

## Article

# Determining Sustainable Food Choice Motives: Validity and Reliability of the Sustainable Food Choice Questionnaire (SUS-FCQ) in Turkish Adults

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**Abstract:** Understanding sustainable food choices is key to shifting consumer behavior toward sustainable food consumption. This study aimed to determine the validity and reliability of the Sustainable Food Choice Questionnaire (SUS-FCQ) in 602 Turkish adults. The linguistic equivalence of the SUS-FCQ was provided using the standard translation–back translation method, content validity, and pilot testing. Then, the convergent, discriminant, and construct (exploratory factor analysis (EFA) and confirmatory factor analysis (CFA)) validity and reliability (test–retest and internal consistency) were evaluated. Cronbach’s alpha coefficient was found to be excellent (0.961) and the intraclass correlation coefficient was found to be moderate (0.689) using the test–retest method. As a result of the EFA, two-factor structures were found, and the factor loadings of the items were 0.651 and 0.878. These factors explained 79.17% of the total variance, and discriminant and convergent validity was provided for both factors. The results of this study suggest that the adapted SUS-FCQ is valid and reliable for determining sustainable food choice motives in the Turkish population. Therefore, the SUS-FCQ can be a useful instrument to encourage people to shift toward and adhere to sustainable food consumption.

**Keywords:** sustainable consumer behavior; food choice; food choice motives; consumer preference



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## 1. Introduction

Sustainable diets are defined as “diets 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” by the FAO [1]. However, existing dietary patterns are related to various sustainability concerns, including their significant impact on the environment, animal welfare, and ethical considerations [2]. Food choices play a crucial role in the sustainability of the diet; therefore, gaining an understanding of consumer food choices is crucial for achieving sustainability goals [2].

The State of Food Security and Nutrition in the World 2022 (SOFI) report remarked that approximately 29.3% of the world’s population is reasonably or severely food insecure and almost 828 million individuals are affected by starvation globally [3]. Within the scope of the United Nations Environment Program (UNEP), in 2015, the Sustainable Development Goals (SDGs) were launched to reduce food waste and reach the aim of ensuring safe food for all by 2030 [4]. However, according to a global assessment of countries’ progress toward attaining the SDGs in The Sustainable Development Report 2023, progress toward the SDGs across the world, including in Turkey (Turkey ranks 72nd among 193 countries), is not adequate [5]. In other words, although there are only six years left until 2030, the

achievement of the SDGs is becoming increasingly difficult, especially with setbacks due to COVID-19, which has pushed the rates of food insecurity even higher [3]. On the other hand, the EAT-Lancet Commission has established objectives for promoting healthier and more sustainable diets, offering recommendations on the types and quantities of food to consume on an individual basis [3]. Sustainable diets can be achieved through nutritional modifications, including reducing the consumption of animal-based foods by replacing them with plant-based alternatives and avoiding ultra-processed foods that are high in saturated fat and added sugars [6]. Nonetheless, motivational strategies that stimulate individuals to shift their current diet to a sustainable alternative still need to be investigated [6]. The key to understanding the sustainability of a diet may lie in examining the motives that influence food choices [6].

Both food choices and sustainable diet concepts are complex because they depend on various factors (socio-demographic, economic, attitude, norms, culture, religion, consumption context, etc.) [7]. In addition, due to the nature of the sustainability concept, including water utilization, animal welfare, food safety, food security, local production, seasonal production, and ethical working conditions, and a possible trade-off between these dimensions, understanding the sustainability motivations underlying food choices is difficult [8,9]. Moreover, adaptation to a sustainable diet is directly linked to individuals' sustainable food choice motivations because food choice motives are at the root of dietary behavior [4,5].

Therefore, determining sustainable food choice motivation for all individuals is a key factor in order to directly promote sustainable diets and indirectly attain the Sustainable Development Goals (SDGs) nationally and globally [3,4]. Although various tools have been developed for this purpose in the literature, no scale has fully captured all the dimensions of sustainable food choice motivations due to the complex nature of food choices and the multidimensionality of sustainability [2]. For example, the scale that was developed by Lindeman et al. (2000) includes some subscales for animal welfare and environmental protection, political value, and religion [10]. The scales developed in the following years by Ozcaglar-Toulouse et al. (2006) and Siriex et al. (2008) focus on only fair-trade products [11,12]. More recently, two scales have been developed by Renner et al. (2012) and Onwezen et al. (2019), respectively; in these scales, environmental concerns and local and seasonal consumption, respectively, are not included [13,14]. Furthermore, although some scales include numerous components of sustainability, they do not integrate sustainability motives with food choice motives [15]. For instance, although a scale developed by Sautron et al. (2015) has broad coverage of the concept of sustainability, it contains limited content on food choice motives [15]. Considering these significant drawbacks, for the first time, a comprehensive tool called the Sustainable Food Choice Questionnaire (SUS-FCQ) was developed. This tool is suitable for measuring the full concept of sustainability (including environmental welfare, ethical concern, animal welfare, local, and seasonal factors) and for evaluating sustainability motivations together with other food choice motivations [2].

Although sustainable eating behaviors have been studied in Turkey, sustainable food choices have not been studied before [16]. Moreover, no sustainable food choice questionnaire has yet been adapted for the Turkish population. Nonetheless, a deeper understanding of the reasons behind consumers' food choices is crucial to encourage behaviors to shift toward sustainable choices [2]. Considering this gap, the current study adds to the existing literature by translating the SUS-FCQ into the Turkish language. The adapted questionnaire reveals the importance of sustainability motives in food choices by distinguishing general sustainability and local and seasonal motives and can also be used together with food choice questionnaires. The SUS-FCQ was chosen for adaptation in Turkish since it is a reliable and valid instrument that has been used in five other countries (the Netherlands, Denmark, Czech Republic, France, and Italy), making it a suitable choice for country comparisons.

Based on the above background, the aim of this study was to empirically determine the validity and reliability of the SUS-FCQ in the Turkish population. Within the scope of the validity and reliability of the SUS-FCQ, the standard translation-back translation method

ensured linguistic equivalence. Then, content, convergent, discriminant, and construct (exploratory factor analysis (EFA) and confirmatory factor analysis (CFA)) validity and reliability (test–retest and internal consistency) were evaluated.

