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# Turkish adaptation and psychometric test of the health literacy scale in old age

Fatma Zehra Genç, RN, PhD, Instructor<sup>a,\*</sup>, Suzan Yıldız, RN, PhD, Assistant Professor<sup>b</sup>,  
Naile Bilgili, RN, PhD, Professor<sup>c</sup>

<sup>a</sup> Department of Public Health Nursing, Coordination of Project Development and Support, Necmettin Erbakan University, Konya, Türkiye

<sup>b</sup> Department of Public Health Nursing, Faculty of Health Sciences, Tokat Gaziosmanpaşa University, Tokat, Türkiye

<sup>c</sup> Department of Public Health Nursing, Faculty of Nursing, Gazi University, Ankara, Türkiye



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## ABSTRACT

To determine the validity and reliability of the Health Literacy Scale in Old Age in Turkish and to examine the psychometric properties of the scale. A total of 450 older individuals aged over 65 years living in a community in a province of Türkiye constituted the sample of this research. Data were collected using a personal information form, the European Health Literacy Short Form, and the Health Literacy Scale in Old Age. The Cronbach  $\alpha$  value of the five-factor 18-item scale of four-point Likert type was 0.83, the total variance explained by the factor regarding the scale was 55.973 %, the content validity index was 0.85, and the test-retest reliability value was 0.887. The relationship between the adapted scale and the European Health Literacy Scale Short Form was 0.512. As a result, 18 items of the Health Literacy Scale in Old Age have reasonable length and reliable and valid features.

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## Introduction

The World Health Organization defines health literacy as cognitive and social skills that determine an individual's motivation and ability to access, understand, and use information in the protection and promotion of health.<sup>1</sup> Health literacy means that the individual puts their own health, the health of their family and society in context, understands which factors affect this situation, and knows how to cope with them.<sup>2</sup> Sørensen et al.<sup>2</sup> developed an integrative conceptual model that included referring to motivation and competencies in accessing, understanding, evaluating, and applying health-related information. With this conceptual model, health literacy is determined by the ability to express opinions about health-related recommendations and decisions, orientation in the health system, deciding when to seek professional help, the ability to ask someone for help on health-related issues, and the endurance and patience to deal with complex health-related problems over time.<sup>2–4</sup>

Older individuals use more medical services than other segments of the population.<sup>5</sup> In this context, the health literacy of older people is expected to be high. In the literature, low health literacy is associated with difficulties in adherence to medication, disruption of routine medical care, poor lifestyle habits,<sup>6</sup> poor management of non-

communicable diseases,<sup>7</sup> frailty, deterioration in health-related quality of life,<sup>8</sup> and mortality and morbidity.<sup>9</sup> Increasing the health literacy levels of older people, who may be disadvantaged in society, will accelerate progress in reducing inequalities, especially in health and beyond.<sup>1,10</sup> In this context, determining/testing the health literacy of older individuals becomes important. For this, valid and reliable evaluation tools are needed. When the international literature is examined, health literacy scales have been developed or adapted in Korea,<sup>11</sup> Tavian,<sup>12,13</sup> Finland,<sup>14</sup> and Germany.<sup>4</sup> In the national literature, there are tools that measure the health literacy of individuals aged 18–65 years in Türkiye.<sup>15–18</sup> There is no measurement tool that evaluates health literacy specifically for older people. In studies conducted in Türkiye, three tools measuring the health literacy of older people are frequently used.<sup>19–21</sup> There are Turkish validity and reliability scales regarding health literacy in the literature.<sup>15–16,19–21</sup> Three of these scales<sup>6,10,11</sup> cannot be used because their validity and reliability have not been tested in individuals aged over 65 years. One scale<sup>19</sup> was tested for validity and reliability in sick individuals admitting to tertiary care services, and the other two scales<sup>20,21</sup> were used in a target group that included a very small number of older individuals (3.8–10%), so its use may be limited.

Health literacy scales in the national literature are not specific to older individuals.<sup>15–17,19–21</sup> The scale developed by Konopik et al.<sup>4</sup> is directly specific to older individuals and, compared with existing scales, helps distinguish higher proficiency levels with newly

\*Corresponding author.

