

Psychometric testing of the Turkish version of the Health Literacy for School-Aged Children Scale

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Abstract

This study aimed to assess the validity and reliability of the Turkish version of the Health Literacy for School-Aged Children (HLSAC-T) scale. This study was a cross-sectional and methodological design. The sample consisted of 563 sixth and ninth grade students in Izmir, Turkey. Data were collected with the socio-demographic characteristics questionnaire, HLSAC-T, and Turkish version of the Adolescent Lifestyle Profile. Cronbach's α for the scale was .77 and item-total correlations were between .49 and .61 ($p < .001$). The model fit indices were determined to be the root mean square error of approximation at .035, the goodness of fit index at .99, and the comparative fit index at .99. The concordance validity and convergent validity were supported and the discriminant validity suggested that the scale successfully discriminated students who cared about healthy lifestyle from the students who did not. The HLSAC-T showed an adequate reliability and validity for determining the subjective health literacy of Turkish school-aged children. The results showed promise that the scale could be translated into other languages.

Keywords

Adolescent, health literacy, reliability, school-aged children, Turkey

Introduction

Health literacy has become an important public health issue in recent years and is considered as an effective health policy and health promotion method (United Nations Economic and Social Council, 2010). Health literacy is defined as cognitive and social skills that determine the motivation and

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ability of an individual to access, understand, and use health-related information in ways which promote and maintain good health (Dodson et al., 2015). According to the European Health Literacy Survey conducted in eight European countries, approximately half of adults were found to have inadequate or problematic health literacy (Sorensen et al., 2015). Studies have revealed a relationship between low health literacy and adverse health outcomes (more hospitalization, more admissions to emergency services, less use of preventive health and early diagnosis services, unnecessary medical investigations, increased health expenses, etc.) (Baker et al., 1998; Berkman et al., 2011; DeWalt and Hink, 2009; Kobayashi et al., 2014).

Promotion of health literacy in adults has provided clues that initiatives aiming to improve health literacy for children will have more positive outcomes (Marx et al., 2007). Meeting the specific health literacy needs of children plays a role in shaping their attitudes and behaviors which will remain up to adulthood (Velardo and Drummond, 2017). Hanson and Gluckman (2011) stated that gaining children health literacy at an early age reduced noncommunicable diseases among them. Other previous studies indicated a relationship between low health literacy and childhood obesity (Sharif and Blank, 2010), and between low health literacy and more risk-taking or violent behaviors in adolescents (DeWalt and Hink, 2009). Children are the target group for health education initiatives since they are able to use the mass media and other technologies to access health information and convey their learning skills into adulthood (Manganello, 2008).

The majority of studies addressing health literacy in children have assessed the relationship between parents' health literacy levels and the health outcomes of children (DeWalt et al., 2004; Heerman et al., 2014; Yin et al., 2007).

Measurement tools used in studies measuring health literacy in children are usually the adapted forms of the adult version. In their systematic review study, Sanders et al. (2009) stated that there was not a valid measurement tool developed to assess health literacy in children. In addition, the majority of studies focusing on health literacy in children are related to medical conditions. Very few studies have been conducted outside the clinical setting, for example, schools (Schmidt et al., 2010; Wu et al., 2010). However, a reliable, and valid instrument has been developed to measure the school-aged children's subjective health literacy (Paakkari et al., 2016). The Health Literacy for School-Aged Children (HLSAC) is a self-reported scale which measures child health literacy that comprises a broad range of knowledge and competencies that people seek to encompass, evaluate, construct, and use the theoretical knowledge, practical knowledge, critical thinking, self-awareness and citizenship (Paakkari et al., 2016). A positive HLSAC total score has been shown to be a good predictor for participation in sports club activities, especially beneficial for those having low or moderate school achievement level (Paakkari et al. 2017). From a public health perspective, health literacy is considered to be a direct consequence of health promoting activities or the purpose of health education in the school community (Ormshaw et al., 2013). Therefore, using measurement tools developed to assess school children's health literacy is of priority in the assessment of the effectiveness of health promotion programs.