## 2. Materials and Methods

### 2.1. Study Design

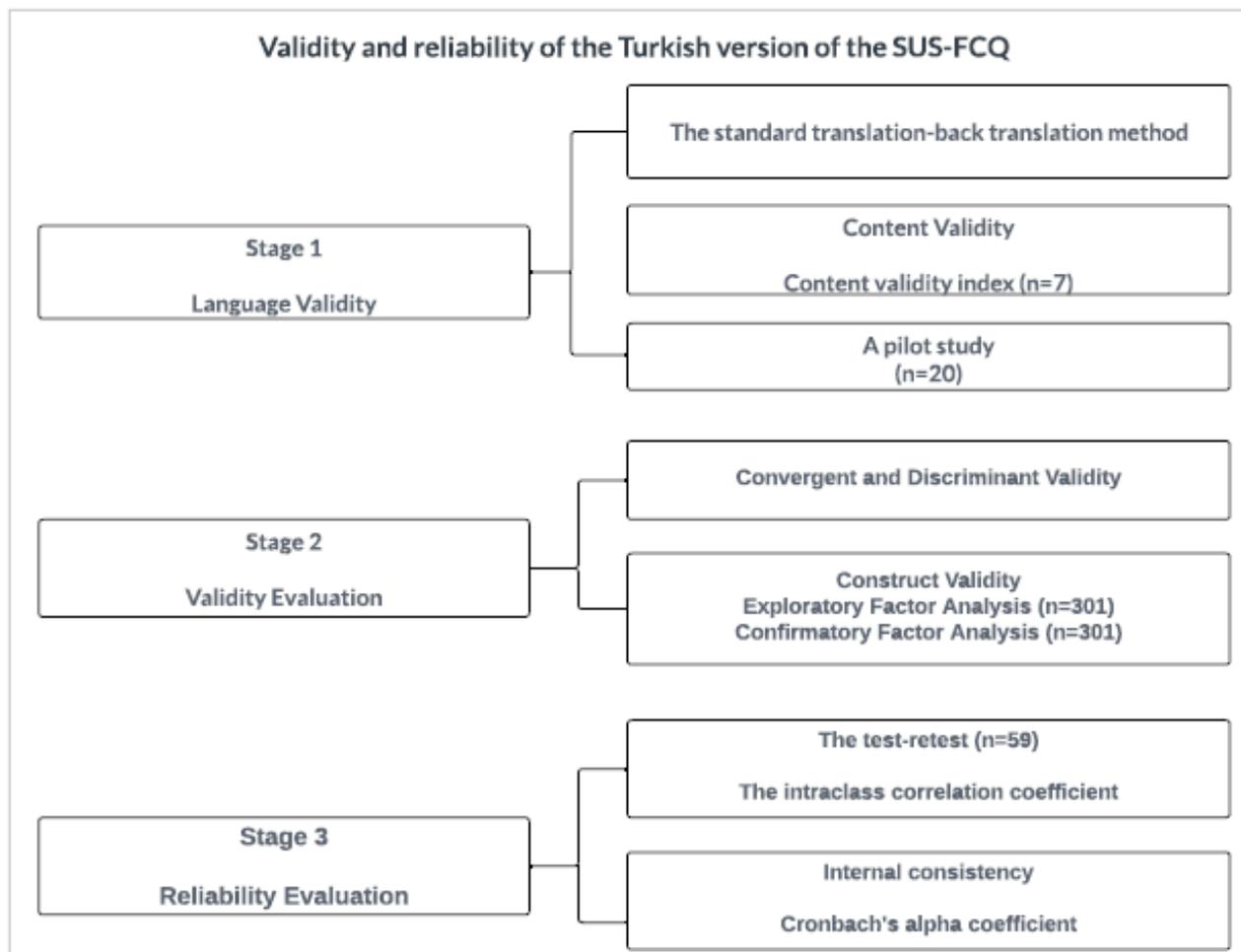
The research questions and hypotheses of this study are presented in Table 1. This study was carried out in 3 basic stages (Figure 1). In the first stage, the psycholinguistic features of the questionnaire were examined. The equivalence of language for the SUS-FCQ was ascertained using the standard translation–back translation method. The research questions (R1 and R2) were evaluated, the content validity tested using the content validity index (CVI), a pilot study carried out, and the adapted SUS-FCQ finalized (detailed in Section 2.4).

**Table 1.** Research questions and hypotheses of this study.

Level of Evidence and Reliability	Number of Research Question (R) or Hypothesis (H)	Research Question or Hypothesis
Evidence based on content validity	R1	Are the items relevant and appropriate in terms of Turkish culture and Turkish adults' sustainability motives in food choices?
	R2	Are the items clear, plain, and easy to understand?
	H1	The adapted SUS-FCQ has a suitable content validity index.
Evidence based on internal structure	H2	The data from this study confirm the two-factor model of the original SUS-FCQ.
	H3	Individual items of the SUS-FCQ show high correlations within its respective factors.
Evidence based on convergent and discriminant validity	H4	The maximum shared variance (MSV) and average shared variance (ASV) values of the factors were lower than the average variance extracted.
Reliability: internal consistency	H5	The adapted SUS-FCQ shows good internal consistency.
Reliability: repeatability	H6	The adapted SUS-FCQ shows an acceptable intraclass correlation coefficient.

In stage 2, within the scope of the construct validation process, firstly, the integral parts of process convergent and discriminant validity were evaluated. Then, the internal structure was evaluated through exploratory factor analysis (EFA), the structure obtained from the EFA was confirmed using confirmatory factor analysis (CFA), and convergent and discriminant validity were evaluated. In other words, hypotheses H2, H3, and H4 were questioned (detailed in Section 2.6).

In stage 3, repeatability and internal consistency were evaluated using the intraclass correlation coefficient and Cronbach's alpha coefficient, respectively (detailed in Section 2.5).



