

Psychometric Properties of the Persian Version of the Health Literacy Scale Short-Form (HLS-SF12)

Ehsan Mokari-Menshadi¹, Saeed Moshtaghi^{1*}

¹ Department of Psychology, Dezful Branch, Islamic Azad University, Dezful, Iran

*Corresponding Author: Saeed Moshtaghi, Ph.D., Department of Psychology, Dezful Branch, Islamic Azad University, Dezful, Iran. Tel: +98-9036871600, Email: moshtaghi@iaud.ac.ir

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Abstract

Background: Health Literacy (HL) is closely related to health status. Measuring public HL levels helps to warn about health status and manage health problems through timely interventions. The items of relevant evaluation tools are complex and numerous in Iran, and there is no recognized HL brief scale for the whole population.

Objectives: The aim of this study was to translate the Health Literacy Scale Short-Form (12-item) (HLS-SF12) and test the validity and reliability of the Persian version of the HLS-SF12 in the Iranian population.

Methods: This research was descriptive with a psychometrics aim. The research population included 289 male and female students from four faculties of Islamic Azad University of Dezful, who were selected using a random sampling method. The Persian version of HLS-SF12 was used to collect data. The construct validity (exploratory factor analysis and confirmatory factor analysis) and internal reliability of the instrument were evaluated. The research data was analyzed using SPSS-26 and AMOS-26 software.

Results: The Cronbach's alpha reliability of the HLS-SF12 and subscales were in the range of 0.72 to 0.88. Exploratory factor analysis confirmed the existence of three factors in HLS-SF12. Confirmatory factor analysis supported the original three-factor model of the questionnaire, and fit indices indicated a good model fit index for Persian HLS-SF12 (GFI = 0.961, CFI = 0.974, IFI = 0.966, TLI = 0.971, and RMSEA = 0.073).

Conclusion: The Persian version of HLS-SF12 has good reliability and validity, and can be used as a tool to evaluate the HL of Iranian students. In addition, due to the strength of the structure and having appropriate psychometric specifications, HLS-SF12 had the capability to be used by researchers.

Keywords: Health Literacy, Reliability, Validation, Factor Analysis

1. Background

According to the World Health Organization's (WHO's) definition, Health Literacy (HL) is the cognitive and social skills which determine the motivation and ability of individuals to gain access to, understand, and use information in ways which promote and maintain good health.¹ The HL was first introduced in 1974 in an educational panel and has since been discussed by researchers in various fields.² It is defined as the knowledge to access, analyze, understand health information, and make correct decisions.³ It is evident that the more knowledge individuals have regarding the methods of infection, prevention, treatment, nutrition, and how to be present in public places, the fewer fatalities and costs will be imposed on society.⁴ For example, during epidemics, individuals with HL are less likely to insist on attending parties and gatherings. The result of low HL is indifference towards various diseases and less adherence to care programs.² Furthermore, HL depends on individual skills and the ability to access and use health information such as policies, resources, and values of

health care.⁵ It is recognized as an important indicator in the outcomes and costs of health care, such that the effectiveness of health care systems requires individuals to have an optimal level of HL.⁶ According to a report by an institute of medicine in the United States (US), nearly 80 million adults in the US lack the skills to utilize health information.⁷ In Iran, according to the results of a study, about half of the population has low HL.⁸ This problem is more prevalent in vulnerable groups (including the elderly and individuals with low literacy).⁹ Inadequate HL leads to consequences such as reduced self-care behaviors, lack of access to appropriate health services, less willingness to seek treatment, and increased mortality rates.¹⁰

Based on several conducted studies,^{11,12} little attention is given to HL in school and university educational programs. Their findings also emphasize the need to focus on health literacy. To understand the status of health literacy among different individuals, numerous tools have been designed and introduced worldwide.¹³⁻²² Osborne et al.¹³ designed a 9-component, 44-item health

literacy questionnaire for Australian adults. The validity of this questionnaire has been confirmed through further research in Denmark,¹⁴ Germany,¹⁵ Slovakia,¹⁶ China,¹⁷ Australia,¹⁸ and Jordan.¹⁹ Seo et al.²⁰ designed a short-form of the HL questionnaire for Korean adults with three components (healthcare, disease prevention, and health promotion). Liu et al.²¹ also designed a 10-item, single-component HL questionnaire for Chinese adults. Additionally, a 9-dimension questionnaire was validated in the Norwegian community.²²

