

Reliability and Validity of the Persian Version of the Short Health Literacy Questionnaire for Musculoskeletal Patients

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ABSTRACT

Background and Objectives: This study aimed to evaluate the reliability and validity of the Persian version of the osteoarthritis short health literacy questionnaire (OSHL) for musculoskeletal patients (LiMP) among individuals with osteoarthritis in Iran.

Materials and Methods: A cross-sectional validation study was conducted with 420 patients aged 45–75 years, recruited from the rheumatology clinic of Shahid Beheshti Hospital in Hamadan. The LiMP questionnaire underwent a rigorous translation and back-translation process. Psychometric evaluation included assessments of face validity (qualitative interviews and item impact scores), content validity (expert panel review, Content Validity Ratio [CVR], and Content Validity Index [CVI]), and construct validity (exploratory and confirmatory factor analyses). Reliability was examined using Cronbach's alpha for internal consistency and the intraclass correlation coefficient (ICC) for test-retest stability.

Results: The Persian LiMP demonstrated strong face and content validity, with all items achieving impact scores above 1.5, a CVR of 0.86, and a CVI of 0.95. Exploratory factor analysis identified a three-factor structure: Musculoskeletal Conditions, F2: Musculoskeletal Diagnosis and treatment, and F3: Anatomy and terminology; accounting for 71.07% of the variance, confirmed by confirmatory factor analysis with good model fit indices (e.g., the Comparative Fit Index = 0.962, the root mean square error of approximation = 0.083). All subscales showed high internal consistency (Cronbach's alpha > 0.70) and satisfactory test-retest reliability (mean the Intraclass correlation coefficient = 0.789). Convergent and discriminant validity were generally supported.

Conclusion: The Persian version of the LiMP for musculoskeletal patients is a reliable and valid instrument for assessing health literacy in this population. Its use can facilitate targeted interventions and improve patient outcomes.

Paper Type: Research Article

Keywords: Musculoskeletal, Health literacy, Psychometric properties.

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Introduction

Musculoskeletal disorders are among the most prevalent causes of disability and reduced quality of life worldwide, affecting millions of individuals and placing a significant burden on healthcare systems. Effective management of these conditions relies not only on clinical interventions but also on patients' ability to understand, interpret, and act upon health information relevant to their musculoskeletal health. This capacity, known as health literacy, is increasingly recognized as a critical determinant of health outcomes, influencing self-management, adherence to treatment, and engagement with healthcare providers (1-3).

Health literacy is a multidimensional construct that extends beyond basic reading and comprehension skills. It encompasses the ability to access, evaluate, and apply health information in various contexts, including the management of chronic musculoskeletal conditions. Recent research highlights that inadequate health literacy is associated with poorer physical function, increased pain, and higher healthcare utilization among musculoskeletal patients (1, 2).

Furthermore, low health literacy has been linked to increased healthcare costs, higher complication rates, and suboptimal recovery following orthopedic procedures (3).

Given the complexity of musculoskeletal conditions and the diversity of patient populations, there is a growing need for reliable, valid, and culturally adapted instruments to assess health literacy in this context. The development and validation of such tools are essential for identifying patients at risk of poor outcomes and for

designing targeted interventions to improve health literacy and, consequently, health outcomes.

The Literacy in Musculoskeletal Problems (LiMP) questionnaire was developed to specifically measure health literacy within the musculoskeletal domain. While several psychometric evaluations of the LiMP tool exist in other languages and contexts (4, 5), there is a pressing need for culturally adapted, validated instruments for non-English speaking populations. Rosenbaum, et al, (2016) approximately 33% of Americans have inadequate health literacy, which is associated with decreased medical knowledge, increased hospitalization and use of emergency care, and worse control of diseases (6). Johnson et, al (2017) confirms that there is a greater prevalence of limited musculoskeletal health literacy as compared to general health literacy, and that this transcends geographic boundaries (7), in this study there were 55 participants in the rural emergency department (ED), and 65 in the urban ED. Adequate general health literacy was found in 62% of rural and 52% of urban patients, while 44% of rural and 43% of urban patients had adequate musculoskeletal health literacy.

So, in present study addresses lack of evaluation of the literacy scale in musculoskeletal problems patients; Studies have linked higher LiMP scores to better outcomes in total knee arthroplasty, suggesting that the questionnaire effectively captures relevant health literacy dimensions that impact patient satisfaction and functional status (8).

