RESEARCH ARTICLE

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Reliability and Validity of the Turkish Version of the Food Disgust Scale

ABSTRACT

Objective: The feeling of disgust for food plays an important role in many situations, especially in food choice and consumption. Since the feeling of disgust is effective in many events that affect individuals' daily-life, it is important to understand the role of this emotion in food-related behaviours. Recently, a 32-item instrument to Food Disgust Scale (FDS) developed and validated. This study aims to validate the FDS for the first time in Turkish population.

Methods: This cross-sectional study included 240 healthy Turkish individuals between the ages of 19-65. The research was carried out on the internet between July 2020-February 2021 with the survey method. The scale was evaluated with a six-point Likert scale as in the original. Statistical analyses were made with the R-Project program and lavaan packages. A Turkish version of the FDS (FDS-TR) was tested with confirmatory factor analysis (CFA) in order to test the original item.

Results: In this study, the Cronbach's Alpha coefficient of the scale was determined as 0.914. The Cronbach's Alpha reliability coefficients for FDS-TR subscales varied between 0.717-0.902. The fit indices provided by confirmatory factor analysis results were also within the acceptable range.

Conclusions: This study results indicate that FDS-TR is highly reliable in healthy individuals and can be used safely in future studies. It is recommended that the scale be used to determine the effects of food disgust on many issues such as food waste, obesity, eating behaviour in our country.

Keywords: Disgust, Likert Scale, Reliability, Turkish Society, Validity.

Gıda Tiksinme Ölçeğinin Türkçe Uyarlamasının Geçerlik ve Güvenirliği

ÖZET

Amaç: Gıdalardan tiksinme duygusu, özellikle gıda seçimi ve tüketimi olmak üzere birçok durumda önemli rol oynar. Bireylerin günlük yaşamı etkileyen pek çok olayda iğrenme duygusu etkili olduğundan, bu duygunun gıdalarla ilgili davranışlardaki rolünü anlamak önem arz etmektedir. Son zamanlarda, 32 maddelik bir Gıda Tiksinme Ölçeği (GTÖ) geliştirilmiş ve onaylanmıştır. Bu çalışma, Türk popülasyonunda ilk kez GTÖ'ni doğrulamayı amaçlamaktadır.

Gereç ve Yöntem: Bu kesitsel çalışmaya Türkiye'de yaşayan, 19-65 yaş arası sağlıklı 240 kişi dahil edilmiştir. Araştırma anket formu yöntemi ile Temmuz 2020-Şubat 2021 tarihleri arasında internet ortamında yürütülmüştür. Ölçek orijinalindeki gibi altılı Likert ile değerlendirilmiştir İstatistiksel analizler R-Project programı ve lavaan paketleri ile yapılmıştır. Orijinal ölçek maddelerini test etmek için GTÖ'nin Türkçe uyarlaması (GTÖ-TR) doğrulayıcı faktör analizi (DFA) ile test edilmiştir.

Bulgular: Bu çalışmada ölçeğin Cronbach's Alpha katsayısı 0.914 olarak belirlenmiştir. GTÖ-Tr alt boyutları için Cronbach's Alpha güvenirlik katsayıları 0.717-0.902 arasında değişmektedir. Doğrulayıcı faktör analizi sonucu hesaplanan uyum indeksleri de kabul edilebilir aralıktadır.

Sonuç: Çalışma sonuçları, GTÖ-TR'nin sağlıklı bireylerde oldukça güvenilir olduğunu ve gelecekteki çalışmalarda güvenle kullanılabileceğini göstermektedir. Ölçeğin, ülkemizde toplumun gıdadan tiksinmeye yönelik davranışlarının gıda israfı, obezite, yeme davranışı bozuklukları gibi pek çok konu üzerindeki etkisinin belirlenmesinde kullanılması önerilmektedir.

Anahtar Kelimeler: Tiksinme, Likert Ölçek, Güvenirlik, Türk Toplumu, Geçerlik.

INTRODUCTION

Disgust is a fundamental human emotion that acts as a defence against microbes and potentially harmful substances by triggering avoidance and that has an important role in our daily lives (1). For example, disgust may affect hand washing (2) prevention of diseases (3,4) adoption of new food products (5) eating behaviour (6) and food wastefulness (7).

Fundamentally, food disgust is the mechanism of rejecting food and it affects the methods of food processing, food consumption etc. (2,3,8). Studies have shown that individuals with more prominent food disgust have limited variety in their diets (2,8), obese individuals have less tendency towards food disgust compared to individuals with normal body weight (9). and more easily disgusted consumers cause more wasted food compared to consumers that are not disgusted easily (7).