**Figure 1.** Flowchart of this study.

## 2.2. Study Sample

This cross-sectional study was carried out between February 2023 and June 2023 in adherence to the tenets of the Declaration of Helsinki and was ratified by the Istanbul Medeniyet University Research Ethics Committee (Ethics Committee number: 2023/0101, date: 8 February 2023). Data were collected through an online survey. The questionnaire was created using Google Forms and was posted on the Istanbul Medeniyet University website. The survey was advertised on social media (e.g., Facebook, LinkedIn, and Instagram) and digital channels (email, WhatsApp, relevant university student groups, etc.). All adults aged  $\geq 18$  whose mother language was Turkish were eligible to participate. Six hundred and ninety-seven individuals completed the questionnaire, and informed consent was obtained from all participants. The participant exclusion criteria were the following: individuals with disease and/or disability; individuals who followed a specific diet (vegans, vegetarians, and individuals who consumed only certain foods due to food intolerance, illness, or personal reasons); and pregnant and/or breastfeeding women. A total of 602 participants were recruited.

In the literature, it has been remarked that the sample size should number at least 300 in order to provide a scale that ensures validity [17] and at least 30 data pairs are needed for the test–retest method [18]. In that context, this study was carried out with 602 participants and the questionnaire was re-administered to 59 randomly selected participants with an interval of 4 weeks to determine the test–retest reliability.

## 2.3. Sustainable Food Choice Questionnaire

This questionnaire was developed by Verain et al. in order to provide a comprehensive and validated scale with which to gain an understanding of the sustainability motives

behind individuals' food consumption behaviors and to measure sustainability motives across the entire range of food choice factors [16]. Briefly, it involved two factors and nine items (all thirteen items/six items after reduction) in the final version. The first factor was "general sustainability", which included six items that consisted of environmental, ethical, and animal welfare aspects including "Is produced without animals being in pain" and "Is produced in an animal-friendly way" under the animal welfare category; "Is produced without exploitation", "Is produced without child labor", and "Is produced without exploitation" under the ethical concern category; and "Is prepared in an environmentally friendly way" and "Is produced in an environmentally friendly way" under the environmental welfare category. The second factor was "local and seasonal", which included the following three items: "Is a local/regional product", "Is a seasonal product", and "Comes from close by (short transport distance)." For each item, participants were asked to indicate the importance of these aspects in relation to the food they ate on an ordinary day. In the scale evaluation, 1 = not at all important and 7 = very important, and individuals were asked to choose within this range. The SUS-FCQ was detailed further in the original study [2].

#### 2.4. Language Validity

This study was planned to accommodate the "Adaptation Model", which was generated by utilizing intercultural-scale adaptation studies conducted in Europe, the USA, and Turkey [19].

**Equivalence of language:** The linguistic equivalence of the SUS-FCQ was provided using the standard translation–back translation method [20]. Accordingly, the questionnaire was independently translated into Turkish by two academicians who were fluent in both Turkish and English and had knowledge of Turkish culture and scale constructs. The questionnaire was then back-translated into English by three native researchers who had not seen the original version of the tool. Subsequently, the two questionnaires were checked, evaluated, and corrected by the researchers for suitability, clarity, and based on cultural factors.

**Content validity:** Seven academicians and nutritionists evaluated the content validity of the adapted SUS-FCQ using CVI. The items were scored for clarity and simplicity, with each item on the SUS-FCQ rated between 1 and 4 points (1: not suitable, 2: somewhat suitable but requires revision, 3: quite suitable but requires minor modification, and 4: very suitable). The total CVI of the adapted SUS-FCQ was found to be 0.86 (>0.80 values were accepted as suitable) [21].

**Pilot testing:** The adapted SUS-FCQ was tested by 30 individuals who satisfied the study inclusion criteria and, subsequently, the questionnaire was finalized according to their feedback. The results of the test participants were not incorporated into the study sample. Moreover, data from the pilot study were not included in the validity and reliability stages of this study. The pilot group evaluated the adapted SUS-FCQ in terms of Turkish cultural and traditional values (food culture, morality, religion, etc.), and the items were assessed based on simplicity, plainness, and clarity. As a result, it was determined that the scale was appropriate and understandable in terms of applicability to Turkish culture. Moreover, the survey completion time of the test participants was approximately 10 min.

#### 2.5. Reliability of SUS-FCQ

Within the scope of reliability, invariance over time (repeatability) was evaluated using the test–retest method. It is recommended that the period between the first and second applications of the survey should be 2–4 weeks [22]; therefore, the SUS-FCQ was first administered to 59 participants, followed by a second application after four weeks. The results were evaluated using intraclass correlation coefficients. Intraclass correlation coefficients in the range of 0.50–0.75 and 0.75–0.90 are considered to indicate moderate and good reliability, respectively [23].

Internal consistency was investigated using Cronbach's alpha, which must be  $\geq 0.70$  to be considered reliable, while values of 0.80–0.90 are considered good and  $\geq 0.90$  is considered excellent [24].

### 2.6. Validity of SUS-FCQ

Within the scope of reliability, firstly, convergent and discriminant validity were evaluated. Then, construct validity was tested using EFA, and the structure obtained from the EFA was confirmed using CFA [25]. Since separate datasets must be used in EFA and CFA [25], the sample was randomly divided into two sub-samples (EFA:  $n = 301$  and CFA:  $n = 301$ ). The suitability of the dataset for the EFA was evaluated with the Kaiser–Meier–Olkin coefficient and Bartlett's Test of Sphericity. The Kaiser–Meyer–Olkin value must be at least 0.50 [26] and the Bartlett's Test of Sphericity value must meet a significance level of  $p < 0.05$  [27]. Then, the varimax method was used for rotation, and principal component analysis was applied for factor extraction and factor structure. According to the principal component analysis results, factors with eigenvalues ( $\lambda$ ) of  $\geq 1.0$  were accepted [28].

The chi-square/degree of freedom ( $\chi^2/SD$ ), root-mean-square error of approximation (RMSEA), comparative fit index (CFI), Tucker–Lewis index (TLI), goodness-of-fit index (GFI), Bentler and Bonnet's normed fit index (NFI), Standardized Root-Mean-Square Residual (SRMR), and incremental fit index (IFI) were used as fit indices. The chi-square/degrees of freedom ( $\chi^2/SD$ ) results were between 2 and 5; the CFI, TLI, NFI, IFI, and GFI results were greater than 0.9; and the RMSEA and SRMR results were  $< 0.05$ , indicating a good fit [29].