In the Turkish literature, there is only one tool to assess e-health literacy of school-aged children: the Adolescent e-Health Literacy Scale (Coşkun and Bebiş, 2015). This scale was developed by adapting the Adult e-Health Literacy Scale to Turkish society. Apart from the aforementioned scale, there is no measurement tool whose validity and reliability have been established to test health literacy in children. Therefore, there is a requirement for a brief instrument based on a broader notion of health literacy that can be applied easily to school children. In addition, to our knowledge, no study to date has explored a brief and valid instrument for the measurement of children's health literacy. The main aim of this study was to assess the validity and reliability of the

Turkish version of the HLSAC (HLSAC-T) scale which is an instrument that measures subjective health literacy of school children.

Methods

Design

This cross-sectional, methodological study was carried out between April 2017 and May 2017 in two junior high schools and two senior high schools located in an urban area and affiliated to the Directorate of National Education in Izmir, Turkey.

Setting and sample

In scale analysis studies, experts recommend that the size of the sampling should be 5- or 10-fold the number of the items in the scale (Akgül, 1997). Thus, the sample was estimated to include at least 100 children to test the validity and reliability of the 10-item HLSAC. However, in order to better demonstrate the relationship between the variables, all the students in the selected schools were included in the study. The inclusion criteria were that the participants should be either the sixth- or ninth-graders, volunteer to participate in the study, and be able to read and understand the instruments. The number of the sixth- or ninth-graders was 610. Of them, 563 (325 ninth graders, 238 sixth graders) volunteered to participate in the study. The response rate was 92.29%.

Instruments

The study data were collected with the socio-demographic characteristics questionnaire, HLSAC-T, and Turkish version of the Adolescent Lifestyle Profile (ALP-T).

The HLSAC scale developed by Paakkari et al. (2016) is a 10-item tool designed to assess the subjective health literacy of school-aged children. The items are rated on a four-point Likert-type scale. The minimum and maximum possible scores to be obtained from the scale were 10 and 40, respectively. The high HLSAC score indicates that the participant's health literacy level is high. In the original study, the Cronbach's α was .93. The exploratory factor analysis ($\chi^2(25) = 681.41, p < .001$, root mean square error of approximation (RMSEA) = .08, comparative fit index (CFI) = .96, Tucker-Lewis index (TLI) = .92, standardized root mean square residual (SRMR) = .03) confirmed that the scale consisted of five core components.

Translation and content validity of the HLSAC

The HLSAC was translated into Turkish using the back-translation technique. The back-translated and original HLSAC were compared with each other and found to be highly similar. The content validity index (CVI) was ascertained by an expert panel. In this study, eight experts (specializing in public health, pediatrics, or school nursing) were given the original HLSAC and HLSAC-T together. They were asked to assess the relevance of each item on a scale of 1 to 4 (1 = *not relevant*, 4 = *very relevant*). The CVI was computed by summing the percentage agreement scores of all the items that were given by the experts a rating of '3' or '4'. Based on the experts' scores, the scale-level CVI (S-CVI) and item-level CVI (I-CVI) of the HLSAC-T were calculated. The criterion for high content validity, .80, was accepted (Pierce, 1995). The final version of the HLSAC-T was pretested on 20 school children and regarded to be efficient.

The ALP is a version of the Healthy Lifestyle Scale II developed for adolescents. The scale which includes 40 items and seven subscales is a four-point Likert-type scale. The scale has no cutoff point, as the score increases, so does the level of positive health behavior. The ALP-T was developed by Ardic and Esin (2015), and its validity ($\chi^2 = 176.05$, $df = 91$, $p < .001$, $\chi^2/df = 1.93$, goodness of fit index (GFI) = .93, CFI = .94, adjusted GFI (AGFI) = .90, RMSEA = .060, SRMR = .060) and reliability (Cronbach's $\alpha = .87$) were established. In this present study, *health responsibility, physical activity, and nutrition* subscales of the ALP-T were used to ensure the validity of the HLSAC-T.

