Original Article

Development and Validation of the Health Literacy Scale for Workers

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Abstract

Background: Health literacy has received growing attention in recent years to reduce health disparities. Health literate individuals can gain access, understand and use health information to maintain, improve and promote good health.

Objective: To develop and assess the psychometric properties of a tool for the measurement of health literacy among workers, the Health Literacy Scale for Workers (HELSW).

Methods: 15 companies were selected from the factories of the industrial city of Saveh. 450 (400 male and 50 female) workers from Saveh, Iran, were selected through a multistage random sampling. The study had two stages—a qualitative and a quantitative stage. In the qualitative phase, the workers' beliefs were extracted based on 61 in-depth interviews. Content validity was assessed with the help of 12 experts in the field of health education, public health and occupational health. Also, face validity was evaluated through interviewing with 20 workers. In the quantitative phase, the reliability of the questionnaire was evaluated by measuring the internal consistency and test-retest reliability. The construct validity was assessed by the principal component analysis using varimax rotation.

Results: In the exploratory factor analysis, six domains (*ie*, access, reading, understanding, assessment, decision making and applying health information, and self-efficacy) with 34 items were loaded; the model explained 64.3% of the total variance. Intraclass correlation coefficient and test-retest reliability ranged from 0.72 to 0.84 and 0.69 to 0.86, respectively.

Conclusion: It seems that the developed Persian questionnaire, HELSW, is a reliable and valid measure of the health literacy in workers.

Keywords: Health literacy; Reproducibility of results; Psychometrics; Surveys and questionnaires; Iran

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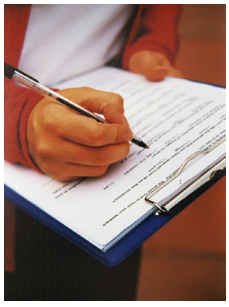

Introduction

In the 21st century, people need to have a wide range of competencies and literacies to have good performance. These literacies are diverse, dynamic and flexible, as they range from the ability to read and write a newspaper to the ability to understand the written information and material.[1,2] Health literacy is a series of skills like reading, listening, analyzing, decision making, and the ability to apply these skills in health situations, which does not necessarily depend on the years of education or the general ability to read.[3] In other words, health literacy could be recognized as the capacity to acquire, process, and understand the necessary information and the required services to make right decisions in the field of health.[4,5] Given the

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fact that health literacy is now considered a global issue, the World Health Organization (WHO) has recently introduced health literacy as one of the significant determinants of health. WHO has advised countries of the world to form an association made up of all those affected by this issue to monitor and coordinate strategic activities for the promotion of health literacy in different communities.[6] In the 5th Global Conference on Health Promotion held by WHO in Mexico, health literacy was defined as cognitive and social skills determining the motivations and abilities of individuals to access, understand, and apply the information in a way that is conducive to maintaining and promoting health. In this definition, health literacy is defined as an individual factor and considered a key factor in public health.[7]

Much evidence suggests that many unpleasant health consequences have resulted from inadequate health literacy.[8] Inadequate health literacy is associated with poor personal health, inappropriate use of drugs, failure to follow the doctors' instructions, poor control of blood sugar, less participation in treatment decisions, and greater use of hospitals and emergency services.[9] The impact of low health literacy on self-care disability, increased complications rate and consequences of chronic diseases has been proven.[10] According to the report by the American Center for Health Care Strategies, people with low health literacy tend not to follow the instructions by health experts and thus experience less preventive care, more hospitalizations and medical visits, and more incurred medical expenses.[11]

Inadequate health literacy leads to less health knowledge, poor communication with physicians and health staff, increased problems caused by self-control and self-care, and poor health status.[9] People with low health literacy have poor performance in self-care skills too.[12]

Various studies have so far been conducted on the evaluation of health literacy in different countries; some of the studies only investigated health literacy in different groups, while others studied its correlation with some diseases and their prevention. Studies conducted in the USA, New Zealand, Canada, and Australia demonstrated that more than half of the people had major problems with reading and understanding health tasks and information.[13] Studies also showed that health literacy is effective in predicting health and disease consequences.[14,15]

