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Validity and Reliability of the Turkish Version of the Mental Health Literacy Scale in a General Population

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ABSTRACT

Objectives: This study examines the validity and reliability of the Turkish version of the Mental Health Literacy Scale (T-MHLS) in a general population sample. Mental health literacy (MHL) is essential for recognizing and addressing mental health disorders; however, limited knowledge in this area contributes to underreported cases and untreated conditions.

Methods: The study was conducted using face-to-face interviews, adapting the T-MHLS from the original MHLS. Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) were conducted to validate the structure of the scale. The sample size and data collection method ensured robust data, while validity and reliability analyses followed established psychometric protocols.

Results: Data were collected from 401 participants, and items with low factor loadings were removed, resulting in a final five-factor structure with 30 items, explaining 58.7% of the variance. Known-group validity analysis revealed that factors such as gender, marital status, education level, income perception, and personal or familial experiences with mental illness significantly influenced MHL scores. The Cronbach's alpha for the final scale was 0.861.

Conclusions: The T-MHLS is shown to be a valid and reliable tool for assessing mental health literacy in Turkey. This scale is recommended for use in future studies involving various demographic groups to effectively measure MHL levels.

Keywords: Mental Health Literacy, Turkish Version, Scale Validation, Validity

Globally, 1.1 billion individuals are affected by mental illnesses or substance abuse disorders, collectively representing a substantial proportion of the non-fatal disease burden [1]. Untreated mental disorders give rise to a number of adverse outcomes, including difficulties in work settings, the formation of problematic interpersonal relationships, and impaired family functioning. Furthermore, they are associated with an increased risk of developing physical conditions such as diabetes mellitus, heart disease, and stroke, which ultimately reduce life expectancy [2-4].

Despite the significance of mental health, the proportion of individuals with mental health disorders who seek and obtain appropriate assistance remains relatively low [5]. Mental disorders affect one-third of the global population each year, but only two-thirds receive treatment. In countries like India and China,

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up to 80% do not seek medical assistance [5]. In Europe, 27% of the population is affected annually, with 74% not receiving treatment [6]. Factors contributing to these low treatment rates include stigma, distrust of those who can offer help, and difficulty in recognizing mental health disorders [7].

The concept of health literacy, which has been in use for over four decades, has recently gained significant attention, resulting in a notable increase in research publications on the subject [1]. As research on health literacy has expanded, it has provided a more nuanced understanding of the concept, which has further allowed for the study of health literacy in specific subcategories. Mental health literacy (MHL) is one of that subcategories.

In 1997, Jorm *et al*. [8] defined MHL as "knowledge and beliefs about mental disorders which aid their recognition, management, or prevention". MLH's scope was defined as the ability to recognize specific disorders; knowing how to seek mental health information; knowledge of risk factors and causes, of self-treatments, and of professional help available; and attitudes that promote recognition and appropriate help-seeking in the same article. Low MHL rates contribute to the underreporting and undiagnosis of mental disorders, which, in turn, result in untreated illnesses, unemployment, higher morbidity and mortality rates, increased stress for caregivers, and lost years of life due to suicide and homicide [9].

A variety of methods and scales are employed to assess MHL. Some of these scales concentrate on particular disorders (e.g., depression or bipolar disorder) and may consequently fail to include essential elements of MHL. Conversely, other scales include questions that extend beyond the boundaries of MHL. Moreover, some scales are unable to generate quantitative results. This underscores the necessity for an updated, quantitative scale to assess MHL in a reliable and consistent manner [10].

O'Connor and Casey [11] developed Mental Health Literacy Scale (MHLS) in 2015 to address these issues. In a systematic review, the MHLS was identified as the optimal scale in accordance with the COSMIN (Consensus-Based Standards for the Selection of Health Status Measurement Instruments) criteria for measuring MHL [12]. Since its publication, the MHLS has been translated into numerous languages and has been employed extensively.

Despite previous studies examining the validity and reliability of the MHLS in Turkish, discrepancies in sampled populations and results have led to variations in item counts and the distribution of sub-factors in the Turkish version of the scale [13, 14]. This study aimed to evaluate the validity and reliability of the Turkish version of the MHLS within a population representative of the broader community and to examine factors associated with MHLS scores.