So, the current work aimed to assess the reliability and validity of the Persian version

of the LiMP questionnaire for musculoskeletal patients, employing standard psychometric procedures to ensure comprehensive evaluation of its measurement properties in an Iranian population.

Materials and Methods

Study Setting

This research focused on patients diagnosed with osteoarthritis who attended the rheumatology clinic at Shahid Beheshti Hospital in Hamadan, Iran. In total, 420 participants were selected using a stratified cluster random sampling method during June and July 2024.

Sampling

The initial study population included all 420 patients with osteoarthritis who visited the Rheumatology Clinic at Shahid Beheshti Hospital in Hamadan, Iran. From these patients, 200 participants were randomly chosen for Exploratory Factor Analysis (EFA), while the remaining 220 were assigned to Confirmatory Factor Analysis (CFA).

Inclusion criteria was included: aged 45–75 years, patient record at the rheumatology department or clinic, structural and radiological joint abnormalities (grade 2 or lower) (9), ability to read and write in Farsi, no diagnoses of chronic fatigue syndrome, willing and able to participate. Also, exclusion criteria was included: if they had any cognitive impairment, or unable sign their own consent or incomplete and non-responses questionnaire

Ethical Approval and Process

The study protocol received approval from the Ethics Committee of Hamadan University of Medical Sciences (Approval No: 140105183544, Ethics Code:

IR.UMSHA.REC.1401.390). The research team coordinated with institutional administrators to obtain permission. All patients were provided written informed consent after assurances of confidentiality.

Questionnaire Translation

firstly, the scale was translated from English to Persian following the Sousa, 2011 translation protocol (9). The LiMP questionnaire was translated following a robust process: First, it was translated into Persian independently by two fluent speakers, then two separate translators then back-translated it into English (10). Subsequently, a native English speaker reviewed the translation to ensure conceptual equivalence. The panel of experts reviewed and approved this final version.

Validation Procedures

Both qualitative and quantitative assessment of Face Validity was done; for qualitative content validity assessment ten patients participated in interviews with the principal investigator to discuss item clarity, difficulty, and ambiguity (11, 12).

Also, for quantitative validity assessment: The item impact score was calculated (13).

Although, qualitative and quantitative assessment of content validity was evaluated. (12, 14); which the CVR and CVI were assessed (15).

Construct Validity

Exploratory Factor Analysis

The rules for determining the sample size in covariance models are 10-15 items for each measured variable (16). Some also consider 200 samples to be sufficient (17). Thus, the structural validity of the scale was examined using Exploratory Factor Analysis (EFA) with Varimax rotation. A factor analysis was

conducted by choosing a minimum sample size of 5–10 times the amount per item of the popular instrument. Thus, the target population in this work included 200 patients of rheumatology clinic of Shahid Beheshti Hospital in Hamadan, who were recruited through a stratified cluster random sampling process.

Conducted with a subset of 200 patients, using the Kaiser-Meyer-Olkin (KMO) test (acceptable if ≥ 0.8) to check sample adequacy (18, 19). Bartlett's Sphericity Test confirmed the data's suitability. Items with communalities greater than 0.4 were retained (18).

Based on the results in social science and psychological studies, the commonality of items is usually considered low and medium by the maximum likelihood (ML) method, at 0.4-0.7 (20). Therefore, the appropriate cutoff point for item sharing using the maximum likelihood method (ML) is above 0.4, according to the results of various studies (21, 22); on the other hand, in the study of Child. D (2006), it was mentioned that item sharing below 0.2 should be eliminated (23); in addition, in the study of Field. A, (2009), it was stated that item sharing above 0.3 is desirable (24). Varimax rotation was used, as some overlap between underlying factors was expected.

Confirmatory Factor Analysis: CFA with used of AMOS Graphics v27 was assessed, which involving 220 patients who were recruited through a stratified cluster random sampling process, to confirm the factor structure. Based on some surveys that have recommended that this phase should be achieved on sample sizes between 100 and 200 participants (25). Goodness-of-fit was

assessed using these standard indicators (26-28): $\chi^2/df < 3.0$, GFI, CFI, TLI > 0.90 , Root mean square error of approximation < 0.1 .

