

Original Article

Validity and reliability of the Public Health Literacy Knowledge Scale: The Turkish version

Inci Arikan, Omer Faruk Tekin

Department of Public Health, Kutahya Health Sciences University, Medicine Faculty, Kutahya, Turkey

Kuwait Medical Journal 2020; 52 (1): 4 - 9

ABSTRACT

Objectives: The identification of health literacy has a crucial role in raising the level of health and improving health consciousness. To measure health literacy based on the public health approach, Pleasant and Kuruvilla developed the Public Health Literacy Knowledge Scale (PHLKS). The availability of PHLKS in different societies will contribute to situational investigation and community awareness by public health professionals. The aim of this study was to evaluate the validity and reliability of the PHLKS in Turkish society.

Design: Cross-sectional study. PHLKS was translated into Turkish.

Setting: This study was conducted on a random sample of people from rural and urban family health center in Kutahya Province, located in the West Anatolia Region.

Subject: Data were collected by researchers via face-to-face interviews with participants.

Intervention: PHLKS was used as an intervention tool.

Main outcome measure: Not applicable

Results: According to factor analysis, variance in the one-dimensional structure was 52.8%, and the factor loads of 17 items in the scale ranged between 0.39 and 0.72. For internal consistency, Cronbach's alpha was found to be 0.673. The average scores of the public health literacy information level in the rural region were significantly lower than those in the urban region ($Z: -3.167$, $p: 0.002$).

Conclusion: Although PHLKS can be used as a valid and reliable scale for the Turkish society and culture, it will be beneficial if applied to larger and different sample groups.

KEY WORDS: literacy, public health, reliability, scale, validity

INTRODUCTION

Recently, health perceptions, lifestyles, and preferences of individuals have influenced health policies, especially in developed countries. These health policies focus more on issues such as chronic diseases, health promotion, and health literacy^[1-3]. One of the aims of the Ministry of Health in our country is to improve health literacy among individuals to increase the responsibility of personal health. Thus, it will be possible for individuals to acquire the competency to reach, understand, and practice correct healthcare for the treatment of diseases. However, it should be noted that health literacy is the competence of healthy individuals to benefit from primary healthcare and should be acquired for primary protection.

At this point, the concept of public health literacy has emerged, and the ability of individuals to address public health subjects has been defined as the ability to assess useful and harmful interventions for public health^[4,5]. The identification of public health literacy has a crucial role in raising the level of health and improving health consciousness^[5].

To measure health literacy based on the public health approach, Pleasant and Kuruvilla developed the Public Health Literacy Knowledge Scale (PHLKS)^[6]. The availability of this scale in different societies will contribute to situational investigation and community awareness by public health professionals. However, currently, there is no public health literacy scale available in our country.

Address correspondence to:

Inci Arikan, Assistant Associate professor, Department of Public Health, Kutahya Health Sciences University, Medicine Faculty, Kutahya, ZIP Code: 43100, Turkey. Tel: +90 274 265 2031-1166; Fax: +90 274 265 22 85. E-mail: iciarikan@hotmail.com; inci.arikan@dpu.edu.tr

The aim of this study was to evaluate the validity and reliability of Turkish version of PHLKS.

SUBJECTS AND METHODS

Study Design

The study was conducted on a sample of people from rural and urban regions in Kütahya Province, located in the West Anatolia Region. There are "family health centers" in Kütahya, where preventive and primary health care is performed. This care is provided by 70 (25 urban, 45 rural) family health centers. The province was divided into two regions (rural and urban). Two family health centers from each region were selected randomly.

The field study was conducted in August - September 2017. It was a cross-sectional study involving individuals aged >18 years.

The approval of the local ethics committee (no:2015-KAEK-86/08-65) and necessary formal approvals were obtained for the research. Permission for using the scale was obtained by interviewing Pleasant. The participation in the study was based on volunteerism, and the identification of information of participants was not requested. Every step of the study was conducted according to Helsinki criteria. Sampling will not be performed for the study. A sample volume which is 20 times more than the number of questions in the measure will be used in accordance with the literature knowledge^[7], which was determined as a minimum of 250 individuals.

Data Collection Tools

The prepared questionnaire and study data were collected by the researchers via face-to-face interviews with participants. The questionnaire included questions regarding sociodemographic characteristics of participants, PHLKS, Health Perception Scale (HPS), and Single-Item Health Literacy Screening Question.

