
Validity and Reliability of the Arabic Version of the European Health Literacy Questionnaire (HLS-EU-Q47-Arabic)

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Abstract

Health literacy is a public health concern that refers to an individual's awareness, competence to access and motivation, understand, appraise and apply health information to prevent illness and promote a healthy lifestyle. This study aimed to adapt the European Health Literacy Questionnaire (HLS-EUQ47) into Arabic. The questionnaire was translated into Arabic by using translation-back-translation. Forward translation-the back-translation method was used for language validity and the final Arabic version was formed. HLS-EUQ47 was administered to 470 Libyan parents of primary school students in the West area of Libya. Construct validity was assessed by confirmatory factor analysis. Convergent validity was examined using the Composite Reliability (CR) and Average Variance Extracted (AVE). Discriminant validity was tested by examining the square root of AVE for each construct against correlations, reliability was examined using Cronbach's alpha coefficient and Intra-Class Correlation Coefficient. The questionnaire was shown to have good construct validity, satisfactory goodness-of-fit of the data to the hypothetical model in three health literacy domains, high internal consistency (Cronbach's alpha >0.90), satisfactory convergent validity. This study revealed that the HLS-EU-Q47 was a valid and reliable measuring instrument

satisfactory and comprehensive measuring health literacy survey tool for use in Arab countries.

Keywords

Validation, Health literacy, HLS-EU-Q47, Arabic, Confirmatory factor analysis.

Introduction

Health literacy is a key determinant of health-related concerns. Along with genetic and environmental factors, health literacy and health-related behavior plays an important role in health promotion and disease prevention (Beaglehole *et al.*, 2011). Health literacy was defined as follows: ‘health literacy entails people’s knowledge, motivation and competences to access, understand, appraise and apply health information to make judgments and decisions in everyday life concerning healthcare, disease prevention and health promotion to maintain or improve quality of life during the life course’ (Sørensen *et al.*, 2012). The majority of studies reported that a low health literacy level is associated with a negative effect on the management of diseases and patient adherence to treatment. A low level of health literacy also leads to insufficient awareness about diseases and causes bad health outcomes. Thus, it is associated with higher morbidity and mortality rates (Kaufman *et al.*, 2001). Health literacy is an important concept for public health, it also confirms the need for healthcare suppliers to be aware of health literacy levels within their community and to take into consideration the health literacy levels when developing intervention programs to improve health (Van den Broucke, 2014). Because there was a need for a comprehensive tool to measure health literacy among the population, the European Health Literacy Survey (HLS-EU) Consortium was developed under the scope of the European Health Literacy Project 2009–2012. This consortium created the European Health Literacy Survey Questionnaire (HLS-EU-Q47), which can measure people's ability to understand, appraise and apply health-related issues (Sørensen *et al.*, 2013). The questionnaire has been used in eight European countries (Germany, Austria, Bulgaria, the Netherlands, Ireland, Spain, Poland, and Greece) (Consortium, 2012) and has been translated into several languages in Europe (Sørensen *et al.*, 2015) and Asia (Duong *et al.*, 2017). To date, there are no health literacy studies which use standardized instruments in Arab countries. It is very essential to adapt the HLS-EU-Q47 scale into Arabic as there is no reliable and valid scale measuring health literacy in Arab countries. Thus, this study aims to

validate the comprehensive health literacy questionnaire HLS-EU-Q47-Arabic among population in Libya.

Methods

Questionnaires and measurements

The European Health Literacy Questionnaire (HLS-EU-Q47) measures an individual's ability to realize, estimate and apply health-related information (Consortium, 2012). It was based on a conceptual model of health literacy and measures four competences to deal with health-relevant information (health care, disease prevention, and health promotion) and four information-processing competencies (accessing, understanding, appraising and applying) related to health-relevant decision-making. These are composed of a matrix with 12 sub-dimensions. It is a self-report a 4-point Likert-type survey with responses ranging from very difficult (1) to very easy (4). "The indices for health literacy were standardized to unified metrics from 0 to 50 using the formula; $\text{Index} = (\text{mean} - 1) * (50/3)$ where Index is the specific index calculated, mean is the mean of all items for each individual, 1 is the minimal possible value of the mean, 3 is the range of the mean, and 50 is the chosen maximum value of the new metric, and the participants can be categorized into four groups: 'inadequate' (0–25), 'problematic' (>25–33), 'sufficient' (>33–42) and 'excellent' (>42–50)" (Consortium, 2012).