METHODS

Sampling and Data Collection

This study was designed as a methodological study. Data were collected from the waiting rooms of surgery and internal medicine outpatient clinics from the relatives of patients who were over 18 years old and volunteered to participate in the study. To determine the sample size, a variable-to-participant ratio of at least 10:1 was targeted. The scale, consisting of 35 items, was administered to 401 participants. Data collection was carried out through face-to-face interviews, which ensured no missing data.

Data Collection Tools

Personal Information Form

A personal data form, developed by the researchers based on a literature review, was used to gather information on participants' age, gender, marital status, education level, income perception, occupation, any diagnosed chronic illnesses (and specific illnesses, if any), any diagnosed mental disorders, current treatment for mental disorders, and presence of family members with a mental disorder diagnosis.

Turkish Version of Mental Health Literacy Scale

The MHLS is a 35-item scale developed by O'Connor and Casey [11] in 2015 for the purpose of measuring six key characteristics of mental health literacy. The MHLS employs a 4- or 5-point Likert scale, with a potential range of scores from 35 to 160. It incorporates both positively and negatively worded items.

Turkish version of MHLS (T-MHLS) was formed by Akdoğan [13] in 2018. A group translation method (Hambleton, Merenda, and Spielberger) was used to

facilitate linguistic adaptation. In the initial phase, the scale was translated into Turkish by seven experts proficient in English and native Turkish speakers. In the second phase, a distinct group of translators revised the translated text independently, without reference to the original, and subsequently conducted a comparison with the source text. In the third phase, the revised scale was back-translated into English. Three linguistic experts compared this version with the original, made the necessary adjustments, and obtained feedback from the original author. Finally, the scale was tested on a group of 20 individuals, and adjustments were made based on their feedback. The content reliability index was calculated, with the lowest score determined to be 0.890 [13].

Ethical Considerations

Ethical approval was obtained from the Istanbul University Istanbul Faculty of Medicine Clinical Research Ethics Committee (decision date: 09.08.2019; decision number: 2019-13/1007). Permission to employ the MHLS was obtained from Matt O'Connor, the scale's original developer, and Emine Akdoğan, the creator of the Turkish version.

Statistical Analysis

The reliability of the Turkish version of the MHLS (T-MHLS) was evaluated through the implementation of Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA). In order for an item to be included in the item analysis, the item-total score correlation must be at least 0.20 for all items. The adequacy of the sample was evaluated through the application of the Kaiser-Meyer-Olkin (KMO) coefficient and Bartlett's Sphericity Test, with the established criteria being a KMO value exceeding 0.70 and a highly significant Bartlett's X^2 [15]. Principal component analysis with Varimax rotation was employed in the EFA. Factors that contributed more than 5% of the variance and had eigenvalues above 1 were retained. It was anticipated that each item would demonstrate a minimum shared variance and factor loading of 0.40 in both the factor and pattern matrices, with a minimum difference of 0.10 to control for double loading. CFA was conducted to validate the model generated by EFA. Error adjustments were applied based on model recommendations: adjustments decreasing χ^2 by at least 20 points if $\chi^2 <$ 1000, and by at least 30 points if $\chi^2 \geq 1000$, within the same factor's variables.

The model fit was evaluated using several indices, including the ratio of χ^2 to df, the root mean square error of approximation (RMSEA), the 90% confidence interval for RMSEA, the standardized root mean square residual (SRMR), the Tucker–Lewis index (TLI), and the comparative fit index (CFI). The acceptable thresholds for these indices are outlined in Table 1. The objective was to achieve a difference of no more than 0.10 between the lower and upper bounds of the 90% confidence interval (CI) for the RMSEA. Cronbach's alpha was calculated to assess the internal consistency reliability of the scale, while the Guttman split-half coefficient was employed to evaluate the correlation between the first and second halves of the scale.To assess known-group validity, the Mann-Whitney U test, Kruskal-Wallis test, or Spearman correlation were applied to group-based questions from the personal information form, and effect sizes were calculated for group differences. CFA was conducted using IBM SPSS AMOS 16, and other statistical analyses were performed with SPSS version 21.0.

RESULTS

Sample characteristics

The mean age of the participants was 38.4±13.8 years; 55.1% were men. Most participants were married (63.3%). Other characteristics of the participants are shown in Table 2.