PHLKS

Developed by Pleasant and Kuruvilla in 2008, PHLKS is a measure of 17 items concerning the core issues of public health^[6]. Each item is answered as true or false, and 1 point is given for each correct answer. The minimum score is 0, and the maximum score is 17, with no cut-off value. The validity and reliability of the scale has been tested in China, Mexico, Ghana, and India. Cronbach alpha was 0.79 (0.67 - 0.89).

HPS

HPS is a Likert-type measure developed by Diamond *et al* in 2007^[8]. It has 15 items and four subfactors titled "Center of Control," "Self-awareness," "Certainty," and "Importance of Health." Each item in the measure is answered in the form of "Strongly agree (5)," "Agree

(4)," "Neither agree nor disagree (3)," "Disagree (2)," and "Strongly Disagree." Negative expressions in the measure are scored in reverse. The minimum score is 15, and the maximum is 75. The lowest scores for the subscales "Center of Control," "Self-awareness," "Certainty," and "Importance of Health" are 5, 3, 4, and 3, whereas the highest scores are 25, 15, 20, and 15, respectively. The validity and reliability of the scale in the Turkish population was evaluated by Kadioglu and Yildiz in 2012. Cronbach alpha was 0.70^[9].

Single-Item Health Literacy Screening Question

It included the following question: "How often do you get help to read health instructions, brochures, or other written materials from your doctor or pharmacist?" It is a 5-point Likert scale, with 1 point for the answer "Never" and 5 for "Always." For individuals scoring >2 points, the screening is considered positive, indicating that the individual has difficulty in reading healthcare material^[10].

Validity-Reliability Evaluation of the Scale

Independent language experts translated English into Turkish for cultural adaptation and language validity of the scale. Another expert then translated Turkish into English. The scale was translated into Turkish and back-translated into English. There was no discrepancy between the two translation results. The original instrument scale was assessed by public health experts for content compliance and clarity. The preliminary test was performed on 10 people, and the participants indicated that it was clear and understandable.

To test construct validity, confirmatory factor analysis was initially performed. Two hypotheses were then proposed to test the concurrent criterion validity.

Hypothesis 1: People with low levels of public health literacy have lower health perceptions. To test this hypothesis, HPS and PHLKS scores were compared.

Hypothesis 2: People living in rural areas have lower public health literacy levels than those living in urban areas. To test this hypothesis, participants in the rural and urban areas were compared using their PHLKS scores.

The correlation between the test-retest scores was determined to test the time-invariance of the scale. After 15 days from the application of the questionnaire, the scale was again applied to 50 individuals in the study group.

The Single-Item Health Literacy Screening Question was used as the gold standard to determine the predictive value of the scale. The regions where individuals scored <2 points for this question were predicted to have a higher score than PHLKS, and the cut-off score was calculated.

Table 1: Validity and reliability evaluation

Validity - Reliability	Validity - Reliability value	Scores and Cronbach's α value	Test value
Construct validity	Factor analysis	Variance: 52.8% Factor loads: 0.39 - 0.72	KMO* : 0.74 Bartlett test: 951.75 p <0.001
The concurrent criterion validity	Hypothesis 1	The mean score of PHLKS: 12.64 \pm 2.32	r: 0.433
Reliability	Hypothesis 2	The mean score of HPS: 50.32 \pm 6.69 The mean score of rural PHLKS: 12.23 \pm 2.12 The mean score of urban PHLKS: 13.03 \pm 2.44	p <0.001 Z: -3.167 p: 0.002
Reliability	Test-retest	The mean score of test: 12.42 \pm 2.24 The mean score of retest: 12.21 \pm 2.19	r: 0.849 p <0.001 Z: -1.268 p: 0.205
	Internal consistency	Cronbach's α : 0.673	p <0.001

*Kaiser-Meyer-Olkin test; PHLKS: Public Health Literacy Knowledge Scale; HPS: Health Perception Scale

Statistical Analysis

SPSS version 21 for Windows (SPSS Inc., Chicago, IL, USA) was used for data analysis. The number, percentage, mean, and standard deviation were used to evaluate the descriptive data. Mann-Whitney U test and Spearman's correlation were used to compare group averages because the data were not normally distributed.

Factor analysis and Spearman's correlation analysis were used to determine construct validity. Item total score correlation, internal consistency (Cronbach alpha), and test-retest correlation (Wilcoxon signed rank test) were used to assess the reliability of the scale. The estimated value of the scale was calculated using ROC analysis.

RESULTS

The study involved 285 participants, with 133 (46.7%) males and 152 (53.3%) females, of which 48.4% belonged to rural areas.