### 2.7. Statistical Analysis

Data were investigated using IBM SPSS V23 and IBM SPSS AMOS V24 (SPSS Inc., Chicago, IL, USA). Whether the data were normally distributed was evaluated with multiple normality assumptions and the Kolmogorov–Smirnov test. Bootstrap ML (maximum likelihood) was used as the calculation method in structural equation models. The Wilcoxon test was used to compare test–retest scores that were not normally distributed. Analysis results are shown as mean  $\pm$  standard deviation ( $X \pm SD$ ) and median (minimum–maximum) for quantitative data. The significance level was determined to be  $< 0.05$ .

## 3. Results

### 3.1. Study Population

Validity was determined with 602 individuals; the mean age of participants was  $27.9 \pm 9.6$  years, and 84.2% of the sample were women. The mean age of the test–retest sample was  $27.2 \pm 10.3$  years, and 83.1% of the participants were women.

### 3.2. Validity Analysis

#### 3.2.1. Construct Validity

In the original SUS-FCQ validity and reliability study, the SUS-FCQ initially included 16 items but was later reduced to 9 items for practical application [2]. However, the factor loadings and reliability of the subscales, including animal welfare (five items, alpha of 0.93), ethical concern (three items, alpha of 0.87), and environmental welfare (five items, alpha of 0.93), were found to be high [2]. Owing to these results, it was stated that these subscales could be used separately in studies requiring that only one aspect be considered [2]. Accordingly, in this study, the EFA was conducted on 16 items to determine their factor loadings and distributions, and to reveal the factor structure. After performing rotation and principal component analysis using the varimax method for factor extraction, three items—“Is prepared in an environmentally friendly way”, “Is produced in an environmentally friendly way”, and “Is produced without disturbing the balance of nature”—were removed from the adapted SUS-FCQ, because these three items were under both factors. After these items were removed, the Kaiser–Meier–Olkin coefficient and the Bartlett's Test of Sphericity value were 0.944 and  $\chi^2 = 8235.884$ ,  $p < 0.001$ , respectively. These results showed that the data were suitable for

EFA. The extraction values of the questionnaire, consisting of thirteen items, were all  $\geq 0.3$  [30], and all values were  $>0.5$  [31]. As a result of the EFA, the two-factor structure was revealed to be as in the original version of the SUS-FCQ. The final version of the adapted SUS-FCQ was as follows: items 1–8 fell into the first factor called “general sustainability” and items 9–13 were located under the second factor named “local, seasonal, and environmental well-being”. According to the results of the EFA, the factor loadings of the items and the eigenvalue coefficients of factors were higher than 0.65 and 4, respectively, and thus the adapted SUS-FCQ explained 79.17% of the total variance (Table 2).

**Table 2.** Factor loadings, extraction values, anti-image correlation coefficients of the sustainability items, eigenvalue coefficients of factors, and percentages to explain variance based on the EFA.

Item	Factor Loading	Extraction Value	Anti-Image Correlation Coefficient
Factor 1: General sustainability			
1. Is produced without animals being in pain	0.843	0.757	0.953
2. Is produced in an animal-friendly way	0.878	0.839	0.932
3. Is produced with respect for animal rights	0.878	0.868	0.953
4. Is produced with sufficient space for the animals	0.867	0.876	0.946
5. Is a free-range product	0.651	0.643	0.960
6. Is produced without exploitation	0.834	0.822	0.965
7. Is produced without child labor	0.716	0.735	0.944
8. Is traded in a fair way	0.750	0.846	0.953
Eigenvalue coefficient		6.062	
Explained variance (%)		46.634	
Factor 2: Local, seasonal, and environmental welfare			
9. Is produced with minimal CO <sub>2</sub> emissions	0.682	0.775	0.925
10. Is packaged in an environmentally friendly way	0.711	0.803	0.927
11. Is a local/regional product	0.840	0.822	0.929
12. Is a seasonal product	0.774	0.718	0.937
13. Comes from close by	0.874	0.787	0.941
Eigenvalue coefficient		4.229	
Explained variance (%)		32.531	

The results of the CFA are shown in Table 3. As a result of the two-factor CFA consisting of a total of 12 items (according to the EFA and discriminant validity results, 3 items and then 1 item were removed from the scale, respectively), the fit indices were calculated as  $\chi^2/SD = 7.877$ , GFI = 0.90, NFI = 0.951, IFI = 0.957, TLI = 0.941, CFI = 0.956, RMSEA = 0.122, and SRMR = 0.046. According to the fit indices, except for  $\chi^2/SD$  and RMSEA, the model had an acceptable fit. Moreover, considering that  $\chi^2/SD$  and RMSEA values are sensitive to a normal distribution, it has been remarked that these values approach acceptable threshold values, particularly in cases where multiple normality is not achieved [32]. In addition, all path coefficients of the items were statistically significant ( $p < 0.001$ ) (Supplementary Materials, Path diagrams S1 and S2). Therefore, the Turkish version of the SUS-FCQ was deemed valid, acceptable, and applicable according to the results of the EFA and CFA.

**Table 3.** Mean values and standard deviations of the CFA.

Item		$\beta^1$ (%95 CI) *	$\beta^2$ (%95 CI) **	St. Dev.	<i>p</i>
Factor 1: General sustainability					
1	<---	1 (1–1)	0.802 (0.743–0.848)	---	---
2	<---	0.948 (0.888–1.004)	0.872 (0.823–0.911)	0.03	<0.001
3	<---	1 (0.93–1.082)	0.906 (0.869–0.936)	0.039	<0.001
4	<---	0.989 (0.929–1.051)	0.939 (0.914–0.959)	0.031	<0.001
5	<---	0.887 (0.807–0.973)	0.784 (0.723–0.835)	0.042	<0.001
6	<---	1.035 (0.953–1.129)	0.901 (0.846–0.945)	0.044	<0.001
7	<---	0.95 (0.863–1.044)	0.82 (0.763–0.866)	0.046	<0.001
8	<---	0.977 (0.888–1.076)	0.896 (0.856–0.925)	0.047	<0.001
Factor 2: Local, seasonal, and environmental welfare					
9	<---	1 (1–1)	0.931(0.898–0.956)	---	---
10	<---	1.016 (0.973–1.062)	0.958 (0.936–0.976)	0.023	<0.001
11	<---	0.813 (0.718–0.897)	0.764 (0.694–0.824)	0.046	<0.001
12	<---	0.683 (0.58–0.778)	0.676 (0.589–0.75)	0.05	<0.001

\*  $\beta^1$ : Unstandardized beta coefficient. \*\*  $\beta^2$ : Standardized beta coefficient; bootstrap 95% confidence interval.

