RESEARCH ARTICLE

Cross-Cultural Adaptation, Validity, and Reliability of the Persian Translation of the Merle d'Aubigné-Postel Score

Mohammadreza Razzaghof, MD; Sina Esmaeili, MD; Mehdi Rezaee, MD; Masoud Kazemifard, MD; Ghasem Daneshgar, MD; SM Javad Mortazavi, MD

Research performed at Imam Khomeini Hospital Complex, Tehran, Iran

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Abstract

Objectives: The Merle d'Aubigné–Postel (MDP) score is a widely used patient-reported outcome measure (PROM) for assessing hip function for pain, walking ability, and mobility. Despite its widespread international use, no validated Persian version has been available to date. This study aimed to translate and culturally adapt the MDP score into Persian and evaluate its reliability and validity in Persian-speaking patients undergoing total hip arthroplasty (THA).

Methods: Following Guillemin et al. guidelines, Persian translation was done using a forward–backward process, followed by expert review and pretesting with 20 patients to ensure clarity and cultural relevance. The adapted instrument was validated in 103 Persian-speaking patients who had undergone THA with at least one year of follow-up. Internal consistency (Cronbach's alpha), test–retest reliability (intraclass correlation coefficient [ICC]), construct validity (correlation with the Harris Hip Score [HHS]), criterion validity (correlation with HHS and the Western Ontario and McMaster Universities Osteoarthritis Index [WOMAC]), and content validity (floor and ceiling effects) were evaluated. Inter-rater reliability for mobility was assessed by three orthopedic residents.

Results: The Persian MDP score demonstrated high internal consistency (α= 0.74) and excellent test–retest reliability (ICC= 0.95; 95%CI: 0.91–0.98). Inter-rater reliability for mobility was excellent (ICC= 0.89; 95%CI: 0.82–0.94). Construct validity was supported by strong domain-specific correlations (e.g., MDP pain vs. HHS pain: r= 0.73; 95%CI: 0.62–0.81). Criterion validity was confirmed by strong correlations with WOMAC (r= 0.745; 95%CI: 0.65–0.82) and HHS (r= 0.753; 95%CI: 0.66–0.83). Content validity showed no floor effect (0%) and an acceptable ceiling effect (14.5%).

Conclusion: The Persian MDP score is a valid and reliable instrument for assessing outcomes after THA in Persian-speaking patients. Its simplicity and strong psychometric properties support its use in clinical and research settings. However, the observed ceiling effect should be considered for excellent postoperative outcomes.

Level of evidence: III

Keywords: Cultural adaptation, Merle d'Aubigné-Postel score, Patient-reported outcome measures, Total hip arthroplasty

Introduction

Various outcome measures are commonly used to evaluate the success of total hip arthroplasty (THA), including complication rates, revision rates, and patient-reported outcome measures (PROMs).[1-4] PROMs are particularly valuable for assessing the impact of musculoskeletal disorders and their treatments from the patient's perspective, enabling the transformation of qualitative patient experiences into quantitative data.[5] A variety of PROMs have been specifically developed to assess hip pathologies.[6-11] Among these, the Merle d'Aubigné–

Corresponding Author: SM Javad Mortazavi, Joint Reconstruction Research Center, Imam Khomeini Hospital Complex, East Bagher Khan Street, North Chamran Highway, Tehran, Iran

Email: smjmort@yahoo.com

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Postel (MDP) scoring system, introduced in 1954, remains one of the oldest and most widely used tools for evaluating functional outcomes of the hip.[12] Owing to its simplicity and ease of interpretation, the MDP score is frequently used in both preoperative and postoperative settings in hip and pelvic procedures.[13-17] This instrument assesses three core domains—pain, walking ability, and hip mobility—providing a practical framework for clinical evaluation.[12]

Most outcome questionnaires reported in the literature were originally developed in English and may not be directly applicable across all cultural contexts. Although these tools are widely accepted as standards within the global scientific community, their appropriate use requires translation and cultural adaptation to ensure validity and reliability across different linguistic and cultural settings.[18,19] Persian, also known as Farsi, is a pluricentric language spoken across multiple countries with regional variations, primarily in Iran, Afghanistan, and Tajikistan. It is estimated to have between 150 and 200 million speakers worldwide.[20] Given the absence of a validated Persian version of the MDP score and the growing need for culturally adapted clinical instruments, this study aimed to translate and culturally adapt the MDP score into Persian and to evaluate its validity and reliability in the follow-up of patients undergoing THA.

