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Original Research

Translation, Cross-Cultural Adaptation, and Validation of the Persian Version of the Harris Hip Score

Ghazal Hashemi Zenooz, PhD[a], Afshin Taheriazam, MD[b, c], Zahra Mosallanezhad, PhD[a], Charles Philip Gabel, PhD[d], Markus Melloh, MD, PhD[e], Hamid Reza Mokhtarinia, PhD[f, *]

[a] Department of Physiotherapy, University of Social Welfare and Rehabilitation Sciences, Tehran, Iran
[b] Department of Orthopedics, Faculty of medicine, Tehran Medical Sciences, Islamic Azad University, Tehran, Iran
[c] Farhikhtegan Medical Convergence Sciences Research Center, Farhikhtegan Hospital Tehran Medical Sciences, Islamic Azad University, Tehran, Iran
[d] Access Physiotherapy, Coolum Beach, Sunshine Coast, QLD, Australia
[e] Queensland University of Technology, School of Public Health and Social Work, Brisbane, Australia
[f] Department of Ergonomics, University of Social Welfare and Rehabilitation Sciences, Tehran, Iran

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ABSTRACT

Background: The Harris hip score (HHS), a self-administered questionnaire, is widely used to evaluate hip pathology affecting health-related quality of life and physical function. This study's purpose was HHS translation to Persian (HHS-Pr) and validation in patients with different hip pathologies.
Methods: Translation and cultural adaptation followed existing guidelines. Hip pathology patients (n = 151) completed the HHS, 12-Item Health Survey, and the Western Ontario and McMaster Universities Arthritis Index (WOMAC). Criterion validity was determined from comparisons between the HHS measures and the different corresponding WOMAC domains. Internal consistency used Cronbach's alpha (α), content validity the "content validity index," and floor/ceiling effect the end-range 15%. Test-retest reliability used the intraclass correlation coefficient (subsample n = 30) at 3-7 days that compared baseline with a repeated measure. Measurement precision and change sensitivity used longitudinal assessment (subgroup n = 30) from the standard error of the measurement and minimal detectable change.
Results: Cross-cultural adaptation required minor wording changes. The mean HHS-Pr was 57.77 ± 19.69. Criterion validity was significant with the WOMAC (r = −0.76) and 12-Item Health Survey Physical Component Summary (r = 0.47). Internal consistency was high before (α = 0.75) and after standardization (α = 0.86). Content validity was satisfactory (content validity index = 0.88). No floor/ceiling effects were found. Test-retest reliability (intraclass correlation coefficient = 0.85) was excellent, as was standard error of the measurement (raw score = 5.8) and minimal detectable change (raw score = 11.4).
Conclusions: The HHS-Pr demonstrated adequate validity, reliability, and sensitivity to change. These psychometric properties sufficiently measure functional status in patients with hip pathologies in a Persian-speaking population.

Introduction

Hip osteoarthritis (HOA) is a prevalent degenerative arthritis caused by the wearing down of the articular cartilage layers [1] and leading to pain, stiffness, and decreased functional mobility [2]. Several tools are available to evaluate the functional status and success of interventions in osteoarthritis patients. Among the available patient-reported outcome measures (PROMs) [3,4], the regional and joint-specific PROMs are more appropriate in the research and clinical setting due to their cost-effectiveness, time consumption, and administrative burden [5,6]. The Harris hip score (HHS) is a widely used tool for evaluation of hip pathologies [7,8]. It was originally developed to assess the pain, function, range of motion, and deformity of HOA patients. The HHS has been translated and validated into different languages such as Turkish, Arabic, Portuguese [9–11], Italian [1], and Slovenian [8].

