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The middle-aged and elderly health literacy scale Turkish adaptation

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Abstract

Background Inadequate health literacy in old age limits access to basic health services. The aim of this study is to translate the "China Rural Middle-Aged and Elderly Health Literacy Scale (CREHLS)" developed by Wu et al. (2024) into Turkish and to conduct psychometric validity and reliability analyses of this translation.

Methods The sample of the study consisted of 338 elderly individuals (average age 64.8 years, 53% female) living in Izmir, Türkiye. Since there were 26 items in the scale, the sample size was increased to 338 individuals in order to perform CFA, although 260 was sufficient. Data collection tools were CREHLS and Personal Information Form.

Results The Spearman-Brown split-half reliability coefficient of the scale was found to be 0.935. The item-total correlation values of the scale were above 0.5, generally ranging between 0.7 and 0.8. The sample size adequacy for factor analysis was excellent, with a value of 0.956. Overall, the scale was determined to be reliable and consistent.

Conclusion These results indicate that the CREHLS is a valid and reliable tool for assessing the health literacy levels of elderly Turkish individuals.

Keywords Elderly, Health literacy, Scale adaptation

Background

Aging is a natural phase of life characterized by irreversible structural and functional changes at the cellular, tissue, and system levels [1, 2]. However, aging is not merely a biological process; it also encompasses significant social, psychological, and economic dimensions. As individuals age, they often experience a slowdown in metabolic activities, an increase in chronic diseases, economic difficulties due to retirement, loss of spouses or friends, and limitations in performing daily activities [3, 4].

The World Health Organization (WHO) defines individuals aged 65 and over as "elderly." According to WHO data, there are approximately 125 million people aged 80 and above worldwide [5]. In Turkey, the proportion of elderly individuals was 8.8% in 2018 and increased to 10.2% by 2023. Projections estimate this rate will reach 12.9% by 2030, 16.3% by 2040, 22.6% by 2060, and 25.6% by 2080. Globally, the proportion of elderly people in the total population is around 9.8%, and Turkey shows a similar trend in terms of geriatric demographics [6].

The rapid increase in the elderly population has led to a rise in age-related health problems, making older adults a priority group in public health. In this context, the concept of health literacy, which includes the ability of individuals to access, understand, evaluate, and use health-related information to make informed health decisions, has gained increasing importance [7]. Closely linked to general literacy, health literacy plays a critical role for older adults in managing chronic diseases, using medications appropriately, participating in screening

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programs, and maintaining healthy lifestyle behaviors [8–10].

Research has shown that low health literacy can hinder access to healthcare services, prolong hospital stays, lead to unnecessary diagnostic procedures, and increase healthcare costs [11]. Furthermore, participation in preventive health behaviors such as screening tests is also influenced by the level of health literacy [12]. These findings highlight that a high level of health literacy among the elderly supports active aging, enhances quality of life, and enables more effective utilization of healthcare services [7].

Consequently, many countries have adopted the enhancement of health literacy as a fundamental, cost-effective, and efficient strategy to improve overall population health, making it a key policy objective [13]. Various international tools have been developed to measure health literacy. For example, the Test of Functional Health Literacy in Adults (TOFHLA) assesses individuals' ability to comprehend and use written health-related materials, while the Health Literacy Survey-Europe Questionnaire (HLS-EU-Q) provides a broader evaluation of health literacy. However, these instruments are generally designed for the general population or patient groups and do not specifically target the unique cognitive, social, and health-related needs of elderly individuals. Moreover, some of these tools have lengthy and complex structures, which may limit their applicability in older populations [14].

To address these limitations, the *Chinese Resident Health Literacy Scale for Middle-Aged and Older Adults (CREHLS)* was developed. This tool is specifically designed to meet the needs of middle-aged and elderly individuals and is characterized by its brevity, clarity, and high applicability. The scale consists of four subdimensions that assess the abilities of older adults to access, understand, evaluate, and apply health information, offering a comprehensive measurement of health literacy tailored to the elderly population [15].