E-mail addresses: [fatmzehragn@gmail.com](mailto:fatmzehragn@gmail.com), [fgenc@erbakan.edu.tr](mailto:fgenc@erbakan.edu.tr) (F.Z. Genç).

developed items. It is also thought that it would be useful to determine the health literacy levels of older people living in the community.<sup>4</sup> Health literacy is defined as a lifelong competency area and gains special importance considering age-related health limitations.<sup>4</sup> In this context, it is important to evaluate the health literacy specific to older individuals. In this research, it was aimed to verify the validity and reliability of the scale developed by Konopik et al.<sup>4</sup> for older individuals, in Turkish.

The questions sought to be answered in the research are as follows

1. Is the Health Literacy scale in Old Age valid in Turkish society?
2. Is the Health Literacy scale in Old Age reliable in Turkish society?
3. What is the total score of the Health Literacy Scale in Old Age?
4. Is there a relationship between the Health Literacy Scale in Old Age score and the European Health Literacy Scale Short Form score?

## Method

### Research type

The research was conducted methodologically and reported according to the Consensus-based Standards for the selection of health Measurement Instruments (COSMIN) checklist.

### Population and sample of the research

Individuals aged 65 years and over living in eight neighborhoods in a district of a province of Türkiye constituted the population of the study. There are different opinions for methodological studies in sample selection, and there are acceptances for participants to be ten times the number of scale items.<sup>22,23</sup> This research was conducted in May 2024, in public places such as town squares, parks, and mosques. The participants were volunteer older individuals aged 65 years and over who had no issues preventing communication, were not bedridden, were mentally healthy, and were literate. Data were collected from a total of 450 older individuals, 200 for Exploratory Factor Analysis (EFA), 200 for Confirmatory Factor Analysis (CFA), and 50 for test-retest.

### Data collection method and forms

Data for the research were collected by one of the authors through face-to-face interviews. The data collection took place on Thursdays, Fridays, and Saturdays from 9 AM to 1 PM in May 2024, using printed data collection forms. The researchers created a personal information form, which was used alongside the draft adaptation of the Health Literacy Scale in Old Age (HLS-OA) and the European Health Literacy Scale Short Form (HLS-EU-16), which has established validity and reliability in Turkish. All data collection forms were employed for exploratory factor analysis (EFA) and confirmatory factor analysis (CFA), while only the HLS-OA scale was used for the test-retest reliability assessment.

### Data collection forms

1. *Personal Information Form*: This form was created by the researchers in line with the literature<sup>4,12,21</sup> to determine the individual characteristics of the participant group. The form included nine questions in total (age, sex, marital status, education status, income status, smoking status, chronic disease status, continuous medication use, and health status).

2. *Health Literacy Survey Questionnaire in Old Age (HLS-OA)*: The conceptual framework of the scale is based on the European Health Literacy Survey Questionnaire.<sup>3</sup> Konopik et al.<sup>4</sup> added eight new items to the scale specific to older individuals after qualitative interviews with older individuals and removed five items that did not work/function. Konopik et al.<sup>4</sup> ultimately developed a four-point Likert-type scale measuring the health literacy of older individuals with a total of 19 items. Older individuals can respond to scale items as 4 = very easy, 3 = easy, 2 = difficult, 1 = very difficult. Konopik et al.<sup>4</sup> found the Cronbach  $\alpha$  reliability coefficient value of the newly developed scale as 0.80. The Cronbach  $\alpha$  reliability coefficient value of the scale in this study was 0.83.
3. *European Health Literacy Survey Questionnaire Short Form (HLS-EU-16)*: The scale was developed by the European Health Literacy Consortium within the scope of the European Health Literacy Survey Questionnaire (HLS-EU) between 2009 and 2012, and its 16-item short form was developed by Röthlin et al.<sup>3</sup> The Turkish validity and reliability study was performed by Emiral et al.<sup>20</sup> The scale has three sub-dimensions: health care, disease prevention, and health promotion. The scale has a total of 16 items and is of five-point Likert type. Older individuals can respond to scale items between 0 and 4. Answers vary from very easy to very difficult, and a standardized index score is used to calculate the total score ( $\text{Index} = (\text{average} - 1) * (50/3)$ ). Index scores vary between 0 and 50. As the score obtained from the scale increases, the level of health literacy also increases. Those who score 33 and above on the scale are considered to have adequate health literacy levels. The Cronbach  $\alpha$  reliability coefficient value of the scale is 0.89. The Cronbach  $\alpha$  reliability coefficient value of the scale in the present study was 0.69.

