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Turkish Adaptation of Sustainable and Healthy Eating Behavior Scale: A Validity and Reliability Study on Young Adults

Sürdürülebilir ve Sağlıklı Beslenme Davranışı Ölçeği'nin Türkçe Uyarlaması: Genç Erişkinlerde Geçerlik ve Güvenirlik Çalışması

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ABSTRACT Objective: Increasing nutrition needs and overconsumption of animal-based products have led to an environmental burden threatening ecological balance, also chronic diseases, and increasing medical expenditures. Eco-friendly and sustainable diets require understanding consumers' attitudes towards health, nutrition, and the environment for their implementation. In this study, the aim is to adapt the Sustainable and Healthy Eating Behavior Scale to Turkish for young adults. **Material and Methods:** A reliability and validity study was conducted on students from three universities. A total of 847 voluntary participants, who met the research criteria and successfully responded to the qualifying question, were randomly selected. The dataset was randomly divided into 2 groups - training (n=347) set for reliability and validity tests, verification (n=500) set for verifying the validity of the model. Exploratory factor analysis and confirmatory factor analysis (CFA) was conducted for validity and Cronbach's alfa value was taken into account for determining the reliability of the scale. Factor loadings of 0.500 or more for items, were accepted as reliable and valid for the adapted scale. The level of significance was taken as $p<0.05$. **Results:** Adapted scale had 7 factors with 22 items. Cronbach alfa value was 0.898 for the total scale score. Standardized estimates obtained by CFA were statistically significant in both training and verification sets, thus verifying the construct validity ($p<0.001$). **Conclusion:** The adapted scale was found to be a valid and reliable tool to measure Sustainable and Healthy Eating Behaviors in Turkish young adults.

Keywords: Sustainable nutrition; Sustainable Healthy Eating Scale; validity; reliability; Turkish scale

ÖZET Amaç: Artan beslenme ihtiyacı ve hayvansal kaynaklı ürünlerin aşırı tüketimi, ekolojik dengeyi tehdit eden çevresel bir yüke, ayrıca kronik hastalıklara ve artan tıbbi harcamalara yol açmaktadır. Çevre dostu ve sürdürülebilir diyetlerin uygulanabilmesi için tüketicilerin sağlık, beslenme ve çevreye yönelik tutumlarını anlamak gereklidir. Bu çalışmada, Sürdürülebilir ve Sağlıklı Beslenme Davranışı Ölçeği'nin genç erişkinler için Türkçeye uyarlanması amaçlanmıştır. **Gereç ve Yöntemler:** Bu çalışma 3 üniversiteden öğrenciler ile yürütülmüştür. Çalışma kriterlerini karşılayan ve eleme sorusuna başarılı bir şekilde cevap veren rastgele seçilmiş toplam 847 öğrenci çalışmaya dâhil edilmiştir. Veri seti geçerlik ve güvenirlik testleri için eğitim seti (n=347) ve modelin geçerliliğini doğrulamak için doğrulama seti (n=500) olarak rastgele ikiye ayrılmıştır. Geçerlik için açımlayıcı faktör analizleri ve doğrulayıcı faktör analizleri (DFA) yapılmış ve ölçeğin güvenirliğinin belirlenmesinde Cronbach alfa değeri dikkate alınmıştır. Maddelerin faktör yüklerinin 0,500 ve üzeri olması uyarlanan ölçek için geçerli ve güvenilir kabul edilmiştir. Anlamlılık düzeyi $p<0,05$ olarak alınmıştır. **Bulgular:** Uyarlanan ölçekte 22 madde ile 7 faktör bulunmaktadır. Ölçek toplam puanı için Cronbach alfa değeri 0,898'dir. DFA tarafından elde edilen standartlaştırılmış tahminler hem eğitim hem de doğrulama setlerinde istatistiksel olarak anlamlı bulunmuş ve yapı geçerliği doğrulanmıştır ($p<0,001$). **Sonuç:** Bu çalışmada, Sürdürülebilir ve Sağlıklı Beslenme Davranışı Ölçeği'nin Türkçe formunun genç erişkinler için geçerli ve güvenilir bir araç olduğu sonucuna varılmıştır.