Materials and Methods

Study Design

This cross-sectional study was conducted at the Joint Reconstruction Research Center (JRRC) of the Imam Khomeini Hospital Complex (IKHC) in Tehran, Iran, between 2023 and 2024. Adult patients (≥18 years) who were fluent in Persian (speaking, reading, and writing) and had undergone primary THA with a follow-up period of at least one year were included. The minimum one-year follow-up period was selected to ensure that patients had achieved stable functional outcomes and to minimize the influence of early postoperative recovery variations on outcome measurements. Patients were excluded if they had undergone revision surgery or were unable to complete the questionnaire because of cognitive impairment. The study was approved by the Institutional Review Board of Tehran University of Medical Sciences (IRB approval ID: IR.TUMS.IKHC.REC.1403.294). Written informed consent was obtained from all participants after they had been informed of the purpose of the study.

The sample size was determined based on established guidelines for validation studies, which recommend a minimum of 5–10 participants per item for factor analysis and at least 100 participants for correlation analyses. Given that the MDP includes three domains and that robust correlation analysis was required, a target sample size of more than 100 patients was considered appropriate.

Translation and Cross-Cultural Adaptation

The translation and cross-cultural adaptation process followed the guidelines proposed by Guillemin et al.[21], which outline a systematic approach for adapting scoring systems for use in different linguistic and cultural contexts. The procedure involved two primary stages: (1) translation of the MDP from English into Persian followed by back-translation into English, and (2) data collection to assess the reliability and cultural appropriateness of the adapted instrument. The translation process comprised forward translation, consensus-based reconciliation and revision, backward translation, expert panel review, and pretesting.[22]

Forward Translation

Two bilingual translators fluent in both English and Persian performed the forward translation. One translator, who was familiar with medical terminology and the field of orthopaedics, had extensive knowledge of the study objectives and underlying concepts. The second translator, who had no medical background or prior exposure to the study, provided a non-technical perspective to help identify potential cultural differences. Both translators worked independently to produce two separate forward translations.

Consensus and Revision

A consensus meeting was conducted with an expert committee comprising three hip surgeons and two independent reviewers. During this meeting, the committee compared the two forward translations and discussed necessary revisions to harmonize the versions. Ultimately, a consensual Persian version of the MDP was developed.

Backward Translation

Two additional bilingual translators, who had no prior knowledge of the study or its objectives, independently performed the back-translation of the Persian version into English. These translators were selected to ensure impartiality in the translation process. The two back-translated versions were subsequently compared and analyzed in the next stage.

Expert Review

A second meeting was convened with the expert committee to review all forward-translated and back-translated versions. The committee systematically evaluated the accuracy, cultural relevance, and clarity of the translations. After considering all suggestions and making the necessary adjustments, the final Persian version of the MDP was approved by unanimous consensus.

Pretesting

To assess the clarity and comprehensibility of the final Persian version, a pretest was conducted in which 20 patients completed the questionnaire. Three orthopedic residents were trained in the standardized administration of the mobility section of the MDP to evaluate inter-rater reliability. Participants were also asked to provide feedback

on the clarity and meaning of each item, and any suggestions regarding the structure or functionality of the questionnaire were documented. Based on this feedback, the Persian version was further refined and finalized for use in the study.

Patients and Scoring Systems

A total of 103 patients who had undergone THA were included in the study. Participants were asked to complete the Persian versions of the MDP, the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), and the Harris Hip Score (HHS) to assess postoperative pain and function.[23,24] Two validated outcome measures, WOMAC and HHS, were selected for comparison with the MDP to evaluate the correlations between these instruments.

The MDP is a physician- or physiotherapist-administered scale with a maximum score of 18 points, divided into three domains: pain, walking ability, and hip mobility. Each domain is scored from 0 to 6, where 0 indicates the worst state and 6 the best possible state of the patient.[12] The pain domain assesses the severity and persistence of pain as well as its relationship to activity and rest. The walking ability domain evaluates the need for mobility aids and the duration of walking. Finally, the hip mobility domain assesses the range of hip flexion and abduction.

Reliability

The internal consistency of the Persian version of the MDP was assessed using Cronbach's alpha (α) coefficient and McDonald's omega (ω), which measure the degree of interrelatedness among items within a scale. Values between 0.70 and 0.95 for both α and ω were considered indicative of acceptable internal consistency.[25]

Test–retest reliability, which reflects the stability of scores when the same instrument is administered twice over a 2-week interval with no expected change in the underlying condition, was evaluated using the intraclass correlation coefficient (ICC). An ICC value greater than 0.40 was considered satisfactory, whereas a value greater than 0.80 was deemed excellent.[26] The 2-week interval was selected based on previous validation studies in similar populations, balancing the need to minimize recall bias while ensuring clinical stability in patients more than one year after surgery.

