function	53.31	16.39	62.91	18.6	9.6	0.623 (0.262 - 0.793)	0.768 (0.416 - 0.884)

*Plus, sign means that the condition of patient has been worsened over time (higher score = Deterioration).

Table 2: Mean, standard Deviation, Change, ICC between different assessments of each subscale.

HOOS subscales	HOOS Score						Change*	ICC (95% CI)	Cronbach's alpha (95% CI)
	First assessment		Second assessment		Third assessment				
	Mean	SD	Mean	SD	Mean	SD			
Symptom	56.32	15.43	51.51	16.32	44.24	17.69	-12.08	0.615 (0.410 - 0.749)	0.827 (0.675 - 0.899)
Pain	48.63	15.7	43.56	15.68	35.44	18.09	-13.19	0.568 (0.353 - 0.714)	0.798 (0.621 - 0.882)
ADL	49.58	16.92	44.93	16.98	36.22	19.99	-13.36	0.561 (0.371 - 0.699)	0.793 (0.639 - 0.874)
Sport/recreation	50.94	17.92	45.51	19.17	37.5	20.95	-13.44	0.561 (0.389 - 0.690)	0.793 (0.657 - 0.870)
QoL	45.87	15.71	42.21	15.99	34.78	18.26	-11.09	0.566 (0.400 - 0.692)	0.796 (0.666 - 0.871)

*Minus sign means that the condition of patient has been worsend over time (lower score = Deterioration).

distribution, as well as floor and ceiling effects. Floor effect is the percentage of patients who scored the lowest possible score (score of 0), and ceiling effect is the percentage of those with the highest score (score of 100). If more than 30% of the respondents had a floor or ceiling effect, the effects would be considered to be relevant.

It is hypothesized that HOOS evaluates hip disability through five dimensions, and this was investigated using factor analysis.

Spearman's correlation coefficient between HOOS and Western Ontario and McMaster Universities Arthritis Index (WOMAC) was calculated to test convergent validity of the HOOS. Since WOMAC has already been validated in Arabic speaking countries, higher correlation coefficient would prove convergent validity of the HOOS. Nonetheless, it is important to note that higher score on WOMAC indicates greater disability, while patients with greater disability would score low on HOOS. This means that negative correlation betwwen WOMAC and HOOS would prove that HOOS is a valid instrument for assessing hip disability.

Questionnaires

Hip disability and ostheoarthritis outcome score (HOOS)

The HOOS is a patient-administered questionnaire that consists of 40 items, which are answered using a Likert-type scale. These items are divided into 5 subscales: pain (10 items), symptoms (5 items), activity of daily living (17 items), sport and recreation (4 items), and hip related quality of life (4 items). Scores are calculated for each subscale separately by transforming raw data to a 0-100 point scale – where 0 indicates extreme pain and discomfort, and 100, on the other hand, indicates that respondent has no problems [16].

When answering the questions, patients are asked to recall a period of the last week before the testing occurs. The HOOS takes approximately 10-15 minutes to complete.

All 110 patients had completed HOOS in at least two different occasions (T1 and T2), and 106 of them completed it a third time (T3). There were two and a half weeks between each of these three occasions.

Western ontario and mcmaster universities osteoarthritis index (WOMAC) [8]

24 Likert-type items make this WOMAC, and using it, every patient gets three scores, from three different subscales. First subscale – pain – has 5 questions (score range 0-20), 2 questions address stiffness (score range 0-8), and physical function has 17 questions (range 0-68). A 0 score on each of the subscales means that patient essentially has not felt any discomfort in his/her hip (if any); on the other hand, a higher score suggests greater disability.

The survey was taken on two different occasions, and 2 weeks had passed between the two testing situations.

Results

Psychometric analysis

Womac questionnaire: WOMAC has been validated in Arabic speaking countries, and since then it has been used in practice. Nevertheless, additional analyses have been conducted in order to explore psychometric characteristics of a WOMAC questionnaire that had been used in this study.

Test reliability for the first testing situation - calculated using Cronbach's alpha - was 0.98 for the pain subscale, 0.98 for the stiffness, and 0.99 for the physical function subscale. For the second testing, reliability was 0.99, 0.97, and 0.99 (pain, stiffness, and physical function, respectively). This only proves that WOMAC is an instrument with good reliability.