Anahtar Kelimeler: Sürdürülebilir beslenme; Sürdürülebilir Sağlıklı Beslenme Ölçeği; geçerlik; güvenirlik; Türkçe ölçek

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On a global basis, the highest food consumption ever has been reported in recent times which has oppressed natural food resources, causing loss of biodiversity and environmental degradation.[1] In addition, it has been stated that 30% more food is consumed each year than the planet can replenish, and this rate is increasing progressively.[2-6] The EAT-Lancet Commission, which brought together world-leading researchers in nutrition, health, sustainability and policy from across the globe, published a report on the increasing nutritional need of the world population, leading to deteriorating ecological balance. As per the report, it would be impossible to feed the ever-increasing world population with a healthy and sustainable diet without improving food production systems, changing people's eating habits and reducing food waste.[5] In addition, it has been reported that many health problems caused by excessive food consumption may have an economic and environmental burden, and this situation could only be reversed by adopting sustainable diets.[7] In line with its Sustainable Development Goals commitments, the United Nations has added to its 10-year Nutrition Action Plan (2016-2025), goals promoting sustainably produced healthy diets and transforming food systems to improve nutrition.[8] United Nations System Standing Committee on Nutrition has defined "*sustainable diets as those with low environmental impacts which contribute to food and nutrition security and to healthy life for present and future generations*." These diets are "*protective and respectful of biodiversity and ecosystems, culturally acceptable, accessible, economically fair and affordable, nutritionally adequate, safe and healthy, while optimizing natural and human resources.*[9] Although, the current dietary guidelines in most countries are mainly focused on health, some (Germany, Brazil, Netherlands, Sweden, etc.) have added sustainable nutrition principles to the existing dietary recommendations.[10-12]

Every individual has the right to a healthy, accessible, reliable and culturally acceptable diet with low negative impact on the environment. In order to ensure that healthy nutrition is also sustainable, comprehensive policies at the national level and adequate training and education must be provided to ensure knowledge and awareness about healthy, diverse, balanced nutrition for sustainable development and life. In this respect, consumer attitudes and perceptions towards nutrition should be extensively investigated and understood.[13,14] There are several tools as the "sustainability index of food practices", "sustainable food behavior scale" and the "green eating behavior scale" to evaluate various aspects of behaviors related to sustainable nutrition.[15-17] However, these tools stress on sustainability only without taking "healthy eating" into account. Żakowska-Biemans et al., developed a scale called "Sustainable and Healthy Eating (SHE)" in 2019, measuring sustainable and healthy eating behaviors of young adults using both Food and Agricultural Organization' (FAO) definition of "sustainable nutrition" and the LiveWell approach enabling a holistic assessment of individuals and the environment.[18] This study was aimed to validate the scale in Turkish and evaluate the reliability among young university students.

MATERIAL AND METHODS

This study was conducted on 847 students aged 18-30, enrolled in two private and one state universities in İstanbul, Türkiye during February 2021-July 2021 academic semester. Initially, 1,138 university students participated in the study. However, 116 were disqualified due to age and chronic diseases exclusion criteria. A qualifying question (does packaged foods produced in Türkiye have an "environmentally friendly" "food label") evaluating their general awareness was asked to the participants. The correct response to the question was "No" and only those who provided this response were included in the study. Based on this, another 175 participants were excluded. After exclusion, 847 students were included in the study. This number of students is in accordance with the recommendation for validation studies, which is 5-10 times the number of items in the scale.[19] Data was collected by means of online survey method due to coronavirus disease-2019 lockdown during 2020-2021 academic semester. The flowchart for participant recruitment process has been provided in Figure 1.