In Iran, Tavousi et al.⁸ identified various HL assessment tools but concluded that the existing tools are complex and not comprehensive, simple, or short. In a subsequent study, Tavousi et al.²³ found that only a few validated HL assessment tools are available in Iran. For example, the HL questionnaire by Ghanbari et al. has 28 items and eight components and is designed for ages 15 to 18.²⁴ The health literacy questionnaire by Montazeri et al. has 33 items and five components and is designed for adults.²⁵ This questionnaire has been used more than other tools among the 13 researcher-made health literacy assessment tools in Iran for data collection and HL assessment in research studies.²³ The HL questionnaire by Masoumi et al.²⁶ has four components and 40 items and is designed to assess sexual HL.

1.1. HLS-SF12

The 12-item short-form health literacy scale (HLS-SF12) has been developed by Tuyen V. Duong (2019) for people over the age of 15 in Asia, which is on the basis of the HL survey questionnaire-47 (HLS-EUQ47). The HLS-SF12 as an assessment tool retains the original conceptual framework of HLS-EU-Q47 and is an optimized version for fast, comprehensive and effective measurement of health literacy.²⁷ A short assessment tool can be incorporated into assessment questionnaires such as patient visit assessments to quickly screen out vulnerable groups in HL and facilitate the implementation of targeted health education and assessment of intervention effects.^{28,29} Foreign scholars have applied the HLS-SF12 scale to studies of patients in general outpatient clinics, orthopedic, and Chinese medicine departments. They have also validated and analyzed the factors associated with HL in this group among rural residents in Vietnam,³¹ contributing to the development of mental health and healthcare quality. This has provided evidence supporting governmental and organizational strategies aimed at improving mental health and healthcare quality.³² Several studies have shown that the scale has good reliability and validity, and is generalizable in across-cultural backgrounds, geographic differences and social group differences, and can be used as a valid measurement tool for applying health literacy to multiple groups. At present, there is no recognized short-form HL scale for the whole population in Iran, and the relevant HL measurement questionnaires

have many items and are complicated, and there is a lack of relevant studies on whether the HLS-SF12 can be used in the Iranian population.

2. Objectives

Therefore, this study introduces the HLS-SF12, evaluates the reliability and validity in the Iranian population, and forms an Iranian version of the short-form HL scale to provide a rapid and effective measurement tool for the HL study of the whole population in Iran. Measuring public HL levels helps to monitor health status and manage health problems. This study aims to translate the HLS-SF12 and test the validity and reliability of the Persian version of the HLS-SF12 in the Iranian population. This aims to provide a rapid and effective measurement tool for studying HL across the entire population of Iran.

3. Methods

This cross-sectional study employed a methodological study design. The statistical population included all students of Islamic Azad University of Dezful, who were studying in four faculties (Humanities, Nursing and Midwifery, Engineering, and Agriculture). Kline suggests a minimum sample size of 200 for modeling studies, but in this research, a sample size of 300 was considered for greater generalizability. After excluding incomplete questionnaires, 289 participants were included in the study, selected through convenience sampling. Convenience sampling method was used for this study. Inclusion criteria included: being a student at one of the four faculties of Islamic Azad University of Dezful, willingness to participate in the research and completing the questionnaires. The exclusion criteria included: incomplete completion of research questionnaires and unwillingness to cooperate.

3.1. Data Collection

The HLS-SF12, developed by Tuyen V. Duong et al. (2019)²⁷ and applicable to public HL measurement, includes three dimensions of health care, disease prevention and health promotion, with 12 entries, each rated on a 4-point scale (1 = very difficult, 2 = difficult, 3 = easy, 4 = very easy), using a formula to calculate a standardized HL index ranging from 0 to 50, with higher indices representing higher levels of HL. The formula is, $\text{index} = (\text{mean} - 1) * (50/3)$, where the mean is the average of all items involved for each individual, 1 is the minimum possible value of the mean (when the minimum value of the index is 0), 3 is the range of maximum value (4) minus minimum value (1) of the average score of the respondent for each question, $3 = 4 - 1$, and 50 is the maximum value of the index. The formula is used to calculate a standardized HL index ranging from 0 to 50, with higher indices representing a higher level of HL.