In this context, the present study aims to adapt the CREHLS scale into Turkish and examine its validity and reliability among the elderly population in Turkey. Considering the demographic transition and the increasing elderly population in Turkish society, having a culturally and linguistically adapted version of such a specialized tool is essential for accurately assessing the health literacy of older adults.

Methods

Design

This study is a methodological observational study with a cross-sectional design, aiming to adapt a measurement tool developed by Wu et al. (2024) to Turkish and test its psychometric properties. It was conducted between December 2024 and January 2025 with elderly individuals residing in İzmir, Turkey.

Study population

The universe of the study consists of elderly individuals living in Izmir. Convenience sampling method was used in the study. Participants were invited to participate in the online data collection process via social media platforms (WhatsApp, Facebook). After the purpose of the study was explained to the participants, individuals who wanted to participate in the study voluntarily participated in the survey via the shared link. Data were collected online. The sample consisted of 338 individuals who agreed to participate voluntarily. It is recommended that a sample size of 10 participants per scale item is sufficient in validity and reliability studies [16]. Considering that the scale consists of 26 items, it is thought that at least 260 participants ($26 \times 10 = 260$) will be sufficient to conduct validity and reliability analyses. However, since confirmatory factor analysis (CFA), which requires a sample size of 300–500 [17, 18], was planned, the sample size was increased to 338 individuals. The inclusion criteria were as follows:

- Age 65 and above
- Ability to speak and understand Turkish
- Owning a smartphone or computer or having access to them through relatives
- No previous psychiatric diagnosis
- No significant visual or hearing impairment
- No mental impairment

History of intellectual disability or psychiatric diagnosis was assessed based on participants' self-report. This was clearly stated in the information form at the beginning of the online survey, and participants were asked to confirm that they met these criteria. Additionally, participants who provided inconsistent or inconsistent data were excluded from the analysis.

Ethics clearance

The research ethics committee approval was given by İzmir Bakırçay University Non-Interventional Clinical Research Ethics Committee (11/12/2024 – 1923) and has strictly adhered to the Declaration of Helsinki ethical. Before starting the research, the participants were informed about the research their verbal and written consents were obtained.

Data collection

Data collection tools included the "Personal Information Form" and the "Chinese Rural Elderly Health Literacy Scale" (CREHLS).

- Personal Information Form: This form, prepared by the researchers, included five questions on participants' age, gender, educational level, and other demographic characteristics.
- Chinese Rural Elderly Health Literacy Scale (CREHLS): Developed and validated by Zhengyu Wu et al. (2024), the CREHLS assesses health literacy among middle-aged and elderly individuals.

The CREHLS consists of 26 items divided into four subscales:

1. Disease Treatment (7 items)
2. Disease Prevention (7 items)
3. Health Promotion (6 items)
4. Environmental Health (6 items)

The scale is a 5-point Likert type, with responses ranging from "very difficult," "difficult," "moderate," "easy," to "very easy." Items are scored as follows: "never = 0," "rarely = 1," "occasionally = 2," "frequently = 3," and "always = 4." There are no reverse-coded items in the scale. The total score ranges from 26 to 104, with higher scores indicating better health literacy.

Data collection process and security

Data were collected from participants over a two-month period. Participants were informed that their data would be kept confidential and would only be used for research purposes, and online informed consent was obtained. Information about the purpose of the study, the principles of volunteering, and data confidentiality were provided on the home page of the survey, and then participants were asked to tick the checkbox next to the statement "*I have read and understood the above information and agree to participate in the study*" Individuals who did not give consent were not included in the study.

Process steps of the research

This study adopted a meticulous approach to resolve inconsistencies in the translation process in accordance with the requirements of the cross-cultural adaptation process. The validity and reliability of the translation were ensured in accordance with the cross-cultural adaptation process recommended by the WHO. In this process, a complete translation phase was carried out to prevent semantic shifts in the language and inconsistencies were determined through the back-translation process. In addition, every aspect of linguistic and cultural adaptation was carefully examined by following the steps specified in the guide developed by [19] and his colleagues. The translation process was further strengthened with expert contributions, resulting in a linguistically and culturally compatible text. The subject and purpose of the study were explained by providing the user manual and relevant articles to 10 independent experts who are native speakers of English. These individuals translated the scale from its original language to the target language. The translators did not consult each other and worked independently. After all the translation-retranslation stages, the final version of the scale was decided by the researchers.