In order to ensure the validity and reliability analysis of the scale, permission was obtained from

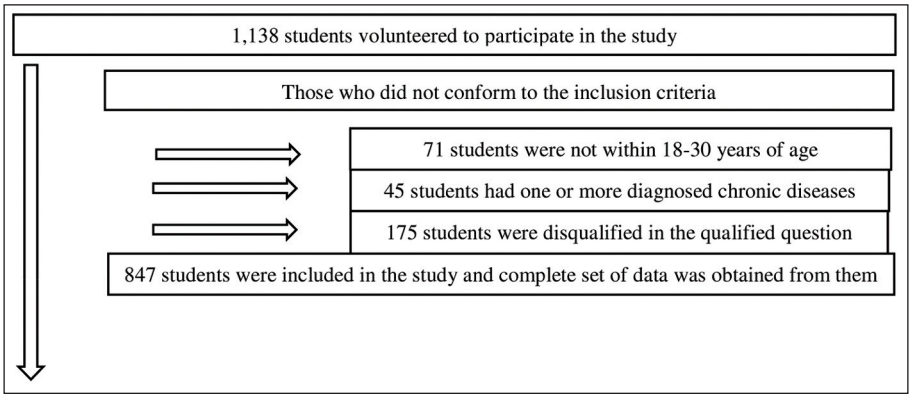

FIGURE 1: Flowchart showing participant recruitment process.

the authors of the original scale through an official email.

For the validation and reliability analysis of the scale, permission was obtained from the Ethics Committee of the University of Health Sciences, İstanbul, Türkiye. The approval, dated November 20, 2020, was granted under reference number 46418926-050.01.04. The study was conducted in accordance with the guidelines outlined in the Declaration of Helsinki, emphasizing the ethical principles for medical research involving human participants. Prior to their participation, informed consent was obtained from all of the participants.

SHE BEHAVIORS SCALE

The scale was first created as 50 statements/items containing questions about dietary recommendations (e.g., 5 servings of fruit and vegetables per day, low salt and sugar consumption, varied and balanced diet, processed food consumption), purchasing of organic, local and seasonal foods, consumption of meat and plant-based foods, and sustainability aspects (e.g., food waste).[18] Later, the scale was reduced to 34 items by removing 16 items after the pre-test and 34 items were grouped under eight factors. The items were scored on a 7-point Likert scale. Participants were asked to rate each item from 1 to 7 as "never", "very rarely", "rarely", "sometimes", "often", "very often" and "always". Factor scores were calculated by taking the average of the scores (between 1 and 7 points) allotted to the items in that factor. While calculating the total scale score, the mean of scores allotted to factors were taken into account.

RELIABILITY AND VALIDITY ASSESSMENT OF SHE SCALE

The scale was translated from English to Turkish independently by three nutrition experts with good English proficiency. These three translated documents were then compared and reviewed by the researchers along with the translators and a common translated Turkish text of the scale was obtained. This was translated back into English by three other nutrition experts with profound knowledge in Turkish and English and unaware of the original scale. Reverse translated English document were compared with the original scale for ambiguity, inappropriateness, and non-synchronicity of terminology.

A pilot study was first conducted with 50 students in order to understand the perceptiveness of items by the participants. Accordingly, the final version of the scale was constituted. Students participating in the pilot study were not included in the actual study.

The data analyses were carried out in three stages. In the first stage, the data set (847 in all) was randomly divided into two groups as training set (n=347) with 40% of the data and validation/verification set (n=500) with 60% of the data set. In the second stage, validation and reliability of the items from the original SHE scale was conducted with the training set data using exploratory factor analysis (EFA), confirmatory factor analysis (CFA), Cronbach's alpha value etc. In the third stage of the analyses study, verification of the model was performed with an independent data set (verification set) using CFA.