In order to check content validity, floor and ceiling effects were examined. 10% of the patients have recorded floor effect on pain subscale, 14% on stiffness subscale, and 12% on the physical function. On the other hand, 3% have recorded ceiling effect on pain subscale, 3% on stiffness subscale, and 3% on the physical function. Being that these percentages are far less than 30% (which is considered relevant)

Table 3: Descriptive statistics of HOOS questionnaire.

Assessment	Subscale	N[1]	Min[2]	Max[3]	Mean	SD[4]	Floor effect	Ceiling effect
First	S[7]	110	5	80	56.1	15.44	0%	0%
	P[8]	110	0	77.5	48.4	15.7	2%	0%
	A[9]	110	0	76.5	49.6	16.92	1%	0%
	SR[10]	110	0	81.3	51	17.93	2%	0%
	Q[11]	110	0	75	45.9	15.71	5%	0%
Second	S	110	0	80	51	16.32	1%	0%
	P	110	0	77.5	43.3	15.68	2%	0%
	A	110	0	76.5	44.7	16.99	2%	0%
	SR	110	0	81.3	45.1	19.17	2%	0%
	Q	110	0	75	42	15.99	5%	0%
Third	S	106	0	80	44.2	17.7	1%	0%
	P	106	0	82.5	35.4	18.09	5%	0%
	A	106	0	88.2	36.2	19.99	7%	0%
	SR	106	0	93.8	37.5	20.95	6%	0%
	Q	106	0	75	34.8	18.26	10%	0%

Note: 1: Sample size; 2: Minimum; 3: Maximum; 4: Standard deviation; 5: Skewness; 6: Kurtosis; 7: Symptoms; 8: Pain; 9: Activity of daily living; 10: Sport and recreation; 11: Quality of life.

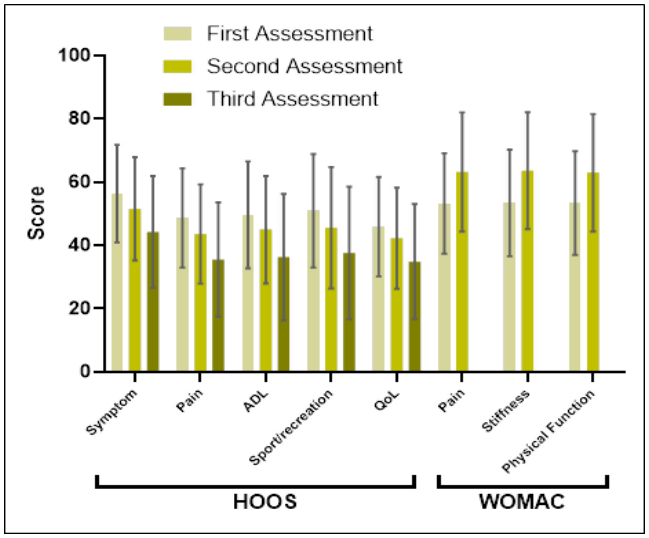

Figure 1: Mean score along with their standard deviations of each subscale during 3 different assessments for HOOS and 2 different assessments for WOMAC questionnaire. Decrease of mean score in HOOS, Increase mean score in WOMAC = worsened condition.

– this is an argument in favour of content validity of WOMAC.

A 2 weeks' test-retest reliability was applied to the present manuscript. Of the 110 patients that fulfilled the questionnaire, 107 responded to the second assessment after the initial evaluation.

Test-retest reliability was determined using intra-class correlation coefficient (ICC) (two-way random effects model, absolute agreement) [16]. According to the previously published by Koo et al [17], based on the 95% confident interval of the ICC estimate, values less than 0.5, between 0.5 and 0.75, between 0.75 and 0.9, and greater than 0.90 are indicative of poor, moderate, good, and excellent reliability, respectively. As shown in table 1, considering 95% of confidence interval, WOMAC subscales show moderate retest reliability ($0.5 < ICC < 0.75$), while illustrating acceptable to strong internal consistency among two assessments for pain ($\alpha = 0.735$), stiffness ($\alpha = 0.745$) and physical function ($\alpha = 0.768$).

Hip disability and ostheoarthritis outcome score (HOOS)

To test the reliability of the instrument, Cronbach's alpha was calculated. For each of the three testing occasions the reliability of each subscale was excellent – $\alpha 1 = 0.99$, $\alpha 2 = 0.99$, and $\alpha 3 = 0.99$. Intra-class correlation coefficients for each of the subscales was between 0.56 (Activity of daily living subscale) and 0.62 (Symptoms subscale), and this puts them all in a category of instruments with moderate reliability.