The socio-demographic characteristics questionnaire was developed by the researcher and included items questioning the participants' age, grade, gender, parents' education status, parents' employment status, the child's perception of health, the child's perception of school achievement, source of the child's health knowledge, the importance of a healthy lifestyle for the child, and the average time the child spends daily reading/studying at home.

Data collection/procedure

Instruments were administered to volunteer students at school hours in the classrooms. The students were asked to fill out the socio-demographic characteristics questionnaire and the ALP-T first, then the HLSAC-T, so that responses were not affected. While the data were collected, the researcher and a teacher were present in the classrooms and the students were assured that their responses would be kept confidential. The researcher encouraged the students to fill in the self-report surveys on their own.

Data analysis

The study data were analyzed using the SPSS 15.0 version and Lisrel 8.0, and the statistical significance was accepted as $p < .05$. The children's characteristics were summarized using descriptive statistics. The validity was measured through the concordance validity, construct validity, convergent validity, and discriminant validity. The concordance validity was examined by I-CVI and S-CVI. The construct validity was examined by the confirmatory factor analysis (CFA). The convergent validity was examined through by correlations between HLSAC-T and ALP-T subscales (health responsibility, physical activity, and nutrition) with Pearson's correlation analysis. The discriminant validity was examined with the *t*-test by differentiating between the HLSAC-T scores of the students who did not care about healthy lifestyle and those of the students who cared about healthy lifestyle. The reliability of the scale was assessed by Cronbach's α reliability coefficient and item-total correlation with Spearman's correlation analysis. To test the reliability, Cronbach's α of at least .70 and item-total correlations within .30-.70 range were taken as the criteria values (Burns and Grove 2009; Devellis 2003). To determine the factors affecting health literacy, the multiple regression analysis was conducted.

Ethical considerations

Approvals to conduct the study were obtained from the Dokuz Eylul University Ethical Committee (approval no: 3144-GOA-2017/ 03-16) and İzmir Provincial Directorate of National Education. Written consent from the parents and verbal consent from the children were obtained.

Results

The mean age of the participants in this present study was 13.67 ± 1.54 , and 51.5% of them were female. Of the students who participated in the study, 42.3% were in the sixth grade and 57.7% were in the ninth grade. Of the students' mothers and fathers, 22.4% and 30.2% had university education, respectively. Thirty-three percentage of the mothers and 79.9% of the fathers were full-time employees. Of the students, 13.3% considered their health status as fair, 41.9% considered their school achievement as fair, 37.7% stated that they obtained health-related information from their parents, and 74.2% stated that leading a healthy lifestyle was very important and that they spent 2.16 ± 1.42 hours a day reading/studying at home (Table 1).

Validity of the HLSAC

Concordance validity of the HLSAC. The eight experts' opinions were evaluated with S-CVI and I-CVI. S-CVI was 96.25% and I-CVI was 87.5–100.0%. The scores given by the experts were consistent with each other.

Construct validity of the HLSAC. We conducted CFA to test the five-factor structure of the scale. Confirmatory factor loads were also .30–.60 in CFA. The model fit indices were determined as RMSEA = .035, GFI = .99, CFI = .99, normal fit index (NFI) = .98, non-normal fit index (NNFI) = .98, AGFI = .97, $\chi^2 = 38.86$, $df = 23$, $\chi^2/df = 1.68$, p value = .02055 (Figure 1). The five-factor model indicated an acceptable model fit for the several criteria.

Convergent validity of the HLSAC. The convergent validity focused on the relationship between HLSAC-T and ALP-T physical activity, nutrition, and health responsibility scores, using Pearson's correlation coefficient. A significant positive correlation was determined between the participating students' HLSAC-T scores and their scores for the physical activity, nutrition, and health responsibility subscales of the ALP-T ($r = .32, .31, \text{ and } .47$, respectively; $p < .001$), indicating acceptable convergent validity.

Discriminant validity. The discriminant validity of the HLSAC-T was investigated by examining whether the HLSAC-T could discriminate the students who cared about healthy lifestyle from the students who did not. The mean scores obtained from the HLSAC-T scale by the students who cared and did not care about healthy lifestyle were 28.40 ± 5.75 and 33.71 ± 3.87 , respectively, and the difference between them was significant ($t = -4.088, p < .05$).