Construct Validty

Item Analysis and EFA

Following the initial item-total score correlation analysis, four items (questions 9, 10, 12, and 15) with correlation coefficients below 0.2 were identified, but they were retained for the initial factor analysis phase. The KMO coefficient for the T-MHLS was calculated as 0.864, and Bartlett's Sphericity Test yielded a χ^2 value of 6476.476 ($P<0.001$), indicating that the sample size was adequate for factor analysis.

A principal component analysis with Varimax rotation was conducted to identify the underlying factors. This initial analysis revealed eight factors with eigenvalues greater than one. Since five of these

TABLE 1. Model Fit Indices and Acceptable Thresholds for Goodness-Of-Fit

Fit indices	Good fit criteria	Acceptable fit criteria
χ^2/df[1]	$0 \leq \chi^2/df \leq 2$	$2 \leq \chi^2/df \leq 5$
RMSEA[2]	0≤RMSEA≤0.05	0.05≤RMSEA≤0.08
SRMR[3]	0≤SRMR≤0.05	0.05≤SRMR≤0.08
TLI[4]	0.95≤TLI≤1.00	0.90≤TLI≤0.95
CFI[5]	0.95≤CFI≤1.00	0.90≤CFI≤0.95

[1]χ^2/df, the ratio of chi-square to degrees of freedom; [2]RMSEA, root mean square error of approximation; [3]SRMR, standardized root mean square residual, [4]TLI, Turker-Lewis index; [5]CFI, comparative fit index.

TABLE 2. General Characteristics of the Participants

Descriptive Characteristics	Number	Percentage (%)
Gender		
Male	221	55.1
Female	180	44.9
Marital status		
Married	254	63.3
Single	147	36.7
Education level		
Primary school or below	49	12.2
Middle school	30	7.5
High school	115	28.7
University or above	186	51.6
Perceived income		
High income	63	15.7
Average	230	57.4
Low income	108	26.9
Chronic illness		
Yes	69	17.2
No	332	82.8
Presence of mental illness		
Yes	27	6.7
No	374	93.3
Relatives with mental illness		
Yes	21	5.2
No	380	94.8

factors explained approximately 5% or more of the variance, the analysis was repeated with a five-factor model. In this analysis, the same four items exhibited factor loadings below 0.4. In light of their low item-total correlations and factor loadings, these items were excluded from the scale.

In the final analysis, all remaining items exhibited extraction values above 0.30 prior to rotation, and no item demonstrated a factor loading below 0.40 on its primary factor within the rotated factor matrix. Furthermore, no items demonstrated cross-loading. Following the exclusion of the four items previously mentioned, a five-factor structure was identified, which explained 57.3% of the total variance in the 31-item version of the scale (Table 3).

Confirmatory Factor Analysis

The five-factor, 31-item scale was found to be a valid and reliable measurement tool for MHL following the EFA. CFA was conducted to assess the model's fit and to identify any potentially problematic items. In the initial model, only one item (item 20) had a factor loading below 0.3 (factor loading = 0.298). As this item was also the only one with a factor loading below 0.5 in the EFA (0.441), it was excluded, and the model was re-evaluated (Figure 1).

CFA Model Fit Indices

The fit index values of the model before setting the covariance of errors are shown in Table 4. Values other than TLI were found to be close to acceptable or good fit levels. The 90% confidence interval bounds for RMSEA were found to have a difference of 0.10 units between them. Corrections were applied to the model by adjusting three error covariances as presented in Figure 1, and the fit index values obtained after setting the covariance are presented in Table 4.

Known-group Validity

Table 5 shows the results of the known-group validity analysis. Higher mental health literacy scores were significantly associated with being female (P=0.018), single (P=0.016), having a higher level of education (P<0.001), perceiving high income (P=0.003), having a mental illness (P<0.001), receiving treatment for a mental illness (P<0.001), or having a relative with a mental illness (P<0.001).