### 3.2.2. Convergent and Discriminant Validity

To ensure the discriminant validity of the scale, we tested whether the maximum shared variance (MSV) and average shared variance (ASV) were less than the average variance extracted (AVE) values and whether the correlation value between the factors was less than the square root of the AVE. As a result of this evaluation, it was determined that Factor 2 did not meet this condition, so the item “Comes from close by”, which had the lowest factor loading in Factor 2, was removed from the scale. Then, the discriminant and convergent validity of the adapted SUS-FCQ was evaluated (Table 4). The AVE values of Factors 1 and 2 were greater than 0.50 and the CR values were greater than 0.7, thus ensuring the convergent validity of the scale [33].

**Table 4.** Convergent and discriminant validity of SUS-FCQ.

	CR	AVE	MSV	ASV	Factor 1	Factor 2
Factor 1: General sustainability	0.96	0.751	0.692	0.692	* 0.866	
Factor 2: Local, seasonal, and environmental welfare	0.904	0.706	0.692	0.692	0.832	* 0.84

CR: composite reliability, AVE: average variance extracted, MSV: maximum shared variance, and ASV: average shared variance. \* Represents the square root values of AVE.

The MSV and ASV values of the factors were lower than the AVE values and the correlation value between the factors was lower than the square root of the AVE, thus confirming discriminant validity for both factors.

### 3.3. Reliability Analysis

After the SUS-FCQ was adapted and validated in Turkish, the Cronbach’s alpha coefficient was excellent (0.964). The total item score correlation of all items was found to be higher than 0.30 (Table 5). The results of Tukey’s test of additivity showed that the adapted SUS-FCQ had a collectible structure ( $F = 5.329$ ;  $p = 0.021$ ) and, according to Hotelling’s T-squared distribution, it had different sub-dimensions ( $F = 14.672$ ;  $p < 0.001$ ).

The intraclass correlation coefficient was moderate (0.516) (Supplementary Materials, Table S1). The difference between the test and retest median values of the general score, Factor 1, and Factor 2 was not statistically significant ( $p = 0.589$ ,  $p = 0.594$ , and  $p = 0.516$ , respectively). As a result, the adapted SUS-FCQ was found to be valid and reliable.

**Table 5.** Means, standard deviations, total item score correlations, and Cronbach’s  $\alpha$  values if items were deleted from the adapted SUS-FCQ.

Factor	Item	Score		Total Item Score Correlation	Cronbach’s $\alpha$ If Item Deleted	Confidence Coefficient ( $\alpha$ )
		Mean	SD			
General sustainability	1	5.650	1.671	0.802	0.958	0.960
	2	5.930	1.469	0.868	0.953	
	3	5.960	1.479	0.898	0.951	
	4	6.010	1.411	0.912	0.951	
	5	5.720	1.516	0.748	0.96	
	6	5.930	1.538	0.876	0.953	
	7	5.990	1.553	0.811	0.957	
	8	6.030	1.461	0.874	0.953	
Local, seasonal, and environmental welfare	9	5.740	1.524	0.810	0.886	0.914
	10	5.810	1.505	0.856	0.870	
	11	5.660	1.508	0.817	0.884	
	12	5.860	1.435	0.733	0.912	

Hotelling’s T-squared distribution ( $F = 14.672$ ;  $p < 0.001$ ); Tukey’s test of additivity ( $F = 5.329$ ;  $p = 0.021$ ).

#### 4. Discussion

Sustainability-related concerns about our current diets are increasingly being raised, and in order to encourage the transition to more sustainable diets, understanding the sustainability motivations underlying food choices is crucial. The Food Choice Questionnaire is often used to assess the reasons for consumers’ food choices, but sustainability motives are not sufficiently represented. The assessment of sustainability motives across the entire range of factors that influence food choices at the national level lacks a sufficient and reliable scale. To the best of our knowledge, there are no valid and reliable tools to determine sustainable food choice motives in Turkey; thus, in this study, the reliability and validity of the SUS-FCQ were evaluated for the first time.

In this study, the psychometric features of the SUS-FCQ were investigated and the construct validity (EFA and CFA), content, convergent, and discriminatory validity, internal consistency reliability (Cronbach’s alpha coefficient), and repeatability results showed that the adapted SUS-FCQ is an appropriate research instrument for the Turkish population. The EFA of the adapted SUS-FCQ resulted in a two-factor structure like the original SUS-FCQ [2]. However, unlike the original SUS-FCQ, the “environmental welfare” items under the “general sustainability” dimension were included under the “local and seasonal” dimension [2]. When considering the validity and reliability studies of various food choice questionnaires (FCQs) in the literature, in the study conducted by Lindeman and Väänänen [10], “environmental welfare” and “animal welfare” were included under the same dimension. Moreover, in Sautron et al.’s study [15], “ethical” and “environmental welfare” were included under the same dimension, while in Reisch et al.’s study [34], “environmental”, “ethical”, and “animal welfare” were found to be different dimensions. It is thought that the different dimensionalities of sustainable food choice motives (environmental welfare, ethical concern, animal welfare, and local and seasonal factors) among FCQs are due to differences in perceptions of the sustainability concept [35,36]. In other words, it has been remarked that differences in dimensionality mainly depend on the way foods are perceived in society, culture, subcultures (ethnic groups), and on an individual basis. This is because people perceive food according to individual sensory characteristics, personal norms, knowledge, involvement, motives, beliefs, and political and moral values [15,35–37]. Moreover, since available questionnaires other than the SUS-FCQ include limited food choice motives and evaluate only specific aspects of sustainability, the dimensions of the FCQs may differ [13,35–37].