It is important to understand the role of disgust in terms of food-related behaviours as it is one of the impactful factors affecting many parts of daily life. In order to understand this role of disgust, scientific interest has increased in the subject of food related disgust. Better understanding of the underlying mechanisms of food disgust will both provide better understanding of the behaviour and also contribute towards various subjects such as estimating food preferences of people, regulating eating behaviours of people, making the acceptance of newly developed food products easier and preventing food waste. Hartmann and Siegrist (8). developed the Food Disgust Scale (FDS) with 32 items to measure the sensitivity of disgust of people towards food and food related situations. FDS is the first scale that offers an insight to food disgust and that fills a void in the current literature. With this scale, individuals' reactions related to disgust towards food related situations such as food contamination, decay etc. are evaluated. Inter-cultural differences may affect food disgust sensitivity. Therefore, it is an interesting subject to show how the Food Disgust Scale (FDS) will provide results in different cultures. As far as we are aware, the validity and reliability of FDS for Turkish has not been researched. The purpose of this present research is to adapt the Food Disgust Scale developed by Hartmann and Siegrist (8) to Turkish.

MATERIAL AND METHODS

Type and Sample of the Research: This research is a methodological type research conducted in order to adapt Food Disgust Scale to Turkish and to evaluate its validity and reliability. Even though sample size can be estimated with relative criteria such as factor and number of items, sample size usually needs to be 5-10 times the number of items in the scale (10). Therefore, when it is considered that there are 32 items in the original scale, a sample size of 160 people is going to be sufficient for this research. A total of 240 healthy individuals between the ages of 19-63 participated in the study.

The research inclusion criteria are; acceptance of participation to the study by individuals, being older than 18 years of age, having no visual impairment, being literate in Turkish and having internet access. The research was conducted via questionnaire form method over the internet (Microsoft Forms) between July 2020-February 2021. Researchers announced the study by sharing the study link through their own social media platforms (Facebook®, WhatsApp® and Instagram®). Additionally, as the individuals that saw the study announcement and participants shared the study link through their own social media, the data collection process was completed in eight months. The information about the study was given to the individuals through an information text that was at the beginning of the questionnaire form and the individuals that had decided to participate in the study filled the form and submitted it online. On average, participants answered the questionnaire in 10-15 minutes.

Data Collection Tools: Sociodemographic information form and Food Disgust Scale (FDS) was used to collect data.

Sociodemographic Information Form: In the socio-demographic information form which is the first section of the questionnaire form, there are 7 questions that ask for general information such as "age, gender, level of education, occupation, marital status, level of income and family type" about the sample.

Food Disgust Scale (FDS): Food disgust scale is psychometrically validated scale that was developed by Hartmann and Siegrist in 2018 (8) that measures the food disgust of individuals. The scale consists of 32 items and 8 subscales. The subscales of the scale are; animal meat (4 items- situations associated with raw meat or certain parts of animals), poor hygiene (5 items- poor hygienic conditions in the preparation of food or eating), human contamination (4 items- shared use of cutlery or other people's contact with utensils and food,), mold (4 items- mold that has been removed from food), decaying fruit (4 items- fruits that are overripe and change their color or texture), fish (4 items- texture and smell of fish), decaying vegetables (4 items- vegetables that are overripe and change their color or texture) and living contaminants (3 items- exposure of food to worms). The participants are asked how disgusted they are about the products or situations given in the scale. The answers range from "Not Disgusting at All" -1- to "Extremely Disgusting" -6-. Higher score should state higher food disgust.

Ethical Aspect of the Research: Firstly, permission to adapt the scale was obtained from the authors of the "Food Disgust Scale" via e-mail.

Ethics Committee approval was obtained from Selcuk University Faculty of Health Sciences Ethics Committee for Non-Interventional Clinical Investigations with decision numbered 2020/597.

Data Analyses: All of the statistical analyses were completed using R-Project software (11) and lavaan (12) packages. To begin with, frequency analysis results of the demographic variables and descriptive statistics regarding scale items were given. Afterwards, for the subscales of the Food Disgust Scale, Cronbach's Alpha reliability analysis was applied. The adapted Food Disgust Scale was verified through a confirmatory factor analysis (CFA) using a maximum likelihood estimation method. The fit of the model was examined through the Chi-squared test, comparative fit index (CFI), goodness-of-fit index (GFI), adjusted goodness-of-fit index (AGFI), Tucker-Lewis index (TLI), nonnormed fit index (NNFI), incremental fit index (IFI) and root mean square error of approximation (RMSEA). The margin of error in the research was evaluated as 95% validity ($p<0.05$).

