

## ORIGINAL ARTICLE

# Validity and reliability of the Turkish version of the self-perceived food literacy scale

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**Summary.** *Purpose:* The present study was aimed at adapting the Self-Perceived Food Literacy Scale into Turkish and investigating its psychometric properties. *Methods:* This study was conducted with 391 adults aged  $\geq 18$  years living in a provincial center. This five-point likert scale consists of 29 items and 8 sub-scales. In the analysis of the study data, cronbach's alpha values, intraclass correlation coefficient and item-total and inter-scale correlation coefficients were calculated, and the confirmatory factor analysis and linear regression analysis were performed. *Results:* The cronbach's alpha value was 0.84, 0.70, 0.76, 0.61, 0.89, 0.69, 0.90, 0.92 for the subscales respectively (food preparation skills, resilience and resistance, healthy snack styles, social and conscious eating, examining food labels, daily food planning, healthy budgeting, healthy food stockpiling) and 0.83 for the overall scale. The test-retest intraclass correlation coefficient is between 0.80 and 0.96. The goodness of fit values of the confirmatory factor analysis are between 0.062-0.93. *Conclusion:* The Self-Perceived Food Literacy Scale adapted to Turkish society is a valid and reliable scale.

**Key Words:** literacy, food literacy, validity, reliability

## Introduction

Food literacy defined by Vidgen and Gallegos as “the scaffolding that empowers individuals, households, communities or nations to protect diet quality through change and strengthens dietary resilience over time” (1) is a platform that supports the development and maintenance of healthy eating behaviors (2). In other words, food literacy is expressed as “a set of interrelated skills and abilities that are key to properly planning, managing, selecting, preparing and eating food in order to achieve a balanced diet and to improve psycho-physical well-being” (3). In a limited number of studies conducted on the issue, high food literacy is shown to be related to healthy dietary behaviors such as consuming vegetables and fruits, but avoiding consuming fast food meals, sugar-sweetened drinks and salt (3,4). In addition, it is reported that the limited number of studies aimed at revealing the relationship

between food literacy and dietary quality and health outcomes might stem from the lack of measurement tools used to measure food literacy (5-7).

Although improvement of the nutritional status of the general population is the leading target of the health policy in Turkey, there are a limited number of studies on food literacy (8, 9). There are measurement tools focusing on nutritional knowledge and nutrition literacy level in Turkey (10,11). In addition, in Turkey, there is one study in which the reliability and validity of the short-form of the one-dimensional food literacy questionnaire was tested with university students (12) but there is no comprehensive measurement tool used to assess food literacy adapted to Turkish in the community sample. Self-Perceived Food Literacy (SPFL) Scale was developed by Poelman et al. in 2018 in order to determine individuals' food literacy levels including knowledge, skills and behavior to plan, manage, select, prepare and eat food healthily (13).

Unhealthy diet is the main cause of a significant proportion of deaths related to chronic diseases (14) and interventions aimed at gaining society healthy dietary habits are considered as one of the priority attempts to reduce the burden of chronic diseases (5). In addition, in the literature, it is stated that food literacy is one of the most important dimensions used to assess the effectiveness of public health nutrition policy interventions (3). Adapting the SPFL Scale, which enables the assessment of the food literacy level of the society, to Turkish is important in terms of its use in the planning and assessment of public health nutrition interventions aimed at gaining the society healthy diet habits.

The present study was aimed at adapting the SPFL Scale into Turkish and investigating its psychometric properties.

## Methods

### *Study design and sample*

This methodological study was conducted in Balıkesir, a province in northwestern Turkey. The sample size of the study was planned to be at least ten fold the number of the items in the scale. The population of the study consists of  $\geq 18$  year-old adults living in a neighborhood in the city center of Balıkesir. To determine the research group in the cluster sampling method, the streets in the neighborhood were accepted as clusters, and 391 adults aged 18 and over, who were living in four randomly selected streets, had the cognitive competence to answer the questions and agreed to participate in the study were included in the study. Of the participants of the study, thirty selected randomly were given a retest two weeks after data collection.

### *Data collection tools*

Prior to data collection, ethical approval was received from Balıkesir University Clinical Research Ethics Committee (Decision date and no: 30.01.2019-2019/17). The present study followed the principles outlined in the Declaration of Helsinki for Human Studies. The study data were collected using the Personal Information Form developed by the researchers based on the relevant literature and questioning the sociodemographic and dietary habits of the participant,

SPFL Scale, Barratt Impulsiveness Scale Short Form (BIS-11-SF), and Brief Self-Control Scale (BSCS) through face-to-face interviews.