Following the adaptation of the scale to Turkish, the assessment of its internal consistency reliability was conducted using Cronbach's α coefficient. It is generally recommended that the α coefficient should be at least 0.70, with values of 0.80 and above considered very good, and values of 0.90 and above considered excellent.[20]

To assess the importance of the items in the scale, we utilized two approaches: EFA and corrected item-total score correlations. EFA allowed us to identify the factor loads, indicating the strength of each item's relationship with the underlying constructs. Additionally, we examined the corrected item-total score correlations, which provided insight into the extent to which each item contributed to the overall scale score. To further evaluate the adapted scale, CFA was conducted. This analysis involved comparing the factor structure of the adapted scale with that of the original scale to identify similarities and differences. It aimed to determine the suitability of the model for the specific population under study.[21,22]

The items identified through EFA were re-evaluated using CFA without any modifications. Various fit indices were reported, including chi-square/degree of freedom (χ^2/df), root mean square approximation error (RMSEA), standardized root mean square error (SRMR), comparative fit index (CFI), normed fit index (NFI), non-normed fit index (NNFI), and goodness of fit index (GFI). These fit indices provide information on how well the model fits the observed data and indicate the overall goodness of fit.

In summary, the essentiality of the items in the scale was evaluated through factor loads obtained via EFA and corrected item-total score correlations. CFA was employed to compare the factor structure of the adapted scale with the original scale, assess similarities and differences, and evaluate the suitability of the model for the relevant population. Fit indices, including χ^2/df, RMSEA, SRMR, CFI, NFI, NNFI, and GFI, were reported to gauge the adequacy of the model fit.[23,24]

STATISTICAL ANALYSES

Frequencies and percentages for categorical variables, as well as mean, standard deviation, median and inter-quartile range for continuous variables were calculated. EFA, CFA of items were conducted for determining validity of the scale, Cronbach's alpha values were calculated to determine the internal consistency coefficient for reliability measurement of the scale. By means of EFA, number of factors, factor loading and percentage of explained variance were obtained. Confirmatory factor analysis provided standardized coefficient estimates, co-variances of modifications and model fit indices. The estimation method was maximum likelihood estimation was used for estimating the parameters of the model. Statistical analyses were performed by using SPSS Version 26.0 (IBM Corporation, New York, USA) and latent variable analyses (Lavaan) package (version 0.6-7) in R software. The significance level was 0.05.

RESULTS

The data from all participants (n=847) was divided into two groups as the training set (40%) and the validation set, (60%) randomly. The general characteristics of the participants have been provided in Table 1.

Item analysis, EFA and CFA was performed with the training set and CFA was performed with verification set. In the training set, (347 in total) 227 (65.4%) were females, the mean age of participants being 21.22±2.68 years (median=20, first quartile=19, third quartile=22 years). In the validation set, (500 in total) 328 (65.6%) were females, the mean age of participants being 21.07±2.64 (median=20, first quartile=19, third quartile=22 years-old).

The adapted version of the SHE scale in Turkish has been provided in Table 2. The scale comprises of 7 factors and 22 items.

In the original scale there were 8 factors (F) comprising of 34 items in all. F1: healthy and balanced diet (10 items), F2: quality labels - regional and organic (5 items), F3: meat reduction (4 items), F4: local food (3 items), F5: low fat (3 items), F6: avoiding food waste (3 items), F7: animal welfare (3 items) and F8: seasonal food (3 items) comprising of 34 items. During the EFA of 34 items, 12 items that did not create a factor load and F8 was discarded from the Turkish version.

While there were 10 items under the F1 in the original scale, 5 items took place in the Turkish ver-

TABLE 1: Characteristics of the participants.

		Training Set		Verification Set	
Age	$\bar{X}$±SD	21.22±2.68		21.07±2.64	
	Median (Q1-Q3)	20 (19-22)		20 (19-22)	
		n	%	n	%
Gender	Female	227	65.4	328	65.6
	Male	120	34.6	172	34.4
BMI (kg/m^2)	Underweight	46	14.2	67	14.0
	Normal	194	59.9	312	65.3
	Overweight	60	18.5	85	17.8
	Obese	24	7.4	14	2.9

SD: Standard deviation; BMI: Body mass index.

TABLE 2: Sustainable and Healthy Eating Behavior Scale (Turkish version).