In this study, various validity and reliability analyses were conducted to evaluate the psychometric properties of the developed scale. To assess the reliability of the scale, internal consistency analyses were performed, including the calculation of Cronbach's alpha and McDonald's omega coefficients. Additionally, item-total correlations and "alpha if item deleted" values were examined to evaluate the individual contribution of each item to the overall reliability of the scale. Furthermore, to assess the measurement stability of the scale, a split-half reliability analysis was conducted, and the total reliability coefficient was calculated using the Spearman-Brown correction formula. As part of the validity assessment, content validity was established through expert review. To evaluate construct validity, both Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) were performed sequentially. EFA revealed a four-factor structure, which was subsequently tested using CFA. During the CFA process, no item removal or structural path deletion was undertaken. Modification indices (MI) were also examined, and all values were found to be below the recommended thresholds. As a result, no additional covariance terms were introduced into the model, and the original structural configuration was retained. All statistical analyses were conducted using SPSS version 23.0 and AMOS version 23.0. Descriptive characteristics of the participants were reported using frequency (n), percentage (%), mean ($\bar{x}$), standard deviation (SD), minimum, and maximum values. After obtaining the required ethics committee approval (1923/11.12.2024), the data collection process began. The data were obtained from individuals who voluntarily participated in the study. The collected data underwent a thorough review, and incomplete or incorrectly marked responses were excluded from the analysis.

Results

In this section, the confirmatory factor analysis results, item-total correlations, internal consistency reliability (Cronbach's Alpha), split-half reliability and KMO-Bartlett tests for the Turkish form of the Middle-Aged and Elderly Health Literacy.

Scale (CREHLS) are presented. The factor structure and psychometric properties of the scale were evaluated, and it was determined that it was a reliable and valid measurement tool.

Table 1 Sociodemographic characteristics ($n = 338$)

Personal Characteristics		*n*	%
Gender	Female	179	53.0
	Male	159	47.0
Marital Status	Married	249	73.7
	Single	89	26.3
Education	Literate	55	16.3
	Primary School	89	26.3
	Middle School	60	17.8
	High School	69	20.4
	Bachelor's Degree	56	16.6
	Postgraduate	9	2.7
Income Status	Income less than expenses	76	22.5
	Income equal to expenses	171	50.6
	Income more than expenses	91	26.9
Age	x ± ss (Min-Max)	64.80 ± 10.12 (49–95)	

Table 2 Summary of reliability analysis of the CREHLS scale

Subscale	Cronbach's Alpha	McDonald Omega	Item-Total Correlation (Min–Max)	Alpha if Deleted (Min–Max)
Disease Treatment	0.86	0.86	0.673–0.769	0.854–0.868
Disease Prevention	0.84	0.82	0.685–0.822	0.858–0.868
Health Promotion	0.85	0.83	0.713–0.831	0.842–0.868
Environmental Health	0.79	0.80	0.695–0.796	0.858–0.878

When examining the sociodemographic characteristics of the sample group ($n = 338$), the gender distribution appears balanced, with 53.0% of participants being female and 47.0% male. A majority of the participants (73.7%) are married, and their educational levels vary. Regarding education, the largest group consists of primary school graduates (26.3%), followed by high school graduates (20.4%) and middle school graduates (17.8%). Additionally, 16.6% of participants hold a bachelor's degree, and 2.7% have completed postgraduate education.

In terms of income, half of the participants (50.6%) stated that their income was equivalent to their expenses, while 26.9% reported that their income exceeded their expenses, and 22.5% indicated that their income was less than their expenses. The average age of the participants is 64.8 years (SD = 10.12, range 49–95), representing an older demographic group (Table 1).