The SPFL Scale consists of 29 items in the following 8 subscales: food preparation skills, resilience and resistance, healthy snack styles, social and conscious eating, examining food labels, daily food planning, healthy budgeting and healthy food stockpiling. The items are rated on a five-point likert type scale. The sum of the scores obtained from all the items of the scale shows the level of SPFL and the higher the score is the higher level of food literacy is. Cronbach alpha coefficient is reported 0.83 for the overall scale and between 0.58-0.90 for the subscales (13). Adaptation of the SPFL scale into Turkish language was performed by implementing standardized international methods (15).

The BIS-11-SF was developed by Patton et al. in 1995 (16) to assess impulsiveness and it was adapted to Turkish by Tamam et al. in 2013. The scale consists of 15 items in the 3 subscales (non planning, motor impulsivity and attention impulsivity). The items are rated on a four-point likert type scale. The higher the score is the higher level of impulsiveness (Cronbach's  $\alpha=0.83$ ) (17).

The BSCS was developed by Tangney et al. in 2004 (18) and it was adapted to Turkish by Nebioğlu et al. in 2012. This scale is the single-factor self-report scale. The items are rated on a five-point likert type scale. The higher the score is the higher level of self-control is (Cronbach's  $\alpha=0.87$ ). (19).

### *Statistical analysis*

The floor and ceiling effects of the subscale scores were calculated. In the reliability analysis, the Cronbach's alpha values were calculated which is the internal consistency coefficient of the scores for the overall scale and its subscales (20). Intraclass Correlation Coefficients (ICC) obtained from the test-retest analysis performed for each subscale and the overall scale used as an indicator of the stability of the scale over time were also given in results section (20).

In the validity analysis, Confirmatory Factor Analysis (CFA), convergent-divergent validity and discriminant validity were investigated. Because the present study is a scale adaptation study, it was only tested to what extent the existing structure produced was compatible with the conceptual structure. To achieve this,

the CFA was performed. After the analysis, the error variance of each item and the item-subscale coefficient were investigated and of the CFA results, the Root Mean Square Error of Approximation (RMSEA), Comparative Fit Index (CFI), Standardized Root Mean Square Residuals (SRMR) and Chi square/degree of freedom ( $\chi^2/df$ ) were given in results section. The correlation coefficient between the subscales of the SPFL Scale and correlation coefficients for the BSCS and BIS-11-SF were examined for the convergent and divergent validity (20). While correlation coefficients whose magnitude ranged between 0.10 and 0.30 were accepted to have low correlation and those between 0.31 and 0.50 to have moderate correlation, and correlation coefficients whose magnitude was  $\geq 0.51$  were accepted to have high correlation (21). Of the indicators of healthy eating, levels of fruit and vegetable consumption, type of bread consumed, salt use, the number of main meals, adding salt to food without tasting, drinking tea with sugar, smoking and alcohol consumption were compared with the mean score obtained from the SPFL Scale. In this comparison, the univariate analysis and multivariate linear regression analysis adjusted for age, sex, educational status, Body Mass Index (BMI), BIS-11-SF and BSCS were used. The results obtained were given both with Beta coefficients and significance levels, and with effect sizes (21).

Analysis of the descriptive characteristics, reliability and validity analysis were performed in the SPSS 25.0 and Stata 14 statistics programs, the CFA employed to confirm construct validity was performed in the LISREL 9.1 program.

## Results

### *Descriptive characteristics of the participants*

The mean age of the participants was  $36.9 \pm 15.1$ . Of the participants, 7.0% were in the 18-34 age group, 50.6% were women, 47.3% were married, 46.8% were university graduates, 46.3 worked at a paid job, and 59.6% had a moderate income. The average height, body weight and BMI of the participants was  $169.3 \pm 9.4$  cm. (min:150, max:198cm.),  $72.4 \pm 13.9$  kg (min:40, max:120 kg.),  $25.2 \pm 4.3$  kg/m<sup>2</sup> (min:15.0, max:37.2kg/m<sup>2</sup>) respectively. According to their statements, of the participants, 28.6% had a low physical activity, 40.2% were smokers, 19.2% drank alcohol, 65.5% mostly ate white bread, 51.2% mostly consumed olive oil, and 17.1% and 35.3% did not consume fruits or vegetables respectively.