Test-retest reliability was also performed using Intra-class Correlation (ICC). The results (Table 2) indicated that subscale "symptoms" has the highest intra-class correlation with 0.615 (95% CI 0.410, 0.749), while the other subscales of HOOS show moderate level (~ 0.56) of retest reliability.

In order to be able to compare the results of WOMAC questionnaire with those from HOOS, it was important to standardize the scores of WOMAC to the range of 0-100. Figure 1 illustrates the change and the mean level of different subscales in different during different assessments which were conducted 2 weeks apart from each other. It is visually evident that the mean score of HOOS subscales decreased which is related to more pain and symptoms. At the same time the WOMAC mean score is showing an upward trend, which is also related with more pain and in general worsened conditions of the patient. This illustrates a visual agreement between the two questionnaires.

Floor effect was only once recorded above 5%, and that was in testing situation 3 for subscale Hip related quality of life. For all other subscales, in all the test periods, floor effect was 5% or less. On the

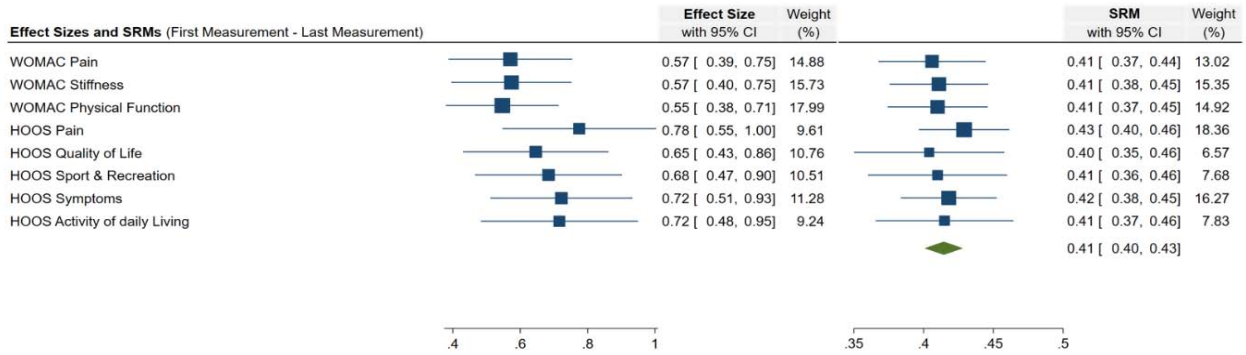

Figure 2: Forest Plot of Effect Sizes and SRMs for the WOMAC subscales and HOOS subscales. Bars represent the 95% confidence intervals.