Additional Validity Measures with convergent and discriminant validity were evaluated: Metrics such as Average Variance Extracted (AVE > 0.50), Construct Reliability (CR > 0.7 and higher than AVE), and Maximum Shared Variance (MSV) were reported (29). Finally, Reliability Assessment with internal Consistency and Stability were evaluated. Cronbach's alpha coefficient was calculated for each dimension. The test-retest reliability was evaluated using intraclass correlation coefficients over a two-week interval (30).

Results

Statistical analysis and Validity Assessment

In total, 420 patients contributed to this study. The mean (\pm SD) age of the respondents was 23.4 ± 5.22 . Based on the educational status, among the 420 participants, 102 participants (24.3%) mainly had diploma, 100 participants (23.8%) had illiterate. Also, 293 participants (69.8%) were women, and 302 (71.9%) were single. Around 213 of patients (50.7%) were homemaker. Moreover, 288 (68.6%) participants had < 5 years history disease and 334 (79.5%) of them had the knee-related complaints (Table 1).

The Persian version of LiMP were validated based on content validity, construct validity, as well as face validity.

Both qualitative and quantitative assessment of Face Validity was done; as ten patients participated in interviews with the principal investigator to discuss item clarity, difficulty, and ambiguity. This continued until there were no further change suggestions.

Table 1. Summary statistics for characteristics of study participants (n = 420)

Variables	EFA Stage (n = 200) Participants	CFA Stage (n = 220) Participants	Total Participants (n = 420)
Age (years), mean (SD)	59.26 (12.83)	59.33 (12.74)	59.30 (12.77)
Age, n (%)			
20-45	29(14.5)	29(13.2)	59(14.1)
46-65	108(54.0)	121(55.0)	229(54.5)
>65	63 (31.5)	69 (31.4)	132(31.4)
Gender, n (%)			
Men	62 (31.0)	65 (29.5)	127(30.2)
Woman	138 (69.0)	155(70.5)	293(69.8)
Marital Status, n (%)			
Single	144 (72.0)	158(71.8)	302(71.9)
Married	11(5.5)	13(5.9)	24 (5.7)
Widow	12 (6.0)	14 (6.4)	26(6.2)
Widower	33 (16.5)	35 (15.9)	68 (16.2)
Educational status, n (%)			
Illiterate	48(24.0)	52(23.6)	100(23.8)
Elementary	39 (19.5)	45 (20.5)	84(20.0)
College	17 (8.5)	19(8.6)	36 (8.6)
Diploma	48(24.0)	54 (24.5)	102(24.3)
University	48 (24.0)	50(22.7)	98(23.3)
Job, n (%)			
Employee	34(17.0)	35(15.9)	69(16.4)
Retire	21(10.5)	23(10.5)	44(10.9)
Labor	7(3.5)	8(3.6)	15(3.6)
Free job	28(14.0)	28(12.7)	56(13.3)
No job	11(5.5)	12(5.5)	23(5.5)
Homeworker	99(49.5)	114(51.8)	213(50.7)
History disease(years), mean (SD)	5.32 (5.19)	5.35(5.31)	5.33(5.25)
History disease n (%)			
<5	137(68.5)	151(68.6)	288(68.6)
5-10	43(21.5)	47(21.4)	90(21.4)
>10	20(10.0)	22(10.0)	42(10.0)
Joint affect, n (%)			
Pelvis	21(10.5)	35(15.9)	56(13.3)
The knee	164(82.0)	170(77.3)	334(79.5)
Others	15(7.5)	15(8.6)	30(7.1)

And for quantitative assessment: The item impact score was calculated, with each item rated for importance on a scale of 1 to 5. Items with scores above 1.5 were considered appropriate; all items exceeded this cut-off.

Although, qualitative and quantitative assessment of Content Validity was evaluated. As qualitative assessment ten subject-matter experts reviewed the questionnaire's grammar, wording, item

arrangement, and scoring. Their evaluation focused on clarity, simplicity, relevance, and transparency, and items were revised based on their feedback. And for and quantitative assessment experts rated each item's necessity using a 3-point Likert scale. The Content Validity Ratio (CVR) was calculated, with a minimum acceptable value of 0.62 for ten experts. The instrument achieved a mean CVR of 0.86 and a Content Validity Index (CVI) of 0.95, indicating strong content validity.