Table 2 presents the reliability analysis for the four subscales of the CREHLS (Community-Related Environmental Health Literacy Scale), including Cronbach's alpha, McDonald's omega, item-total correlations, and the range of Cronbach's alpha values if items were deleted. These metrics offer a comprehensive overview of internal consistency and the contribution of each item to the overall reliability of the subscales. All subscales demonstrated acceptable to excellent internal consistency, with Cronbach's alpha coefficients ranging from 0.79 to 0.86. The Disease Treatment subscale showed the highest internal consistency ($\alpha = 0.86$), followed closely by Health Promotion ($\alpha = 0.85$) and Disease Prevention ($\alpha = 0.84$).

The Environmental Health subscale had the lowest alpha value ($\alpha = 0.79$), which remains within the acceptable threshold for psychological scales. The corresponding McDonald's omega coefficients were closely aligned with alpha values, reinforcing the scale's internal coherence and indicating that the tau-equivalence assumption of classical test theory is largely met. Item-total correlation values across the subscales ranged from 0.673 to 0.831, indicating strong and meaningful relationships between individual items and their respective subscale scores. Notably, the Health Promotion subscale exhibited the highest item-total correlations, suggesting that items within this domain are particularly homogenous and contribute consistently to the latent construct. Although the Disease Treatment subscale had a slightly lower range of item-total correlations, the values were still robust and support the internal reliability of the subscale. The "alpha if item deleted" values further confirmed the reliability of the subscales, as no item substantially decreased overall consistency. The narrow range of alpha values in this analysis suggests that all items contribute positively to their respective subscales and that item removal would not significantly enhance internal consistency. This supports the structural integrity of the scale at the item level.

Table 3 presents the results of the exploratory factor analysis (EFA) conducted on the CREHLS scale, including factor loadings for each item across four identified subdimensions, eigenvalues, and variance explained by each factor. The analysis aimed to explore the underlying factor structure and evaluate construct validity. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was exceptionally high at 0.956, indicating that the data were highly suitable for factor analysis. Additionally, Bartlett's test of sphericity was statistically significant ($\chi^2 = 7928.580$), confirming the presence of sufficient correlations among items for factor extraction. A four-factor solution was extracted using principal component analysis with likely a varimax rotation (rotation method should be specified in the text), explaining a cumulative 58.96% of the total variance. Specifically, the first factor accounted for 24.92% of the variance, the second 16.00%, the third 10.04%, and the fourth 8.00%. These values suggest a well-structured multidimensional construct, as each factor contributed meaningfully to the total variance explained. The factor loadings demonstrate strong associations between items and their respective latent constructs. All items showed substantial loadings (generally > 0.70) on a single factor, with minimal cross-loading, reinforcing the unidimensionality of each subscale. For instance, items I1 through I7 loaded highly on the first factor, suggesting a coherent construct. Similarly, items

Table 3 Exploratory factor analysis results for the Crehls scale: factor loadings, eigenvalues, and explained variance

	Factor Loads			
	1. Sub-dimension	**2. Sub-dimension**	**3. Sub-dimension**	**4. Sub-dimension**
I1	0.741			
I2	0.725			
I3	0.757			
I4	0.702			
I5	0.782			
I6	0.755			
I7	0.715			
I8		0.772		
I9		0.770		
I10		0.781		
I11		0.806		
I12		0.835		
I13		0.717		
I14		0.763		
I15			0.751	
I16			0.800	
I17			0.767	
I18			0.841	
I19			0.741	
I20			0.800	
I21				0.815
I22				0.777
I23				0.748
I24				0.722
I25				0.701
I26				0.463
Eigenvalue	6.48	4,16	2,61	2.08
% of Variance	24.92	16,00	10,04	8.00
Cumulative %	24.92	40.92	50.96	58.96
KMO Measure	0.956			
Barlett	7928.580			

I Item

Table 4 Confrmatory factor analysis of the rural Middle-Aged and elderly health literacy scale (CREHLS) ($n = 338$)