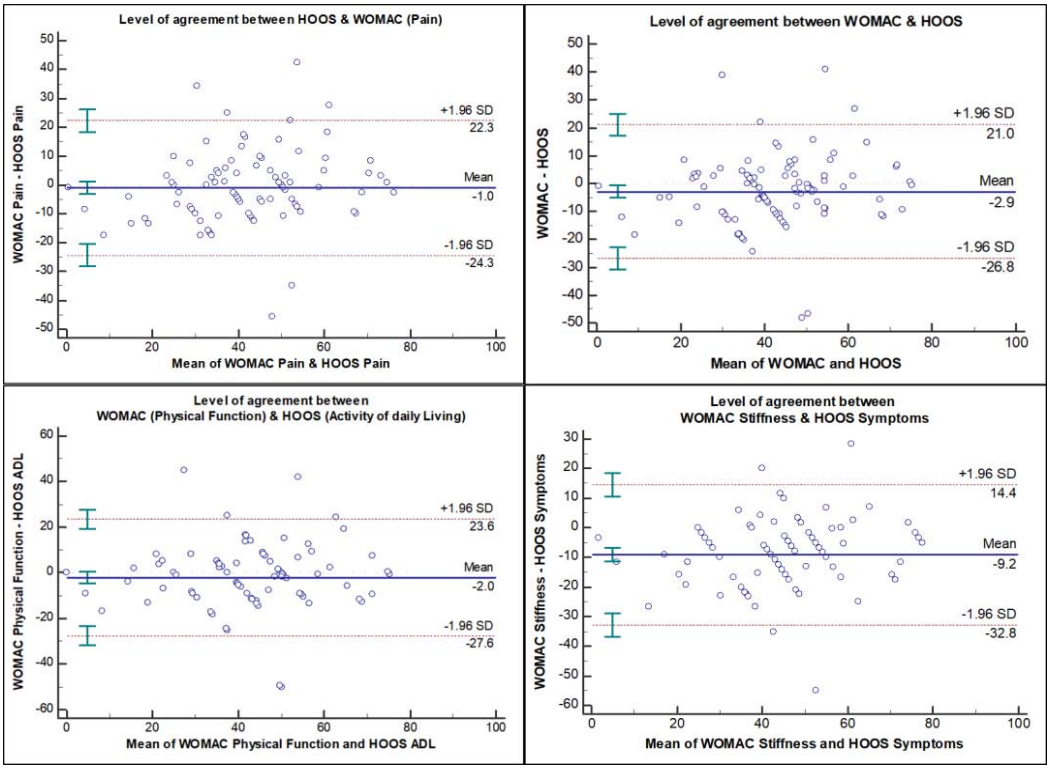

Figure 3: Bland-Altman Plot to demonstrate the level of agreement between difference subscales of HOOS and WOMAC.

other hand, no ceiling effect was recorded for any of the subscales. Shapiro-Wilk test was used to check if the data significantly deviates from the normal distribution, and it showed that it did – in all three time periods all of the subscales deviate from a normal distribution.

In order to test factor validity, factor analysis was performed; first, principal components analysis, and then principal axis factoring (with Direct Oblimin rotation). Both have yielded one factor that explains 86% of the variance.

As can be seen in the table below, there are medium to large negative correlations between all of the HOOS subscales on one side, and the subscales from the WOMAC questionnaire on the other. This shows that patients with high scores on WOMAC have low scores on HOOS. This means that those who experience greater hip pain have higher scores on WOMAC, and lower HOOS.

Responsiveness

14 patients (13.1%) reported overall relevant improvement in their condition by responding to the WOMAC questionnaire, while 53 patients (49.5%) reported worsening of their condition, and 40 of participants remained stable (37.4%). On the other hand, only 3 patients (2.8%) reported to remain stable by responding to HOOS questionnaire. The majority of them (81.1%) believed their condition to be deteriorated, and only 16% of them reported relevant improvement after 2 weeks. In addition, it is relevant to note that 14 patients (12.7%) showed opposite responses (improvement according to WOMAC and deterioration according to HOOS and vice versa).

Effects are often used to give meaning to change over time in

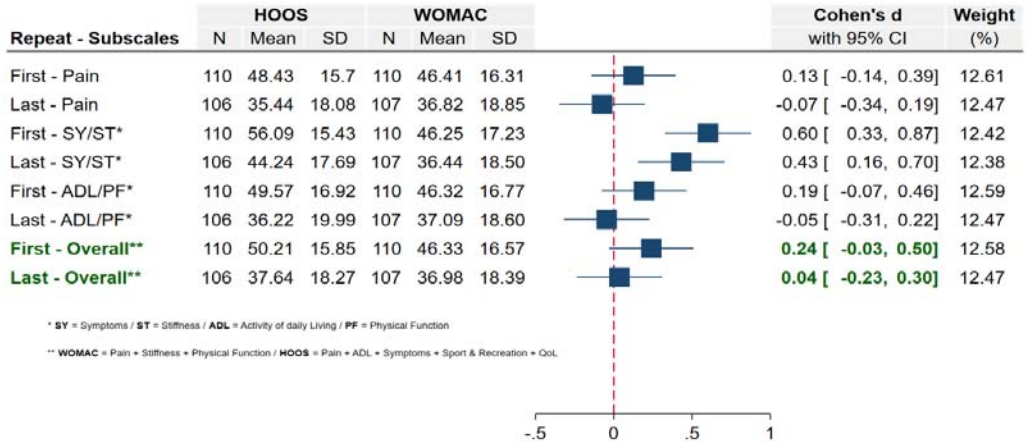

Figure 4: Forest plot illustrating the Effect Size (Cohen's d) along with 95% confidence interval. First and last measurement of three subscales (Pain, Symptoms/ Stiffness, Activity of daily living (ADL)/Physical Function (PF)) between HOOS and WOMAC are compared together. Note: WOMAC scores are rescaled in the range of 0-100 and then reverse coded to match HOOS scores (0 = highest pain, symptoms, 100 = No pain, symptoms).

Table 4: Convergent validity of the HOOS (Spearman's rank correlation coefficient).