### Ethical dimensions of research

Before starting the research, approval was received from the university ethics committee (Date: February 27th, 2024, Decision No. 01, 4th session). Necessary written permissions were obtained from the district governorship of the district where the research would be conducted (Date: April 18th, 2024, Number: E595019767999103). Additionally, communication was established with Konopik,<sup>4</sup> one of the authors who developed the scale, and permission was obtained via e-mail.

### Validity and reliability process

During the validity process, translation-back-translation phase, expert opinion, criterion-related/concurrent validity, and construct validity were performed. The draft scale was edited in line with expert opinions and the final version was evaluated in terms of Turkish language structure by an academic who is an expert in Turkish language. Expert opinions were sought from a diverse group of professionals, including four academic nurses specializing in geriatric nursing, two academic nurses with expertise in scale development, two academic nurses proficient in English, one academic nurse specialized in the Turkish language, one academic nurse with a focus on psychiatry, and two academic nurses specializing in public health nursing. All experts hold at least a master's degree and are actively engaged in both their fields and academia. The content validity index (CGI) of the scale was calculated using the Davis<sup>24</sup> technique with the opinions of 12 experts in total. Criterion-related validity was ensured by using the Health Literacy Scale in Old Age and the European Health Literacy Scale Short Form. EFA and CFA were conducted to evaluate construct validity.

During the reliability process, test-retest and internal consistency were evaluated. To determine invariance, the intermittent test-retest method was used and the scale was re-administered to 50 older

individuals 10 days after administration.<sup>25</sup> Cronbach's alpha reliability coefficient and item-total score reliability were evaluated for internal consistency.

### Pilot application

The comprehensibility of the items on the scale was tested with five older individuals. A think-aloud protocol was applied to male and female individuals with different socio-cultural levels and ages. Each item was read aloud and it was questioned whether all five older individuals understood the items in the same way. The process continued until the items were approved to express the same meaning. Items that were not understood or had different meanings were rechecked, and two items (fourth and ninth items) were edited to make them more understandable.

### Evaluation of data

Data were analyzed using the IBM SPSS V29 and IBM AMOS V27. To determine the suitability of the data for principal component analysis and determine the relationship structure between the items, the prerequisite Kaiser-Meyer Olkin (KMO) value and Bartlett's Sphericity test were used to establish whether the correlation matrix was equal to the identity matrix. EFA was used to provide evidence of construct validity. The eigenvalue, which is the sum of the squares of the factor loadings, was calculated, showing that it explained the part of the factor.

To determine the suitability of the data for principal component analysis, the Cronbach  $\alpha$  coefficient was calculated to provide evidence of internal consistency (a measure of error-freeness), test-retest reliability was calculated to determine the consistency of the developed tool despite changing conditions and conditions, and item test correlations were calculated to provide evidence of item validity. CFA was conducted with another 200 older individuals to provide evidence that the scale could yield the same structure in similar groups.

Correlations of the scores that individuals received from the European Health Literacy Scale Short Form and the Health Literacy Scale in Old Age were examined. It was checked and confirmed that the multiple normality assumption of the draft scale was met, and the Maximum Likelihood (ML) method was used. The significance level was accepted as  $p < 0.05$ .

### Results

The average age of the older individuals included in the study was 70.03 years and 70.5 % were male. Of the older individuals, 85 % were married, 56.5 % were primary/secondary school graduates, 73 % had a medium income level, and 54 % had lived in the borough most of their lives. Half (49.5 %) of the participants stated that their general health was at a moderate level and 82 % said that they were first admitted to public hospitals when they got sick. The average score of individuals on the Health Literacy Scale in Old Age was  $51.45 \pm 7.28$ , and the average score on the European Health Literacy Scale was  $34.10 \pm 6.86$  (Table 1). The relationship between the scale scores was examined using Pearson correlation analysis and the correlation value was obtained as 0.512 ( $p < 0.01$ ).