* Corresponding author. Department of Ergonomics, University of Social Welfare and Rehabilitation Sciences, Kodakyar Avenue Daneshjo Boulevard, Evin, 1985713834 Tehran, Iran. Tel.: +98 212 218 0119.
E-mail address: Hrmokhtarinia@yahoo.com

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In a recent Persian study by Mirghaderi et al [12], the Persian version of HHS was provided, but serious limitations were noted. These indicate the need to conduct further research into this version as the Persian HHS was only assessed among patients undergoing total hip arthroplasty surgery, limiting the generalizability of the results. Further, only limited psychometric properties were evaluated, where crucial properties such as face and content validity were not considered. To assess the criterion validity, the use of generic health status scales is a priority for joint-specific or disease-specific scores, and this was not used in the Persian HHS study. Consequently, the aim of this study was to translate, culturally adapt, and evaluate the psychometric properties of reliability and validity of the translated Persian version of the HHS (HHS-Pr) in various conditions of hip pathology.

Material and methods

Study design

This cross-sectional study was approved by the ethical committee of University of Social Welfare and Rehabilitation Sciences. The data was collected from patients with a variety of hip pathologies who were referred to one of 3 orthopaedic clinics in Tehran city from September 2023 to November 2023.

Translation and cultural adaptation

The process of translation and cultural adaptation was performed in 5 stages in accordance with the recommendation guidelines [13]. Two independent native bilingual Persian translators performed the forward translation (stage 1). One of the translators was a physiotherapist who acted as a professional literary translator familiar with the topic, and an additional professional translator was unfamiliar with the subject. For *stage 2*, one researcher and one translator synthesized a general version of the Persian HHS (HHS-Pr). *Stage 3* involved 2 additional blinded bilingual translators who independently performed the back-translation into English. *In stage 4*, an expert committee composed of 2 physiotherapists, 2 orthopaedic surgeons, a psychologist, the 4 translators, and a methodologist obtained consensus on a prefinal HHS. *Stage 5* involved the pilot stage with a sample of n = 10 physiotherapists and orthopaedic surgeons for the physical examination section and n = 15 patients with different hip pathologies for the remaining sections who reached a consensus on the clarity of language, readability, understandability, and simplicity of the final HHS-Pr version made available for psychometric evaluation.

Psychometric properties evaluation

Six HHS-Pr psychometric properties were considered for evaluation: face and content validity, reliability, internal consistency, floor/ceiling effect, precision, sensitivity, and criterion validity. In the pilot test during stage 5 of the translation and cultural adaptation step, the participants were interviewed as detailed above, which verified face validity. Content validity index (CVI) as a measure of content validity was determined by 8 experts including a physiotherapist, an occupational therapist, and an orthopaedic surgeon. The proportion of experts that gave a rating of 3-4 on a 4-point Likert scale was considered as average (1 = not relevant, 4 = very relevant) [14,15]. Floor and ceiling effects were greater than 15% [15]. To determine the test-retest reliability by calculating the intraclass correlation coefficients ($ICC_{2,1}$), the HHS-Pr questionnaire was completed by the participants and professionals at 2 different appointments with an interval of 3-7 days during a period of no intervention [16]. Minimal detectable change (MDC) at the 95% limits of confidence (MDC_{95}) was calculated from (MDC_{95} = standard error of the measurement [SEM] $\sqrt{2}*1.96$) [17], where the SEM = standard deviation $\sqrt{1-ICC}$) [18]. Two Persian instruments, Western Ontario and McMaster Universities Arthritis Index (WOMAC) and SF12 [19,20], were used in this study as criteria for the criterion validity of the HHS-Pr.

Participants

Patients with hip pathology who visited one of 3 specialized hip orthopaedic clinics were considered for enrollment in the study. The inclusion criteria for pathology were arthritis, avascular necrosis, labral lesions, osteoporosis, arthroplasty, or fractures. Further inclusion criteria were the ability to read and understand the self-report questionnaires, an age of at least 40 years, medical stability, and willingness to participate. Exclusion criteria were the inability to complete the questionnaires, cognitive impairment, and lack of ability to understand the Persian language. According to the published guidelines [21], a subject-to-item ratio method is used for sample size determination in psychometric validation studies. It was shown that around 92% of the articles reported a subject to item ratio of $\geq$2, whereas 25% had a ratio of $\geq$20 [22]. We selected a ratio of 10 per item with a 15% dropout as our ratio precedent to ensure a minimum sample size. Consequently, with n = 151 (13 items of HHS) [23,24], we exceeded the required minimum of n = 130. A final sample of 151 patients was enrolled in the study. A subsample of n = 30 participants were randomly selected using a random number generator (an online tool) for test-retest reliability. An extra exclusion criterion, changes in the HOA treatment, was considered for reliability patients during the 3-7-day interval. All participants signed an informed consent prior to inclusion.