	WOMAC		
	Pain	**Stiffness**	**Physical function**
First Assessment			
HOOS Symptoms	-.54**	-.53**	-.52**
HOOS Pain	-.48**	-.46**	-.45**
HOOS Activity of daily living	-.41**	-.42**	-.42**
HOOS Sport and recreation	-.38**	-.40**	-.40**
HOOS Quality of life	-.51**	-.51**	-.52**
Second Assessment			
HOOS Symptoms	-.45**	-.48**	-.52**
HOOS Pain	-.44**	-.49**	-.50**
HOOS Activity of daily living	-.34**	-.39**	-.41**
HOOS Sport and recreation	-.39**	-.42**	-.43**
HOOS Quality of life	-.45**	-.47**	-.47**

Note: **Correlation is significant at the 0.01 level (2-tailed).

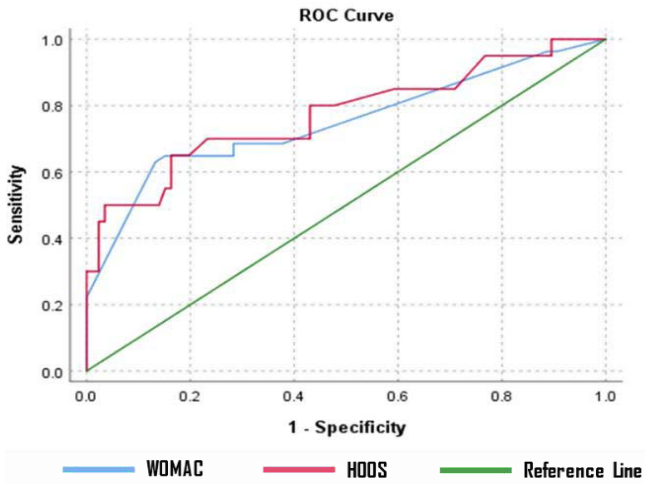

Figure 5: ROC Curve to determine how well/different WOMAC and HOOS are distinguishing between patients who are reporting improvement and those who are reporting worsening of their condition.

terms of 'trivial' (ES < 0.20), 'small' (ES ≥ 0.20 < 0.50),'moderate' (ES ≥ 0.50 < 0.80) or 'large' (ES ≥ 0.80) change. Cohen 26 introduced this 'matched pairs' effect size, which was later renamed the standardised response mean (SRM) by Liang et al [18]. According to responsiveness test, WOMAC subscales show similar responsiveness (SRM = 0.41) between first and second measurement. Among HOOS subscales, the most responsive scale was the pain scale (SRM = 0.43), while Quality of life scale resulted in the lowest responsiveness statistics (SRM = 0.40) among HOOS subscales. This is important to note, however, that responsive change of subscales of both questionnaires are very similar and the differences are not considerable (Figure 2).

Level of agreement between WOMAC & HOOS

One of the best methods to measure the level of agreement between two measurement methods is Bland-Altman plot. In this method, the mean difference between WOMAC and HOOS subscales are plotted as a function of mean of WOMAC and HOOS subscales. Three subscales of each questionnaire are compared to each other, since they are believed to be equivalent (Pain, Symptoms/Stiffness and Activity of Daily living/Physical Function). As shown in the graphs, no systemic bias is observed between WOMAC and HOOS, when it comes to "Pain" (M = -1.0, 95% CI -3.26 – 1.23, p = 0.372) and "Physical function/Activity of daily living" (M = -1.99, 95% CI -4.45 – 0.47, p = 0.112) subscales, however, when the subscales "Symptoms" from HOOS and "Stiffness" from WOMAC are compared to each other, it is shown that their mean clearly deviate from each other (M = -9.18, 95% CI -11.45 - 6.91, p < 0.001) which means there is a systemic bias.

Overall mean difference between WOMAC and HOOS shows that there could be a systemic bias between two questionnaires (M = -2.89, 95% CI -5.19 - -0.59, p = 0.014). In order to test this result, linear regression was performed with mean difference between WOMAC and HOOS as a dependent variable and mean value of WOMAC and HOOS as independent variable. In contrast to Bland-Altman plot, the result of linear regression indicates no statistically significant

Table 5: Effect Sizes and SRMs for the WOMAC subscales and HOOS subscales. Bars represent the 95% confidence intervals.