Twelve expert opinions were received for the draft scale, and the content validity index (CVI) was calculated. Using the Davis<sup>24</sup> technique, the score for each item was determined by dividing the number of experts who rated an item as "3" (fairly appropriate) or "4" (extremely appropriate) by the total number of experts. The scores of all items were summed and then divided by the total number of items in the scale and the CVI was calculated as 0.85. As a result of

**Table 1**  
Characteristics of participants (n=200)

Characteristics	N	%
<b>Sex</b>		
Female	59	29.5
Male	141	70.5
<b>Marital status</b>		
Married	170	85.0
Single	30	15.0
<b>Educational status</b>		
Literate	33	16.5
Primary/Middle school	113	56.5
High school	38	19.0
University	16	8.0
<b>Income status</b>		
Low	49	24.5
Middle	146	73.0
High	5	2.5
<b>The place you lived the longest in your life</b>		
Province	19	9.5
District	108	54.0
Town/Village	73	36.5
<b>First consulted health institution</b>		
Family Health Center	22	11.0
Public Hospital	164	82.0
University Hospital	7	3.5
Private Hospital	7	3.5
<b>General health perception</b>		
Bad	17	8.5
Middle	99	49.5
Good	84	42.0
<b>Characteristics</b>		
Age	Mean $\pm$ SD	Median (Min - Max.)
Health Literacy Scale-European Union-Q16	51.45 $\pm$ 7.28	52.00 (28.00 - 76.00)
Health Literacy Measurement in Old Age	34.10 $\pm$ 6.86	33.30 (10.40 - 50.00)

expert opinions on 19 items, an 85 % agreement was found regarding the content validity.

To create a certain structure in the scale, EFA was conducted with the first dataset (n=200). The verification of the structure created as a result of the analysis on another group was performed using CFA on the second dataset (n = 200). When EFA was conducted on the draft scale, the third item of the 19-item scale ("accepting health-related restrictions as a part of life and aging") was removed because it loaded over 0.40 on all three factors and the difference between the factor loadings was below 0.20. The final scale consisted of 18 items. To examine the relationship between the items, the KMO value was examined and found as 0.832. Bartlett's test of sphericity was performed to test whether the correlation matrix was equal to the identity matrix and a correlation was found between the variables ( $\chi^2 = 865.938$ ,  $p < 0.001$ ). When the factor eigenvalues graph of the scale was examined, it was seen that the scale was grouped under five factors with eigenvalues greater than 1. As a result of EFA, a five-factor structure was obtained. Item factor loadings varied between 0.358 and 0.824 (Table 2). The five factors of the scale explained 55.97 % of the total variance with 18 items.