Exploratory Factor Analysis

The Kaiser-Meyer-Olkin (KMO) and Bartlett's Test of Sphericity were used to determine the appropriateness of the sample for factor analysis. Eigenvalues above one and factor loadings greater than 0.40 were considered appropriate to verify the possible underlying factors.

Primary EFA results as presented in the following as Bartlett's and KMO test indicated the appropriateness of the data for factor analysis (χ^2 of 1244.353, KMO index of 0.709,

df of 36, $P < .001$), approving the suitability of the factor model. These two tests revealed the appropriateness of the respondents' data for EFA, which was conducted on the 9 items of the OSHL scale by the maximum likelihood process with the varimax rotation. Based on primary exploratory factor loadings of items and the scree scheme (Figure 1).

Three factors were extracted, reporting eigenvalue of higher than 1, accounting for 71.07% of the variance with 9 items (Table 2).

The next step involves verifying and validating the factor structure obtained from exploratory factor analysis (EFA) through confirmatory factor analysis (CFA).

According to the GOF (goodness-of-fit) indices, the studied model fits appropriately to the standard accept one database. Thus, the Confirmatory Factor Analysis (CFA) proves the model's adequacy and the decent fitting of its structural model for the participants. Table 3 represents the model fit indices (Figure 2).



Figure 1. EFA Scree plot of the Persian version of LiMP

Table 2. The final exploratory Results of the Persian version of LiMP Rotated Component Matrix^a

Parameter	Component ^a		
	F1 ^b	F2 ^b	F3 ^b
Q7OSHL7: Arthritis is ...	0.889		
Q5OSHL5: What is sciatica?	0.880		
Q1OSHL1: A “fractured” bone is ...	0.733		
Q8OSHL8: How does Rheumatoid Arthritis (RA) differ from Osteoarthritis (OA)?	0.668		
Q2OSHL2: All of the following facts about X-rays are true EXCEPT:		0.933	
Q9OSHL9: If you break your wrist, what might your doctor give you to help you heal?		0.911	
Q4OSHL4: An Orthopedic Surgeon is __?			0.782
Q3OSHL3: What is the name of the bone in your thigh?			0.748
Q6OSHL6: The knee is a ...			0.547

Extraction Method: Maximum Likelihood.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 3 iterations.

Three-domain structure (F1: Musculoskeletal Conditions, F2: Musculoskeletal Diagnosis and treatment, and F3: Anatomy and terminology)

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Reliability

Results of the proposed model fulfils the convergent validity. To check the discriminant validity, the MSV was compared with AVE, and the square root of each dimension's AVE was compared with the correlations for each pair of dimensions addressed by AVE and MSV (AVE > MSV) as presented in the correlation matrix Table 4, the MSV of all factors was lower than AVE.

Table 3. Measurement model-fit index

Measure	Recommended value	Result Value	Remark
Chi-square/degree of freedom	<3	2.504	Good fit
Tucker Lewis Index	>0.9	0.942	Good fit
Comparative Fit Index	>0.9	0.962	Good fit
Goodness of Fit Index	>0.9	0.944	Good fit
Root mean square error of approximation	<0.1	0.083	Good fit