As a result of the CFA, the eigenvalue coefficient of the second factor (local, seasonal, and environmental welfare) and the total variance were found to be higher than in the original study (the eigenvalue coefficient of the second factor was 1.5, and the explained variance was 68.6%) [2]. In this study, fit indices, except for  $\chi^2/SD$  and RMSEA, had suitable values, as in the original study conducted in five countries (the Netherlands, Denmark, Czech Republic, France, and Italy) [2]. Cronbach's  $\alpha$  coefficients were found to be excellent at 0.960 and 0.919 for general sustainability and local, seasonal, and environmental welfare, respectively; these results are similar to those of the original scale (general sustainability: 0.962; local and seasonal: 0.853) [2]. Additionally, in this study, for the first time, the repeatability of the SUS-FCQ was evaluated (test–retest method), and the intraclass correlation coefficients were found to be moderate. When the results of the original SUS-FCQ study are compared with this study conducted in Turkey, it can be seen that the sustainability motives of consumers are quite similar [2]. "Is traded in a fair way" and "Is produced with sufficient space for the animals" under the "general sustainability" factor were found to have the highest values, respectively. This result can be explained as follows: Turkish society is sensitive to the fair and honest procurement of food and animal welfare owing to their value judgments and religious beliefs. On the other hand, the mean value of the item "Comes from close by" (5.190) was found to be the lowest. Similarly, in Dikmen et al.'s "In the Validation of a Turkish version of the food choice questionnaire (FCQ)" study, the mean values of the items "Comes from countries I approve of politically" and "Has the country of origin clearly marked" were found to be lower (2.29 and 2.45) than the other items [38]. These results show that the country of origin of a food product and the distance of the place where a food product is supplied are low-motivation factors for Turkish consumers. Moreover, Turkish consumers may not realize that sustainability is supported by protecting the environment via using less expensive and more natural resources, achieved by selecting short-distance food products. In other words, consumers have relatively limited awareness of the concept and scope of sustainability, and they do not associate these items with the concept of sustainability or find it convincing.

This study had strengths and some limitations. First, the test–retest reliability of the SUS-FCQ was evaluated for the first time in this study. Second, multiple validity assessment methods were used (content, construct, convergent, and discriminatory validity). Moreover, the validity and reliability of the long form of the original SUS-FCQ were evaluated so that the subscales could be used as separate scales in the future. In addition, through the online application of the adapted SUS-FCQ, data were collected from across the country in order to provide a reliable and representative analysis of sustainable food choices in the general Turkish population.

Since there were no objective measurements (such as urine and blood biomarkers) used for validation, owing to the nature of the SUS-FCQ, social desirability bias was the main limitation of this study. Moreover, we included only healthy adults in this study to minimize specific factors that may affect individuals' sustainable food choices and excluded special groups (pregnant and/or breastfeeding women and those following a specific diet (vegans, vegetarians, and individuals who consumed only certain foods due to food intolerance, illness, or personal reasons)). Therefore, we recommend that the validity and reliability of the adapted SUS-FCQ be evaluated before using it for the aforementioned groups, adolescents, and the free-living elderly population. Moreover, while the use of a web-based survey offers the benefit of reaching a large number of participants at a lower cost, it also poses the risk of bias in the selection of participants. The individuals involved in this online survey may have volunteered out of a particular interest in food, sustainability, and health, potentially skewing the results concerning sustainability-related food choices. Moreover, because of the web-based methodology of the present study, the study sample did not cover the entire population, especially missing out on those with low literacy levels.

## 5. Conclusions

Food and the diet are strongly related to sustainability. Accordingly, sustainable food choice is a key strategy in shifting food consumption behaviors to achieve a healthier population and environment. Our findings suggest that the Turkish-adapted SUS-FCQ is a valid and reliable instrument that enables the assessment of sustainable food choice motives of the Turkish population and a better understanding of the position of sustainability motives against other motives that influence consumers' food choices. The SUS-FCQ can be used in large-scale epidemiological and intervention studies; this tool offers the advantages of being short, relatively simple to complete, feasible, useful, inexpensive, and effective, and it does not require trained personnel for application. Moreover, the SUS-FCQ is highly feasible for conducting comparisons between multiple countries in terms of sustainable food choice motives, as it can be used in various areas such as food policies, the food industry, local produce and manufacturers, food, the environment, and health sciences.

In this respect, the Turkish-adapted SUS-FCQ can assist in determining sustainable food choice motives in the Turkish population and in taking action regarding adherence to sustainable food consumption and diet by raising awareness and informing the planning of sustainability policies. For food policymakers, it is important to encourage consumers to make sustainable food choices, with sustainable labeling being the key factor [39]. The SUS-FCQ can assist food policymakers in investigating sustainable food choice motivations of the population, supporting them to propose or improve sustainability food labeling guidelines.

Regarding the food industry, segments of the food market require sustainable and healthy food alternatives. Enabling the food industry to identify consumers' motives for sustainable food choices is advantageous for the development of sustainable food products appropriate for consumer segments and sustainability-specific marketing strategies and improvements in food labeling. Within this scope, determining consumers' sustainable food choice motives also supports food developers and researchers, which may increase product diversity and competition in the food market worldwide [40]. Beyond that, the transition of existing dietary patterns to a healthy and sustainable alternative is crucial for the achievement of the United Nations Sustainable Development Goals, and in this respect, the existence of validated tools in different countries is an important step toward determining how food choices can be guided from the perspective of sustainability, taking into account the characteristics of the population [41]. The validated Turkish-language SUS-FCQ questionnaire resulting from this study can be implemented as a nationally representative survey aimed at determining sustainable food choice motives in Turkey. Turkey also represents an interesting case study because when compared to the water footprint results of the Turkey Nutrition and Health Studies conducted in 2010 and 2017, the Mediterranean Adequacy Index showed that adherence to the Mediterranean diet decreased as a result of an increase in the consumption of a Western-style diet [41].