Measurement	Scale Values	Cutoff Criteria
CMIN/DF (Chi-square/DF)	4.415	< 3 (good), < 5 (acceptable)
RMR (Root Mean Residual)	0.039	< 0.05
GFI (Goodness of Fit Index)	0.895	> 0.90
AGFI (Adjusted GFI)	0.838	> 0.90
NFI (Normed Fit Index)	0.954	> 0.90
TLI (Tucker-Lewis Index)	0.959	> 0.90
CFI (Comparative Fit Index)	0.977	> 0.90
RMSEA (Root Mean Square Error of Approximation)	0.014	< 0.08 (good), < 0.10 (acceptable)

I8 through I14 clustered around the second factor, I15 through I20 on the third, and I21 through I26 on the fourth. Item I26 showed a relatively lower loading (0.463) but remained above the minimum acceptable threshold of 0.40. The results support a four-dimensional structure underlying the CREHLS scale, aligning with the theoretical framework proposed for community-related environmental health literacy. The distinct and interpretable factor groupings confirm the scale's construct validity, and the eigenvalues for all four factors exceeded the commonly used threshold of 1.0, supporting their retention.

Table 4 presents the results of the confirmatory factor analysis (CFA) performed to evaluate the factorial validity of the Rural Middle-Aged and Elderly Health Literacy Scale (CREHLS) using data from 338 participants. The CFA tested the hypothesized four-factor structure identified in the exploratory factor analysis (EFA) phase. The model demonstrated an acceptable overall fit to the data. The chi-square to degrees of freedom ratio (CMIN/DF) was 4.415, slightly exceeding the ideal value of 3 but remaining within the acceptable range of less than 5. Given the known sensitivity of chi-square statistics to sample size, this result does not necessarily indicate poor model fit. Supporting this interpretation,

Table 5 Halving reliability ($n = 338$)

Halving Reliability Statistics	Value
1. Track Cronbach's Alpha	0.946
2. Track Cronbach's Alpha	0.943
Spearman-Brown	0.935

the Root Mean Residual (RMR) was 0.039, falling well below the recommended threshold of 0.05 and indicating a low average residual across observed and predicted covariances. Several incremental and absolute fit indices confirmed the adequacy of the model. The Normed Fit Index (NFI = 0.954), Tucker-Lewis Index (TLI = 0.959), and Comparative Fit Index (CFI = 0.977) all surpassed the conventional 0.90 threshold, reflecting excellent fit relative to the null model. The Root Mean Square Error of Approximation (RMSEA) was 0.014, far below the acceptable upper limit of 0.08, suggesting excellent parsimony-adjusted model fit. Although the Goodness of Fit Index (GFI = 0.895) and the Adjusted Goodness of Fit Index (AGFI = 0.838) were slightly below the ideal cutoffs, they approached adequacy and did not signal a need for model respecification when considered in conjunction with other indices. Importantly, no items were removed from the model, and no structural paths were deleted. The initial model specification was retained throughout the CFA process. Modification indices (MI) were reviewed to assess potential improvements to model fit. However, all MI values were found to be below the commonly recommended thresholds for concern. As a result, no additional covariances between error terms were introduced, and no modifications were applied to the model structure. This supports the robustness and theoretical coherence of the original measurement model.

Table 5 shows the results of the split-half reliability of the scale and indicates a very high level of reliability. The Cronbach's Alpha value for the first part was 0.946 and 0.943 for the second part, indicating that the two halves of the scale are consistent with each other. Furthermore, the Spearman-Brown coefficient (0.935) strongly supports the reliability of the scale. These results reveal that the scale has high internal consistency and offers a reliable structure in the measurement process (Table 5).