Reliability of HLSAC.

The Cronbach's α for the scale was .77. Item-total correlations were between .49 and .61 and were statistically significant ($p < .001$). Removal of any item from the scale did not increase the Cronbach's α .

Factors related to health literacy

The multiple regression analysis was conducted to determine the independent variables (age, gender, grade, mother/father education, mother/father employment, perception of health, perception of school achievement, source of health knowledge, importance of a healthy lifestyle, time

Table 1. Participant characteristics.

Characteristics	<i>n</i>	%
Age	13.67 (SD 1.54)	
Gender		
Female	290	51.5
Male	273	48.5
Grade		
Sixth	238	42.3
Ninth	325	57.7
Mother's education		
Primary school	91	16.2
Junior high school	119	21.1
Senior high school	227	40.3
University	126	22.4
Father's education		
Primary school	58	10.3
Junior high school	125	22.2
Senior high school	210	37.3
University	170	30.2
Mother's employment status		
Full-time employed	186	33.0
Part-time employed	58	10.3
Not working	319	56.7
Father's employment status		
Full-time employed	450	79.9
Part-time employed	18	3.2
Not working	95	16.9
Perception of health		
Bad	7	1.2
Moderate	68	12.1
Good	231	41.0
Very good	257	45.7
Perception of school achievement		
Bad	37	6.6
Moderate	199	35.3
Good	236	41.9
Very good	91	16.2
Source of health knowledge		
Teachers	22	3.9
Parents	212	37.7
Health personnel	141	25.0
Magazines/books	15	2.7
Internet	94	16.7
More than one	79	14.0
Importance of a healthy lifestyle		
Not important	20	3.6
Somewhat important	125	22.2
Very important	418	74.2
Time for daily reading/studying at home	2.16 (SD 1.42)	

SD: standard deviation.