Factor	Items
F1: Healthy and Balanced Diet	
F1-1	I choose food that keeps me healthy.
F1-2	I choose food that is nutritious.
F1-3	I choose food that contains a lot of vitamins and minerals.
F1-4	I try to have a balanced diet.
F1-5	I choose food that contains no additives.
F2: Quality Labels (Regional and Organic)	
F2-1	I choose products with clear information/indication on country of origin.
F2-2	I choose food products with a regional certificate.
F2-3	When buying food, I check certificates and quality marks on labels.
F3: Meat Reduction	
F3-1	Pulses replace meat in my cooking.
F3-2	I try to eat as much pulses as possible in order to reduce meat consumption.
F3-3	I avoid eating meat.
F4: Local Food	
F4-1	I buy fruits and vegetables directly from the farmer.
F4-2	Whenever possible, I choose fruits and vegetables from my own allotments (plots).
F4-3	In season, I shop at farmer's market.
F5: Low Fat	
F5-1	I choose low fat products.
F5-2	Whenever possible, I choose low fat food products.
F5-3	I avoid food products containing lots of fat.
F6: Avoiding Food Waste	
F6-1	I don't waste food.
F6-2	I use leftovers from food.
F6-3	I try not to throw away food.
F7: Animal Welfare	
F7-1	I choose free range eggs.
F7-2	I avoid buying battery eggs.

sion. The 5 items which were excluded due to insufficient factor load were "I avoid sugary drinks", "I choose food that contains natural ingredients", "I choose food that contains no artificial ingredients", "I choose whole grains products", "I limit my salt usage".

Similarly, there were 5 items in the original scale under F2, however in the Turkish version 3 items namely "I choose food products with the regional certificate", "when buying food, I check certificates and quality marks on labels" and "I choose products with

clear information/indication on the country of origin" were included, of which the third item regarding country of origin was present among the 50 statements used in the original study but did not take place in the scale.[18] The remaining 3 items ("whenever possible, I buy organic food", "I buy regional food" and "I choose food that is produced in an environmental friendly way") had insufficient factor load and therefore were discarded.

There were 4 items in the original scale under F3; however, the Turkish version had 3 items. The item "try to eat as much plant-protein source food products as possible, e.g., pulses" was discarded due to insufficient factor load. All items under F4, F5 and F6 of original scale were included in the Turkish version. However, the item "whenever possible, I buy fish from sustainable fishing" under F7 was excluded. F8 of original scale had 3 items. Two items ("I eat five portions of fruits and vegetables a day" and "I eat seasonal fruits and vegetables" were excluded due to insufficient factor load. F8 was discarded, only the item, "in season, I shop at farmer's market" under F8 was included as the third item in F4 combining with the item related to local food ("I buy locally produced food") present in the original version of the scale.

Twelve items from the original scale were excluded from the scale because they had low factor loads indicating a low correlation with the factor in item-all analyzes. Very low R^2 fit indices for these items indicating goodness of fit of the model was not significant in CFA.

After the items were removed, explained total variance increased from 61.51% to 69.23%, Cronbach's alpha value changed from 0.888 to 0.903 for F1 (healthy and balanced diet), from 0.853 to 0.834 for F2 (quality labels - regional and organic), from 0.838 to 0.851 for F3 (meat reduction), from 0.803 to 0.775 in F4 (local food) and from 0.925 to 0.898 in total scale score. Mean of the total scale score was found to be 89.41 (standard deviation=19.86), the median value was 91, the minimum, maximum first quartile and third quartile statistics were 24, 137, 78 and 103, respectively. Also, standardized estimates obtained by CFA were statistically significant in both training and validation sets, thus verifying the construct validity ($p<0.001$).

The result of CFA was well-fitted as seen in Table 3. Fit indices for training set obtained by measurement model was acceptable (fit-statistics for training set: c^2 (188)=339.49, $p<0.001$; $c^2/df=1.806$; RMSEA=0.048; SRMR=0.054; NFI=0.935; NNFI=0.963; CFI=0.920; GFI=0.929, n=347). Fit indices for validation set obtained by measurement model was acceptable (Fit-statistics for validation Set: c^2 (187)=424.37, $p<0.001$; $c^2/df=2.269$; RMSEA=0.050; SRMR=0.060; NFI=0.943; NNFI=0.959; CFI=0.967; GFI=0.929, n=500). Modification was done between Item F6-2 and F6-3 (Covariance estimation=-0.341; standard error=0.095; $p<0.001$).