Tuyen V. Duong (2019)²⁷ reported that the Cronbach's Alpha of the Health Literacy Scale Short Form was >0.70, the Cronbach's Alpha coefficients was 0.49 to 0.72 for the Health Care sub scale, 0.64 to 0.77 for the Disease Prevention sub scale, and 0.64 to 0.77 for the Health Promotion sub scale, and the Cronbach's Alpha coefficients ranged from 0.59 to 0.81, indicating that the scales had good internal consistency. The Persian version of the HLS-SF12 was used for the test after the transcultural adaptation. Two native Iranian and fluent in English (one medical and one in English) translated the scale independently. Then, one native Iranian fluent in English compared and analyzed the first two translated versions and discussed with the first two translators to form a composite draft of the Persian version of the scale. Afterwards, two English translators with no medical background back-translated the composite version of the Persian version of the scale separately without knowing the content of the scale. Finally, a medical master who was a native Persian speaker and fluent in English, and who did not participate in the translation and back-translation process, compared the back-translated version of the scale with the original scale and revised it together with the two back-translators to form the first draft of the Persian version of the HL scale. The SPSS 26.0 and AMOS 26.0 were used for the data entry and analysis. The scale's reliability was evaluated by internal consistency

Cronbach's alpha coefficient, test-retest reliability and. The scale's validity was analyzed by explanatory factor analysis (EFA) and Confirmatory Factor Analysis (CFA).

4. Results

4.1. Construct Validity

Bartlett's test of sphericity showed that Kaiser-Meyer-Olkin (KMO) was 0.783, $\chi^2 = 602.755$, $df = 66$ and $P = 0.001$. Based on the factor analysis, three factors with eigenvalue above 1 have been identified. Table 1 shows the eigenvalue and variance explained by the factors. The first, second and third factors explain 31.2%, 19.1% and 7.6% of the total variance, respectively. These factors explained 59% of the total variance.

The CFA was used to test the structural validity of the scale, and the scale was validated according to the three-factor structural model of the original scale. The Root Mean Square Error of Approximation (RMSEA) of the model was 0.07; The Goodness of Fit Index (GFI) of the model was 0.96; The Comparative Fit Index (CFI) of the mode was 0.97; The Incremental Fit Index (IFI) of the model is 0.97; The Tucker-Lewis Index (TLI) of the model is 0.96. All values were greater than 0.90, revealing that the results fit well. Collectively, it appears that the models for health care, disease prevention, and health promotion fit well. The results of the validated factor analysis have been shown in Table 2.

Table 1. The EFA Results of the Persian Version of the HLS-SF12 Scale

Items	Factor loading		
	Factor 1	Factor 2	Factor 3
Item 1	0.663		
Item 2	0.822		
Item 3	0.845		
Item 4	0.721		
Item 5		0.712	
Item 6		0.916	
Item 7		0.641	
Item 8		0.513	0.328
Item 9			0.392
Item 10			0.469
Item 11			0.866
Item 12			0.554
Eigenvalue	4.948	3.571	1.988
Explained variance (%)	31.202	19.112	7.553
Total explained variance (%)	59.032		
KMO (Kaiser-Meyer-Olkin)	0.783		
Bartlett χ^2 (P)	602.715 (0.001)		

Table 2. Model fit indices of the scale. χ^2 , Chi-square; *RMSEA*, root mean square error of approximation; *GFI*, goodness-of-fit index; *CFI*, comparative fit index; *IFI*, incremental fit index; *NFI*, normed fit index; *TLI*, Tucker-Lewis Index

	χ^2	DF	χ^2/DF	RMSEA	GFI	CFI	IFI	NFI	TLI
Three-Factor-Model	80.209	49	1.637	0.073	0.9961	0.974	0.966	0.876	0.971

The CFA results indicated that factor loading of the first sub-dimension ranged between 0.62 and 0.85, factor loadings of the second sub-dimension ranged between 0.66 and 0.88 and factor loadings of the third sub-dimension ranged between 0.17 and 0.83 (Figure 1).