Instruments

Harris hip score (HHS)

The HHS is a joint-specific outcome measure with scores in the 4 domains of pain (44 points), function (47 points), deformity (4 points), and range of motion (5 points) (0 = extreme symptoms; 100 = no symptoms) [25] (score <70 = poor result; 70-80 = fair; 80-90 = good; 90-100 = excellent [26]).

Western Ontario and McMaster Universities Arthritis Index (WOMAC)

The WOMAC is a self-administered questionnaire [27] that consists of 24 questions divided into the 3 subscales of pain, stiffness, and physical function. For each question, a Likert scale of 0-4, none (0), mild (1), moderate (2), severe (3), and extreme are considered. Total WOMAC scores (0-96) are computed by summing the 3 subscale scores [1,28]. The Persian version of the WOMAC was used in the current study [20].

12-Item Short Form Survey (SF-12)

The 12-Item Short Form Survey (SF-12) is a general self-reported outcome measure that detects changes in health-related quality of life [1]. It covers 8 health domains in 2 subscales assess quality of life and is named the Physical Component Summary (PCS-12) and Mental Component Summary (MCS-12) [29]. The mean score is 50.0 ± 10.0 (range: 0-100), where a higher score indicates better quality of life. The Persian version of the SF-12 was used in this study [19].

Statistical analysis

Statistical analyses were conducted with Package for the Social Sciences (SPSS) ver. 17.5 (SPSS Inc., Chicago, IL). The level of significance for all statistical procedures was set at $P \leq .05$. Kolmogorov-Smirnov test was used to check the normal distribution of the data. The descriptive results for continuous and categorical variables were presented as mean ± standard deviation and percentages (%), respectively. Internal consistency was analyzed by calculating the Cronbach's alpha. Cronbach's α value of higher than 0.70 was considered satisfactory [30]. ICCs between 0.75 and 0.90 were considered good, and ICCs greater than 0.90 were excellent [30,31]. Pearson's coefficients greater than 0.5 were considered strong, between 0.35 and 0.5 moderate, and less than 0.35 weak [32].

Results

Translation and cultural adaptations

During the translation process, consensus on 2 domains of pain and distance were reached by the expert committee. In the pain domain, the term "aspirin" usage is not routine in Iranian culture and was substituted with the considered synonym for "painkillers" including nonsteroidal anti-inflammatory drugs (NSAIDs). In the "distance walked" domain, the "block" is an American term that is not familiar to Iranian people and was substituted with a duration time or meters as a clearer expression of the distance, where a city block in the United States is around 300 feet or about 100 meters long that, at a moderate walking pace for a healthy subject takes about 1-2 minutes on average. Hence, it was decided to keep both of the words duration time (30 minutes) and meters (1 kilometer) instead of "6 blocks" and accordingly the 10-15 minutes and 300-500 meters instead of "2 or 3 blocks." All other questions had no apparent difficulty.

Descriptive analysis

The mean age of patients was 48.16 ± 16.03 years, and n = 68 (45.03%) patients were male, and n = 83 (54.96%) patients were female. The majority of patients were diagnosed as HOA (n = 61, 40.39%). In patients where both hips were involved, the most painful side was considered for subsequent analysis (n = 26, 17.21%). The mean HHS and WOMAC scores were 57.77 ± 19.69 and 45.36 ± 18.04, respectively. The descriptive and clinical characteristics of the patients and obtained scores are detailed in Table 1.