A study carried out in the American Center for Health Care Strategies showed that people with low health literacy are less likely to understand the written and spoken information provided by health experts or follow their instructions and therefore have poorer health status.[16] Another study carried out in the USA estimated the prevalence of inadequate health literacy among adults at 48%; only 3% of the elderly Americans had adequate health literacy.[17]

In a study on British adults, health literacy was as low as 30%.[18] Another study conducted in the USA indicated that complications of diabetes mellitus are more prevalent in people with low health literacy.[12] A study conducted in Iran indicated that 44% of the Iranians aged 18–65 years have low health literacy.[6]

To make right decisions about health, people must be able to understand and apply the information provided. Furthermore, service providers must be aware of patients' abilities to process the information to improve the consequences of their diseases.[7,10]

A healthy workforce is among the primary terms of efficiency, and it is of the utmost importance in sustainable development. Promoting workforce safety is among the requirements of welfare promotion, and it is in line with the socioeco-

For the validated Persian questionnaire see the Web Extra on the Journal Web site available from http://www.theijoem.com/ijoem/index.php/ijoem/article/view/1498/1072

nomic goals of all countries. Most people spend over one-third of their post-puberty life in hazardous workplaces, while they are at risk of a variety of occupational hazards.[19,20] The worst adverse consequence of these hazards is premature mortality of the workforce. Accidents and diseases in general, and occupational accidents and diseases, in particular, affect the economic indicators and lead to human loss.[20,21]

The prevalence of occupational diseases presently ranges from 1% to 10% in the world. In Iran, occupational diseases account for an average of 5% of the diseases. According to the statistics of the International Labor Organization, each day about 6000 people are killed worldwide due to work-related accidents and diseases.[22] A total of 350 000 people dies annually in occupational accidents; 1 700 000 die due to occupational diseases. In other words, someone is killed every 15 seconds due to work-related accidents and diseases. Based on available evidence, each year 160 million people worldwide become infected with occupational diseases and 2700 million have occupational accidents.[19]

Researchers consider “the lack of attention to factors affecting prevention” one of the reasons for the high prevalence of occupational accidents and diseases.[23,24] One of the factors affecting health promotion and the prevention of occupational accidents and diseases is health literacy.[11] Health literacy was based on the idea that health and literacy are vital sources for life today. Studies over the past 15 years show that health literacy directly affects health behavior; it also gives people more control over their health as individuals, family members, or members of society.

Despite the importance of health literacy, and given that a suitable instrument is required for its assessment, here, we describe how we developed and validate the Health Literacy Scale for Workers (HELSW).

Materials and Methods

Saveh is a city located in Markazi province, Iran. Having over 65 000 workers, it is the largest industrial city in Iran. Our approach for designing the instrument was preparing a questionnaire that would include the main aspects of the definition of health including access, understanding, and applying health information. It should also be easy to use under various circumstances for assessing health literacy in the working population. The study was conducted in two phases.

Creating the Items

It was a qualitative content analysis carried out from April to August 2015. Using content analysis, the workers' beliefs were extracted based on 61 in-depth interviews. In this part, in-depth interviews were carried out in five factories and workshops to generate the original items pool for the study.

Research units were chosen based on purposive sampling, and data collection continued to saturation. The interviews with workers, as the participants, started with the general question “what is your opinion about health literacy and its role in preventing occupational accidents and diseases?" and continued with questions about the meaning of health, health literacy, occupational accidents and diseases, knowledge of sources of health information, and applying health information and services. Each interview lasted for 30–45 min. All the interviews were recorded with the permission of the participant.

Data analyses were done through permanent and continuous analyses. At first, the interviews were grouped into their smallest units; codes and themes were marked as classified units. In this phase, 59 items were extracted after careful review of the items by the research team. The items extracted in this phase were then

evaluated for content validity and face validity to continue the psychometry.