In studies investigating sustainable food choice motives, adult consumers were the target study population, as one of the criteria for the majority of studies was only to include decision-makers directly involved in food purchasing [42]. Generally, people with chronic diseases or those undergoing some type of diet were not considered, as in our study. Moreover, subgroups with special dietary requirements or those who had chronic diseases were generally excluded from the studies. However, on the contrary, some studies investigated specific target populations, including adolescents and the elderly population.

Further studies should be conducted on these specific target groups and consumer segments. In particular, since adolescents as a consumer segment are adults of the future population, determining their sustainable food choice motives and increasing their awareness regarding sustainability by providing educational resources and opportunities is very important in terms of achieving sustainability goals [42].

In conclusion, encouraging consumers' sustainable food choices will undoubtedly help achieve the goals of protecting the environment, promoting individual and societal well-being, and developing new avenues for sustainable consumption. The adapted SUS-

FCQ is a useful and valid instrument for determining sustainable food choice motives in Turkey and points to opportunities and strategies for encouraging people to adopt healthier and more sustainable food consumption behaviors.

**Supplementary Materials:** The following supporting information can be downloaded at <https://www.mdpi.com/article/10.3390/su16093519/s1>, Table S1. Test-retest reliability of the adapted SUS-FCQ; Path diagram S1; Path diagram S2.

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## References

- Burlingame, B.; Dernini, S. Sustainable diets and biodiversity directions and solutions for policy, research and action. In *Biodiversity and Sustainable Diets United against Hunger*; FAO Headquarters: Roma, Italy, 2010.
- Verain, M.C.D.; Snoek, H.M.; Onwezen, M.C.; Reinders, M.J.; Bouwman, E.P. Sustainable food choice motives: The development and cross-country validation of the Sustainable Food Choice Questionnaire (SUS-FCQ). *Food Qual. Prefer.* **2021**, *93*, 104267. [\[CrossRef\]](#)
- Food and Agriculture Organization of the United Nations (FAO). The State of Food Security and Nutrition in the World 2022. Available online: <https://www.fao.org/newsroom/detail/un-report-global-hunger-SOFI-2022-FAO/en> (accessed on 2 September 2023).
- United Nations Environment Program (UNEP). Sustainable Development Goals. Available online: <https://www.unep.org/explore-topics/sustainable-development-goals#:~:text=UNEP%E2%80%99s%20core%20mission%20is%20to,achievement%20of%20all%2017%20SDGs> (accessed on 1 September 2023).
- Sachs, J.D.; Lafortune, G.; Fuller, G.; Drumm, E. *Implementing the SDG Stimulus. Sustainable Development Report 2023*; SDSN: Paris, France; Dublin University Press: Dublin, Ireland, 2023. [\[CrossRef\]](#)
- Marty, L.; Chambaron, S.; de Lauzon-Guillain, B. The motivational roots of sustainable diets: Analysis of food choice motives associated to health, environmental and socio-cultural aspects of diet sustainability in a sample of French adults. *Clean. Responsible Consum.* **2022**, *5*, 100059. [\[CrossRef\]](#)
- Stok, F.M.; Hoffmann, S.; Volkert, D.; Boeing, H.; Ensenauer, R.; Stelmach-Mardas, M.; Kiesswetter, E.; Weber, A.; Rohm, H.; Lien, N.; et al. The DONE framework: Creation, evaluation, and updating of an interdisciplinary, dynamic framework 2.0 of determinants of nutrition and eating. *PLoS ONE* **2017**, *12*, e0171077. [\[CrossRef\]](#)
- Aleksandrowicz, L.; Green, R.; Joy, E.J.; Smith, P.; Haines, A. The impacts of dietary change on greenhouse gas emissions, land use, water use, and health: A Systematic Review. *PLoS ONE* **2016**, *11*, e0165797. [\[CrossRef\]](#) [\[PubMed\]](#)
- Johnston, J.L.; Fanzo, J.C.; Cogill, B. Understanding sustainable diets: A descriptive analysis of the determinants and processes that influence diets and their impact on health, food security, and environmental sustainability. *Adv. Nutr.* **2014**, *5*, 418–429. [\[CrossRef\]](#) [\[PubMed\]](#)
- Lindeman, M.; Vänänen, M. Measurement of ethical food choice motives. *Appetite* **2000**, *34*, 55–59. [\[CrossRef\]](#) [\[PubMed\]](#)
- Ozcaglar-Toulouse, N.; Shiu, E.; Shaw, D. In search of fair trade: Ethical consumer decision making in France. *Int. J. Consum. Stud.* **2006**, *30*, 502–514. [\[CrossRef\]](#)
- Sirieix, L.; Grolleau, G.; Schaer, B. Do consumers care about food miles? An empirical analysis in France. *Int. J. Consum. Stud.* **2008**, *32*, 508–515. [\[CrossRef\]](#)
- Renner, B.; Sproesser, G.; Strohbach, S.; Schupp, H.T. Why we eat what we eat. The Eating Motivation Survey (TEMS). *Appetite* **2012**, *59*, 117–128. [\[CrossRef\]](#) [\[PubMed\]](#)
- Onwezen, M.C.; Reinders, M.J.; Verain, M.C.D.; Snoek, H.M. The development of a single-item Food Choice Questionnaire. *Food Qual. Prefer.* **2019**, *71*, 34–45. [\[CrossRef\]](#)