DISCUSSION

In this study, adaptability of the scale developed by Żakowska-Biemans et al. to measure the SHE behaviors of young adults (18-30 years), in Turkish, was conducted on university students.[18] Descriptive factor analysis, CFA and Cronbach alpha coefficient were used to perform Turkish validity and reliability analysis of the scale.

As a result of the analyses, the final scale consisting of 22 items and 7 sub-dimensions was found to be valid and reliable to measure SHE behaviors in Turkish young adults in the population.

The Cronbach's α internal reliability coefficients of the study ranged from 0.751 to 0.963 similar to the original scale (0.60-0.92). The total Cronbach's α value was found to be 0.898. In this study, χ^2/df, CFI and RMSEA values were evaluated and $\chi^2/df=2.269$; RMSEA=0.050; CFI=0.967; GFI=0.929 are found as given. In this study, these adaptation indices were found to have suitable values as the original.

While there were 10 items under the F1 factor in the original scale, there were 5 items in this study. The factor load in the items "I choose food that contains no artificial ingredients", "I choose food that contains natural ingredients", "I choose whole grains products", "I avoid sugary drinks" and "I limit my salt usage" was found insufficient and not uploaded to correct sub-dimension. These results show that university students think that whole wheat or whole

TABLE 3: Scale adaptation procedure.

	Training Set (n=347)						Validation Set (n=500)	
	Item Analysis	Corrected Item-Total	Cronbach's Alpha if	EFA[a]	CFA[b]		CFA[c,d]	
Factor	X̄±SD	Correlation	Item Deleted	Factor Loadings	Std. Est.	R^2	Std. Est.	R^2
F1: Healthy and Balanced Diet								
F1-1	4.94±1.48	0.869	0.852	0.986	0.927	0.860	0.945	0.893
F1-2	4.95±1.53	0.826	0.861	0.892	0.897	0.804	0.923	0.852
F1-3	4.91±1.45	0.807	0.866	0.836	0.897	0.805	0.884	0.781
F1-4	4.37±1.52	0.717	0.885	0.613	0.744	0.553	0.710	0.504
F1-5	3.87±1.66	0.567	0.920	0.412	0.583	0.340	0.508	0.258
Sum of Factor 1	23.03±6.47	M=24 Minimum=5 Maximum=35						
		Q1=19 Q3=28 CA: 0.903	EV=32.17%					
F2: Quality Labels (Regional and Organic Food)								
F2-1	3.3±1.64	0.724	0.736	0.886	0.819	0.671	0.857	0.734
F2-2	3.22±1.55	0.755	0.709	0.830	0.904	0.817	0.909	0.826
F2-3	4.03±1.66	0.606	0.854	0.595	0.663	0.439	0.632	0.399
Sum of Factor 2	10.55±4.2	M=10 Minimum=3 Maximum=21	EV=6.32%					
		Q1=7 Q3=13 CA: 0.834						
F3: Meat Reduction								
F3-1	2.93±1.66	0.795	0.720	0.871	0.871	0.758	0.823	0.678
F3-2	2.98±1.68	0.772	0.743	0.921	0.931	0.867	0.873	0.762
F3-3	2.26±1.61	0.607	0.895	0.653	0.638	0.407	0.725	0.526
Sum of Factor 3	8.17±4.35	M=7 Minimum=3 Maximum=21	EV=7.2%					
		Q1=5 Q3=11 CA: 0.851						
F4: Local Food								
F4-1	3.18±1.39	0.686	0.610	0.848	0.882	0.777	0.870	0.757
F4-2	3.29±1.67	0.566	0.719	0.669	0.662	0.438	0.762	0.581
F4-3	3.51±1.76	0.563	0.731	0.631	0.659	0.435	0.722	0.522
Sum of Factor 4	9.99±3.99	M=10 Minimum=3 Maximum=21	EV=4.79%					
		Q1=7 Q3=13 CA: 0.775						
F5: Low Fat								
F5-1	4.56±1.6	0.946	0.925	0.965	0.981	0.963	0.977	0.954
F5-2	4.6±1.64	0.925	0.940	0.919	0.956	0.915	0.970	0.941
F5-3	4.51±1.7	0.888	0.968	0.882	0.904	0.818	0.840	0.706
Sum of Factor 5	13.67±4.76	M=14 Minimum=3 Maximum=21	EV=10.75%					
		Q1=10 Q3=18 CA: 0.963						
F6: Avoiding Food Waste								
F6-1	5.77±1.38	0.691	0.534	0.945	0.891	0.794	0.773	0.598
F6-2	5.08±1.63	0.565	0.674	0.663	0.697	0.485	0.728	0.530
F6-3	5.85±1.51	0.478	0.765	0.500	0.574	0.329	0.772	0.597
Sum of Factor 6	16.71±3.69	M=17 Minimum=3 Maximum=21	EV=4.43%					
		Q1=15 Q3=20 CA:0.751						
F7: Animal Welfare								
F7-1	3.81±1.78	0.763	-	0.746	0.890	0.792	0.947	0.896
F7-2	3.48±1.85	0.763	-	0.929	0.857	0.735	0.760	0.577
Sum of Factor 7	7.29±3.41	M=7 Minimum=2 Maximum=14	EV=3.58%					
		Q1=4 Q3=10 CA: 0.865						
Total of Scale	89.41±19.86	M=91 Minimum=24 Maximum=137	EV=69.23%					
		Q1=78 Q3=103 CA: 0.898						