Questionnaire	Subscales	Effect Size (Cohen's d)	95% CI		SRM	95% CI	
WOMAC	Pain	0.571	0.387	0.751	0.406	0.358	0.434
	Stiffness	0.574	0.395	0.749	0.411	0.366	0.436
	Physical Function	0.547	0.378	0.709	0.41	0.363	0.434
HOOS	Pain	0.775	0.546	0.999	0.429	0.387	0.451
	Quality of Life	0.646	0.436	0.864	0.404	0.33	0.437
	Sport & Recreation	0.684	0.473	0.906	0.41	0.339	0.438
	Symptoms	0.722	0.512	0.93	0.418	0.374	0.442
	Activity of daily Living	0.716	0.472	0.934	0.415	0.346	0.444

difference between the two measurement methods (β = 0.107, 95% CI -0.054 – 0.269, t = 1.319, p = 0.190) (Figure 3).

In order to further investigate the level of agreement between HOOS and WOMAC over time, especially for the three subscales which are supposed to be equivalent in HOOS and WOMAC (Pain, Symptoms/Stiffness, Activity of daily living (ADL)/Physical Function(PF)), Effect size, namely Cohen's d, was calculated, as shown in Figure 4. Subscale Symptom (HOOS)/Stiffness (WOMAC) show the highest effect size (d = 0.6, 95% CI 0.16 – 0.70), which indicates that HOOS scores for Symptoms are higher than WOMAC scores for Stiffness. Cohen's d value is 0.24 (95% CI, -0.03 – 0.5) for the overall effect size when all subscales of each questionnaire are taken into account.

In order to compare the diagnostic performance of two measurement methods (WOMAC and HOOS), ROC curve analysis is also performed. In a Receiver Operating Characteristic (ROC) curve the true positive rate (Sensitivity) is plotted in function of the false positive rate (100-Specificity) for different cut-off points. Each point on the ROC curve represents a sensitivity/specificity pair corresponding to a particular decision threshold. The purpose of the ROC curve in this study was to determine whether there is a similarity between two methods distinguishing between patients with improved conditions and those with worsened condition. As shown in the graph, Area under the curve (AUC) of both groups (WOMAC and HOOS) are very similar (AUCWOMAC = 0.749, AUCHOOS = 0.772). This observation is also confirmed by performing z-test (z = -0.279, 95% CI -0.184 – 0.138, AUC difference = -0.023, p = 0.780).

Discussion

The primary objective of this study was to create a reliable and valid Arabic version of HOOS by translation and adaptation. For this purpose, the Arabic version of HOOS is compared to the efficacy and results of WOMAC questionnaire. Preliminary validity and reliability tests revealed that there is moderate reverse correlation between WOMAC subscales and HOOS subscales, which indicated that they are related in the right direction, since their scores are in the opposite directions (0 for WOMAC = no pain / 0 for HOOS = extreme pain).

However, Altman and Bland set out their views regarding the correct analysis of the data gathered in studies of this type and pointed out it is not appropriate to us the correlation coefficient between the two measurements is as a measure of agreement [19]. Since they pointed out that methods can correlate well yet disagree greatly, as would occur if one method read consistently higher than the other. That's why Bland-Altman Plot was used to measure the level of agreement between WOMAC and HOOS. According to Nilsdotter et al [20]. WOMAC subscales (Pain, Stiffness and Physical function) can be equivalent to three subscales of HOOS (Pain, Symptoms and Activity of daily living). Based on these assumptions, these three subscales of WOMAC and HOOS are compared to each other over time. The Bland-Altman plots indicated that Pain subscale in HOSS is a great substitute for Pain subscale in WOMAC, since the within subject differences were statistically zero. The same condition was also valid for "Activity of Daily living" subscale in HOOS, which proved to have strong agreement with "Physical function" subscale in WOMAC. However, when it comes to subscale "Symptoms/Stiffness", there is clearly a systemic bias between the two questionnaires, which indicate that Symptoms in HOOS are not a good substitute for "Stiffness" in WOMAC. It could be due to the fact that subscale "Stiffness" covers much narrower conditions than subscale "Symptoms", which could lead to discrepancies between them. The illustrated forest plots, and effect sizes, showed that HOOS scores was generally higher than WOMAC score, but this difference cannot be considered to be strong and relevant. ROC Curve analysis was also performed, and the strength of both methods to distinguish between improved and deteriorated condition are examined. Since both methods showed similar area under the curve (AUC), it could be concluded that HOOS and WOMAC are similar to explain the condition of patients.