TABLE 3. Factor Structure, Communalities, and Item-Total Correlations of the T-MHLS

Factor names, item numbers, and content	Factor loadings	Communalities	Item-total correlation
Attitude toward individuals with mental disorders			
Eigenvalue= 6.17, Variance= 19.91%, α= 0.930			
29. Being a neighbor with them	0.843	0.735	0.409
30. Participating in social activities with them	0.861	0.775	0.413
31. Being friends with them	0.885	0.802	0.416
32. Working with them at the workplace	0.900	0.824	0.374
33. Marrying someone with a mental disorder (within family)	0.822	0.709	0.370
34. Voting for them	0.663	0.672	0.407
35. Hiring them for a job	0.853	0.747	0.389
Attitudes toward mental disorders			
Eigenvalue= 5.13, Variance= 16.54%, α= 0.875			
20. They can recover if they want*	0.441	0.491	0.225
21. It is a sign of weakness	0.683	0.632	0.546
22. It is not a disease	0.746	0.600	0.582
23. They are dangerous	0.747	0.660	0.600
24. Avoiding them is the best solution	0.744	0.633	0.609
25. I wouldn't tell anyone if I had one	0.778	0.695	0.595
26. Seeking professional help is a sign of weakness	0.777	0.695	0.632
27. I wouldn't seek help from a professional	0.716	0.634	0.605
28. Treatment is ineffective	0.660	0.560	0.500
Recognition of mental disorders			
Eigenvalue= 3.07, Variance= 9.89%, α= 0.809			
1. Recognizing social phobia	0.624	0.532	0.221
2. Recognizing generalized anxiety disorder	0.726	0.586	0.338
3. Recognizing major depressive disorder	0.684	0.551	0.338
4. Recognizing personality disorders	0.623	0.489	0.285
5. Recognizing dysthymia	0.723	0.589	0.355
6. Recognizing agoraphobia symptoms	0.580	0.513	0.277
7. Recognizing bipolar disorder symptoms	0.645	0.488	0.365
8. Recognizing substance dependency symptoms	0.504	0.444	0.315
Accessing mental health information			
Eigenvalue=1.88, Variance=6.06%, α=0.79			
16. Obtaining information	0.753	0.615	0.449
17. Using computers and phones to access information	0.715	0.643	0.317
18. Getting information from a professional	0.786	0.718	0.497
19. Accessing resources	0.734	0.673	0.530
Knowledge about mental disorder treatments			
Eigenvalue=1.51, Variance=4.86%, α=0.66			
11. Quality of sleep	0.643	0.670	0.284
13. Cognitive behavioral therapy	0.814	0.690	0.313
14. Confidentiality principle of professionals	0.772	0.682	0.269

T-MHLS, Turkish version of the mental health literacy scale.
*Removed from the scale after confirmatory factor analysis.