[a]Principal axis factoring extraction method with promax rotation (3).

[b]Fit-statistics for train set: χ^2 (188)=339.49, p<0.001; χ^2/df=1.806; RMSEA=0.048; SRMR=0.054; NFI=0.935; NNFI=0.963; CFI=0.920; GFI=0.929 (n=347).

[c]Fit-statistics for validation set: χ^2 (187)=424.37, p<0.001; χ^2/df=2.269; RMSEA=0.050; SRMR=0.060; NFI=0.943; NNFI=0.959; CFI=0.967; GFI=0.929 (n=500).

[d]Model modification between F6-2 and F6-3: Covariance estimation=-0.341 (SE=0.095), p<0.001

EFA: Exploratory Factor Analysis; CFA: Confirmatory Factor Analysis; SD: Standard deviation; Std. Est: Standardized Factor Loadings; EV: Percentage of explained variance; CA: Cronbach's alpha; RMSEA: Root mean square approximation error; SRMR: Standardized root mean square error; NFI: Normed fit index; NNFI: Non-normed fit index; CFI: Comparative fit index; GFI: Goodness of fit index.

grain bread consumption was not included in healthy nutrition criteria. In addition, there was low factor load in the questions about reducing sugary drinks and salt consumption under this sub-dimension. This suggests that the young population had insufficient knowledge about the negative effects of excessive salt and sugar consumption on health and did not perceive their reduction in diet as a healthy behavior. It has been determined that university students generally have bad eating habits, do not consume the daily recommended amount of fruits and vegetables, and consume more sugar, processed meats, and high-fat, high-calorie foods.[25] In the transition from adolescence to young adulthood, young adults have difficulty in making healthy food choices due to increased independence and peer influence.[26] The fact that the items regarding choice of foods with natural and artificial ingredients under this factor had insufficient factor load indicates that the students lacked knowledge on these issues.