### *Reliability analysis*

The ceiling effects was 17.4%, 24.3% and 27.9% for the social and conscious eating, healthy budgeting and healthy food stockpiling subscales respectively. The floor effects was 27.4% for the examining food labels subscale. Both the floor and ceiling effect was less than 15.0% for the other subscales and the overall scale. The Cronbach's alpha value between were 0.61 to 0.92 in the subscales, and 0.83 for the overall scale. The ICC analysis results for the test-retest consistency of the scale between were 0.80 to 0.96 (Table 1).

### *Validity analysis*

According to the results of the CFA, the scale has an acceptable level of fit ( $\chi^2/df=2.51$ ). In addition, the

**Table 1.** Reliability analysis results of the SPFL Scale

Subscales	Floor %	Ceiling %	Cronbach's Alfa	ICC
1.Food preparation skills	0.8	7.4	0.84	0.95
2.Resilience and resistance	1.5	0.8	0.70	0.96
3.Healthy snack styles	2.3	7.9	0.76	0.94
4.Social and conscious eating	0.8	17.4	0.61	0.85
5.Examining food labels	27.4	9.2	0.89	0.86
6.Daily food planning	10.5	14.1	0.69	0.87
7.Healthy budgeting	9.0	24.3	0.90	0.89
8.Healthy food stockpiling	3.6	27.9	0.92	0.80
Overall scale	0.3	0.0	0.83	0.95

ICC: Intraclass Correlation Coefficients.

RMSEA value (RMSEA=0.062), an indicator of the approximation error levels of a measurement model, was within acceptable limits. The CFI (CFI=0.93) was within acceptable limits. The SRMR value was 0.069. Error variances and factor loads were extreme in some items (Figure 1).

The correlation between the subscales and the overall SPFL Scale ranged from moderate to high. While the food preparation skills subscale had the highest correlation with the overall SPFL Scale (0.717), the social and conscious eating subscale had

the lowest correlation (0.309). While the correlation between the SPFL scale and BIS-11-SF was negative ( $r=-0.437$ ), the correlation between the SPFL scale and BSCS was positive ( $r=0.427$ ) (Table 2).

The analysis of the variables affecting the total SPFL Scale score revealed that there was a significant correlation between the total SPFL Scale score and the BIS-11-SF score, BSCS score, low physical activity, obesity and unhealthy diet habits ( $p<0.05$ ). Even after adjustments for age, sex, educational status, BIS-11-SF score, BSCS score and BMI, there was a significant correlation between the total SPFL Scale score and low physical activity and unhealthy diet habits ( $p<0.05$ ) (Table 3).

### Discussion

In this methodological study, the aim was to adapt the SPFL Scale into Turkish. The percentage distribution of the floor effects of the subscales of the SPFL scale ranged between 0.8 and 27.4%. The subscale with the highest floor effect was the examining of food labels (27.4%), which was above the value of 15%. This may be because the subscale consists of two items. The result also shows that the participants were less sensitive to the examining of food labels. The percentage distribution of the ceiling effect of the subscales of the SPFL Scale ranged between 0.8% and 27.9%. The ceil-