There is a significant difference between the Arabic culture and the Western culture, especially in terms of the requirement to sit or squat in the tailor position, mostly for members of the geriatric population (the elderly people). Lifestyle practices that involve sitting and sleeping on the floor act as great risk factors for Total Hip Arthroplasty (THA) revision [10, 11]. Because there are many cases of hip osteoarthritis in the Arab world, it is necessary to procure validated instruments that permits self-assessment of patients and can be used for comparison of studies on an international level. It is pertinent to state that the Hip Disability and Osteoarthritis Outcome Score (HOOS) has been cross-culturally adapted into Arabic and validated for Hip OA patients.

Questionnaires distributed were completed. Very few had missing data. While we made no observation for the OA group with respect to ceiling and floor effects, the THA Pain and Symptoms subscales had a visible ceiling effect. This can be understood because post-surgery pain relief contrasts with preoperative osteoarthritis patients

experiencing various disabilities.

We made comparisons between the internal consistency results and those documented in other language versions of the Hip Disability and Osteoarthritis Outcome Score [11-13]. For the Activities of Daily Living (ADL) subscale, Cronbach's alpha was the highest (0.99 – physical function subscale), which is in line with past validation studies (0.94 for the French version, 0.96 for the Korean, and 0.98-0.95 for the THA/OA group - Dutch version) [11-13]. Internal consistency for symptoms subscale (pain & stiffness) was at a satisfactory level (0.99/0.97 respectively) also in line with other reports (0.75 for the Korean version, 0.95/0.94 in the Dutch version) [12, 13].

The five subscales of the Hip Disability and osteoarthritis Outcome Score had a high correlation with the SF_36 BP subscale, which also presented in the Dutch validation [12]. The moderate correlation between the ADL of the HOOS and the pain subscales and the NAS-J-HIP acceptance subscale may be a reflection of the fact that the primary symptoms of hip osteoarthritis are ADL disability and pain. This agrees with Koyama et al [14], who believed that improvement of HRQoL might be possible through pain control and by promoting acceptance. However, there is need for further research to validate this point.

High responsiveness creates the possibility of reducing the number of subjects required to demonstrate a significant difference between the groups. In our study, we observed a significant improvement in HOOS after THA, and thus could be valuable for evaluation of responsiveness.

The study has several limitations that could influence final interpretations. These include:

- Both groups do not have the same number of patients
- Few patients participated in the responsiveness testing
- Follow-up times for responsiveness testing had a wide range rather than a consistent time. This will be tackled in future studies no doubt.
- Uneven distribution of samples. Samples may not be a proper representation of the Arabic population only including pre and post-surgery patients, and
- Limited comparisons to other language cross-cultural adaptations of hip outcome scores with respect to responsiveness to treatment with hyaluronic acid.

Although visco-supplementation is recognized by the Osteoarthritis Research Society International (OARSI) guidelines for the treatment of the hip osteoarthritis, Arab patients did not benefit from it, and therefore not included in our sample. Future studies will include cases with medical treatments such as this, with the goal of addressing the role of intra-articular hyaluronic acid applications in symptomatic hip joint osteoarthritis.

Conclusion

The primary purpose of this study was to create a reliable and valid Arabic version of HOOS by translation and adaptation. For this purpose, the Arabic version of HOOS is compared to the efficacy and results of WOMAC questionnaire. Its reliability - calculated both through Cronbach's alpha and ICC - was good or moderate. Although the distributions for all subscales deviate from a normal one, no significant ceiling or floor effects were observed.

Correlation with WOMAC subscales are medium to large, which points to its convergent validity. Bland-Altman plot indicated that there is a very good agreement between Pain subscale of HOOS and WOMAC, which was also valid between Physical function in WOMAC and ADL in HOOS. Overall, Arabic version of HOOS proved to be a good diagnostic tool for patients with hip problems, but it is important to pay extra attention about the differences in symptoms expressed in HOOS in comparison to WOMAC.