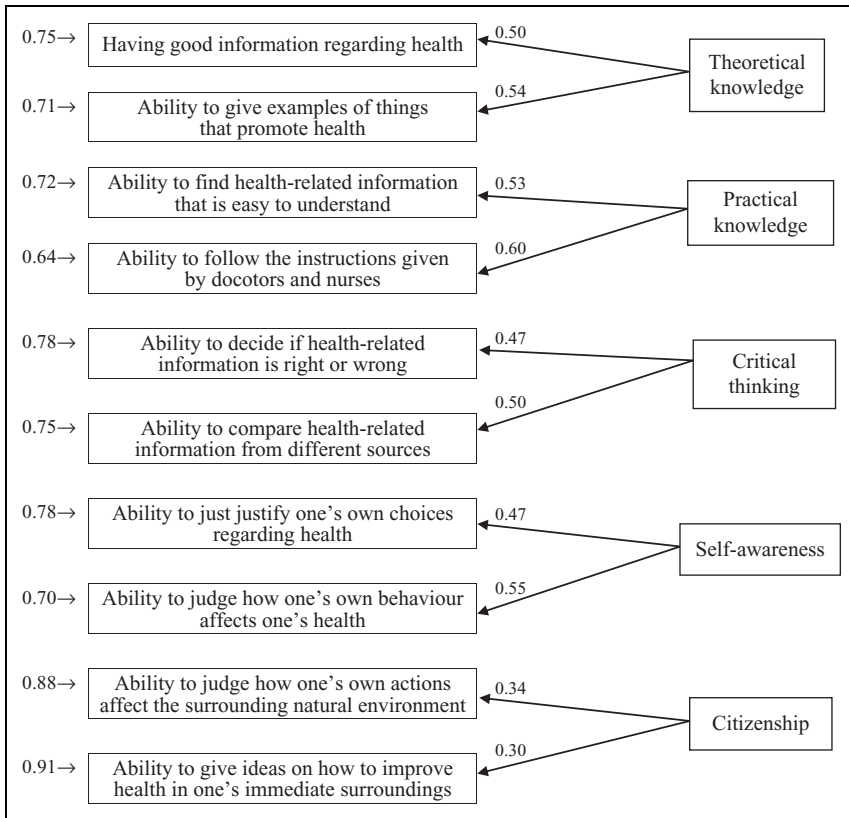


Figure 1. CFA of the HLSAC-T. $\chi^2 = 38.86$, $df = 23$, p value < 0.05 , RMSEA = 0.035, GFI = 0.99, CFI = 0.99, NFI = 0.98, NNFI = 0.98, and AGFI = 0.97. CFI: comparative fit index; GFI: goodness of fit index; NFI: normal fit index; NNFI: non-normal fit index; RMSEA: root mean square error of approximation; AGFI: adjusted GFI; CFA: confirmatory factor analysis; HLSAC-T: Turkish Health Literacy for School-Aged Children scale.

spent daily reading/studying at home) affecting the children’s health literacy scores. The results of the multiple regression analysis demonstrated a significant correlation between the independent variables and the participating students’ HLSAC-T scores ($R = .37$; $F = 7.071$, $p < .001$). These variables accounted for 13% of the participating students’ health literacy. Of the independent variables, perceived health status ($<.001$) and the importance of healthy lifestyle ($<.001$) were significantly associated with health literacy. Other variables were not significant in determining health literacy. The factors that most strongly affected the students’ health literacy were determined as positive health perception ($\beta = .18$) and attaching great importance to a healthy lifestyle ($\beta = .17$; Table 2).

Discussion

The aim of this study was to test the psychometric properties of the Turkish version of the HLSAC (HLSAC-T) scale which is a reliable and valid tool to measure the subjective health literacy of school-aged children. The HLSAC was chosen as a target measurement tool to assess the since it is

Table 2. Multiple regression analysis of factors affecting health literacy.

Variables	B	Standard error	Standardized β	t	p
(Constant)	11.475	6.745		1.701	.089
Grade	2.372	1.164	.27	2.038	.042
Age	.736	.370	.27	1.992	.047
Gender	-.658	.346	-.07	-1.905	.057
Mother education	-.172	.212	-.04	-.812	.417
Father education	.359	.211	.08	1.700	.090
Mother employment status	-.288	.194	-.06	-1.482	.139
Father employment status	.469	.224	.08	2.091	.037
Perception of health	1.075	.255	.18	4.212	<.001
Perception of school achievement	.433	.231	.08	1.876	.061
Source of health knowledge	.119	.488	.01	.245	.807
Importance of a healthy lifestyle	1.390	.334	.17	4.158	<.001
Time for daily reading at home	.050	.123	.01	.403	.687

Note: $R = .37$, $R^2 = .13$, $F = 7.071$, $p < .001$, Durbin-Watson = 1.811.

a practical, theoretical, and comprehensive measurement tool. For the development of the HLSAC-T, first, a multistage translation and back-translation process was applied. To ensure the cultural and functional equivalence of the scale and to increase the strength and effectiveness of the translation, the revised approach was applied (Burns and Grove, 2009). Later, the psychometric properties of the scale were evaluated.

To assess the content validity of the scale, the I-CVI and S-CVI values obtained from the analysis of the scores given by an expert panel to the scale items were used. The consistency rate of $\geq .80$ between the experts was accepted as the criterion for the adequacy of the content validity. That both I-CVI and S-CVI values were above .80 in this study showed that there was an agreement between the experts and that the HLSAC-T was suitable for Turkish culture. This finding was similar to those of previous study (S-CVI = .88), in which the e-health literacy scale was adapted to Turkish adolescents (Coşkun and Bebiş, 2015). The results of the CFA used to show the relationship between the scale and its items confirmed the five-subfactor structure of the original scale. Criteria to accept the model as fit in the literature are: CFI, GFI, NFI, AGFI $> .90$, and RMSEA $< .06$ (Hu and Bentler, 1999). The results in this study indicated that CFI, GFI, NFI, and AGFI were higher than .90 and that RMSEA was lower than .06. Fit indices in this study were lower than RMSEA (.08) and higher than CFI (.94) in the study of the original scale (Paakkari et al., 2016). Because in the literature, except for the original study of the scale, there are no other studies in which the psychometric evaluation of the scale was performed, the fit indices of this present study were not compared with those of other studies. These results showed that the data confirmed the five-factor structure of the original scale and that the items correlated with the factors well. The convergent validity is assessed by the relationship between two measurements measuring the same construct. In this study, the convergent validity of the scale was assessed using the relationship between the HLSAC-T and the subscales of the ALP scale (Burns and Grove, 2009). The results showed that there was an acceptable relationship between the HLSAC-T and the subscales of the ALP. The HLSAC-T used to identify the children at risk for health promotion efficaciously distinguished the students who cared about healthy lifestyle from the students who did not.