Assessment of psychometric properties

Reliability results showed that the ICC values for single and average measures were 0.85 and 0.92, respectively. The Cronbach's alpha coefficient and Cronbach's alpha based on standardized items for evaluation of internal consistency were 0.75 and 0.86, respectively. The Cronbach's alpha following the alternating removal of each of the items is reported in Table 2.

The SEM and subsequent MDC_{95} confidence interval for the HHS-Pr total score were 5.78 and 11.39. This implies that in 95% of the patients, a change of 11 points or more is likely to represent a true change in overall HHS-Pr measured function.

The HHS-Pr had a strong correlation with the WOMAC total score (r = −0.76) and a moderate correlation with the PCS-12 of the SF-12 (r = 0.47). Both correlations were statistically significant. In contrast, a weak correlation (r = 0.12) and no significance ($P = .07$) were observed between the HHS-Pr and the SF-12 mental component.

Table 1
Descriptive statistics for clinical characteristics of patients (n = 151) and related questionnaire scores.

Variables	Mean ± SD	Frequency (percentage)
Age	48.16 ± 16.03	-
WOMAC score	45.36 ± 18.04	-
Harris hip score	57.77 ± 19.69	-
SF-12	32.08 ± 6.08	-
PCS-12	39.90 ± 5.10	-
MCS-12	45.96 ± 4.56	-
Gender		
Male	63.24 ± 11.05	68 (45.03%)
Female	56.89 ± 8.67	83 (54.96%)
Diagnosis		
Primary arthritis		61 (40.39%)
Unilateral THA	-	21 (13.90%)
Hip pain	-	18 (11.92%)
Congenital dislocation of hip		9 (5.96)
Femoral fracture	-	10 (6.62)
Osteoporosis		13 (8.60)
Bilateral THA	-	8 (5.30)
AVN Avascular necrosis	-	6 (3.98)
Revision THA	-	5 (3.31)

SD, standard deviation; THA, total hip arthroplasty.

All 8 experts endorsed the relevancy and validity of the total HHS-Pr (CVI = 0.88). No patients had the lowest total score, and just one patient (0.72%) had the highest score indicating no floor or ceiling effects.

Discussion

The HHS, with its 2 critical domains of pain and function, is one of approximately 20 related hip PROMs commonly used for the assessment of hip joint disease [10]. The HHS also serves as a reference measure in the criterion validity evaluation of other hip PROMs [33]. Another priority of the HHS is that it has a higher responsiveness compared to the other joint-specific PROMs such as the WOMAC [33] and generic PROMs such as the 36-Item Short Form Health Survey (SF-36) or SF-12 [34]. In addition to the above advantages, there are no other Persian PROMs for hip disease evaluation except the Hip disability and Osteoarthritis Outcome Score, though the Lower Limb Functional Index as a regional PROM is available in Persian; however there are no studies to date that have detailed these regional PROM psychometric properties in a hip-only population. Consequently, in the current study, the original HHS was considered for translation and evaluation of its psychometric properties in a Persian-speaking population.

To our knowledge, 6 different language versions of the HHS are available: in Italian [1], Arabic [10], Turkish [9], Portuguese [11], Slovenian [8], and recently in Persian [12]. Some minor changes due to the cultural difference were made in the HHS-Pr version. In the 2 domains of pain and function, some phrases were not familiar to Iranian people. Instead of "stronger than aspirin," we accepted the term "painkiller" or "NSAIDs" due to their higher prescription by the physician and common recognition within the Iranian society. In Iranian culture, there is a belief that drugs containing corticosteroids have stronger effects than aspirin or acetaminophen. Similar to our study, the term "aspirin" was considered as the synonym of "NSAIDs" [1], pain killers [8], and simple analgesics [11] in the Italian, Slovenian, and Portuguese versions, respectively. To define the walking distance, a more acceptable measure in Iranian society is duration in time and distance between 2 points in meters. We incorporated both phrases of duration time in minutes and distance in meters simultaneously in the final version of the HHS-

Table 2
Cronbach's alpha coefficients for the items of the HHS questionnaire.