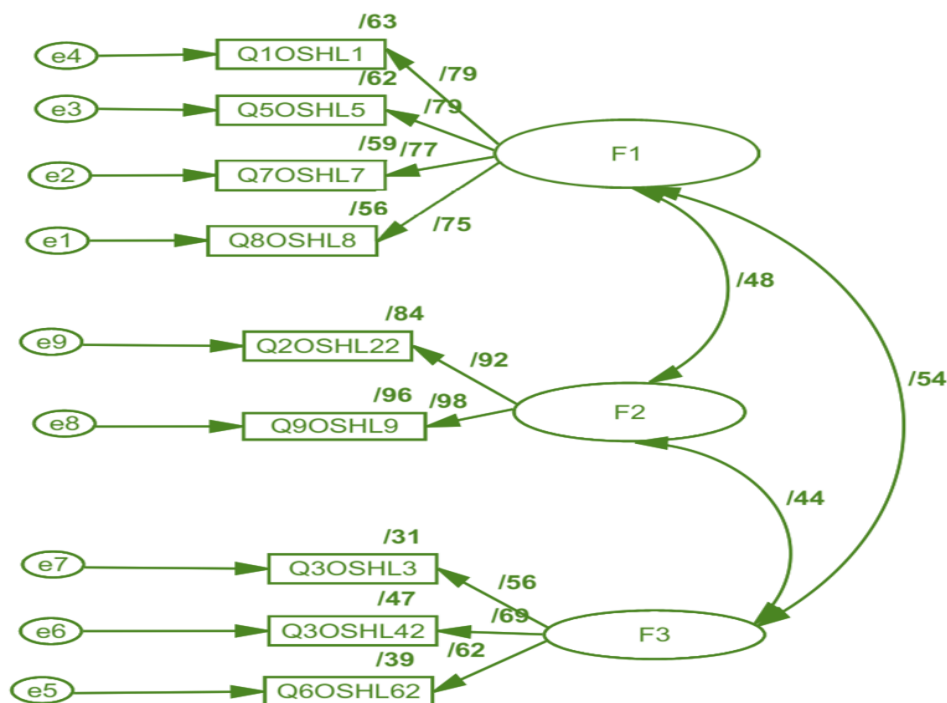


Figure 2. CFA of the health literacy questionnaire for musculoskeletal patients with Three-domain structure (F1: Musculoskeletal Conditions, F2: Musculoskeletal Diagnosis and treatment, and F3: Anatomy and terminology)

So, for assurance about the reliability of the measurement instrument in addition to Cronbach's alpha (CA), the reliability analysis was carried out and the results were presented in Table 5. It can be seen that the value of CA is greater than 0.60 for all the constructs.

It can be concluded from the first step that the model is fit for carrying out SEM and path analysis as it meets all the validity issues. Also, internal consistency was used to evaluate the reliability. The mean ICC was 0.789 with a 95% confidence interval from 0.683 to 0.82 (F(663, 39) = 5.524, P < .001) (Table 5).

Table 4. Convergent validity and reliability

Factors	CR	AVE	MSV	MaxR(H)
Musculoskeletal Conditions	0.914	0.601	0.227	0.933
Musculoskeletal Diagnosis and treatment	0.905	0.903	0.291	0.962
Anatomy and terminology	0.756	0.391	0.195	0.666

Table 5. Cronbach's alpha and ICC of the Factors of the scale

Factors	No of items	Cronbach's alpha	ICC*
Musculoskeletal Conditions	4	0.786	0.843
Musculoskeletal Diagnosis and treatment	2	0.714	0.765
Anatomy and terminology	3	0.855	0.943
TOTAL	9	0.799	0.789

Discussion

This study aimed to evaluate the psychometric properties of the Persian version of the LiMP. The results provide robust evidence for the scale's reliability and validity, supporting its use in clinical and research settings among Persian-speaking populations with musculoskeletal conditions.

Recent studies on health literacy measurement have highlighted the need for culturally adapted, psychometrically sound instruments to assess health literacy in specific patient populations (31).

The Persian version of LiMP questionnaire can be easily used and specific for musculoskeletal patients, in contrast the very well-known and popular instruments cover only

a few dimensions of health literacy and was not specific for target groups and there are general tools (28).

The reliability and validity of the Literacy in Musculoskeletal Problems (LiMP) questionnaire have been assessed through various studies focusing on musculoskeletal health literacy. The LiMP questionnaire is specifically designed to evaluate patients' understanding of musculoskeletal conditions, and its performance has been analyzed in different patient populations. The LiMP questionnaire demonstrated a mean score of 4.68 out of 9, indicating a significant prevalence of limited musculoskeletal literacy, with 69% of participants scoring below the threshold of 6 (32). Internal consistency and stability metrics for the LiMP have not been explicitly detailed in the literature, but the significant correlation with general health literacy assessments suggests a reliable measure of musculoskeletal

comprehension (32). The LiMP questionnaire has shown significant associations with patient-reported outcome measures (PROMs), indicating its validity in reflecting patients' health status and functional outcomes (8, 33).

The present study contributes to this growing body of work by providing evidence for the validity and reliability of a Persian-language tool tailored to musculoskeletal patients. The three-factor structure: Musculoskeletal Conditions, F2: Musculoskeletal Diagnosis and treatment, and F3: Anatomy and terminology; identified here is in line with multidimensional models of health literacy, which capture the complexity of patients' abilities to access, understand, and use health information (34, 35).

The scale demonstrated strong content and face validity, as confirmed by expert panel review and participant feedback. The content validity ratio (CVR) and content validity index (CVI) exceeded recommended thresholds, aligning with recent best practices in scale development, which emphasize the importance of both qualitative and quantitative expert input to ensure comprehensive item coverage and clarity (31, 36).