Inter-rater reliability of the mobility component was assessed by having three trained orthopedic residents independently evaluate the same 30 patients within a 24-hour period. The intraclass correlation coefficient (ICC) for absolute agreement was calculated.

Validity

To assess construct validity, correlations between corresponding domains of the MDP and the HHS were examined. Correlations between conceptually similar domains (e.g., MDP pain vs. HHS pain) were expected to be stronger than those between conceptually unrelated domains (e.g., MDP pain vs. HHS function).[27]

Criterion validity was assessed by examining the strength of correlations between the MDP and the gold-standard measures, the WOMAC and the HHS, using Spearman's rho. A Spearman's rho value greater than 0.55, with a 99% confidence interval, was considered an acceptable threshold for criterion validity.[28]

Content validity was evaluated by assessing the floor and ceiling effects of the MDP. These effects were determined by calculating the proportion of patients who achieved either the minimum score (0 points) or the maximum score (18 points) on the MDP. A floor or ceiling effect was considered significant if at least 30% of patients obtained these scores. Good content validity was considered to be present when fewer than 15% of patients achieved the minimum or maximum scores.[26]

All statistical analyses were performed using SPSS version 28.0 (IBM Corp., Armonk, NY, USA). The normality of data distribution was assessed using the Kolmogorov–Smirnov test. Confidence intervals were calculated for all correlation coefficients. A p-value less than 0.05 was considered statistically significant.

Results

Cross-Cultural Adaptation

The translation and back-translation of the MDP score were performed by two independent translators, resulting in a preliminary Persian version of the questionnaire. An expert committee composed of professionals in the field reviewed and refined the translation to ensure linguistic accuracy and cultural appropriateness. The draft version was pretested in 20 patients, and feedback was collected for further refinement. Additionally, the expert panel anonymously evaluated the clarity of each item in the draft version. No major revisions were required, and the final Persian version of the MDP was approved for subsequent use.

Patient Characteristics

A total of 103 patients who had undergone total hip arthroplasty (THA) participated in the study by completing the questionnaire. The mean age of the participants was 42.1 ± 12.6 years, and the mean follow-up duration was 2.4 years (range, 1–3.7 years). The majority of the patients were female (53.4%) and married (81.6%). The most common diagnosis was avascular necrosis (37.9%), followed by developmental dysplasia of the hip, primary osteoarthritis, and hip fracture [Table 1]. The mean postoperative scores for the MDP, WOMAC, and HHS were 14.5, 81.0, and 77.9, respectively.

Table 1. Patient Characteristics

Variables	Mean ± standard deviation *or* Absolute frequency (%)
Age, years	42.1 ± 12.6
Sex	
Male	48 (46.6%)
Female	55 (53.4%)
Marital status	
Single	16 (15.5%)
Married	84 (81.6%)
Widowed	1 (1.0%)
Divorced	2 (2.0%)
Diagnosis	
Avascular necrosis	39 (37.9%)
Developmental dysplasia	23 (22.3%)
Osteoarthritis	18 (17.5%)
Fracture	15 (14.6%)
Other	8 (7.8%)
Involved side	
Right	58 (56.3%)
Left	45 (43.7%)

The relatively high proportion of avascular necrosis cases (37.9%) and the younger mean age of the participants (42.1 years) in our sample reflect the referral pattern to our tertiary care center, which specializes in the management of complex hip pathologies in younger patients. This demographic profile differs from that of typical primary THA populations but represents an important subgroup of patients requiring outcome assessment.

Reliability

The internal consistency of the Persian MDP at its initial administration was acceptable, with a Cronbach's alpha of 0.74 and a McDonald's ω of 0.79, both exceeding the recommended minimum threshold of 0.70 and indicating good reliability. Cronbach's alpha was subsequently recalculated following the systematic removal of each domain from the scale. Excluding the pain domain reduced the coefficient to 0.69, exclusion of the mobility domain yielded an α of 0.73, and removal of the walking ability domain resulted in an α of 0.74.

Inter-domain correlations ranged from 0.45 to 0.62. Corrected item–total correlations ranged from 0.52 to 0.61, indicating that each domain contributed meaningfully to the overall MDP score [Table 2].