The Cronbach's α which shows correlations between the items of a scale increases if the correlations are strong. In the literature, if the Cronbach's α is .70, it is considered as an acceptable value. In the present study, although the Cronbach's α (.77) of the scale was lower than the reliability of the HLSAC in the original study (.93) (Paakkari et al., 2016), it was higher than .70. These results were also similar to those of other measurement tools [(e.g. e-heals, Rapid Estimate of Adolescent Literacy in Medicine Short Form (REALM-TeenS), Health Literacy Assessment Scale for Adolescents (HAS-A)] developed to assess health literacy in adolescents ($\alpha = .73-.82$) (Coskun and Bebiş, 2015; Manganello et al., 2015; Manganello et al., 2017). This result indicates that the correlation coefficient was high and positive and that the scale had the internal consistency in measuring the same targets. As expected, item-total score correlations in the present study were within the limits of the recommended values (between .30 and .70) (Devellis, 2003).

The most important determinants of the students' health literacy were their perception of health status and their emphasis on healthy lifestyles. This result shows that the students whose health literacy was high perceived their health more positively and cared more about a healthy lifestyle. Previous studies conducted with children and adolescents indicated that there was an association between low health literacy and risky health behaviors such as fighting and carrying weapons (Davis et al., 1999), and alcohol use and smoking (Hawthorne, 1997). These results supported the conclusion that low health literacy is a risk for children's health. In other words, the relationship between health literacy and the variables observed in this study can be regarded as an indicator for the validity and reliability of the scale. The scale can identify variables associated with health literacy.

Limitations

The strength of this study was that children were in different socioeconomic and age groups. On the other hand, the current study had several limitations. The first one was that the test-retest reliability of the scale was not assessed. Secondly, since there was no other study conducted to assess the psychometric evaluation of the original scale, the results of this study were not compared with the results of studies in other cultures. Thirdly, there are no scales that fully assess all aspects of the complex definition of health literacy, which is a limitation of most health literacy scales. Therefore, it is important for researchers to determine which health literacy-related skills they are to assess and to determine the appropriate measurement instrument to be used for this assessment (Manganello et al., 2015). Although the HLSAC has been developed to assess the children's health literacy comprehensively, it does not cover numeracy, one of the key components of health literacy. Fourthly, the study data are open to mistakes of social desirability, as children may have reported the situation they wished instead of the actual situation.

Conclusions and implications

The results of the present study showed that the HLSAC-T scale was a valid and reliable measurement tool for determining the subjective health literacy of Turkish school-aged children. The availability of a short measurement tool which can assess health literacy in many ways in school children gives clinicians, health professionals, and researchers the opportunity to analyze their research results with surveys conducted with large samples. Using a valid, self-report measurement tool in school children will enable them to improve their own skills in key health literacy issues (Manganello et al. 2015). Identification of factors affecting health literacy in children is important

for the development of this field. Further, there is a need for studies to assess how health literacy affects children. Also, the HLSAC-T can be used by health professionals to determine health literacy and factors influencing health literacy. It is recommended that the psychometric evaluation of the HLSAC in various sociocultural groups should be performed in future studies.

Author's note

MÖH contributed to the study design, data collection, data analysis, and manuscript preparation.

Declaration of Conflicting Interests

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