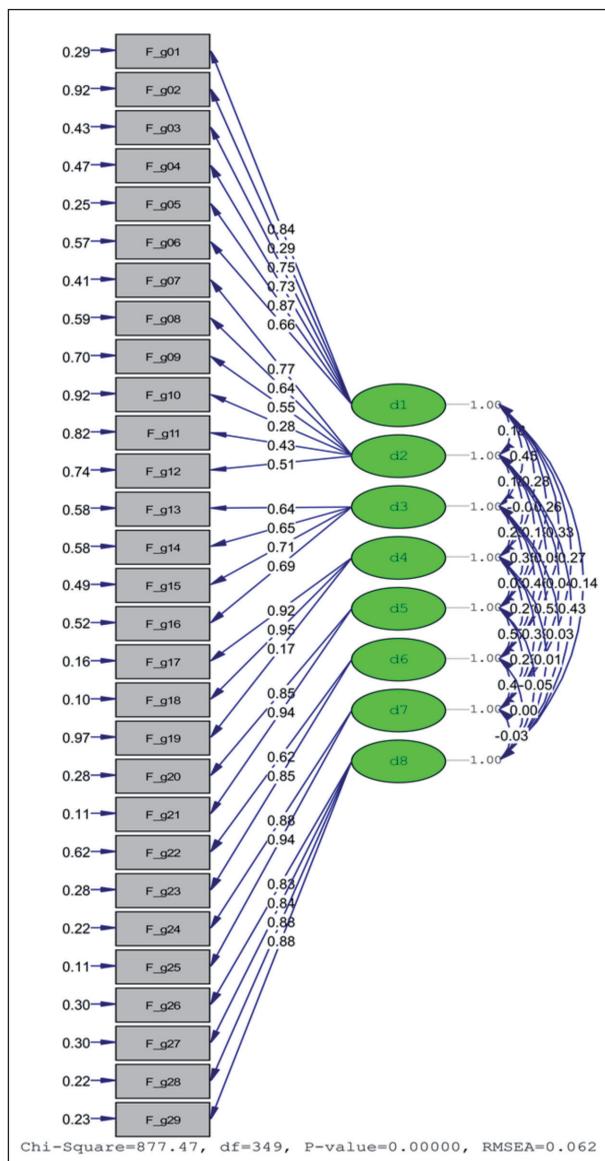


Figure 1. Confirmatory Factor Analysis (CFA)

Table 2. Correlation between the SPFL Scale, BIS-11-SF and BSCS

Subscales and scales	SPFL Scale	BIS-11-SF	BSCS
1.Food preparation skills	0.717**	-0.224**	0.244**
2.Resilience and resistance	0.512**	-0.386**	0.363**
3.Healthy snack styles	0.606**	-0.233**	0.211**
4.Social and conscious eating	0.309**	-0.146**	0.106*
5.Examining food labels	0.473**	-0.103*	0.059
6.Daily food planning	0.444**	-0.119*	0.034
7.Healthy budgeting	0.477**	-0.217**	0.238**
8.Healthy food stockpiling	0.463**	-0.262*	0.323**
SPFL Scale	1		
BIS-11-SF	-0.437**	1	
BSCS	0.427**	-0.650**	1

\*p<0.05, \*\*p<0.01.

**Table 3.** Discriminant validity analysis results of the SPFL Scale

Variables	Crude analyses		Adjusted Model 1		Adjusted Model 2	
	$\beta$	$\eta^2$	$\beta$	$\eta^2$	$\beta$	$\eta^2$
Physical activity (low)	-5.31 <sup>***</sup>	0.03	-6.96 <sup>***</sup>	0.06	-5.76 <sup>***</sup>	0.05
Smoking	-6.02 <sup>***</sup>	0.05	-3.18 <sup>*</sup>	0.01	-0.86	0.001
Alcohol consumption	-4.40 <sup>**</sup>	0.01	-1.97	0.001	0.73	0.001
White bread consumption	-6.83 <sup>***</sup>	0.06	-4.66 <sup>***</sup>	0.03	-3.45 <sup>**</sup>	0.02
Olive oil consumption	Ref	0.04	-	0.02	-	0.01
Sunflower, corn, etc. oil consumption	-3.47	-	-2.26	-	-1.29	-
Butter-margarine consumption	-9.50 <sup>***</sup>	-	-6.31 <sup>*</sup>	-	-2.74	-
Fruit ( $\geq 2$ servings a day)	Ref	0.04	-	0.03	-	0.01
1 day / serving	-0.06	-	0.30	-	0.20	-
Never	-5.47 <sup>**</sup>	-	-4.36 <sup>**</sup>	-	-2.43	-
Vegetables ( $\geq 2$ servings a day)	Ref	0.09	-	0.06	-	0.04
1 day / serving	-2.38	-	-2.18	-	-0.61	-
Never	-11.5 <sup>***</sup>	-	-9.42 <sup>***</sup>	-	-6.76 <sup>***</sup>	-
Adding salt to food without tasting	-5.05 <sup>**</sup>	0.03	-3.67 <sup>*</sup>	0.02	-1.97	0.01
Drinking tea with sugar	-7.26 <sup>***</sup>	0.07	-6.81 <sup>***</sup>	0.07	-5.15 <sup>***</sup>	0.05
The number of main meals (1 or $>3$ )	-10.07 <sup>***</sup>	0.03	-9.56 <sup>***</sup>	0.03	-7.18 <sup>**</sup>	0.02
Body Mass Index ( $<25.00\text{kg/m}^2$ )	Ref	0.02	-	-	-	-
Overweight ( $25.00\text{-}29.99\text{kg/m}^2$ )	-1.94	-	-	-	-	-
Obesity ( $\geq 30.00\text{kg/m}^2$ )	4.64 <sup>*</sup>	-	-	-	-	-
Impulsiveness (continuous)	-0.83 <sup>***</sup>	0.19	-	-	-	-
Self-Control (continuous)	0.73 <sup>***</sup>	0.18	-	-	-	-