To assess test–retest reliability, 40 of the 103 patients completed the MDP a second time. The intraclass correlation coefficient (ICC) between the two administrations was 0.95 (95% CI, 0.91–0.98), demonstrating excellent test–retest reliability. No statistically significant difference was observed between the mean scores of the first (14.50 ± 2.46) and second (14.73 ± 2.34) administrations (p = 0.063).

Table 2. Inter-Domain Correlations and Corrected Item–Total Correlations for the Persian MDP Scale

	MDP (Pain)	**MDP** (Walking ability)	**MDP** (Mobility)	**Corrected item-Total correlation**
MDP (Pain)	1.00	0.62	0.45	0.58
MDP (Walking ability)	0.62	1.00	0.48	0.61
MDP (Mobility)	0.45	0.48	1.00	0.52

MDP, Merle d'Aubigné-Postel

Inter-rater reliability for the mobility component demonstrated excellent agreement among the three orthopedic residents (ICC = 0.89; 95% CI, 0.82–0.94; p < 0.001), indicating consistent assessment of hip range of motion across different evaluators.

Validity

Analysis of correlation coefficients between the HHS and MDP domains confirmed that stronger associations were observed between conceptually related domains rather than unrelated ones. Specifically, the MDP pain score showed a stronger correlation with the HHS pain domain (r = 0.73) than with the HHS function domain (r = 0.59) [Table 3]. Taken together, these findings support the construct validity of the Persian version of the MDP as a patient-reported outcome measure.

Table 3. Spearman correlation coefficients between different domains of Merle d'Aubigné-Postel (MDP) and Harris hip score (HHS)

		MDP (Pain)	**MDP** (Walking ability)	**MDP** (Mobility)
HHS (Pain)	r	**0.73**	0.66	0.47
	P-value	**<0.001**	<0.001	<0.001
HHS (Function)	r	0.59	**0.74**	0.43
	P-value	<0.001	**<0.001**	<0.001
HHS (ROM)	r	0.39	0.48	**0.52**
	P-value	<0.001	<0.001	**<0.001**

HHS, Harris hip score; MDP, Merle d'Aubigné-Postel; ROM, Range of motion

Content validity was assessed by examining floor and ceiling effects. The total score distribution of the Persian MDP was right-skewed, with 14.5% of participants achieving the maximum total score of 18 [Figure 1]. No participants scored 0, indicating the absence of a floor effect. As ceiling effects below 15% are generally considered acceptable, the Persian MDP demonstrated satisfactory content validity. Omain-specific ceiling effects were observed as follows: pain, 19 patients (18.4%); walking ability, 22 patients (21.4%); and mobility, 26 patients (25.2%). Among high-functioning participants (top quartile; total score ≥ 16), individuals were generally younger than the remaining participants (37.6 ± 4.8 vs. 43.7 ± 8.3 years; p = 0.038).

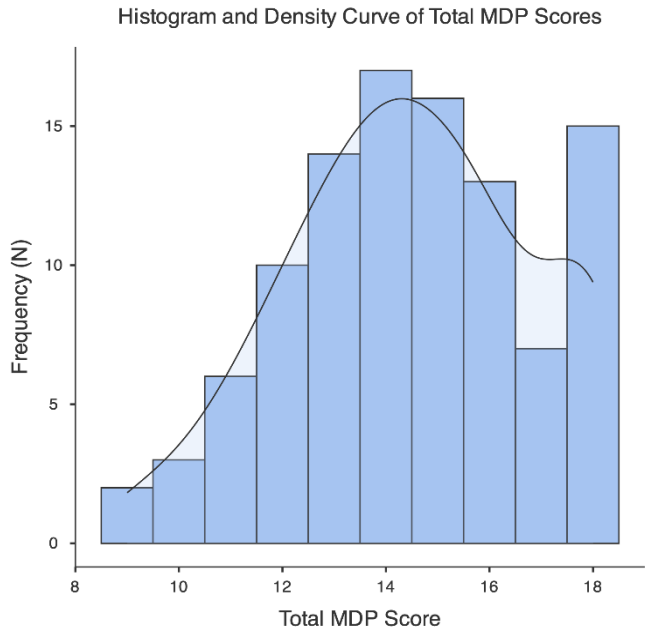

Figure 1. Histogram and density curve of total MDP scores.