Item	Scale mean if item deleted	Scale variance if item deleted	Corrected item-total correlation	Cronbach's alpha if item deleted
Pain	35.5325	142.300	.574	.772
Distance walked	51.7380	301.832	.729	.597
Activities (shoes, socks)	55.9983	347.958	.763	.640
Public transportation	57.7791	374.778	.566	.668
Support	49.6079	315.838	.460	.631
Limp	53.1558	315.439	.534	.623
Stairs	56.5051	348.959	.704	.641
Sitting	54.9161	343.292	.686	.636
Presence of deformity	55.9298	362.013	.268	.664
Total degrees of flexion	54.6127	382.295	.432	.676
Total degrees of abduction	57.7349	385.605	.069	.679
Total degrees of external rotation	58.0654	385.558	.152	.679
Total degrees of adduction	58.1846	385.751	.177	.679

Pr. Similar to our amendments, all other translated versions of the HHS altered the term “blocks” to be replaced by “duration time” [1,8–10]. As stated, several language and cultural adaptation changes were made in the current study during the translation and cultural adaptation process. In contrast to our study, in the recently published HHS-Pr, no corrections were made during the cultural adaptation process. This indicates that face validity has not been addressed.

Content validity evaluation through CVI was not measured in previous reported HHS versions, but as with the present study, no ceiling and floor effects were found in the Italian [1], Slovenian [8], Turkish [10], and Persian [12] versions. The internal consistency estimated by Cronbach’s α was 0.75 for the HHS-Pr, which is above the acceptable level cutoff (>0.70). Our results were similar to the Turkish and Persian (0.70), slightly lower than the Italian (0.816), and Slovenian (0.94), and higher than the Arabic (0.528) versions. Generally, if Cronbach’s alpha is higher than 0.90, it suggests that some items of an instruments are redundant. We did not observe such values in our results. Findings from internal consistency analysis in terms of the Pearson item-total correlations suggested that items of physical examination were not correlated with other items in pain and function. It may be that there is a need for further research to assess the short form or modified version of HHS without consideration of the physical examination items.

Results of the test-retest reliability through ICC calculations were good with an ICC of 0.85. In accordance with our results, previous studies [1,8–10,12] were similar and indicated that HHS-Pr was stable and reproducible in Persian patients. To explain the reliability result, it should be considered that the time interval between the 2 administrations is a critical factor. An interval of 3-7 days is recommended for assessing test-retest reliability that little change should occur in the patients’ health status and good reliability is expected for nonacute patients [35].

The MDC95% was 11.39 points, as calculated from the SEM. This is comparable to the previous published versions of the HHS, Turkish (13.3), and Slovenian (10.1) versions of the MDC reported values. The MDC reflects the lowest score change, which is the result of real change in patient condition status. For HHS-Pr, changes below the 11.39 point contribute to measurement error.

The criterion validity of the HHS-Pr was evaluated by comparison between 2 scales: the WOMAC as a disease-specific instrument and the SF-12 as a generic instrument. Criterion validity results identified that the correlation between the HHS and WOMAC was higher than with the SF-12. Generally, higher responsiveness is present for disease-specific PROMs in comparison to generic PROMs, and this known difference may justify this discrepancy [1]. The findings were similar to those of the Slovenian [8], Turkish [9], Persian [12] and Italian [1] versions, where the WOMAC was used with respective correlations of 0.87, 0.64, 0.69, and 0.75 for each language.

Two common generic instruments have been used in previous studies to test the criterion validity including convergent and discriminate validity of the HHS. The SF-12 was used in the Italian version with results similar to those of this study with a moderate correlation being found between the HHS and PCS-SF12 [1]. The SF-12 was selected as it is shorter than the SF-36 and therefore easier to administer to elderly patients with hip pathology.