The mean score of PHLKS was 12.64 \pm 2.32 (min - max: 5 - 17). The mean score for males was 12.64 \pm 2.22 and for females was 12.65 \pm 2.43. No statistically significant difference was found (p >0.05).

Validity analysis results

Confirmatory factor analysis was used to examine the construct validity of the scale. The Kaiser-Meyer-Olkin coefficient was 0.74, and the Bartlett test result was significant at the advanced level ($X^2 = 951.75$; p =

Table 2: Reliability analysis results of PHLKS

Items of PHLKS	Factor Extraction	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
For a healthy pregnancy and birth, all pregnant women should visit a health worker before the baby is born	0.42	0.27	0.65
Births that are not assisted by a skilled birth attendant are as safe as births that are assisted by a skilled birth attendant	0.43	0.29	0.63
It is normal if children below the age of 1 year weigh the same over a 2-month period	0.54	0.28	0.63
Children who are vaccinated are protected from dangerous diseases	0.39	0.29	0.66
Overall, vaccination has more risks than benefits	0.49	0.31	0.67
Children learn a lot by playing	0.53	0.32	0.67
Most injuries and accidents cannot be prevented	0.56	0.27	0.66
If a child is breathing rapidly or has difficulty breathing, the child should be taken immediately to a health-care provider	0.43	0.26	0.65
Many diseases can be prevented by washing hands before touching food	0.46	0.31	0.66
Using condoms when having sex can prevent the spread of AIDS	0.51	0.27	0.63
Using mosquito nets helps prevent malaria	0.66	0.41	0.69
Exercise helps prevent heart disease	0.72	0.34	0.66
Coughs and colds only get better with medicine	0.51	0.27	0.63
It is the father's gene that decides whether the baby is a boy or a girl	0.47	0.41	0.67
Antibiotics kill viruses as well as bacteria	0.50	0.31	0.63
Cigarette smoking causes lung cancer	0.72	0.33	0.67
All bacteria are harmful to humans	0.62	0.47	0.68

0.001). According to factor analysis, variance in the one-dimensional structure was 52.8%, and the factor loads of 17 items in the scale were found to range between 0.39 and 0.72.

Hypothesis 1 was adopted to test simultaneous criterion validity. There was a positive correlation between PHLKS and HPS scores ($r = 0.333$, $p < 0.001$).

Hypothesis 2 was accepted; the average scores of the public health literacy level were lower in rural areas (12.23 ± 2.12) than in urban areas (13.03 ± 2.44) ($Z = -3.167$, $p = 0.002$) (Table 1).

Reliability analysis results

The Cronbach alpha coefficient for internal consistency was found to be 0.673. On examining the change in scores with respect to time, there was no significant difference in the average scale scores of participants between the first (12.42 ± 2.24) and second (12.21 ± 2.19) interviews ($Z = -1.268$, $p = 0.205$). There was a positive correlation between test and retest scores ($r = 0.849$, $p < 0.001$).

Detailed reliability analysis results are presented in Table 2. The item total score correlation coefficient for the scale was found to be >0.20 , with no negative related substance. The total correlations of the 17 items in the scale ranged between 0.26 and 0.47. When any of the items were subtracted, the Cronbach alpha coefficient, which ranged between 0.62 and 0.68, did not change significantly (Table 2).

Cut-off value

Receiver operating characteristic analysis revealed a cut-off point of 12, with 77% sensitivity and 70%

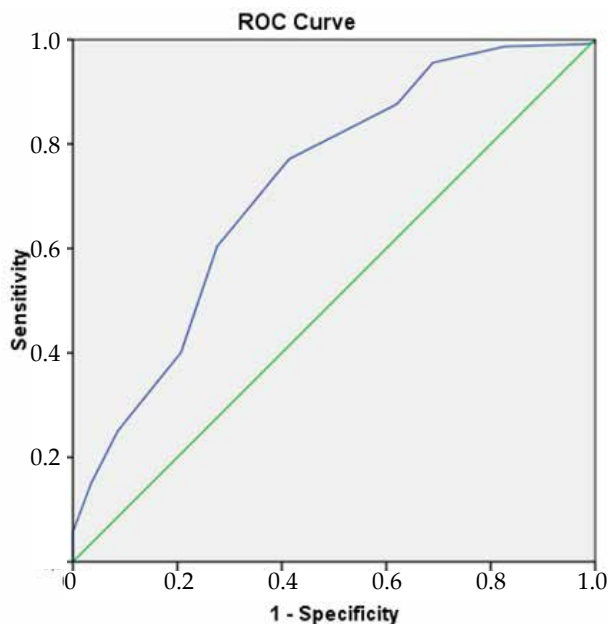


Fig 1. Cut-off value of PHLKS

specificity [Area under the curve = 0.721 (0.64 - 0.80), $p = 0.000$]. Health literacy level was considered to be inadequate for participants with a score of ≤ 12 on the scale (Figure 1).