Criterion validity was evaluated by comparing the MDP to established reference standards, the WOMAC and HHS. The MDP score showed a strong positive correlation with the WOMAC total score (r = 0.745; p < 0.001) and the HHS total score (r = 0.753; p < 0.001), thereby confirming the criterion validity of the Persian version of the MDP.

Post-hoc power analysis revealed that our sample size of 103 patients provided greater than 90% power to detect correlations of 0.30 or greater, and greater than 99% power to detect correlations of 0.40 or greater, confirming the adequacy of our sample size for the reported findings.

Discussion

In this study, we translated and culturally adapted the MDP into Persian and evaluated its reliability and validity. Internal consistency, reflected by a Cronbach's alpha within the recommended range (0.70–0.95), indicated that the items were cohesive and nonredundant. Test–retest reliability was excellent, with an ICC of 0.95 over a 14-day interval, demonstrating the stability of responses over time. Construct validity was supported by strong domain-specific correlations, such as the association between the MDP and HHS pain domains (r = 0.73). Content validity was demonstrated by the absence of a floor effect (0%) and an acceptable ceiling effect (14.5%). Criterion validity was further confirmed by strong correlations with the WOMAC (r = 0.745) and HHS (r = 0.753). Taken together, these findings indicate that the Persian version of the MDP is a reliable and valid instrument for assessing patient-reported outcomes in both clinical practice and research within Persian-speaking populations.

Cronbach's alpha for the Persian MDP was 0.74, exceeding the commonly accepted threshold of 0.70 for research purposes and indicating adequate internal consistency. This finding suggests that the three domains of the Persian MDP—pain, walking ability, and hip mobility—are moderately interrelated and measure related constructs. In a similar study, Ugino et al. evaluated the reliability of a modified version of the MDP in Brazilian patients and reported a Cronbach's alpha of 0.92. This modified version is nearly identical to the original MDP, with the exception that it accounts for the number of hips involved. When Cronbach's alpha was recalculated after the hypothetical removal of individual items, exclusion of the walking ability domain did not reduce the alpha coefficient, in contrast to the removal of the other domains. One possible explanation is that our sample primarily consisted of patients with end-stage hip disorders undergoing THA, in whom pain and restricted active and passive hip range of motion (ROM) are common. These impairments affect gait and contribute to abnormal walking patterns, thereby emphasizing the clinical relevance of the walking ability domain. Similarly, Ugino et al. identified walking ability as the most influential domain among the three in their study.

The test–retest intraclass correlation coefficient (ICC) for the Persian MDP was 0.95 (95% CI: 0.91–0.98) over a 14-day interval, indicating excellent reliability. No statistically significant difference was observed between the mean scores obtained during the initial and subsequent administrations. To our knowledge, no previous studies have evaluated the test–retest reliability of the MDP in other language adaptations. Current guidelines suggest that a PROM is appropriate for group-level research when the ICC exceeds 0.80 and for clinical decision-making in individual patients when the ICC is greater than 0.90.[27,30] These results therefore support the Persian version of the MDP as a reliable instrument for use in both clinical practice and research among Persian-speaking populations.

The test–retest reliability of health-related quality-of-life

instruments has been evaluated using a wide range of intervals, from as short as 10 minutes to as long as one month.[31-33] For conditions expected to change rapidly, it has been recommended that PROMs be re-administered within a 7-day interval.[31-33] In the present study, all participants were more than one year post-THA and did not undergo any additional interventions that would be expected to induce rapid clinical changes, thereby justifying the use of a 2-week test–retest interval. This interval was selected in accordance with previous validation studies conducted in comparable patient populations. Supporting this approach, Marx et al. reported no significant difference in test–retest reliability when using a 2-day versus a 2-week interval among athletic patients with musculoskeletal conditions, indicating that both time frames are sufficiently short to minimize true clinical change while simultaneously reducing the risk of recall bias.[32]

The Persian MDP demonstrated strong correlations with both the HHS ($r = 0.753$, $P < 0.001$) and the WOMAC index ($r = 0.745$, $P < 0.001$), supporting its criterion validity. The WOMAC and HHS were selected as reference instruments because of their extensive validation, translation, and widespread use worldwide in the assessment of hip disorders. Among specific domains, the MDP pain component showed slightly lower—though still strong—correlations with the HHS pain domain compared with the total score. In addition, the MDP walking ability domain demonstrated an excellent correlation with the HHS function domain. The mobility component of the MDP showed a weaker correlation with the HHS range-of-motion (ROM) domain, a finding consistent with the results reported by Øvre et al., in which the mobility domain also demonstrated the lowest correlation.[34] This discrepancy may be explained by differences in the scope of ROM assessment between the two instruments. The HHS evaluates ROM across five movements—flexion, abduction, adduction, internal rotation, and external rotation—whereas the MDP assesses only flexion and abduction.