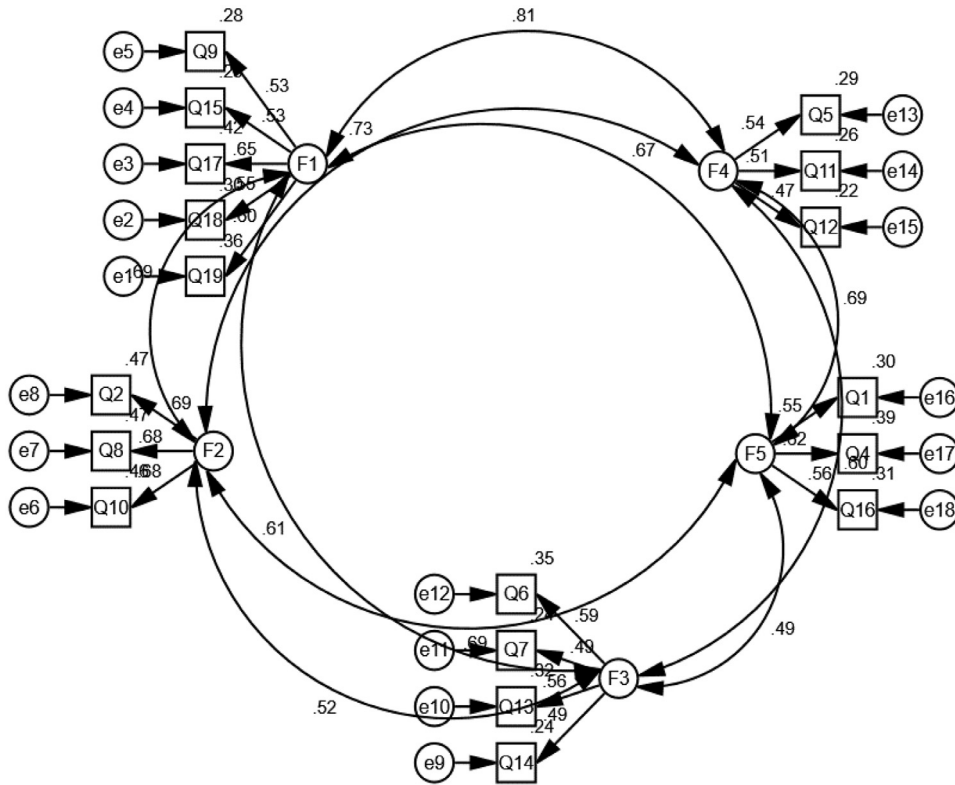
CFA was performed on the second dataset to test the structure of the model that emerged after EFA on the first dataset and to evaluate its validity. Goodness-of-fit indices were examined to evaluate the model as a whole and to evaluate the compatibility of the model and data. The CFA findings of the scale adaptation are presented in Figure 1, Table 3, and Table 4. The fit values found as a result of the CFA findings were as follows: CMIN= 214.541, DF= 125, CMIN/DF= 1.716, RMSEA= 0.060, CFI= 0.880, GFI= 0.897, and AGFI= 0.859.

Test-retest reliability was performed to determine the consistency of the developed tool despite changing conditions. The surveys that were administered and coded to 50 participants were repeated 10 days later and the results were determined using correlation

**Table 2**  
Exploratory factor analysis findings of the health literacy of scale in older people.

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Total Score
HLS-OA-Q9: Use technical equipment that support your health management?	0.466					
HLS-OA-Q15: Get around safely in your neighborhood?	0.358					
HLS-OA-Q17: To call for help in an emergency?	0.590					
HLS-OA-Q18: Grapple with difficult health-related problems?	0.791					
HLS-OA-Q19: Do something nice?	0.648					
HLS-OA-Q2: Detect first signs of illness?		0.661				
HLS-OA-Q8: Detect signs of health in yourself?		0.777				
HLS-OA-Q10: Know your way around the health care system?		0.749				
HLS-OA-Q6: Find someone you can trust in matters of health?			0.631			
HLS-OA-Q7: Find somebody with whom you can practice healthy behavior together?			0.740			
HLS-OA-Q13: Find out where to find venues for the treatment of illnesses in your neighborhood?			0.490			
HLS-OA-Q14: Take time for yourself?			0.783			
HLS-OA-Q5: Voice criticism about recommendations and decisions that concern your health?				0.648		
HLS-OA-Q11: Find out about healthy living programs in your neighborhood?				0.578		
HLS-OA-Q12: Decide whether a health problem needs medical help or can be treated by yourself?				0.653		
HLS-OA-Q1: Talk about health with others?					0.617	
HLS-OA-Q4: Get to places for health and treatment?					0.420	
HLS-OA-Q16: Ask somebody for help in health-related matters?					0.824	
Item Number	5	3	4	3	3	18
Eigenvalues	4.987	1.514	1.338	1.162	1.075	
Variance ratio (%)	27.705	8.409	7.433	6.454	5.972	55.973
Cumulative variance ratio (%)	27.705	36.114	43.547	50.001	55.973	
Cronbach's alpha	0.703	0.717	0.617	0.503	0.588	0.837