4.2. Reliability Analysis

The scale has a total Cronbach's alpha of 0.88. The first,

second and third sub-dimensions have a Cronbach's alpha of 0.86, 0.79, and 0.72, respectively. The correlations of the scale items with the scale total score were found to be in the range of 0.42-0.74, and the corrected item-sub-dimension total score correlation ranged between 0.38 and 0.85 (Table 3).

Test-retest analysis showed that no statistically significant difference was found between the test-retest

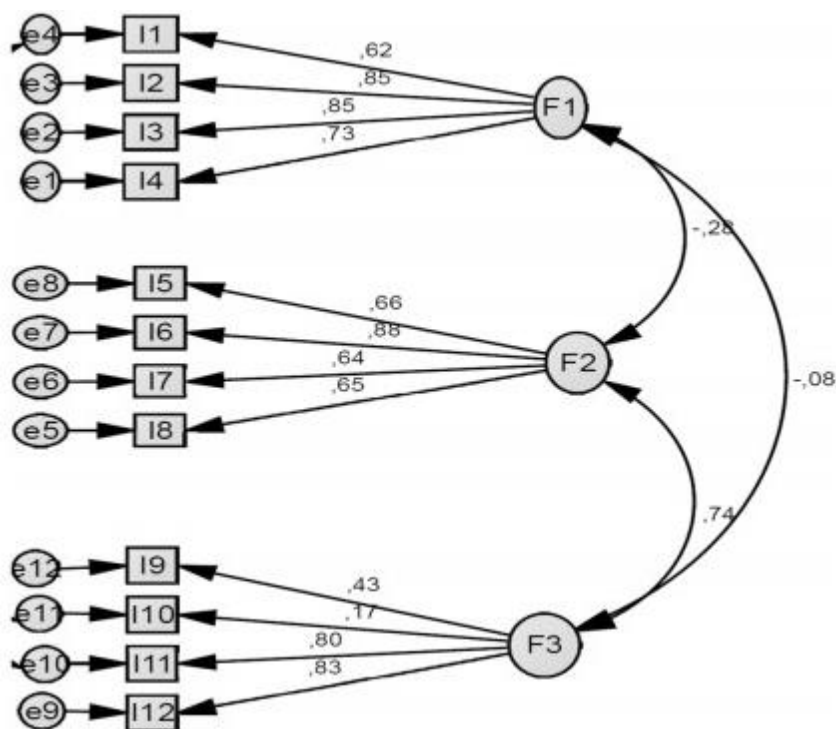


Figure 1. Confirmatory Factor Analysis of the HLS-SF12 Scale.

Table 3. Reliability of the Persian Version of HLS-SF12 Scale

Items	Total scale Cronbach's alpha	Sub-dimensions Cronbach's alpha	Item-total score correlations (r)	Item-sub-dimensions total score correlations(r)
Item 1	0.883	0.865	0.421	0.671
Item 2			0.470	0.849
Item 3			0.596	0.845
Item 4			0.499	0.767
Item 5		0.796	0.561	0.697
Item 6			0.636	0.850
Item 7			0.509	0.671
Item 8			0.568	0.597
Item 9		0.718	0.629	0.531
Item 10			0.430	0.376
Item 11			0.717	0.631
Item 12			0.742	0.672

Table 4. Test-Retest Reliability Analysis of the HLS-SF12 Persian Version

Scale and Subscales	Test M±SD	Retest M±SD	t	P	r	P
HLS-SF12 Persian version	33.35 ± 6.72	32.06 ± 4.12	1.357	0.187	0.650	0.001
Health care	9.26 ± 3.47	7.96 ± 2.59	2.258	0.032	0.529	0.003
Disease prevention	12.66 ± 3.04	12.96 ± 2.63	0.529	0.602	0.407	0.025
Health promotion	11.40 ± 3.10	11.13 ± 2.43	0.510	0.615	0.486	0.006

mean scores of the second and third sub-dimensions of the scale ($P>0.05$). However, a statistically significant difference was found between the test-retest mean scores of the first sub-dimension of the scale ($P<0.05$). The two measurements were determined to have a good correlation, positive and significant for both the scale and its sub-dimensions ($P<0.05$) (Table 4).