Although the present study established the psychometric properties of the Persian MDP, future research should focus on determining the minimal clinically important difference (MCID) for this population. Based on findings from similar studies in other populations, an MCID of approximately 2–3 points on the 18-point MDP scale may be expected; however, this estimate requires confirmation in Persian-speaking patients using anchor-based methods.

Our findings are consistent with validation studies of the MDP in other languages. The internal consistency ($\alpha = 0.74$) is comparable to that reported in other adaptations, although it is slightly lower than in some versions, such as the Brazilian modification ($\alpha = 0.92$). This difference may reflect variations in patient populations as well as cultural factors that could influence the interpretation of individual items.

This study has several limitations that should be acknowledged. First, the study population was relatively young (mean age 42.1 years) and included a high proportion of patients with avascular necrosis (37.9%), which differs from typical primary THA populations that are generally older and predominantly affected by osteoarthritis. This demographic profile likely reflects our institution's role as a tertiary referral center for complex hip pathologies; however, it may limit the generalizability of our findings to broader THA populations. Second, this was a single-center study conducted at a specialized joint reconstruction center, which may introduce selection bias and limit the external validity of the findings for other healthcare settings in Iran or in other Persian-speaking countries.

The two-week interval used for the test–retest reliability analysis represents another limitation. Although this duration is generally appropriate for maintaining stable conditions in patients with subacute or chronic disorders, the absence of an anchor-based method to confirm participants' clinical stability during this period is a drawback. Future studies should incorporate instruments such as the Patient Global Impression of Change (PGIC) or other anchor-based measures to better verify the stability assumption. Additionally, the MDP requires input from both patients and clinicians, which limits its practicality as a purely patient-reported outcome measure (PROM), particularly in settings where consistent clinician involvement cannot be ensured. Finally, the observed ceiling effect of 14.5%, although within acceptable limits, may reduce the instrument's sensitivity to detect changes in high-functioning patients and should therefore be considered when selecting outcome measures for research or clinical practice.

Finally, our study did not assess responsiveness to change over time, which is an important psychometric property for longitudinal outcome assessment. Future studies should therefore evaluate the ability of the Persian MDP to detect clinically meaningful changes following therapeutic interventions.

Conclusion

In conclusion, the MDP score was rigorously translated and culturally adapted into Persian according to established international guidelines. Our findings demonstrate that the Persian MDP is a valid and reliable instrument for assessing functional outcomes in patients following THA. This adapted version is suitable for integration into both clinical practice and research settings within Persian-speaking populations, showing high feasibility and patient comprehensibility. Nevertheless, clinicians should account for the potential ceiling effect in high-functioning patients when selecting this tool for outcome assessment.

Further investigation is warranted to corroborate these

findings across more diverse clinical cohorts—particularly among older populations with primary osteoarthritis—and to evaluate the instrument's concurrent validity against other widely utilized patient-reported outcome measures (PROMs). Future research should prioritize determining the minimal clinically important difference (MCID), assessing longitudinal responsiveness to change, and validating the instrument through multicenter studies across various Persian-speaking regions. Furthermore, the translation and validation of the MDP into additional languages would enhance its global utility and facilitate international cross-cultural comparative research.

List of Abbreviations

MDP: Merle d'Aubigné-Postel
PROM: Patient-reported outcome measure
THA: Total hip arthroplasty
ICC: Intraclass correlation coefficient
HHS: Harris Hip Score
WOMAC: Western Ontario and McMaster Universities Osteoarthritis Index
MCID: Minimal clinically important difference
CI: Confidence interval

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Declaration of Informed Consent: All participants provided written informed consent prior to participation. The authors declare that there is no information in the submitted manuscript that can be used to identify patients.

Mohammadreza Razzaghof [1,2]
Sina Esmaeili [1,2]
Mehdi Rezaee [1]
Masoud Kazemifard [1,2]
Ghasem Daneshgar [1,2]
SM Javad Mortazavi [1]

1 Joint Reconstruction Research Center, Tehran University of Medical Sciences, Tehran, Iran

2 Department of Orthopedic Surgery, Imam Khomeini Hospital Complex, Tehran University of Medical Sciences, Tehran, Iran

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