<sup>\*</sup> $p < 0.05$ , <sup>\*\*</sup> $p < 0.01$ , <sup>\*\*\*</sup> $p < 0.001$ .  $\beta$ : Regression coefficient,  $\eta^2$ : Effect size (0.01-0.04 low, 0.06-0.11 moderate, 0.14-0.20 large). Model 1: Adjusted for age, sex, educational status and BMI. Model 2: Adjusted for age, sex, educational status, BMI, BIS-11-SF and BSCS score.

ing effects of the social and conscious eating (17.4%), healthy budgeting (24.3%) and healthy food stockpiling (27.9%) subscales were above the limit, which can be explained by the fact that the mean age of the participants was low and that their education level was high. In the present study except for the social and conscious eating subscale, the Cronbach's alpha value was above 0.70, which is the minimum acceptable value (20). In the study conducted by Poelman et al., the Cronbach's alpha value was calculated as 0.83 for the overall scale and thus the internal consistency of the scale was considered as good (13). The Cronbach's alpha value for the healthy snack styles subscale was 0.58 in Poelman et al.'s study (13) and 0.76 in the present study. In the present study, the Cronbach's alpha value for the social and conscious eating subscale was considerably low as 0.61. Reason for this can be item 19

“Are you interested in other activities such as reading, working or watching TV while eating?” which was a neutral item that could not be discriminated as positive nor negative by the participants. This low value was due to the item 19 saying had a neutral meaning for the participants in terms of social and conscious eating. The second item “Are you able to prepare food with more than five fresh ingredients” is the other item which affected the internal consistency coefficient of the food preparation skills subscale. It is known that vegetables, legumes, cereals, meat and dairy products are abundantly used in Turkish society in preparing local dishes. Therefore, the responses given to this question may have adversely affected the internal consistency of the related subscale. As a result, it can be said that the internal consistency coefficient of the scale calculated in the present study is consistent with its

versions developed in the Switzerland and Netherlands (6,13). In this study ICC was within the range of 0.80-0.96. According to these results, respondents' responses given to the scale items at a two-week interval were consistent with each other.

The results of the CFA ( $\chi^2/df=2.51$ ) and the results of the CFI were within the acceptable limits (0.93). It was found that the scale was acceptable in terms of the indicators showing residual error, and that the RMSEA value (0.062) was below the accepted limit value ( $<0.08$ ) (21). The items 2, 10 and 19 had the highest error variance whereas the items 18, 21 and 25 had the lowest error variance. In the original article of the scale, not the CFA but the exploratory factor analysis was performed. Therefore, we could not compare the results of the present study with those of other studies (13). As expected, there was a negative correlation between the SPFL Scale and BIS-11-SF ( $r=-0.437$ ) and a positive correlation between the SPFL scale and BSCS ( $r=0.427$ ). These values can be considered as an adequate and acceptable correlation coefficient for psychometric scales (20,21). In the original study of the SPFL Scale, there was a positive correlation between the SPFL scale and BSCS ( $r=0.51$ ), and a negative correlation between the SPFL scale and BIS-11-SF ( $r=-0.31$ ) (13). After adjusting for age, sex, educational status, BMI, the BIS-11-SF score and BSCS score, a significant relationship was determined between SPFL and variables such as white bread consumption, no consumption of vegetables, drinking tea with sugar and having one main meal or more than three main meals a day. Given their effect size, the most powerful discriminating variables were the number of main meals, and daily vegetable consumption. The Turkish version of the SPFL Scale seems to discriminate the above-mentioned behaviors that can be associated with a healthy lifestyle as predicted, which is consistent with the study in which the original scale was developed. In their study, Poelman et al. reported that SPFL was positively related to healthy food consumption and negatively to unhealthy food consumption (13).

One of the advantages of this study is that the sample size was achieved as proposed for the scale adaptation studies. Another advantage is that it is a community-based study. While standard adaptation

methods were used for the adaptation of the scale, classical psychometric methods were used for the analysis. In addition, the test-retest methodology, an important criterion indicating whether a scale is consistent, was used in this study.

## Conclusion

The SPFL Scale adapted to Turkish society is a valid and reliable scale. The psychometric properties of the scale are consistent and discriminative. The scale can be used to determine the level of food literacy as an indicator of healthy eating habits in the general population. Studies can be conducted to test the validity and reliability of the scale in different groups.

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