In the Turkish version of the scale, 3 items under F2 present in the original scale had to be discarded due to low factor load. This could result from the fact that organic, local and traditional food labeling is not very common in Türkiye. The results also show that these labels were not very well known by young adults. In addition, the high sales prices of these products may be the reason why they were not preferred among university students. Studies show that students pay attention to the price and expiration date of the product mostly, while purchasing.[27,28]

In the adapted scale, F3 factor consisted of 3 items similar to the original scale. However, factor load was insufficient for the item "I try to eat as much plant-protein source food products as possible, e.g., pulses" and was discarded. Consumer buying power in Türkiye is lower as compared to developed countries and inequalities are present especially among consumers regarding access to red meat. Individuals must have good economic conditions in order to have meat consumption in their diet every day, which is not very realistic for the general population of Türkiye. Considering that the population of the study was students, with limited pocket money, replacement of meat that is not consumed frequently anyway with pulses was not a common practice. In a study conducted with university students in Türkiye, it was determined that students consume 1.14 kg of red meat and 1.80 kg of chicken per month which was lower than recommended for this group.[29] According to the Turkish dietary guidelines, the nutritional requirement in the meat group is 2.5-3 servings/day for adults and young people. One serving is equivalent to 80 g of cooked meat and chicken, 150 g of cooked fish, 130 g of cooked legumes, 30 g of nuts and walnuts, or 2 eggs.[30] According to the organization for economic cooperation and development data, the total red meat consumption of the general population in Türkiye is 12.5 kg/year. This amount of meat is below both the world average and that of the developed countries.[31] Therefore, looking at the Food Sustainability Index, Türkiye's sustainability score is quite high due to its relatively low meat consumption levels.[32]

There are 3 items in F4, F5 and F6 each similar to the original scale. The total score for factor "avoiding food waste" was 16.71±3.69, the highest score in the scale. This score indicated that students were sensitive about food waste and gave more importance to this issue. In a study examining the sustainable nutrition knowledge and behaviors of university students, it was found that the highest score obtained in the item "I pay attention to take, just as much food as I can consume, on my plate" and that the students generally exhibited positive behaviors towards food waste and evaluating their leftovers.[33] In a study which the Food Sustainability Index scores of 78 countries are included, it was determined that Türkiye ranked 23rd among 78 countries in the food waste and waste category with a score of 69 out of 100.[32] This indicated that general population in Türkiye was sensitive to the issue of food waste. In order to increase the awareness of the society on this issue the "Preserve Food, Protect Your Table" campaign in 2020-2021 was organized in cooperation with the Ministry of Agriculture and Forestry and FAO in Türkiye, and approximately 800,000 people participated in this campaign.[34] This was a major step in creating awareness, reducing food loss through wastage. F7 on "animal welfare" comprised of two items in the Turkish adaption of the scale. The item titled "whenever possible, I buy fish from sustainable fishing" was dis-

carded due to low factor load. This was expected because presently there is inadequate knowledge about sustainable fishing practice in Türkiye. However national policies are being constituted in this area within the scope of "blue economy" project supported by the United Nations environment program.[35]

CONCLUSION

The rapid increase in the world population and the lack of resources increase the importance of the concept of sustainable nutrition. Sustainable nutrition includes many concepts such as changes in nutritional preferences to reduce excessive consumption and transition to nutritious diets with lower environmental impacts, and reduction of losses in food systems and waste. Providing adequate nutrition within sustainable food systems is very important on a global scale. For this reason, it is necessary to acquire nutritional habits sensitive to sustainable nutrition in society. In particular, shaping the eating habits of young adults, who are the consumers and decision-makers of the future, within the principles of sustainability, will create a positive impact on both the population and the environment, and will ensure the sustainable development of the nutrition systems. Turkish version of the SHE scale is a valid and reliable tool that can be used to determine healthy and sustainable eating behaviors for university students between the ages of 18-30.

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Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

Idea/Concept: *Aysun Yüksel;* ***Design:*** *Aysun Yüksel, Ayhan Parmaksız;* ***Data Collection and/or Processing:*** *Aysun Yüksel, Hülya Yılmaz Önal, Aydan Ercan, Indrani Kalkan;* ***Analysis and/or Interpretation:*** *Ayhan Pamaksız, Aysun Yüksel;* ***Literature Review:*** *Aysun Yüksel, Hülya Yılmaz Önal;* ***Writing the Article:*** *Hülya Yılmaz Önal;* ***Critical Review:*** *Aydan Ercan, Indrani Kalkan.*

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