In the other versions, ie, Arabic [10], Slovenian [8], and Turkish [9], the SF-36 as a generic instrument was considered. The SF-36 8 scales [including physical functioning, role limitations due to physical function, bodily pain, general health perceptions, vitality, social function, emotional function, and mental health] can be aggregated into 2 summary measures of the PCS and MCS scores the same as SF-12 [36]. A higher correlation with the Slovenian ($r = 0.687$) and Turkish ($r = 0.63$) versions confirmed the convergent validity of HHS. The PCS is directly related to the pain, function, and symptoms derived from the hip pathology itself, not to other matters such as social and mental factors. Hence, the higher correlation between the HHS and PCS-SF36 is reasonable. Further, a lower correlation between the HHS with the MCS of SF-36 in the Slovenian ($r = 0.548$) and Turkish ($r = 0.14$) versions [8,9] confirmed the divergent validity.

In the Arabic version, the MCS and PCS were not reported; however, the correlation between the total scores of the SF-36 and HHS ($r = 0.71$) were reported as strong criterion validity [10]. In the recently published HHS-Pr [12], unfortunately, the authors did not use generic health status scales to evaluate the criterion validity. Consequently, the comparison of the results is not possible.

Limitations

There are some limitations to our study. The sample size in current study was limited, and participating subjects may not be representative of the entire Iranian subject population with hip pathology.

For test-retest reliability analysis, a 3-7-day interval was considered. Though this presents a stable condition for the subacute to chronic patients during this interval time, it could not be verified as an anchor-based measure of overall status was not concurrently made.

Further, the HHS is considered a legacy PROM as it has been some decades since it was developed, and PROMs with improved methodology are available. Further, the dual requirement for both patient and clinician input detracts from the overall practicality and utility of the PROM.

Strengths

Criterion validity evaluation of the HHS-Pr against both generic and disease-specific questionnaires can be regarded as a study strength. Similarly, for both face and content validity simultaneous evaluation.

Conclusions

This study showed that the HHS was accurately translated into a Persian version that was a reliable and valid measure of hip function in Iranian patients with hip pathology. Consequently the study allows new comparisons between Persian-speaking patients and other already validated HHS versions and the assessment of these patients with this PROM in the clinical setting.

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Conflicts of interest

The authors declare there are no conflicts of interest.

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Ethical approval

This study was approved by the Ethics Committee of the University of Social Welfare and Rehabilitation Sciences, (code: IR.USWR.REC.1402.132).

Availability of data and material

The data that support the findings of this study are available from the corresponding author, HamidReza Mokhtarinia, upon reasonable request.

CRediT authorship contribution statement

Ghazal Hashemi Zenooz: Data curation, Project administration, Writing – review & editing. **Afshin Taheriazam:** Investigation, Methodology, Supervision, Writing – review & editing. **Zahra Mosallanezhad:** Conceptualization, Formal analysis, Methodology, Supervision, Writing – review & editing. **Charles Philip Gabel:** Conceptualization, Methodology, Validation, Writing – original draft, Writing – review & editing. **Markus Melloh:** Conceptualization, Methodology, Writing – review & editing. **Hamid Reza Mokhtarinia:** Writing – review & editing, Methodology, Conceptualization, Supervision, Validation, Writing – original draft.