15. Sautron, V.; Péneau, S.; Camilleri, G.M.; Muller, L.; Ruffieux, B.; Hercberg, S.; Méjean, C. Validity of a questionnaire measuring motives for choosing foods including sustainable concerns. *Appetite* **2015**, *87*, 90–97. [[CrossRef](#)]
16. Köksal, E.; Bilici, S.; Çitar Dazıroğlu, M.E.; Erdoğan Gövez, N. Validity and Reliability of the Turkish Version of the Sustainable and Healthy Eating Behaviors Scale. *Br. J. Nutr.* **2022**, *8*, 1–20. [[CrossRef](#)] [[PubMed](#)]
17. Clarke, L.A.; Watson, D. Constructing validity: Basic issues in objective scale development. *Psychol. Assess.* **1995**, *7*, 309–319. [[CrossRef](#)]
18. Aksayan, S.; Bahar, Z.; Bayık, A. *Hemşirelikte Araştırma ilke, Süreç ve Yöntemleri (Research Principles, Processes and Methods in Nursing)*, 1st ed.; Hemşirelikte Araştırma ve Geliştirme Derneği; Odak Ofset: Istanbul, Turkey, 2002; pp. 114–145.
19. Esin, M.N. Veri toplama araçlarının güvenilirlik ve geçerliği. In *Hemşirelikte Araştırma, Süreç, Uygulama ve Kritik*, 1st ed.; Erdoğan, S., Nahcivan, N., Esin, M.N., Eds.; Nobel Tıp Kitabevleri: İstanbul, Turkey, 2014; pp. 223–233.
20. Capık, C.; Gozum, S.; Aksayan, S. Intercultural scale adaptation stages, language and culture sdaptation: Updated guideline. *Florence Nightingale J. Nurs.* **2018**, *26*, 199–210. [[CrossRef](#)]
21. Polit, D.F.; Beck, C.T. The content validity index: Are you sure you know what’s being reported? Critique and recommendations. *Res. Nurs. Health* **2006**, *29*, 489–497. [[CrossRef](#)] [[PubMed](#)]
22. Aktürk, Z.; Acemoğlu, H. Reliability and validity in medical research. *Dicle Med. J.* **2012**, *39*, 316–319. [[CrossRef](#)]
23. Koo, T.K.; Li, M.Y. A guideline of selecting and reporting intraclass correlation coefficients for reliability research. *J. Chiropr. Med.* **2016**, *15*, 155–163. [[CrossRef](#)] [[PubMed](#)]
24. Kline, R. *Principles and Practices of Structural Equation Modeling*, 4th ed.; The Guilford Press: New York, NY, USA, 2016; pp. 300–334.
25. Van Prooijen, J.-W.; Van Der Kloot, W.A. Confirmatory analysis of exploratively obtained factor structures. *Educ. Psychol. Meas.* **2001**, *61*, 777–792. [[CrossRef](#)]
26. Field, A. Discovering statistics using IBM SPSS statistics. In *Sex and Drugs and Rock “N” Roll*, 4th ed.; Sage: Newcastle upon Tyne, UK, 2013.
27. Polit, D.F.; Beck, C.T. *Nursing Research: Generating and Assessing Evidence in Nursing Practice*, 10th ed.; Lippincott Williams and Wilkins: Philadelphia, PA, USA, 2016.
28. Giordani, P. Principal Component Analysis. In *Encyclopedia of Social Network Analysis and Mining*; Alhaji, R., Rokne, J., Eds.; Springer: New York, NY, USA, 2018; pp. 1831–1844.
29. Hooper, D.; Coughlan, J.; Mullen, M.R. Structural equation modelling: Guidelines for determining model fit. *Electron. J. Bus. Res. Methods* **2008**, *6*, 53–60.
30. Nunnally, J.C. *Psychometric Theory*, 2nd ed.; McGraw-Hill Companies: New York, NY, USA, 1978; p. 701.
31. Tabachnick, B.G.; Fidell, L.S. *Using Multivariate Statistics*, 5th ed.; Allyn & Bacon: Boston, MA, USA, 2007.
32. Gürbüz, S. *Structural Equation Modeling with AMOS*, 2nd ed.; Seçkin Yayıncılık: Ankara, Turkey, 2019; p. 30.
33. Fornell, C.; Larcker, D.F. Evaluating structural equation models with unobservable variables and measurement error. *J. Mark. Res.* **1981**, *18*, 39–50. [[CrossRef](#)]
34. Reisch, L.; Eberle, U.; Lorek, S. Sustainable food consumption: An overview of contemporary issues and policies. *Sustainability* **2013**, *9*, 7–25. [[CrossRef](#)]
35. Markovina, J.; Stewart-Knox, B.J.; Rankin, A.; Gibney, M.; de Almeida, M.D.; Fischer, A.; Kuznesof, S.A.; Poinhos, R.; Panzone, L.; Frewer, L.J. Food4Me study: Validity and reliability of Food Choice Questionnaire in 9 European countries. *Food Qual. Prefer.* **2015**, *45*, 26–32. [[CrossRef](#)]
36. Cunha, L.M.; Cabral, D.; Moura, A.P.; de Almeida, M.D.V. Application of the Food Choice Questionnaire across cultures: Systematic review of cross-cultural and single country studies. *Food Qual. Prefer.* **2018**, *64*, 21–36. [[CrossRef](#)]
37. Spence, A.; Poortinga, W.; Pidgeon, N. The Psychological Distance of Climate Change. *Risk Anal.* **2012**, *32*, 957–972. [[CrossRef](#)] [[PubMed](#)]
38. Dikmen, D.; Inan-Eroglu, E.; Gökteş, Z.; Barut-Uyar, B.; Krabulut, E. Validation of a Turkish version of the food choice questionnaire. *Food Qual. Prefer.* **2016**, *52*, 81–86. [[CrossRef](#)]
39. Thøgersen, J.; Torma, G. A systematic literature review on meta sustainability labeling—What do we (not) know? *J. Clean. Prod.* **2021**, *293*, 126194. [[CrossRef](#)]
40. Meixner, O.; Riefler, P.; Schanes, K. Sustainable Consumer Behavior and Food Marketing. *Sustainability* **2021**, *13*, 12916. [[CrossRef](#)]
41. Erdoğan Gövez, N.; Akpınar Şentüre, Ş.; Ayten, Ş.; Köksal, E. Evaluation of the Turkey Nutrition and Health Surveys according to the mediterranean adequacy index and sustainability through water footprints. *Public Health Nutr.* **2023**, *26*, 2927–2935. [[CrossRef](#)]
42. Ares, G.; De Rosso, S.; Mueller, C.; Philippe, K.; Pickard, A.; Nicklaus, S.; van Kleef, E.; Varela, P. Development of food literacy in children and adolescents: Implications for the design of strategies to promote healthier and more sustainable diets. *Nutr. Rev.* **2024**, *11*, 536–552. [[CrossRef](#)]

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