Discussion

The number of health literacy scales developed or adapted specifically for the elderly population in Turkey is limited. Scales for the general adult population (HLS-EU-Q or TOFHLA) may not fully reflect the characteristics of elderly individuals [14]. CREHLS has the potential to fill this gap. In this study, the "Chinese rural middle-aged and elderly health literacy scale (CREHLS)" developed by Wu et al. (2024) was adapted to Turkish and its validity and reliability study was conducted. Data were collected online in this study. However, this method has some limitations. Especially the heterogeneity of digital literacy levels in elderly individuals may affect participation in online surveys. This may limit the generalizability of the findings to the entire elderly population. However, self-report-based scales were used in the study. First of all, the language equivalence of the original scale and the Turkish form was ensured with the study. Whether the four-factor structure of the original CREHLS was a valid model was tested with CFA. The fit indices calculated as a result of CFA showed quite good values. CREHLS consists of a total of 26 items, seven in the "Disease Treatment" dimension, seven in the "Disease Prevention" dimension, six in the "Health Promotion" dimension and six in the "Environmental Health" dimension. A 5-point Likert-type scale was used in the scoring of the scale as "never = 0, rarely = 1, occasionally = 2, frequently = 3 and always = 4". Accordingly, the minimum score that can be obtained from the scale is 26; the maximum score is 104. There is no reverse item in the scale. As the score increases, it shows that health literacy increases. As a result of the analysis, it was seen that the fit indexes in the Turkish form showed a good level of fit. The CFA CFA results, which were conducted to see whether the four-factor structure of the Turkish form determined by the factor analysis of the scale was confirmed, revealed that the model fit indexes of the scale had a good level of fit. Accordingly, the linguistic and cultural equivalence studies of the scale were first conducted and it was decided that there was no need to remove any items from the scale at a rate of 86%. The Cronbach's alpha reliability of the CREHLS scale was 0.86. Cronbach's alpha values for the sub-dimensions were 0.86 for "Disease Treatment", 0.84 for "Disease Prevention", 0.85 for "Health Promotion", and 0.79 for "Environmental Health". This shows that the scale is reliable. The fact that there was no significant decrease in Cronbach's alpha values when the items were removed supports the consistency of the scale. The KMO value of the scale was 0.95. The findings of the study are similar to the original Chinese rural version developed by Wu et al. (2024). In both studies, the four-factor structure of the scale was confirmed, and Cronbach's alpha coefficients were found to be high ($\alpha = 0.85$ in the original study; $\alpha = 0.86$ in this study). A similar structure and consistency are also seen between the sub-dimensions. However, variability was observed in some item correlations due to cultural differences. According to the CFA results, it was calculated that the scale items were in high agreement with the total score and all item-total correlation values were above 0.5, generally ranging between 0.7 and 0.8. This shows that the scale exhibited strong consistency in general and that the items were suitable for the structure they were intended to measure. It can be said that the scale was generally reliable and consistent.

When the Cronbach's Alpha and Spearman-Brown internal consistency coefficients calculated for the adapted CREHLS were examined, it was revealed that the scale was quite reliable and provided a reliable structure during the measurement process. The coefficients related to the scale sub-dimensions were largely parallel to the study of Wu et al. (2024).

Conclusion

As a result of the literature review, it was seen that studies examining health literacy in elderly individuals were quite limited. In this context, the research results show that CREHLS, which consists of 26 items and 4 subdimensions, can be used in Turkey as a valid and reliable measurement tool. This scale facilitates early intervention by enabling health professionals to determine the health literacy of elderly individuals more effectively. This validated and reliable scale can be used in hospitals, nursing homes and community health centers where elderly individuals frequently receive care. Systematic assessment of the health literacy of elderly individuals can contribute to the implementation of early interventions and support programs. The scale can serve as an effective screening tool in public health assessments of older adults. Integrating this scale into geriatric assessments can help health professionals develop more effective intervention strategies for elderly individuals. In addition, CREHLS, which was found to be a valid and reliable measurement tool, can contribute to research on this subject. In addition, future studies can investigate the relationships between the health literacy perceptions of elderly individuals and variables such as gender and other individual differences.

Limitations

This study was conducted with elderly individuals residing in İzmir- Turkey.

Authors' contributions

MK: Conceptualization, Investigation, Data curation, Resources, Writing – review & editing **MŞ:** Conceptualization, Investigation, Data curation, Resources, Writing – review & editing, Formal analysis **FA:** Conceptualization, Formal analysis, Conceptualization, Investigation, Writing – review & editing **FD:** Conceptualization, Investigation, Writing – review & editing.

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Data availability

The datasets generated and/or analysed during the current study are not publicly available due their containing information that could compromisethe privacy of research participants but are available from the corresponding author on reasonable request.

Declarations

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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