Research Application Plan: Permission for the Turkish adaptation of the Food Disgust Scale was obtained via e-mail from the researcher who developed the scale. As part of the adaptation process for the Food Disgust Scale to Turkish, Brislin's (1970) translation-back translation method has been applied (13). The Turkish translation of the scale had been carried out by two people who are researchers and language experts. Afterwards, researchers analysed the optimal translation for each item and jointly prepared a Turkish text. After the required editing had been done, the scale was translated back. After this reverse translation, the sentences in the original text were compared with the ones in the reverse translated text by the researchers, incomprehensible expressions were edited and form was made ready for expert review. In order to evaluate the content validity of the scale, expert opinion was obtained after language adaptation. In this regard, the scale was presented to three experts who had had related studies in the literature. The experts were asked to state their opinions, with explanations where necessary, in terms of suitability of the scale to the expression in the original form in terms of translation, the comprehensibility of the scale towards the targeted group, evaluation of the sufficiency of the scale in terms of evaluating food disgust. The opinions, suggestions and criticisms of the experts on the evaluation forms and each explanation regarding the items were evaluated and the scale was finalized (14,15).

Before the start of the study, 10 participants who complied with the inclusion criteria were contacted online to conduct a preliminary application in order to evaluate the comprehensibility of the scale. No changes were made to the items of the scale after this preliminary application. 10 participants in the preliminary application were not included in the sample.

RESULTS

The average age of the participants are 29.03 ± 9.17 years. Frequency distributions of demographic information of study participants are presented in Table 1. 80.8% of the participants were female, almost half of the participants had bachelor's degree (48.8%) and 40.8% of the participants had specialized professions (lawyer, doctor, engineer etc.). Moreover, 56.3% of the individuals were single, 37.5% had incomes of 6001 TL or more (440 USD or more), and most of them (90.4%) lived in a nuclear family.

Table 1. Demographic findings regarding the individuals.

Variable	n	%
Gender		
Female	194	80.8
Male	46	19.2
Level of education		
Elementary school	5	2.0
Junior high school	3	1.3
High school	20	8.3
Associate degree	21	8.8
Bachelor's degree	117	48.8
Postgraduate	74	30.8
Occupation		
Unemployed	78	32.5
Student	40	16.6
Specialized professions (lawyer, doctor, engineer etc.)	98	40.8
Self employed	9	3.8
Civil servant	15	6.3
Marital status		
Married	91	37.9
Single	135	56.3
Divorced / Widowed	14	5.8
Level of income		
Less than 1500 TL (less than 110 USD)	26	10.8
Between 1500-3000 TL (between 110 - 219 USD)	40	16.7
Between 3001-4500 TL (between 220 - 329 USD)	44	18.3
Between 4501-6000 TL (between 330 - 439 USD)	40	16.7
6001 TL or more (440 USD or more)	90	37.5

Descriptive statistics of the items of Food Disgust Scale and the results of the Cronbach's Alpha reliability analysis are presented in Table 2. As a result of Cronbach's Alpha reliability analysis, corrected correlation values for all of the items of Food Disgust Scale were found to be positive. As an increase cannot be observed in the reliability coefficient when an item is removed from the Food Disgust Scale, all of the items in the scale are included in the analysis. When the results are evaluated, the Cronbach's Alpha reliability coefficients for animal meat, poor hygiene, human contamination, mold, decaying fruit, fish, decaying vegetables and living contaminants were 0.717, 0.797, 0.828, 0.902, 0.841, 0.766, 0.827 and 0.824, respectively. In this study, the Cronbach's Alpha coefficient of the scale was determined as 0.914. When the obtained reliability coefficients are analysed, it is determined that the adapted scale is highly reliable as a compatible literature (16).

Table 2. Reliability analysis results of food disgust scale.