5. Discussion

This research aimed to evaluate the validity and reliability of the Persian version of HLS-SF12. The scale, with its three sub-scales and 12 items, was found to be a valid and reliable tool to be used in the Iranian culture. The HLS-SF12 was developed based on the HLS-EUQ47. The HLS-SF12 retains the original 12 items and

presents the original architecture of the HLS-EU-Q47 with good reliability.²⁷ This will facilitate a simple and accurate assessment of HL in a larger Asian population or clinical setting. In contrast, the HLS-SF12 scale has not yet been translated into the Persian Characters, and its applicability to the whole population in Iran is not clear. Therefore, this study was conducted to investigate the application of the Persian version of the HLS-SF12 in the Iranian population after a rigorous translation and reliability measurement of the scale. The KMO values were classified as excellent (1.00-0.90), very good (0.89-0.80), good (0.79-0.70), moderate (0.69-0.60), poor (0.59-0.50), and insufficient when below 0.50. In this study, since the KMO value of the scale was higher than 0.70, the sample size for factor analysis was considered to

be at a good level Persian. The eigenvalue must be ≥ 1 to determine the number of factors.³³ In this study, the scale was observed to have three sub-dimensions. The three sub-dimensions explained 59% of the total variance. The literature shows that variance ratios explained between 50% and 60% are generally quite high.³⁴ In the study with the original scale, the three-factor scale explained 55.95% of the variance.³¹ The validity and reliability study using the scale's Chinese version found that the three-factor structure explained 54.62% of the total variance.³⁵ As a result of EFA, the factor loadings of the three-factor scale were >0.30 as recommended by the literature, except for the 8th item. In the Chinese version, the factor loadings of all items ranged between 0.56 and 0.88, and the factor loading of item eight was the lowest compared to the other items.³⁵ Based on the CFA analysis results, five of the seven fit indices (RMSEA, NFI, GFI, IFI, and CFI) showed good fit and two (X^2/DF , TLI) showed excellent fit. CFA was not performed in the original study.³¹ In this study, as a result of the reliability analysis of the Persian version of the scale, the Cronbach's alpha coefficients of the whole scale, the second sub-dimension and the third sub-dimension were between 0.71 and 0.88, so it was considered highly reliable. The Cronbach's alpha value of the first sub-dimension was 0.86, so it was also considered highly reliable. The test-retest results of the scale and its sub-dimensions showed that the scale was invariant over time and with consistent results. The original scale also indicated that the test-retest result had a good test-retest reliability.³¹ Test-retest evaluation of the scale's Chinese version showed that the stability of the scale was satisfactory to good.³⁵

5.1. Limitations

The development and validation of the short form based on a single cross-sectional survey conducted on a population of students of Dezful University may pose restrictions on external validity and reproducibility. However, it is common to develop and test single samples in instrument development and testing.³⁶ On the other hand, it would be necessary to further validate the HLS-SF12 by other advanced study designs.

6. Conclusion

This study introduced the HLS-SF12 and measured the applicability of the Persian version of the HLS-SF12 in our population. The results showed that the Persian version of the HLS-SF12 has good reliability and validity. The scale has 12 items, and each item is clearly expressed and easily understood, which can provide a tool for assessing the current situation and influencing factors of HL in Iran. The scale can be utilized in future research and nursing practice to improve their patients and to guide them in self-care.

Research Highlights

What Is Already Known?

- Health Literacy (HL) is defined as the knowledge to access, analyze, and understand health information, and make correct decisions.
- In order to understand the status of health literacy among different individuals, numerous tools have been designed and introduced worldwide.
- A short assessment tool can be incorporated to quickly screen out vulnerable groups in HL and facilitate the implementation of targeted health education and assessment of intervention effects.

What Does This Study Add?

- Development of a new and Short-Form of Persian Version Health Literacy in Iran.
- This scale displays good psychometric and methodological properties.
- Application in assessing individuals and programs designed to improve HL.

Author Contributions

EM-M contributed to designing the study, data collection, statistical analysis, interpreted the results, and wrote the manuscript. SM contributed to data collection. All the authors approved the final version of the manuscript for submission.

Conflict of Interest Disclosures

All authors declared that they have no conflict of interest.

Ethical Approval

Principles of confidentiality, informed consent, and respect for participants' rights were observed in this study. Before completing the questionnaires, oral informed consent was obtained from the participants. The personal information of the participants was kept confidential throughout the study. All data were analyzed and reported without including any information that could reveal the participants' identity.

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