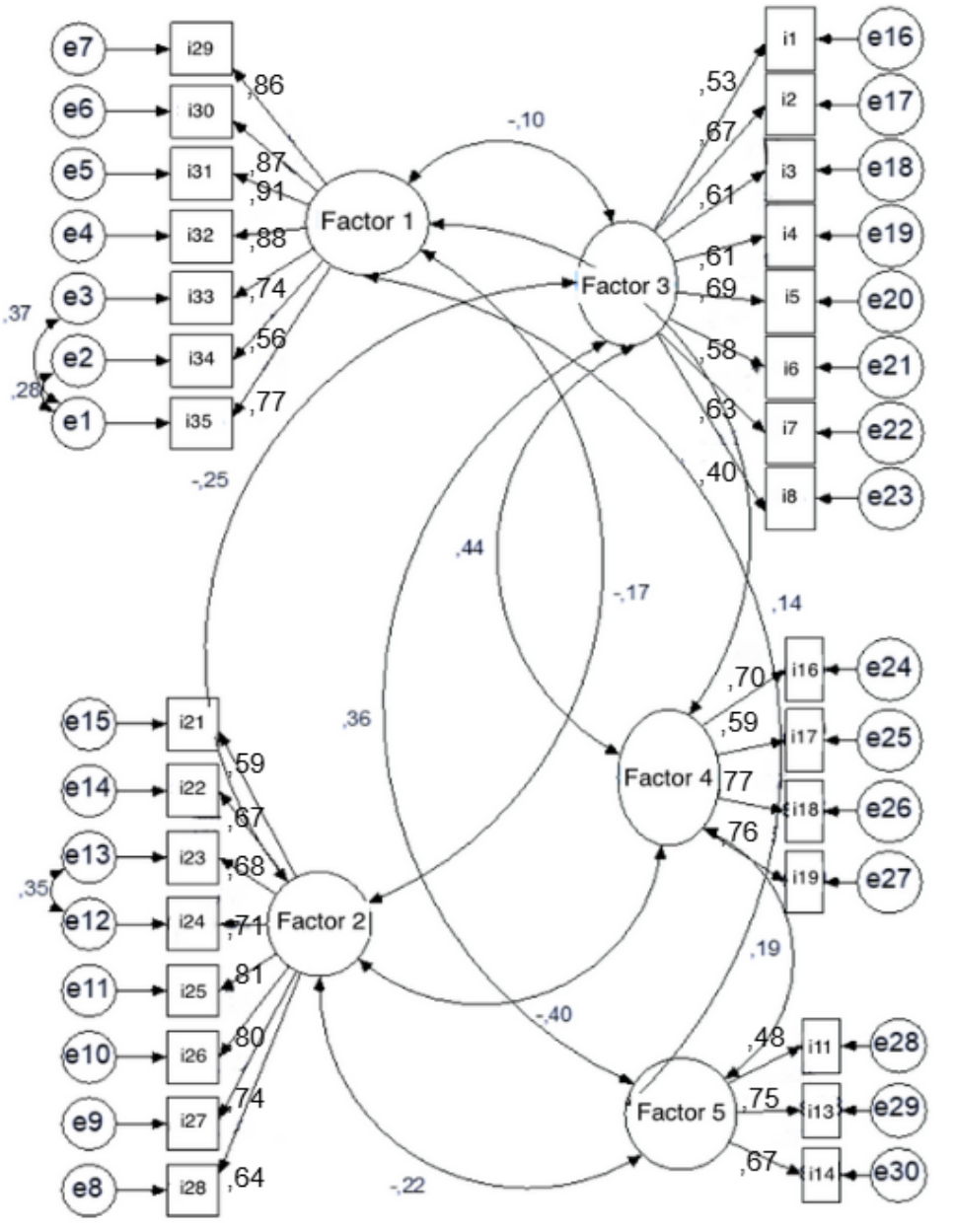


FIGURE 1. **Confirmatory factor analysis model of the 30-item mental health literacy scale.**

TABLE 4. **Model Fit indices Before and After Corrections**

Fit indices	Before correction	After correction
χ^2/df[1]	2.4	2.06
CFI[2]	0.901	0.926
TLI[3]	0.891	0.918
90% CI RMSEA[4]	0.054-0.064	0.046-0.056
RMSEA[5]	0.059	0.051
SRMR[6]	0.054	0.054

[1]Chi-square divided by degrees of freedom, [2]Comparative Fit Index, [3]Turker-Lewis Index, [4]Confidence Interval, [5]Root Mean Square Error of Approximation, [6]Standardized Root Mean Square Residual.