Content Validity

The objective of content validity was to determine whether or not the content of the instrument is capable of measuring the defined objective.[25] To do so, we used both qualitative and quantitative methods and asked the opinion of 12 experts in the field of health education, public health, occupational health, industrial safety, and psychology. In content validity assessment, the experts were asked to conduct a qualitative assessment of the instrument based on the criteria of compliance with grammar, using the right words, the right placement of items, as well as the right scoring, and provide the necessary feedback, based on which some modifications were made to the instrument. In content validity assessment through quantitative method, both content validity ratio (CVR) and content validity index (CVI) were measured. Regarding CVR, the experts were asked about the necessity of each item, and a CVR value >0.56 was considered "acceptable."[26] Regarding the CVI, the criteria of relevance, clarity, and simplicity of the items were assessed and a CVI value >0.79 was considered acceptable.[7] After examining the CVR and CVI values, 18 items were removed.

Face Validity

After verifying the content validity, face validity was assessed in order to determine whether the appearance of the instrument is proper or not for research units and observers. Both qualitative and quantitative methods were used. In the qualitative assessment of face validity for evaluation of the legibility and clarity of the questionnaire items, the questionnaire was presented to 20 workers who would not participate later in the study. The workers were asked to study the items and ask questions about any unclear points or ambiguities. In the next step, the quantitative method of "item impact" was used to reduce and remove the inappropriate items and determine the importance of each item. The instrument was presented to the same 20 workers, while the objectives of the study were explained (written at the beginning of the questionnaire) to them. They were asked to rate the importance of each item in a 5-point Likert scale from '1' (not important at all) to '5' (totally important). Only those questions with scores >1.5 were accepted concerning face validity.[7] To this point, the questionnaire items decreased to 41 after face and content validity. These 41 items entered the second phase of the study, which was quantitative.

After designing the items in the first phase of the study, to assess the psychometry process of the designed items, a cross-sectional study was conducted to assess the construct validity of the questionnaire. In this phase, according to Munro's recommendation to study about 10 people for each item, at least 410 people were necessary to study.[27] To increase the accuracy of the study, we decided to study 480 workers selected using a multistage random sampling from factories in Saveh (420 men and 60 women based on the sex ratio of the population of workers in this city). To select the study participants, at the first stage, 15 companies were selected from the factories of the industrial city of Saveh through a cluster random sampling; in the next stage, 32 workers from each factory were selected from the attendance lists of the companies, using a simple random sampling method. Thirty of 480 questionnaires were not complete, leaving 450 questionnaires for further analysis—a participation rate of 93.7%.

Construct Validity

Exploratory factor analysis was used to assess the construct validity. All the 41 ques-

Table 1: Demographic characteristics of the participants

Variable	Men n (%), (n=400)	Women n (%), (n=50)
Education level		
Illiterate	3 (0.8)	0 (0)
Elementary and secondary school	106 (26.5)	7 (14)
Diploma	204 (51.0)	28 (56)
University	87 (21.8)	15 (30)
History of occupational disease over the last 3 years		
Yes	5 (1.3)	0 (0)
No	395 (98.8)	50 (100)
History of occupational accident over the last 3 years		
Yes	80 (20.0)	3 (6)
No	320 (80.0)	47 (94)
Source of health information		
Radio and TV	128 (32.0)	28 (56)
Health Staff	122 (30.5)	16 (32)
Friends and colleagues	136 (34.0)	18 (36)
Family	112 (28.0)	15 (30)
Internet	120 (30.0)	17 (34)
Books and magazines	100 (25.0)	14 (28)
Health status		
Good	284 (71.0)	33 (66)
Average	91 (22.8)	13 (26)
Poor	25 (6.3)	4 (8)
Job satisfaction		
Yes	252 (63.0)	33 (66)
No	148 (37.0)	17 (34)

tions were analyzed using principal component analysis with varimax rotation, assuming the special value of >1 and cut-off point of 0.5, using SPSS® for Windows® ver 21.0. The adequacy of sample size was assessed using KMO statistic.