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References

[1] Dettoni F, Pellegrino P, La Russa MR, Bonasia DE, Blonna D, Bruzzone M, et al. Validation and cross cultural adaptation of the Italian version of the harris hip score. Hip Int 2014;25:91–7. https://doi.org/10.5301/hipint.5000184.
[2] Aresti N, Kassam J, Nicholas N, Achan P. Hip osteoarthritis. BMJ 2016;354:i3405. https://doi.org/10.1136/bmj.i3405.
[3] Garratt AM, Moffett JK, Farrin AJ. Responsiveness of generic and specific measures of health outcome in low back pain. Spine 2001;26:71–7.
[4] Williams K, Sansoni J, Morris D, Grootemaat P, Thompson C. Patient-reported outcome measures. 2016. https://safetyand quality.gove=.au/sites/default/files/migrated/migrated/PROMs-stakeholder-interviews-report-2018.pdf. [Accessed 16 April 2024].
[5] Cleland J, Gillani R, Bienen EJ, Sadosky A. Assessing dimensionality and responsiveness of outcomes measures for patients with low back pain. Pain Pract 2011;11:57–69.
[6] Walton DM. Making (common) sense of outcome measures. Man Ther 2015;20:723–6.
[7] Hoang-Kim A, Schemitsch E, Kulkarni AV, Beaton D. Methodological challenges in the use of hip-specific composite outcomes: linking measurements from hip fracture trials to the international classification of functioning, disability and health framework. Arch Orthop Trauma Surg 2014;134:219–28. https://doi.org/10.1007/s00402-013-1824-4.
[8] Josipović P, Moharič M, Salamon D. Translation, cross-cultural adaptation and validation of the slovenian version of harris hip score. Health Qual Life Outcomes 2020;18:335. https://doi.org/10.1186/s12955-020-01592-w.
[9] Celik D, Can C, Aslan Y, Ceylan HH, Bilsel K, Ozdincler AR. Translation, cross-cultural adaptation, and validation of the Turkish version of the harris hip score. Hip Int 2014;24:473–9.
[10] Alshaygy I, Alageel M, Aljurayyan A, Alaseem A, Griffen A, Arafah O, et al. Cross-cultural adaptation and validation of the Arabic version of the harris hip score. Arthroplasty Today 2023;19:100990. https://doi.org/10.1016/j.artd.2022.07.006.
[11] Dettoni F, Peelgrino P, La Russa MR, Bonasia DE, Blonna D, Bruzzoni M, et al. Validation and cross cultural adaptation of the Italian version of the Harris Hip Score. Hip Int 2015;25:91–7. https://doi.org/10.5301/hipint.5000184.
[12] Mirghaderi P, Ghaseminejad-Raeini A, Azarboo A, Mirghaderi R, Ravanbod H, Mortazavi SJ. Cross-cultural adaptation and validation of the Persian version of the harris hip score. Arthroplasty Today 2023;23:101180.
[13] Vallellano MD, Rubio-Valdehita S. Carga mental y satisfacción laboral: un estudio comparativo entre trabajadoras sociales, educadoras sociales y profesoras de enseñanza primaria. Ansiedad Estres 2018;24:119–24.
[14] Polit DF, Beck CT, Owen SV. Is the cvi an acceptable indicator of content validity? Appraisal and recommendations. Res Nurs Health 2007;30:459–67. https://doi.org/10.1002/nur.20199.
[15] Terwee CB, Bot SD, de Boer MR, van der Windt DA, Knol DL, Dekker J, et al. Quality criteria were proposed for measurement properties of health status questionnaires. J Clin Epidemiol 2007;60:34–42.
[16] Streiner DL, Norman GR, Cairney J. Health measurement scales: a practical guide to their development and use. Oxford, United Kingdom: Oxford University Press; 2015.
[17] Seamon BA, Kautz SA, Bowden MG, Velozo CA. Revisiting the concept of minimal detectable change for patient-reported outcome measures. Phys Ther 2022;102:8. https://doi.org/10.1093/ptj/pzac068.
[18] Mokhtarinia HR, Hosseini A, Maleki-Ghahfarokhi A, Gabel CP, Zohrabi M. Cross-cultural adaptation, validity, and reliability of the Persian version of the spine functional index. Health Qual Life Outcome 2018;16:1–9.
[19] Montazeri A, Vahdaninia M, Mousavi SJ, Omidvari S. The iranian version of 12-item short form health survey (sf-12): factor structure, internal consistency and construct validity. BMC Publ Health 2009;9:341. https://doi.org/10.1186/1471-2458-9-341.
[20] Nadrian H, Moghimi N, Nadrian E, Moradzadeh R, Bahmanpour K, Iranpour A, et al. Validity and reliability of the Persian versions of womac osteoarthritis index and lequesne algofunctional index. Clin Rheumatol 2012;31:1097–102. https://doi.org/10.1007/s10067-012-1983-7.
[21] Polit DF, Yang FM. Measurement and the measurement of change: a primer for the health professions. Philadelphia, PA: Wolters Kluwer; 2016.
[22] Anthoine E, Moret L, Regnault A, Sébille V, Hardouin J-B. Sample size used to validate a scale: a review of publications on newly-developed patient reported outcomes measures. Health Qual Life Outcome 2014;12:2. https://doi.org/10.1186/s12955-014-0176-2.
[23] McLean JM, Cappelletto J, Clarnette J, Hill CL, Gill T, Mandziak D, et al. Normal population reference values for the oxford and harris hip scores - electronic data collection and its implications for clinical practice. Hip Int 2017;27:389–96. https://doi.org/10.5301/hipint.5000465.
[24] Mahomed NN, Arndt DC, McGrory BJ, Harris WH. The harris hip score: comparison of patient self-report with surgeon assessment. J Arthroplasty 2001;16:575–80.
[25] Kalairajah Y, Azurza K, Hulme C, Molloy S, Drabu KJ. Health outcome measures in the evaluation of total hip arthroplasties—a comparison between the harris hip score and the oxford hip score. J Arthroplasty 2005;20:1037–41.
[26] Söderman P, Malchau H. Is the harris hip score system useful to study the outcome of total hip replacement? Clin Orthop Relat Res 2001;384:189–97.
[27] Bellamy N, Buchanan WW, Goldsmith CH, Campbell J, Stitt LW. Validation study of womac: a health status instrument for measuring clinically important patient relevant outcomes to antirheumatic drug therapy in patients with osteoarthritis of the hip or knee. J Rheumatol 1988;15:1833–40.
[28] Gandek B. Measurement properties of the western ontario and mcmaster universities osteoarthritis index: a systematic review. Arthritis Care Res 2015;67:216–29. https://doi.org/10.1002/acr.22415.
[29] Ware Jr JE, Kosinski M, Keller SD. A 12-item short-form health survey: construction of scales and preliminary tests of reliability and validity. Med Care 1996;34:220–33.