Subscales and Items	Med	R	Adjusted-R	MIC	α
Animal meat					
1. To put animal cartilage into my mouth	4	5	0.516		
2. To see raw meat	2	5	0.583	0.392	0.717
3. To eat a steak that is still bloody inside	5	5	0.408		
4. To see a whole pig (lamb) en brochette *	1	5	0.536		
Poor hygiene					
5. To eat with dirty silverware in a restaurant	6	5	0.607		
6. A meal prepared by a cook who has greasy hair and dirty fingernails	6	4	0.682		
7. If the cook in a restaurant has an open cut	6	5	0.555	0.473	0.797
8. If people blow their nose before they serve my meal	6	4	0.610		
9. Another person's hair in my soup	6	4	0.555		
Human contamination					
10. Food donated from a neighbor whom I barely know	3	5	0.474		
11. If a friend bites into my bread	4	5	0.698		
12. To drink from the same drinking glass a friend has already drunk from	4	5	0.751	0.543	0.828
13. If friends or acquaintance have touched my food	3	5	0.707		
Mold					
14. To eat the mold-free part of a moldy tomato	3	5	0.791		
15. To eat bread from which mold was cut away	3	5	0.813	0.700	0.902
16. To eat hard cheese from which mold was cut off	2	5	0.810		
17. To eat marmalade from which mold was removed from the surface	4	5	0.714		
Decaying fruit					
18. To eat overripe fruits	2	5	0.681		
19. To eat a banana that has black spots	1	5	0.740		
20. To eat fruits (e.g., apple and peach) with pressure marks	1	5	0.691	0.576	0.841
21. To eat apple slices that turned brown when exposed to air	2	5	0.606		
Fish					
22. To have a whole fish with its head on the plate	2	5	0.489		
23. To eat raw fish like sushi	4	5	0.500	0.454	0.766
24. The smell in a fish shop or in fish sections with fresh fish	4	5	0.645		
25. The texture of some kinds of fish in the mouth	3	5	0.644		
Decaying vegetables					
26. To eat brown-colored avocado pulp	3	5	0.548		
27. To eat an overripe cucumber that can already be bent	4	5	0.721	0.544	0.827
28. To eat shrunken radishes	3	5	0.755		
29. To eat salad that is not crispy	4	5	0.595		
Living contaminants					
30. There is a maggot in the cherry that I wanted to eat	5	5	0.772		
31. There is a little snail in the salad that I wanted to eat	6	5	0.582	0.613	0.824
32. There is a worm in my apple	5	5	0.724		

Med: Median, R: Range, Adjusted-R: Corrected item correlation, MIC: Median inter-item correlation, α: Cronbach's alpha coefficient
*The item adapted according to Turkish culture with the permission of the scale authors. In the Turkish adaptation of the scale, the word lamb was preferred instead of pig.

CFA statistics of Food Disgust Scale are shown in Table 3. When the results are analysed, standardized beta coefficients of path coefficients are statistically significant. Fit indices were calculated as a result of the CFA of Food Disgust Scale that had been adapted to Turkish. According to fit indices, Chi-squared statistic was calculated as $\chi^2=354.696$ (sd=436) and the ratio of

χ^2/sd=0.814 was found to be below 2. Other fit indices of the CFA of the Food Disgust Scale are calculated as CFI=1, GFI =0.975, adjusted goodness-of-fit AGFI =0.970, TLI =1, NNFI =1, IFI =1 and all the statistics are above 0.9. Among fit indices, it is calculated that RMSEA =0.000 and this error value is below 0.05. In general, it is seen that Turkish-adapted Food Disgust Scale is statistically valid when CFA findings are analysed (17).

Table 3. CFA statistics of food disgust scale.

Subscales and Items	*β*	STZ(*β*)	z-value	p
Animal meat				
1. To put animal cartilage into my mouth	1	0.648	-	-
2. To see raw meat	0.955	0.676	13.698	<0.001
3. To eat a steak that is still bloody inside	0.665	0.538	12.843	<0.001
4. To see a whole pig (lamb) en brochette *	0.706	0.616	13.397	<0.001
Poor hygiene				
5. To eat with dirty silverware in a restaurant	1	0.569	-	-
6. A meal prepared by a cook who has greasy hair and dirty fingernails	0.990	0.572	5.726	<0.001
7. If the cook in a restaurant has an open cut	1.903	0.694	6.418	<0.001
8. If people blow their nose before they serve my meal	1.173	0.740	6.387	<0.001
9. Another person's hair in my soup	1.657	0.750	6.540	<0.001
Human contamination				
10. Food donated from a neighbor whom I barely know	1	0.720	-	-
11. If a friend bites into my bread	1.041	0.706	13.380	<0.001
12. To drink from the same drinking glass a friend has already drunk from	1.057	0.689	13.317	<0.001
13. If friends or acquaintance have touched my food	1.216	0.834	13.979	<0.001
Mold				
14. To eat the mold-free part of a moldy tomato	1	0.836	-	-
15. To eat bread from which mold was cut away	1.058	0.866	19.860	<0.001
16. To eat hard cheese from which mold was cut off	1.093	0.880	20.019	<0.001
17. To eat marmalade from which mold was removed from the surface	0.979	0.766	19.008	<0.001
Decaying fruit				
18. To eat overripe fruits	1	0.811	-	-
19. To eat a banana that has black spots	0.815	0.726	16.316	<0.001
20. To eat fruits (e.g., apple and peach) with pressure marks	0.730	0.720	16.439	<0.001
21. To eat apple slices that turned brown when exposed to air	0.918	0.749	17.085	<0.001
Fish				
22. To have a whole fish with its head on the plate	1	0.644	-	-
23. To eat raw fish like sushi	0.736	0.457	12.082	<0.001
24. The smell in a fish shop or in fish sections with fresh fish	1.224	0.761	15.294	<0.001
25. The texture of some kinds of fish in the mouth	1.174	0.821	15.548	<0.001
Decaying vegetables				
26. To eat brown-colored avocado pulp	1	0.675	-	-
27. To eat an overripe cucumber that can already be bent	1.073	0.745	16.651	<0.001
28. To eat shrunken radishes	1.201	0.808	16.954	<0.001
29. To eat salad that is not crispy anymore	1.009	0.738	16.412	<0.001
Living contaminants				
30. There is a maggot in the cherry that I wanted to eat	1	0.820	-	-
31. There is a little snail in the salad that I wanted to eat	0.625	0.632	14.647	<0.001
32. There is a worm in my apple	1.203	0.901	17.006	<0.001