Reliability

Internal reliability (the internal consistency) and external reliability (test-retest) methods were used to assess the reliability of the questionnaire. Cronbach's α was used to assess the internal reliability of the scale. To this end, the scale was distributed to and completed by 30 workers once. According to the suggestion made by the researchers, we considered a Cronbach's α <0.5 "unacceptable," 0.5–0.6 "poor," 0.61–0.7 "average," and >0.7 "satisfactory."[27,28] To determine the external reliability, 25 workers were asked to complete the questionnaire. Two weeks later, the workers were asked to complete the questionnaire for the second round. We then calculated the correlation coefficient of the scores obtained that was used as the reliability coefficient. The correlation coefficients ≥0.4 were considered acceptable.[7]

Ethics

The protocol of the present research was approved by the Ethics Committee of Saveh University of Medical Sciences (IR.SAVEHUMS.REC139402). The research team explained the study objectives to all participants. They signed a written informed consent. The questionnaires were completed in a private room.

Results

The 450 participants included 400 men and 50 women. The mean age was 33.2 (SD 8.3) years for men and 29.6 (SD 7.9) years for women. The mean work experience was 9.7 (SD 7.2) years for men, and 6.3 (SD 5.5) for women. The highest literacy level was diploma—51% of men and 56% of women had the degree. Over the past three years, 27% of the participants had had at least one occupational disease or accident. The most frequently used sources for health information among men

Table 2: Results of exploratory factor analysis with varimax rotation

No.	Items	Domains					
		Access	Reading	Understanding	Assessment	Decision making and use	Self-efficacy
1	I can obtain information about my occupational health from different sources (health experts, physicians, posters, *etc*).	0.844					
2	I can obtain information about occupational diseases related to my job.	0.873					
3	I can obtain information about personal safety and health related to my job.	0.820					
4	I can obtain information about the harmful agents at my workplace.	0.832					
5	It is easy for me to read educational material (booklet, pamphlet, brochure, educational and commercial) on occupational diseases and accidents.		0.673				
6	It is easy for me to read written instructions of professional health experts and physicians.		0.690				
7	It is easy for me to read the instructions and safety guides for using industrial machinery.		0.617				
8	It is easy for me to read instructions and safety guides for using chemicals.		0.580				
9	I understand the symbols and guidelines for safe usage of chemicals and machinery.			0.623			
10	I understand the meaning of occupational safety and health notices.			0.782			
11	I understand the benefits offered for using personal safety and health equipment.			0.769			
12	I understand the descriptions by physicians about occupational diseases.			0.767			
13	I understand the descriptions by health experts about occupational hazards and harmful agents at workplace.			0.825			
14	I understand instructions and safety guides for using industrial machinery.			0.645			
15	I understand written instructions by professional health experts and physicians in occupational examinations.			0.623			
16	I understand the meaning of written material in preparatory guides for laboratory tests, radiology, and occupational examinations.			0.512			
17	I can evaluate the accuracy of information given by health experts about occupational health.				0.508		

Continued

Table 2: Results of exploratory factor analysis with varimax rotation

No.	Items	Domains					
		Access	Reading	Understanding	Assessment	Decision making and use	Self-efficacy
18	I can evaluate the accuracy of information given by friends and acquaintances about occupational health.				0.636		
19	I can evaluate the accuracy of recommendations given by colleagues about occupational health.				0.797		
20	I can tell others how to prevent occupational hazards.				0.760		
21	I use occupational safety and health equipment during work.					0.701	
22	I avoid things which would increase the risk of occupational accidents.					0.604	
23	If I have any questions about my disease, I ask a physician or a health expert.					0.569	
24	I regularly use the personal safety equipment recommended for the prevention of occupational diseases and accidents.					0.504	
25	I always take care of my health in any activities.					0.761	
26	When the doctor prescribes some medication for me, I take it as prescribed to the end.					0.730	
27	I always go for checkups, even if I don't have any symptoms of occupational diseases.					0.721	
28	I always use personal safety and health equipment, even if I don't have any symptoms of occupational diseases.					0.502	
29	Upon noticing symptoms of occupational diseases, I know where and to whom to go.					0.511	
30	If one of my colleagues or friends catches an occupational disease, I also will go to see a doctor.					0.516	
31	I try to obtain as much information as possible about occupational health.						0.670
32	I have the necessary skills for obtaining the health information I need.						0.715
33	Upon facing health-threatening diseases or problems, I can manage to obtain the information I need.						0.766
34	I can ask others about the health information I need.						0.770

were friends/colleagues (34%) and radio/TV (32%). The most important sources among women were radio/TV (56%) and friends/colleagues (36%). Most (n=414, 92%) of participants were living in cities, and married (n=400, 89%). In response to the question that "how do you evaluate your present health status?" 71% of men answered "good;" the rate was 66% for women. Furthermore, two-thirds of participants were satisfied with their present jobs (Table 1).