TABLE 5. Comparison of Mental Health Literacy Across Demographic Groups

Variable		Attitude toward individuals with mental disorders	Attitudes toward mental disorders	Recognition of mental disorders	Accessing mental health information	Knowledge about mental disorder treatments	Total MHL scale score
Gender							
Male (n=221)		13.8±5.9	30.1±8.1	24.8±3.74	15.8±3.1	9±2	93.5±13.7
Female (n=180)		15.3±5.8	31.2±6.8	25.2±3.93	15.8±3.4	9.3±1.9	96.8±13
	P value	**0.006**	0.381	0.214	0.811	0.164	**0.018**
Marital status (P value)							
Single (n=147)		14.8±6.3	31.8±7.4,	25.4±3.8	16.3±3.1	9.2±2	97.6±13.1
Married (n=254)		14.3±5.7	29.9±7.6	24.8±3.8	15.5±3.3	9.1±1.9	93.5±13.5
	P value	0.435	**0.008**	0.331	**0.033**	0.221	**0.016**
Education level							
High school or below (n=215)		14.2±6.1	28.6±8	24.4±4	15.3±3.3	8.7±2.1	91±14.1
University or above (n=186)		14.8±5.8	33±6.2	25.7±3.5	16.4±3	9.6±1.6	99.5±10
	P value	0.179	**<0.001**	**0.001**	**0.001**	**<0.001**	**<0.001**
Income perception							
Low income (n=108)		13.7±5.8	28.3±8.5	24.6±4.2	15.3±3.2	8.8±2.1	90.7±14.3
Average income (n=230)		14.8±6.1	31.5±7.1	25.2±3.4	16.1±3.1	9.2±1.8	96.8±12.1
High income (n=63)		14.4±5.3	31.5±6.7	25.1±4.6	15.5±3.6	9.3±2.1	95.7±12.1
	P value	0.262	**0.004**	0.381	0.069	0.166	**0.003**
Chronic illness							
Yes (n=69)		15.7±6.8	30.4±8	25.2±3.7	15.2±3.2	9.1±1.9	95.5±16.2
No (n=332)		14.3±5.7	30.7±7.5	24.9±3.9	15.9±3.2	9.1±2	94.9±12.9
	P value	0.174	0.967	0.493	0.116	0.636	0.665
Mental illness							
Yes (n=27)		20.8±6.7	32.6±7.9	26.6±3.9	15.8±4.1	10.1±1.5	105.8±17.3
No (n=374)		14±5.6	30.5±7.5	24.9±3.8	15.8±3.2	9.1±1.9	94.2±12.8
	P value	**<0.001**	0.075	**0.015**	0.501	**0.006**	**<0.001**
Mental health treatment							
Receiving treatment (n=21)		21.1±7.2	33.3±7.9	27±4.2	15.9±4	10.1±1.5	107.3±17.8
Not receiving treatment (n=380)		14.1±5.7	30.5±7.5	24.9±3.8	15.8±3.2	9.1±1.9	94.3±12.9
	P value	**<0.001**	**0.027**	**0.012**	0.462	**0.029**	**<0.001**
Relative with mental illness							
Yes (n=39)		21.1±5.5	32.6±6.7	25.6±3.4	16±3.3	10.1±1.4	105.4±12
No (n=362)		13.8±5.5	30.4±7.6	24.9±3.9	15.8±3.2	9±2	93.3±13.2
	P value	**<0.001**	0.060	0.077	0.488	**0.001**	**<0.001**

Data are shown as mean±standard deviation. MHL, mental health literacy.

Reliability

The Cronbach's alpha value for the final 30-item version of the scale was found to be 0.861. Cronbach's alpha values for the individual factors were 0.930, 0.890, 0.809, 0.792, and 0.656, respectively. Each item was most strongly correlated with its own factor score, with the lowest item-factor correlation being 0.555. For item-total correlations, no item had a correlation below 0.2, with the lowest being 0.232.

The Guttman Split-Half coefficient for the model was calculated as 0.875. The average T-MHLS total score was 95±13.5, with a minimum score of 55 and a maximum score of 132 out of a possible 139.

DISCUSSION

This study assesses the validity and reliability of the MHLS by applying it to a sample that is more representative of the general population. Furthermore, it compares the final version of the scale with other adaptations conducted in various countries.

The original MHLS was applied to a group of psychology students with an average age of 21.1±6.3 years [11]. In the Turkish adaptation by Akdoğan, the scale was administered to a sample in which 98% were single and 38.8% had taken a psychology course, with a mean age of 22±2.2 years [13]. Akdoğan's study, conducted among university students, suggested reducing the T-MHLS to a 22-item version by excluding 13 questions. However, this shortened version covers only three of the MHLS's six main aspects, omitting important dimensions such as risk factors, information about causes, self-treatment knowledge, and professional help information [13].In comparison, the study by Kesgin *et al*. included a smaller sample (282 vs. 401 in our study) with a demographic distribution less representative of the general population. Additionally, Kesgin *et al*. did not apply EFA, whereas our study employed both EFA and CFA to establish a more robust factor structure. In the final version of our T-MHLS, no items had factor loadings below 0.5 in EFA or below 0.4 in CFA, indicating that each item strongly aligns with the scale's purpose. Moreover, our scale does not contain factors with only two items, unlike Kesgin *et al*.'s version, which included two such factors and several items with factor loadings below 0.4. These aspects underscore the enhanced structural integrity and reliability of our version of the scale [14].

Although the original 35-item scale comprises six main aspects of MHLS, the T-MHLS is a 30-item, five-factor scale that explains 58.7% of the variance and demonstrates acceptable to good fit indices. It covers five main aspects of MHLS, excluding risk factors and information about causes. Table 6 shows the distribution of T-MHLS questions and factors across the MHL aspects.