β: Beta coefficient; STZ(β): Standardized B-beta coefficient

*The item adapted according to Turkish culture with the permission of the scale authors. In the Turkish adaptation of the scale, the word lamb was preferred instead of pig.

DISCUSSION

In our daily lives, disgust plays a significant role. Many factors in our daily lives can be affected by disgust, including eating behaviour (6,18) and the production of food waste (7). In the case of exposure to new and unfamiliar food sources, disgust to food may lead to picky eating (19, 20). In the long run, individuals who exhibit excessively picky eating behaviours may suffer from nutritional deficiencies (21). As a disease avoidance mechanism, food disgust may also be triggered by cues that indicate potential contamination and food inedibility. As a result, people with high food aversion sensitivities may be more sensitive to cues of food spoilage and avoid consuming foods that appear to be deteriorating but may still be edible, resulting in food waste (22). Research has shown

that perception of risk and desire to consume expired food products are correlated (23), as are perceptions of health risk and the amount of food wasted (24).

As of recently, the Food Disgust Scale (FDS) has been developed specifically to measure sensitivity to food-related health-threatening situations (8). The purpose of this research was to adapt the Food Disgust Scale developed by Hartmann and Siegrist (8) to Turkish culture and to study the Turkish form of the scale in terms of validity and reliability. Aside from enabling us to generalize the collected data, scale adaptation studies also provide opportunities to research mutual and different properties between cultures measured (25). It is thought that this scale, adapted into Turkish, will fill a big void in the field. In the first step of the adaptation process, language equivalence study of the original scale was conducted. In this context, the original 32-item form of the scale was translated to Turkish by expert translators. After this step, reverse translation method was conducted and expert reviews was obtained again. It was seen that after the adaptation studies of the scale, equivalency of the Turkish form of the scale to the original scale was acceptable.

In the second step, it was tested if the original form of the scale was reliable and valid for Turkish culture. In the reliability analysis, Cronbach's alpha consistency coefficients were; 0.72 for animal meat, 0.79 for poor hygiene, 0.83 for human contaminants, 0.90 for mold subscale, 0.84 for decaying fruit subscale, 0.77 for fish subscale 0.83 for decaying vegetables and 0.82 for living contaminants subscale. Overall Cronbach's alpha coefficient for the scale was determined as 0.91. Generally, values over 0.70 are considered acceptable for reliability coefficients (26). When the fit indices as a result of confirmatory factor analysis, the ratio of chi-squared over degrees of freedom was below 2. Other fit indices were calculated as; RMSEA=0.000, CFI=1, GFI=0.975, AGFI=0.970, TLI=1, NNFI=1, IFI=1. Therefore, it is evident that Food Disgust Scale is validated through the data obtained from the Turkish sample. These results may be interpreted that the measuring tool will yield valid and reliable results in the future studies.

Through this study, it is determined that Food Disgust Scale is a valid and reliable measuring tool for Turkish culture. This scale, which was determined to be a valid and reliable measure for the Turkish public, might be a reference scale which may be used to develop policies regarding disease prevention, adoption of new foods, evaluation of eating behaviours and food waste reduction, in conducting clinical processes and in scientific studies.

One of the limitations of the study is the fact that research data was collected over the internet due to the COVID-19 pandemic. Moreover, as the scale data was collected online, the sample is limited to literate individuals with internet access. Additionally, due to the voluntary collection of study data, homogeneity was not achieved within the sample. It was observed that female participants showed great interest in the study. Obtaining a more homogeneous sample in future studies is important for comparing the results of the scale with other variables.

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