[30] Amirshakeri B, Ghanavati T, Mokhtarinia HR, Gabel CP. Cross-cultural adaptation, reliability, and validity of the Persian version of the lower limb functional index. Musculoskelet Sci Pract 2022;62:102626.
[31] Koo TK, Li MY. A guideline of selecting and reporting intraclass correlation coefficients for reliability research. J Chiropr Med 2016;15:155–63. https://doi.org/10.1016/j.jcm.2016.02.012.
[32] Glinkowski W, Żukowska A, Dymitrowicz M, Wołyniec E, Glinkowska B, Kozioł-Kaczorek D. Translation, cross-cultural adaptation, and psychometric properties of the polish version of the hip disability and osteoarthritis outcome score (HOOS). Medicina 2019;55:614.
[33] Singh JA, Schleck C, Harmsen S, Lewallen D. Clinically important improvement thresholds for harris hip score and its ability to predict revision risk after primary total hip arthroplasty. BMC Muscoskel Disord 2016;17:256. https://doi.org/10.1186/s12891-016-1106-8.
[34] Shi HY, Chang JK, Wong CY, Wang JW, Tu YK, Chiu HC, et al. Responsiveness and minimal important differences after revision total hip arthroplasty. BMC Musculoskelet Disord 2010;11:261. https://doi.org/10.1186/1471-2474-11-261.
[35] Marx RG, Menezes A, Horovitz L, Jones EC, Warren RF. A comparison of two time intervals for test-retest reliability of health status instruments. J Clin Epidemiol 2003;56:730–5.
[36] Farivar SS, Cunningham WE, Hays RD. Correlated physical and mental health summary scores for the sf-36 and sf-12 health survey, v.1. Health Qual Life Outcome 2007;5:54. https://doi.org/10.1186/1477-7525-5-54.