Factor Structure

A KMO statistic value of 0.91 and a significant ($p<0.001$) Bartlett's test of sphericity indicated the possibility of using factor structure for factor analysis. In exploratory factor analysis using principal component analysis and varimax rotation, six domains with loading factors >50% were clearly distinguished (Table 2). Considering the theoretical structure of health literacy, these six domains were named "access" (4 items), "reading" (4 items), "understanding" (8 items), "assessment" (4 items), "decision making and applying health information" (10 items), and "self-efficacy" (4 items). The final questionnaire was composed of 34 items. The six domains mentioned above explained 64.3% of the total variance observed.

Questionnaire Reliability

The average Cronbach's α was 0.90; the coefficients calculated for all the subscales were found satisfactory (Table 3). The reliability assessment of the questionnaire, using Pearson's r (all between 0.69 and 0.86), was also acceptable.

Table 3: Cronbach's α and intraclass correlation coefficient for the HELSW and its subscales.

Domains	Number of items	Cronbach's α	Intraclass correlation coefficient
Access	4	0.72	0.69
Reading	4	0.80	0.75
Understanding	8	0.74	0.80
Assessment	4	0.84	0.78
Decision making and use	10	0.78	0.82
Self-efficacy	4	0.82	0.86

Discussion

Health literacy is important in improving the access to health care promotion and information. It serves as a critical determinant of health in society and reduces the health difference among people.[29] Therefore, using a suitable instrument for assessing the health literacy in various social groups can help the health planners with the health promotion of society. The present study was conducted to assess the psychometric properties of a Persian questionnaire, HELSW, used to measure the health literacy among Iranian workers. The validity of the questionnaire was assessed using factor analysis. Six domains were identified. The context of these six domains, access, literacy skill, understanding, assessment, decision making and applying health information, and self-efficacy, was consistent with the theoretical foundation and structure defined for health literacy scale. These six domains explained 64.3% of the cumulative variance observed in the results. Our questionnaire did better than that developed by Ghanbari, *et al*, in Iran, who showed that the health literacy questionnaire they designed for adolescents could explain 53.4% of the cumulative variance.[7]

The results from the psychometric assessment indicated that the scale also had a suitable reliability. The Cronbach's α for the subscales ranged between 0.72 and 0.84, showing the internal consistency of the subscales. Test-retest assessment revealed that the questionnaire was reliable

TAKE-HOME MESSAGE

- Health literacy has received growing attention in recent years.
- Using a suitable instrument for assessing the health literacy in various social groups can help the health planners with the health promotion of society.
- Health Literacy Scale for Workers questionnaire has great validity and reliability. It has advantages such as the relatively low number of questions, simple and easy implementation, and its particular design for assessing the occupational health literacy among various groups of workers.

and could be used in different time and place circumstances. In line with our findings, the study conducted by Haghdoost, *et al*, showed an internal consistency of 0.71–0.96; the internal consistency for subscales ranged from 0.73–0.86.[6] In a similar study conducted by McCormack and colleagues, the internal consistency of the instrument designed for health literacy was 0.86.[30]

Regarding the source of information used by participants in this study, friends/colleagues and radio/TV were the most frequently used sources of information. In line with our findings, in the study conducted by Ghanbari, *et al*, in Iran, radio/TV was the first and friends/acquaintances the fourth sources of information used.[7] The study was conducted in 2015 in Iran and reported that the health literacy of workers was 42%.[31] Because the participants' colleagues were the most important source of information they used, health planners must implement programs for promoting health literacy among workers and facilitate health promotion in this social group.

Considering the great validity and reliability of HELSW questionnaire, as well as its advantages such as the relatively low number of questions, simple and easy implementation, and its particular design for assessing the occupational health literacy among various groups of workers, it is an appropriate tool for assessing occupational health literacy.

Conflicts of Interest: None declared.

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