References

1. Kanavaki AM, Rushton A, Efstathiou N, Alrushud A, Klocke R, Abhishek A, et al. Barriers and facilitators of physical activity in knee and hip osteoarthritis: a systematic review of qualitative evidence. BMJ Open. 2017; 7: e017042.
2. Salmon JH, Rat AC, Sellam J, Michel M, Eschard JP, Guillemin F, et al. Economic impact of lower-limb osteoarthritis worldwide: a systematic review of cost-of-illness studies. Osteoarthritis and Cartilage. 2016; 24: 1500–1508.
3. Rahmati M, Mobasheri A, Mozafari M. Inflammatory mediators in osteoarthritis: A critical review of the state-of-the-art, current prospects, and future challenges. Bone. 2016; 85: 81–90.
4. Marshall AR, Noronha M. de, Zacharias A, Kapakoulakis T, Green R. Structure and function of the abductors in patients with hip osteoarthritis: Systematic review and meta-analysis. Journal of Back and Musculoskeletal Rehabilitation. 2016; 29: 191–204.
5. Murphy NJ, Eyles JP & Hunter DJ. Hip Osteoarthritis: Etiopathogenesis and Implications for Management. Advances in Therapy. 2016; 33: 1921–1946.
6. Rahmati M, Mobasheri A & Mozafari M. Inflammatory mediators in osteoarthritis: A critical review of the state-of-the-art, current prospects, and future challenges. Bone. 2016; 85: 81–90.
7. Roos EM, Roos HP, Lohmander LS, Ekdahl C & Beynnon BD. Knee Injury and Osteoarthritis Outcome Score (KOOS)—Development of a Self-Administered Outcome Measure. Journal of Orthopaedic & Sports Physical Therapy. 1998; 28: 88–96.
8. M Klassbo, E Larsson, E Mannevik. Hip disability and osteoarthritis outcome score. An extension of the Western Ontario and McMaster Universities Osteoarthritis Index. Scand J Rheumatol. 2003; 32: 46-51.
9. Nilsdotter A, and Bremander A. Measures of hip function and symptoms: Harris Hip Score (HHS), Hip Disability and Osteoarthritis Outcome Score (HOOS), Oxford Hip Score (OHS), Lequesne Index of Severity for Osteoarthritis of the Hip (LISOH), and American Academy of Orthopedic Surgeons (AAOS) Hip and Knee Questionnaire. Arthritis Care & Research. 2011; 63: 200-207.
10. Satoh M, Kawaguchi T and Masuhara K. Risk factors for revision total hip arthroplasty: emphasis on the characteristics of Japanese lifestyle. Arch Orthop Trauma Surg. 2009; 129: 1707–1713.
11. Mulholland SJ and Wyss UP. Activities of daily living non-Western cultures: range of motion requirements for hip and knee, joint implants. Int Rehabil Res. 2001; 24: 191–198.
12. Ornetti P, Parratte S, Gossec L, Tavernier C, Argenson JN, Roos EM, et al. Cross-cultural adaptation and validation of the French version of the hip disability and osteoarthritis outcome score (HOOS) in hip osteoarthritis patients. Osteoarthritis Cartilage. 2010; 18: 522–552.
13. de Groot IB, Reijman M, Terwee CB, Bierma-Zeinstra SM, Favejee M, Roos EM, et al. Validation of the Dutch version of the hip disability and osteoarthritis outcome score. Osteoarthritis Cartilage. 2007; 15: 104–109.
14. Lee YK, Chung CY, Koo KH, Lee KM, Lee DJ, Lee SC, et al. Transcultural adaptation and testing of psychometric properties of the Korean version of the Hip Disability and Osteoarthritis Outcome Score (HOOS). Osteoarthritis Cartilage. 2011; 19: 853–857.

15. Koyama Y, Miyashita M, Kazuma K, Suzukamo Y, Yamamoto M, Karita T, et al. Preparing a version of the Nottingham Adjustment Scale (for psychological adjustment) tailored to osteoarthritis of the hip. J Orthop Sci. 2006; 11: 359–364.

16. Shrout PE, Fleiss JL. Intraclass correlations: uses in assessing rater reliability. Psychol Bull. 1979; 86: 420–428.

17. Koo TK, Li MY. A Guideline of Selecting and Reporting Intraclass Correlation Coefficients for Reliability Research. Journal of chiropractic medicine. 2016; 15: 155–163.

18. Liang MH, Fossel AH, Larson MG. Comparisons of five health status instruments for orthopedic evaluation. Medical Care. 1990; 28: 632-642.

19. Altman DG and Bland JM. Measurement in medicine: the analysis of method comparison studies. Statistician. 1983; 32: 307–317.

20. Nilsdotter AK, Lohmander LS, Klässbo M, Roos EM. Hip disability and osteoarthritis outcome score (HOOS)-validity and responsiveness in total hip replacement. BMC musculoskeletal disorders. 2003; 4: 10.