KMO= 0.832, Bartlett Ch, Square= 865.938, p <.0001



CMIN=214.541;DF=125; p=.000; CMIN/DF=1.716; RMSEA=.060; GFI=.897; AGFI=.859; CFI=.880

**Fig. 1.** Health literacy of scale in older people standardized path coefficients.

**Table 3**  
Confirmatory factor analysis findings of the health literacy of scale in older people

Item	Factor	$\beta_1$	$\beta_2$	S.D.	C.R.	p
HLS-OA-Q19	<- F1	0.601	1.000			
HLS-OA-Q18	<- F1	0.548	0.986	0.165	5.963	<0.001
HLS-OA-Q17	<- F1	0.648	1.087	0.162	6.701	<0.001
HLS-OA-Q15	<- F1	0.534	0.877	0.15	5.856	<0.001
HLS-OA-Q19	<- F1	0.533	1.131	0.194	5.844	<0.001
HLS-OA-Q10	<- F2	0.675	1.000			
HLS-OA-Q8	<- F2	0.685	0.818	0.110	7.469	<0.001
HLS-OA-Q2	<- F2	0.686	0.909	0.122	7.477	<0.001
HLS-OA-Q14	<- F3	0.493	1.000			
HLS-OA-Q13	<- F3	0.564	0.984	0.210	4.689	<0.001
HLS-OA-Q7	<- F3	0.493	1.034	0.236	4.387	<0.001
HLS-OA-Q6	<- F3	0.587	1.132	0.237	4.766	<0.001
HLS-OA-Q5	<- F4	0.538	1.000			
HLS-OA-Q11	<- F4	0.512	1.173	0.235	5.000	<0.001
HLS-OA-Q12	<- F4	0.465	0.958	0.204	4.694	<0.001
HLS-OA-Q1	<- F5	0.548	1.000			
HLS-OA-Q4	<- F5	0.623	1.206	0.222	5.433	<0.001
HLS-OA-Q16	<- F5	0.558	0.790	0.153	5.158	<0.001

$\beta_1$ : Standardized path coefficients;  $\beta_2$ : Non-Standardized path coefficients, S.D.: Standard deviation, C.R.: Critical Ratio

values. The relationship between the overall scores of individuals in the first application of the scale and the scores received by individuals in the second application was 0.887 ( $p < 0.001$ ;  $n = 50$ ). The Cronbach  $\alpha$  reliability coefficient values of the scale in this study varied between 0.503 and 0.717 depending on the factors. The Cronbach  $\alpha$  reliability coefficient value of the scale as a whole was calculated as 0.83 (Table 2).

## Discussion

Health literacy is one of the resources that plays an important role in increasing individual resilience and well-being and is accepted as a result of individuals' health promotion and development actions such as education and advocacy. Health literacy, through the development of cognitive and social skills, motivation, and greater knowledge, provides older individuals with a better quality of life, health, and well-being, which are necessary for better access, understanding, and use of the system, and therefore greater satisfaction with life.<sup>26</sup> Meeting the health literacy needs of older people, who may be disadvantaged in society, will accelerate progress in reducing inequalities, especially in health and beyond.<sup>1</sup> In this context, determining/testing the health literacy of older individuals becomes important. Accurately assessing the level of health literacy will be possible by developing strategies to improve health outcomes, reduce health inequalities, improve health status, and achieve high quality of life. Sariyar and Kılıç<sup>27</sup> emphasized the importance of determining health literacy levels with valid and reliable measurement tools, taking the cultural and social dimensions of individuals as a basis when selecting measurement tools, and the importance of developing and

**Table 4**  
Goodness of fit indices<sup>37-39</sup>

Goodness of fit indices (FIT)	HLS-OA	Good fitness values
$\chi^2/df$	1.716	<5
RMSEA	0.06	<0.08
GFI	0.897	>0.90
CFI	0.880	>0.90
AGFI	0.859	>0.90