DISCUSSION

Public health literacy is a concept necessary to understand and address the broad array of factors, such as health behavior, treatment and prevention that influence the public's health. The identification of health literacy for these factors has a crucial role in raising the level of health and improving health consciousness, but measuring health literacy presents particular challenge in public health because public health practices are broad and diverse^[1,6,11-13]. Additionally, there is a marked scarcity of tested scale geared to public health^[6,12]. According to our observations, there is no study in the literature about use of PHLKS.

In this study, we aimed to evaluate the validity and reliability of PHLKS developed by Pleasant and Kuruvilla for the Turkish society and its cultural adaptation.

In the preparation of the Turkish form of the scale, experts were consulted to ensure the language and cultural appropriateness of the instrument translation. Expert views and scales indicated that the form of expression, content, suitability, and coverage of the subject area were sufficient.

Factor analysis was used to determine the validity of the scale. Although Likert-type answers may be more appropriate for scales^[14], factor analysis results were found to be appropriate, and the scale showed a one-dimensional structure as in the original. A total variance of 52.8% for this structure was an acceptable value^[15]. In contrast, the process of determining the validity of a scale is the same as the process of a scientific theory development. Also, it has been reported that construct validity can be tested by forming testable hypotheses and by performing statistical evaluation of these hypotheses^[14,16,17]. We tested the hypotheses to determine the validity of PHLKS and confirmed hypotheses 1 and 2 by statistical evaluation.

Inadequate levels of health literacy among individuals are associated with poor health information and negative health outcomes, leading to deterioration of health status^[12,18]. A cross-sectional study investigating the relationship between health literacy and health perception found that 41% of people have low health literacy levels and that their health perceptions are low^[18]. The study by Abel *et al* shows similar results^[12].

There was a positive correlation between PHLKS and Health Perception Scale in our study. However, a high correlation coefficient^[17] required for concurrent

criterion validity was obtained during the development of this scale.

In support of our hypothesis 2, there are studies showing that the level of health literacy in rural areas is lower than that in urban areas^[19,20]. Taken together, we can propose that the expressions of PHLKS are appropriate for Turkish culture, and that PHLKS represents the area to be measured.

Reliability is defined as the accurate determination of the ability of the measurement tool to measure and provide consistent results^[16]. The former is also explained as consistency among the answers obtained at the same time and is determined using the reliability coefficient Cronbach alpha. The higher the internal consistency coefficient, the more likely it is that the items on the scale are consistent with each other. The Cronbach alpha value is expected to be 0.60. The second criterion for reliability is consistency between responses obtained at different times^[16,21].

In our study, Cronbach alpha for PHLKS was found to be 0.673. Cronbach alpha values differ for scales applied (original study) in different populations and cultures. For example, this value was 0.89 for the Mexican study, 0.67 for the Chinese study, and 0.79 for the original study^[6]. These differences may be due to different sample sizes.

Also, the item total score correlation is important to show the relationship between scores obtained from the test items and the total test score. When this correlation is positive and high (>0.20), the materials exemplify similar behaviors, and the internal consistency of the test is high^[16,17,21]. The item total score correlation coefficient for PHLKS ranged between 0.26 and 0.47.

The correct response rate of all items of the research group (except item 15) was found to be >50%. The lowest percentage of correct responses was for the item "Antibiotics kill viruses as well as bacteria," which may be due to the fact that viruses and bacteria are considered to be harmful microorganisms belonging to the same genus. When the participants completed the questionnaire, interviewers had the opportunity to interact and impart knowledge regarding any areas of interest. In addition, face-to-face interviews with the participants helped us achieve outcome. Every item on the scale emphasizes the importance of basic and preventive health services and encourages individuals to think and be conscious about their health.

Attention should be paid to the use of an appropriate scale in determining the level of health literacy in society. It is expected that this scale will be high in reliability and appropriate for the cultural structure of the society and needs^[12,13]. According to our study, PHLKS provides these criteria. That's why

we can propose that PHLKS is appropriate for Turkish culture. The use of such scales, including clinical as well as public health approaches, contributes to public awareness, particularly in understanding and assessing health literacy.