Questions 9, 10, 12, 15, and 20 were excluded from the Turkish version of the scale due to insufficient factor loadings. Nonetheless, the factor

TABLE 6. T-MHLS Factors and MHL Characteristics

Question numbers	T-MHLS factors	Characteristics comprising MHL scope
29-30-31-32-33-34-35	Attitudes toward individuals with mental disorders	Attitudes that support recognizing mental disorders and seeking appropriate help
21-22-23-24-25-26-27-28	Attitudes toward mental disorders	
1-2-3-4-5-6-7-8	Recognition of mental disorders	Ability to recognize specific disorders
16-17-18-19	Accessing information on mental disorders	Knowledge on how to access mental health information
11-13-14	Knowledge of mental disorder treatments	Self-treatment knowledge
		Knowledge of professional help and how to access help
		Knowledge of risk factors and causes

T-MHLS, Turkish version of the mental health literacy Scale; MHL, mental health literacy.

structure of the T-MHLS showed a distribution similar to the original MHLS, suggesting that differences between versions may stem from cultural variations inherent to the distinct countries and populations in which they were applied.

The results of the known-group validity test revealed differences in MHL levels according to gender, marital status, education, income perception, having a diagnosed mental disorder, undergoing mental disorder treatment, and having a relative with a mental disorder. These findings are consistent with previous studies on MHL levels conducted in Australia, Japan, and England [11, 16-18]. Other adaptations of the MHLS show some structural variations as well. For example, the Vietnamese version consists of 31 questions across 4 factors [19] while the Persian version has 29 questions and 5 factors [20]. Another Persian adaptation includes 30 questions with a 5-factor structure [21], and the Pakistani version has 34 questions and 6 factors [22]. When considering the number of items and factor distribution, the T-MHLS aligns with these international adaptations. This suggests that, despite minor cultural differences in each adaptation, the MHLS retains a consistent and broadly applicable structure across diverse countries and cultures.

The Cronbach's alpha value of the T-MHLS was found to be 0.861. The Cronbach's alpha values for the five factors were 0.930, 0.890, 0.809, 0.792, and 0.656, respectively. The T-MHLS and four of its factors demonstrated high internal consistency. The relatively lower Cronbach's alpha value of 0.656 for one factor may be attributed to the fact that this factor comprises only three items.

Strengths and Limitations

The strengths of our study include the use of the MHLS, a new, widely adopted, and high-quality scale, to measure MHL; a study sample with a strong representation of the general population; and the face-to-face data collection method, which resulted in no missing data. However, due to the inability to access the original sample group, test-retest reliability could not be assessed. Additionally, it was not possible to compare the T-MHLS with another scale, as no similar scale exists in Turkish.

CONCLUSION

The T-MHLS is a valid and reliable tool for assessing mental health literacy in Turkish-speaking populations. Five items were removed, resulting in a 30-item scale with five subscales. The T-MHLS can be effectively used to measure mental health literacy levels in Turkey. We recommend testing and applying it in studies involving various demographic groups

Ethics Approval and Consent to Participate

This study was approved by the Istanbul University Istanbul Faculty of Medicine Clinical Research Ethics Committee (Decision No.: 2019-13/1007; date: 09.08.2019). All procedures were conducted in accordance with the ethical standards of the institutional and national research committee and with the 1964 Helsinki Declaration and its later amendments. Permission to employ the MHLS was obtained from Matt O'Connor, the scale's original developer, and Emine Akdoğan, the creator of the Turkish version. Written informed consent was obtained from all individual participants included in the study.

Authors' Contribution

Study Conception: BTG, SK; Study Design: BTG; Supervision: SK; Funding: BTG, SK; Materials: BTG; Data Collection and/or Processing: BTG; Statistical Analysis and/or Data Interpretation: BTG; Literature Review: BTG; Manuscript Preparation: BTG; and Critical Review: SK.

Conflict of Interest

The author(s) disclosed no conflict of interest during the preparation or publication of this manuscript.

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Generative Artificial Intelligence Statement

The author(s) declare that no artificial intelligence-based tools or applications were used during the preparation process of this manuscript. The all content of the study was produced by the author(s) in accordance with scientific research methods and academic ethical principles.

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