$\chi^2$ : ki kare,  $\chi^2/df$ : ki kare/ degrees of freedom, RMSEA: Root Mean Square Error of Approximation, GFI: Goodness-Of-Fit Index, AGFI: Adjustment Goodness Of Fit Index, CFI: Comparative Fit Index, NFI: Normal Fit Index, SRMR: Standard Root Mean square Residual

adapting new tools if there is no suitable measurement tool. Although improving health literacy has become one of the most important public health goals at the global level, there is no clear consensus on how to measure health literacy.<sup>17</sup> Tavousi et al.<sup>28</sup> conducted bibliometric analyzes of health literacy scales. It has been determined that there are 39 tools to measure general health literacy in the international literature, 90 tools specific to disease and condition (content), and a total of 22 tools specific to population, age or nationality.<sup>28</sup> More than adequate instruments exist to measure health literacy, but some instruments do not adequately report psychometric properties, and evidence has shown that well-developed instruments and those with adequate validation measures reported can be useful if appropriately selected according to the aims of a particular study.<sup>28</sup> There are various studies in the literature investigating the health literacy status of older people. Stońska et al.<sup>29</sup> found that 61.3 % of older individuals had low general health literacy levels and only 12 % had excellent health literacy. Almeida and Veiga<sup>26</sup> determined that 61.9 % of older people had inadequate health literacy, 28.6 % had problematic health literacy, and only 9.5 % had adequate health literacy. Xie et al.<sup>30</sup> determined that there was low health literacy among older people in society and emphasized the importance of health literacy in promoting health behaviors. Baysal and Yıldız<sup>31</sup> found that the health literacy of older individuals in the east of Türkiye was at a medium level, Bozkurt and Demirci<sup>32</sup> found that 85.1 % of older individuals in Türkiye had "problematic or insufficient" health literacy, and Yigitbas and Genç<sup>33</sup> determined that older individuals living in the Eastern Black Sea region had insufficient health literacy. Fırat Kılıç et al.<sup>34</sup> reported that the health literacy of older individuals was medium, and Ertem et al.<sup>35</sup> and Fırat Kılıç et al.<sup>34</sup> found that it was at a low level. Although older individuals face the risk of low health literacy, we found that the health literacy of our research group was sufficient according to the European Health Literacy Scale Short Form. It is thought that this difference in the literature arises from the measurement tools used and the differences in the evaluation of these tools. It has been determined that one of the most frequently used tools in bibliometric analysis is the European Health Literacy Survey Questionnaire (HLS-EU-Q).<sup>28</sup> This measurement tool was preferred as a parallel scale in our research. It was determined that the relationship between the HLS-OA and HLS-EU-16 was positively and moderately correlated ( $r = 0.512$ ,  $p < 0.001$ ). Since the research was conducted in public areas, the majority of the study group was male. Many older people Turkish women tend to stay at home or in familiar surroundings, leading to less frequent use of public spaces. Consequently, 70 % of the study group comprised men, which contrasts with findings typically reported in the literature.

In studies conducted in Türkiye, three tools measuring the health literacy of older people are frequently used.<sup>19-21</sup> The first is the health literacy scale, which was adapted by Aras and Temel<sup>19</sup> in a study conducted on 250 inpatients aged over 18 years. In their research, they found that 36.4 % of the sample was aged 65 years old. The scale has 25 items, four sub-dimensions, and was a five-point Likert type. The Cronbach  $\alpha$  reliability coefficient value of the scale is 0.92 and the correlation value with the parallel scale is 0.72 ( $p = 0.01$ ). Aras and Temel<sup>19</sup> received 10 expert opinions and determined the CVI as 0.90. More than three modifications have been made to the scale, and the reliability results of the scale appear to be borderline. (RMSEA= 0.06, CMIN/DF= 1.82, CFI= 0.82, GFI= 0.82, AGFI= 0.78). The second health literacy scale frequently used in older people is HLS-EU-16, which was adapted to Turkish by Emiral et al.<sup>20</sup> This scale is a three-dimensional scale with 16 items. Only 10 % ( $n = 18$ ) of the study group consisted of individuals aged 60 years and over. The Cronbach  $\alpha$  reliability coefficient value of the scale was found as 0.89, and the reliability results were RMSEA=0.08, CMIN/DF=2.19, CFI=0.84, GFI=0.87, AGFI=0.82. The test-retest result, which is another measure



of reliability, could not be found in the research report. The third health literacy scale frequently used in older people is the European Health Literacy Survey Questionnaire (HLS-EU-Q47), adapted to Turkish by Abacıgil et al.<sup>21</sup> These three frequently used scales are limited in measuring the health literacy of older and healthy people living in the community because a very small part of the study group (3.8–10 %) consists of older people, the study group consists of sick individuals, studies are conducted in tertiary care services, the number of items is high, and it may be difficult for older people to answer them.