Process of cultural adaptation

With the agreement from the HLS-EU consortium, the HLS-EU-Q47 was translated into Arabic using forward-backward translation. Following the recommendations for cross-cultural translation (Van de Vijver and Hambleton, 1996), two independent professionals' translators fluent in Arabic and English have translated the questionnaire to Arabic, and, the researcher (MB, native Arabic speaker) compared both versions and discussed with the translators any discrepancies found. Then, two independent English speakers who are blind to the study objectives have translated the questionnaire into English. Comparisons were made between the original and the translated versions by thoroughly analyzing each question. In the final phase, all of the questions were reviewed by a small committee consisting of MB and two Libyan public health experts who can speak Arabic and English. Consequently, a final Arabic version of the questionnaire was produced. The content of the questionnaire was judged by the expert panels, who are public health specialists and experts on health behavior to reflect cultural adaptation. It was tested by reviewing it by five different experts working at different organizations (3 public health

specialists, and 2 experts on health behavior). The questionnaire was tested for face validity among a purposive sample of the parent' of government' primary school student in the West area of Libya for the items' relevance, design, clarity, and understandability of the questionnaire.

Study type and participants for HLS-EU-Q47-Arabic validation

The final version of HLS-EU-Q47-Arabic was tested among Libyan parents of primary school students between August and October 2018 in West cities, of Libya. Libyan parents of government's primary school students who could read and write and who had no health problems preventing them from completing the form were included in the study. The sample size for the study was calculated according to the rule of multiplying the number of scale items ($n = 47$) by 10 (DeVellis, 2016). This calculation resulted in the determination of a study sample of 470 as the required number of participants for the study, approximately 235 participants from one rural area school and 235 participants from one urban area school and was fairly distributed between father and mother (117 fathers, 117mothers).

Sociodemographic characteristics

Parents' age groups (years), gender (male or female), academic level (diploma, bachelor's degree master or Ph.D), financial status, living area (rural or urban), were queried.

Statistical analysis

Data were statistically analyzed using Statistical Package for the Social Sciences (SPSS) 17.0. After examining the normality of distributions of the responses, descriptive data were shown as frequencies and percentages.

Validity analyses

To establish construct validity, confirmatory factor analysis (CFA) was conducted separately for the three health literacy domains of health care, disease prevention, and health promotion, in which items were loaded onto four hypothetical factors related to finding, understanding, judging, and applying health information. The fit of the data to the model was examined using goodness-of-fit indices, including (i) absolute model fit: root mean square error of approximation (RMSEA) and goodness-of-fit index (GFI); (ii) incremental fit: adjusted goodness-of-fit index (AGFI), comparative fit index (CFI), incremental fit index (IFI), and normal fit index (NFI); and (iii) parsimonious fit, or the chi-square goodness-of-fit test. Convergent validity was examined using the Composite Reliability (CR) and Average Variance Extracted (AVE). Discriminant validity was tested by examining

the square root of AVE for each construct against correlations (shared variance) between the present construct and all other constructs in the model. A construct would have adequate discriminant validity if the square root AVE exceeds the correlation among the constructs.

Reliability analyses

Internal consistency was tested with Cronbach's alpha. A test-retest was also examined among the purposive sample (30) parents' of primary school students in the West area of Libya (15 from one rural area school, 15 from one urban area school) fairly distributed between fathers and mothers, and the Intra-Class Correlation Coefficient (ICC) was measured (Cicchetti, 1994).

Results

The participants' characteristics are shown in Table 1.

Construct validity

The CFA was employed to test construct validity. The results showed a good fit of the data to the hypothetical model for three domains of health literacy. The RMSEA index was less than 0.08, and other goodness-of-fit indices (GFI, AGFI, CFI, IFI, and NFI) were > 0.90 for most domains, which is adequate to be considered a good model-data fit (Byrne and Whiten, 1994). The overall results supported the fitness of the four-factor structure within each of the three domains of the HLS-EU-Q47-Arabic (Table 2).

Convergent validity

As shown in Table 3, the measurement model results for three domains of health literacy showed that all items had a loading factor of above 0.50, which was above the threshold (Byrne, 2013). The result of Average Variance Extracted (AVE) is greater than 0.50 for all three constructs of three domains of health literacy which indicating accepted convergent validity (Fornell and Larcker, 1981). Also, composite reliability (CR) ranged from 0.85 to 0.98 which indicating satisfactory values (Fornell and Larcker, 1981). Thus, the results proved that Convergent Validity (AVE) and Composite Reliability (CR) existed for the three domains of health literacy.

Discriminant validity

As shown in Table 4, the square root of Average Variance Extracted for each construct of three domains of health literacy is more than each of the

correlations between constructs. Therefore, discriminant validity is adequate for all three domains.