Exploratory factor analysis (EFA) revealed a clear three-factor structure, accounting for over 70% of the variance, which is consistent with contemporary recommendations for health literacy instruments (34).

The Kaiser-Meyer-Olkin (KMO) index and Bartlett's test confirmed the adequacy of the sample and the appropriateness of factor analysis. Confirmatory factor analysis (CFA) further supported the model, with all fit

indices (e.g., CFI, TLI, RMSEA) indicating a good fit, in line with recent validation studies of health literacy and related scales (37, 38).

The scale showed satisfactory convergent validity, as indicated by average variance extracted (AVE) and composite reliability (CR) values above accepted cutoffs (39).

However, a minor concern was noted regarding discriminant validity, where the square root of the AVE for one factor was less than its correlation with another factor. This issue is not uncommon in multidimensional health literacy scales and has been discussed in recent literature, which suggests that such findings may reflect conceptual overlap between closely related constructs rather than a fundamental flaw in the scale (40). Researchers are encouraged to interpret these results in the context of the theoretical framework and consider additional methods, such as model respecification or item refinement, if discriminant validity concerns persist (40).

The internal consistency of the scale was high, with Cronbach's alpha values exceeding 0.70 for all subscales, meeting the standards for health-related instruments (39).

The intraclass correlation coefficient (ICC) also indicated good test-retest reliability, supporting the stability of the instrument over time. These findings are consistent with recent validation studies of health literacy tools in diverse populations (31, 36). In Kor et al study, A cronbach's alpha coefficient of ≥ 0.70 would considered an indication of acceptable internal consistency, also, A test-retest correlation coefficient of ≥ 0.50 would be considered that the scale is reliable over time (41).

Study Limitations and Strengths: Despite the strengths of this study, such as easily used, short, specific and has a multidimensional structure for musculoskeletal patients; it has several limitations should be acknowledged:

In contrast, while the LiMP questionnaire is a valuable tool for assessing musculoskeletal health literacy, it may not fully encompass the broader aspects of health literacy that affect patient outcomes across different medical conditions; because, health literacy is capacity to act, not only capacity to think. Due to an individual's health literacy skills are crucial for health-related decisions, individuals with inadequate or marginal health literacy often struggle with poor self-care behaviors, receive fewer preventive measures, and have increased all-cause mortality (42-44). Also, health literacy affects the use of health services and impacts patient satisfaction and the physician-patient relationship. So, evaluating both the cognitive and the non-cognitive (functional) aspects of health literacy are important (45) and further research is needed to explore its applicability in diverse populations and settings.

Also, the sample was drawn from a single clinical setting, which may limit generalizability to other regions or patient groups.

Second, the cross-sectional design precludes assessment of responsiveness or predictive validity.

So, minor issues with discriminant validity suggest the need for further refinement or testing in larger, more diverse samples (40).

These limitations are consistent with those reported in recent validation studies and highlight the ongoing challenges in

developing universally applicable health literacy measures (46).

The validated Persian version of LiMP questionnaire can be used to facilitate targeted interventions, improve patient-provider communication, and ultimately enhance health outcomes. Therefore, future research should:

Test the scale's measurement invariance across different demographic groups to ensure unbiased assessment (46).

Explore the scale's predictive validity and responsiveness to interventions.

And consider qualitative studies to further refine items and address any remaining issues with discriminant validity (40).

Conclusion

In summary, the Persian version of LiMP questionnaire for musculoskeletal patients demonstrates strong psychometric properties, supporting its use in both clinical practice and research. Continued validation efforts, particularly in diverse populations and settings, will further strengthen its utility and contribute to the advancement of health literacy assessment in Iran and beyond.

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Availability of Data and Materials: The datasets used and/or analyzed during the current study can be made available by the corresponding author on reasonable request.

Conflicts of interest: The authors have no conflicts of interest to declare.

Consent for publication: Not applicable.

Ethical Approval and consent to participate: The study procedures were carried out following the Declaration of Helsinki. This study was approved by the Ethics Committee of Hamadan University of

Medical Sciences with special code IR.UMSHA.REC.1401.390. Informed consent was taken from all the participants. There was an emphasis on maintaining privacy in keeping and delivering the information accurately without mentioning the names of the participants.

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