CONCLUSION

Although PHLKS can be used as a valid and reliable scale in Turkish society and culture, we believe that it will be useful to apply this scale to larger and different sample groups. Furthermore, determining a cut-off value may make it easier for users to evaluate and compare the results with those of other studies.

ACKNOWLEDGMENT

Conflict of interest: None

Funding: None

REFERENCES

1. Sorensen K, Van den Broucke S, Fullam J, Doyle G, Pelikan J, Slonska Z, *et al.* Health literacy and public health: a systematic review and integration of definitions and models. *BMC Public Health* 2012; 12:80. doi: 10.1186/1471-2458-12-80.
2. Perrenoud B, Velonaki VS, Bodenmann P, Ramelet AS. The effectiveness of health literacy interventions on the informed consent process of health care users: a systematic review protocol. *JBIC Database System Rev Implement Rep* 2015; 13(10):82-94.
3. Peerson A, Saunders M. Health literacy revisited: what do we mean and why does it matter? *Health Promot Int* 2009; 24(3):285-296.
4. Zarcadoolas C, Pleasant A, Greer DS. Understanding health literacy: an expanded model. *Health Promot Int* 2005; 20(2):195-203.
5. Freedman DA, Bess KD, Tucker HA, Boyd DL, Tuchman AM, Wallston KA. Public health literacy defined. *Am J Prev Med* 2009; 36(5):446-451.
6. Pleasant A, Kuruvilla S. A tale of two health literacies: public health and clinical approaches to health literacy. *Health Promot Int* 2008; 23(2):152-159.
7. Jung S. Exploratory factor analysis with small sample sizes: a comparison of three approaches. *Behav Processes* 2013; 97:90-95
8. Diamond JJ, Becker JA, Arenson CA, Chambers CV, Rosenthal MP. Development of a scale to measure adults' perceptions of health: Preliminary findings. *J Community Psychology* 2007; 35(5):557-561.
9. Kadioglu H, Yıldız A. Validity and reliability of Turkish Version of Perception of Health Scale. *Turkiye Klinikleri J Med Sci* 2012; 32(1):47-53.
10. Morris NS, MacLean CD, Chew LD, Littenberg B. The Single Item Literacy Screener: Evaluation of a brief instrument to identify limited reading ability. *BMC Family Practice* 2006; 7:21.

11. Çopurlar CK, Kartal M. What is health literacy? How to measure it? Why is it important? *TJFM&PC* 2016; 10(1):42-47.
12. Abel T, Hofmann K, Ackermann S, Bucher S, Sakarya S. Health literacy among young adults: a short survey tool for public health and health promotion research. *Health Promot Int* 2015; 30(3):725-735.
13. Wängdahl JM, Mårtensson LI. Measuring health literacy -the Swedish Functional Health Literacy scale. *Scand J Caring Sci* 2015; 29(1):165-172.
14. Alnahdi AH. Confirmatory factor analysis of the Arabic version of the Lower Extremity Functional Scale. *Int J Rehabil Res* 2016; 39(1):36-41.
15. Polit DF, Beck CT. The content validity index: Are you sure you know what's being reported? Critique and recommendations. *Res Nurs Health* 2006; 29(5):489-497.
16. Karagöz Y. *SPSS 21.1 Applied Biostatistics Book*. 1st edition, Ankara: Nobel Academic Publications; 2014.
17. Wilson N & McClean S. Questionnaire design: A practical introduction. University of Ulster. Accessed online August, 8, 2017, at: http://www.stats.gla.ac.uk/cti/activities/reviews/95_08/question_design.html
18. Jovic-Vranes A, Bjegovic-Mikanovich V, Marinkovich J. Functional health literacy among primary health-care patients: data from Belgrade pilot study. *J Public Health (Oxf)* 2009; 31(4):490-495.
19. Zahnd WE, Scaife SL, Francis ML. Health literacy skills in rural and urban populations. *Am J Health Behav* 2009; 33(5):550-557.
20. Lee SYD, Tsai TI, Tsai YW, Kuo KN. Health literacy, health status, and healthcare utilization of Taiwanese adults: results from a national survey. *BMC Public Health* 2010; 10(1):614. doi: 10.1186/1471-2458-10-614.
21. Dawson B, Trapp RG. *Basic & Clinical Biostatistics*. 3rd edition. New York: Lange Medical Books/McGraw International Editions; 2001.