Reliability

Cronbach's alpha values greater than or equal to 0.7 indicate satisfactory reliability (Cicchetti, 1994). The statistic test of the questionnaire of the Cronbach's alpha for HLS-EU-Q47-Arabic was 0.97 which is considered good consistency, the items had an item-total correlation above 0.35. Intra-Class Correlation Coefficient (ICC) values between 0.75 and 0.95 indicate satisfactory reliability (Cicchetti, 1994). Intra-Class Correlation Coefficient (ICC) for the HLS-EU-Q47-Arabic was ranged from 0.83 to 0.95 which indicates excellent reliability.

Discussion

The results showed that the HLS-EU-Q47-Arabic was a valid and reliable tool to measure health literacy in Arab countries, with satisfactory model-fit indices, existed convergent validity, adequate discriminant validity, high level of internal consistency reliability, and excellent test-retest reliability. The HLS-EU-Q47-Arabic was validated among Libyan parents, with satisfactory goodness-of-fit indices according to confirmatory factor analyses. As a rule, if the item loadings in one factor are about 0.50 or higher, the factor is considered stable and solid (Costello and Osborne, 2005). However, as their loadings were adequate, it is concluded that the construct validity of the HLS-EU-Q47-Arabic is supported. To obtain further validate of the construct of the HLS-EU-Q47-Arabic, its convergent validity was examined. The Average Variance Extracted for the three constructs was found to be greater than 0.50 which indicated adequate convergent validity (Fornell, and Larcker, 1981). Moreover, discriminant validity was obtained, the square root of Average Variance Extracted for each construct more than each of the correlations between constructs (Byrne, 2013; O'Rourke and Hatcher, 2013). To determine the reliability of the HLS-EU-Q47-Arabic, its internal consistency was examined. A reliability coefficient of 0.80 is considered as the lowest acceptable threshold for a well-developed measurement tool (Nunnally, 1994). The Cronbach's alpha coefficients were 0.97 which is considered satisfactorily high. In the original European study, internal consistency reliability coefficients Cronbach's alpha were all more than 0.90. Similarly, Cronbach's alpha that was obtained in Six Asian countries (Indonesia, Kazakhstan, Malaysia, Myanmar, Taiwan, and Vietnam) was 0.85 to 0.88 which considered satisfactory reliability (Duong *et al.*, 2017). In another study in Turkey in which the HLS-EU-Q47 scale was used, Cronbach's alpha was found to be 0.95 and for the sub-dimensions HC, DP, and HP,

they were found to be 0.86, 0.87 and 0.91, respectively (Abacigil *et al.*, 2018). Intra-Class Correlation Coefficient (ICC) values between 0.55 and 0.75 indicate moderate reliability, values between 0.75 and 0.90 indicate good reliability and values greater than 0.90 indicate excellent reliability (Cicchetti, 1994). The high Intra-Class Correlation Coefficient in our study reveals that the HLS-EU-Q47-Arabic is a reliable measuring instrument. In this study, it was found that 37.6% of the participants had inadequate, 37.2% problematic, 21.9% sufficient and only 3.3% excellent health literacy levels. In contrast to this finding, a study was conducted in the European countries showed the majority of participants had sufficient health literacy levels (36%), while only 12.4% of participants had inadequate health literacy levels (Consortium, 2012). Similar results were reported in Turkey, 13.1, 39.6, 32.9 and 14.5% for the four categorized health literacy indices (Abacigil *et al.*, 2018).

Strengths and Limitations

The studies carried out in Arab countries on health literacy are very limited not only in quantity but also in terms of using an appropriate survey. The HLS-EU-Q47-Arabic has not been validated in previous studies. One of the strengths of the study is that all segments of the community (low literacy to high literacy segments) were included in the study. This ensures that the sample is heterogeneous. Despite the strengths of the current study, some limitations were found, because the study was among Libyan parents, middle-aged people participating were higher than younger and older groups. Therefore, the age distribution of participants did not represent the whole population well.

Conclusion

In conclusion, the current study may provide a reliable, appropriate and comprehensive tool to measure health literacy in Arab countries. Findings from the items of the adapted survey are important in identifying crucial points to improve health in Libya and other Arab countries. For, healthcare programs and decision-makers can be organized and priorities can be defined for the society. Besides, this tool can be used to monitor the efficiency of healthcare and health-promotion programs, hence, contribute to the further improvement of the population's health in Arabic speaking countries.