In this research, HLS-EU-16, which was adapted to Turkish by Emir al et al.,<sup>20</sup> was used as a parallel scale and was found to be moderately correlated to the adapted HLS-OA. Konopik et al.,<sup>4</sup> who developed HLS-OA, which was a new 19-item health literacy scale specifically for older people as a result of qualitative interviews with older people, based on the European Health Literacy. In this study, it was determined that the Turkish version of the 18 items of HLS-OA developed by Konopik et al.<sup>4</sup> for older individuals was valid and reliable.

It is important for factor analysis because more than 50 % of the total variance of the created factor structure means a higher representative power.<sup>36</sup> In this context, it is seen that the adapted scale meets the desired criteria. The item factor loadings of this adapted scale range between 0.358 and 0.824 and are above 0.30. The item and test value scores are highly compatible with each other, and their item validity is quite high.<sup>37</sup> The reliability of the scale was determined in two ways; the Cronbach  $\alpha$  reliability coefficient value was determined as 0.83 and the test-retest reliability was determined as 0.887. This scale has high reliability because it is concluded that the internal consistency of the items in the scale is higher as the Cronbach  $\alpha$  reliability coefficient of the scale approaches 1.<sup>36</sup> The Cronbach  $\alpha$  reliability coefficient of the factors of the scale was determined to be in the range of 0.503–0.717. Although the Cronbach  $\alpha$  value of the HLA-OA, which we adapted in our study, was good, the Cronbach  $\alpha$  value of the HLS-EU-16 scale was found as 0.69. The fact that the reliability coefficient of the scale we used as a parallel scale is at the limit may be due to the five-point Likert structure of the scale.<sup>4</sup> The fit values were found as CMIN=214.541, DF=125, CMIN/DF=1.716, RMSEA= 0.060, CFI=0.880, GFI=0.897, AGFI=0.859. It is seen that these values are quite good for CMIN/DF and RMSEA, and borderline for CFI, GFI, and AGFI.<sup>37</sup> Data assessing the health literacy of older individuals are limited, and it is thought that this may be related to the inappropriateness of previously developed tools. For this reason, it is recommended to use HLA-OA, which has been validated and reliable in Turkish, in the country, to test its validity and reliability again by working with different and more sample groups, to measure the health literacy of older people through the scale, and to conduct structured intervention studies as a result of these measurements.

## Conclusion

The Cronbach  $\alpha$  value of the four-point Likert-type five-factor 18-item scale is 0.83, the total variance explained by the factor regarding the scale is 55.973 %, CVI is 0.85, and the test-retest reliability value is 0.887. The relationship between the adapted scale and HLS-EU-16 is 0.512. As a result, the eighteen items of the health literacy scale in older people have reasonable length, reliable, and valid features. Accordingly, the Turkish validity and reliability scale can be widely used to determine the health literacy of older individuals. It can also be used as a screening tool with the potential to improve the implementation of healthcare strategies and policies for older individuals with low health literacy. It is recommended to use this scale to increase health literacy, better decision-making in healthcare, communication, compliance with treatment, improvement of health conditions, and increase individual-health professional satisfaction.

## Ethics approval and consent to participate/research involving human participants

Before starting the research, approval was received from the university ethics committee (Date: February 27th, 2024, Decision No. 01, 4th session). Necessary written permissions were obtained from the district governorship of the district where the research would be conducted (Date: April 18th, 2024, Number: E595019767999103). Additionally, communication was established with Konopik, one of the authors who developed the scale, and permission was obtained via e-mail.

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## Data availability

Data will be made available on request.

## Declaration of competing interest

The authors declare no competing interests.

## CRediT authorship contribution statement

**Fatma Zehra Genç:** Writing – original draft, Methodology, Investigation, Formal analysis, Conceptualization. **Suzan Yıldız:** Writing – review & editing, Data curation, Conceptualization. **Naile Bilgili:** Writing – review & editing, Supervision, Methodology, Conceptualization.

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