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Table 1 Characteristics of participants (N= 470)

Variable	Frequency (%) (N=470)	
Age groups		
20-30	76 (17)	
30-40	184 (36)	
40-50	139 (31)	
50 or more	71 (16)	
Gender	235 (50)	
Male	235 (50)	
Female	235 (50)	
Residence	235 (50)	
Rural area		
Urban area	192 (40)	
Education	248 (52)	
Diploma	30 (8)	
Bachelor's degree		
Master or PhD	72 (15.4)	
	326 (69.6)	
Income	72 (15)	
Less than 600 LD (130USD)		
600-1200 LD (130-260 USD)		
More than 1200 LD (260 USD)		
	Mean (SD)	
	90 (19.1)	2.56 (0.994)

Health literacy status	110 (23.6)
Inadequate	186 (39.5)
Problematic	84 (17.8)
Sufficient	
Excellent	

LD= Libyan Dinar

Table 2 Construct validity of the HLS-EU-Q47-Arabic with goodness-of-fit indices

model	Absolute model fit		Incremental fit				Parsimonious fit
	RMSEA	GFI	AGFI	CFI	IFI	NFI	χ^2/df
HC-HL	0.055	0.940	0.917	0.991	0.991	0.985	2.43
DP-HL	0.067	0.933	0.904	0.983	0.991	0.975	3.08
HP-HL	0.036	0.960	0.945	0.996	0.996	0.989	1.61

AGFI, adjusted goodness-of-fit index; CFI, comparative fit index; DP-HL, disease prevention health literacy; GFI, goodness-of-fit index; HC-HL, health care health literacy; HLSEU-Q47, European Health Literacy Survey Questionnaire with 47 items; HP-HL, health promotion health literacy; IFI, incremental fit index; NFI, normal fit index; RMSEA, root mean square error of approximation; χ^2/df , relative chi-square

Table 3 Convergent Validity, Composite Reliability of the HLS-EU-Q47-Arabic

Construct	Items	Loading factor	AVE	CR
HCF	HC1F	0.972	0.93	0.96
	HC2F	0.945		
	HC3F	0.959		
	HC4F	0.964		
HCU	HC5U	0.948	0.95	0.98
	HC6U	0.971		
	HC7U	0.966		
	HC8U	0.980		
HCJ	HC9J	0.980	0.94	0.97
	HC10J	0.958		
	HC11J	0.965		
	HC12J	0.973		
HCA	HC13A	1.000	0.95	0.98
	HC14A	0.977		

DPF	HC15A	0.977	0.82	0.91
	HC16A	0.954		
	DP17F	0.950		
	DP18F	0.972		
	DP19F	0.923		
DPU	DP20F	0.939	0.80	0.89
	DP21U	0.998		
	DP22U	0.943		
	DP23U	0.893		
DPJ	DP24J	0.753	0.71	0.85
	DP25J	0.953		
	DP26J	0.963		
	DP27J	0.974		
	DP28J	0.971		
DPA	DP29A	0.994	0.81	0.90
	DP30A	0.941		
	DP31A	0.904		
HPF	HP32F	0.993	0.91	0.95
	HP33F	0.916		
	HP34F	0.953		
	HP35F	0.914		
	HP36F	0.931		
HPU	HP37U	0.999	0.92	0.96
	HP38U	0.925		
	HP39U	0.952		
	HP40U	0.963		
HPJ	HP41J	0.971	0.95	0.98
	HP42J	0.948		
	HP43J	0.978		
HPA	HP44A	0.957	0.93	0.97

	HP45A	0.944		
	HP46A	0.948		
	HP47A	0.971		

HC=Health Care, DP= Disease Prevention, HP= Health Promotion, F= Finding, U= Understanding, J= Judging, A= Applying health information, AVE= Convergent Validity, CR= Composite Reliability

Table 4 Square root AVE for the HLS-EU-Q47-Arabic

	HCF	HCU	HCJ	HCA
HCF	0.964			
HCU	0.496	0.964		
HCJ	0.510	0.321	0.969	
HCA	0.402	0.328	0.404	0.964
	DPF	DPU	DPJ	DPA
DPF	0.905			
DPU	0.804	0.894		
DPJ	0.860	0.459	0.842	
DPA	0.702	0.659	0.425	0.934
	HPF	HPU	HPJ	HPA
HPF	0.953			
HPU	0.941	0.959		
HPJ	0.943	0.312	0.974	
HPA	0.942	0.821	0.512	0.964

HC=Health Care, DP= Disease Prevention, HP= Health Promotion, F= Finding, U= Understanding, J= Judging, A= Applying health information