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Psychometric properties of the gratitude for food scale among Turkish adults: a validity and reliability study

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Abstract:	Abstract This study aimed to adapt the Gratitude for Food Scale (GFS) into Turkish and evaluate the psychometric properties of the GFS for adults (GFS-A), considering the need for culturally sensitive and reliable tools. The study was conducted web-based with 421 adults (41.8% male, 58.2% female). Translation-back translation method was applied in language validity and pilot test (n=50) was performed to evaluate the clarity of the items. Then, construct (exploratory factor analysis (EFA; n=208) and confirmatory factor analysis (CFA; n=213)) validity and convergent validity were tested. In reliability analysis, Cronbach's α coefficient was calculated for internal consistency and test–retest method was applied. As a result of EFA, factor loadings of items in single factor structure were between 0.729 – 0.893 (variance explained=68.88%). According to CFA, fit indices ($\chi 2/sd=1.866$, RMSEA=0.045, TLI=0.992, CFI=0.996, GFI=0.992, AGFI=0.975) were acceptable. Average variance extracted (AVE=0.689) and composite reliability (CR=0.917) were found to be sufficient for convergent validity. Cronbach's α coefficient (0.856) was highly reliable. According to test-retest analysis, intraclass correlation coefficient was found to be 0.613 ($p<0.01$). The Turkish version of GFS-A, with 5 items and one factor, is a valid and reliable tool to measure gratitude for food in Turkish adults.
Response to Reviewers:	

Dear Editor,

The fact that we need food to continue our lives has long given rise to the concept of gratitude for these foods. Gratitude for food expresses a valuable concept that has a long history, as it reflects the respect felt for food, its producers, carriers, and those who cook it. It has become quite popular in recent years and supports the concepts of sustainability and mindfulness, which are necessary for all living things. And also gratitude towards food practices have a preventive role in diseases such as obesity, hypertension, and hyperlipidemia. Currently, awareness-based approaches such as gratitude are expected to create behavioral control towards food consumption.

In relation to the information provided above, I would like to present the article titled "Psychometric properties of the gratitude for food scale among Turkish adults: a validity and reliability study" for the adaptation of the Gratitude for Food scale, which was first developed by Kawasaki et al. (2024) for Japanese adults. Publishing this research in International Journal of Gastronomy and Food Sciencewill allow the results to be compared with other studies. This work is original and has not been published elsewhere, nor is it currently under consideration for publication elsewhere. This study has no funding-related authors. I accept to undertake all the responsibility for authorship during the submission and review stages of the manuscript.

Sincerely

Dr. Ümüş Özbey Yücel

Point-by-Point Responses

Title of Article: Psychometric properties of the gratitude for food scale among Turkish adults: a validity and reliability study

Thank you for your valuable comments and good thoughts about our academic study. Your suggestions included very important notes to improve our article and ourselves.

Reviewer 3

Reviewer' comment 1:

Reviewer #3: The rationale of the study is clearly stated, however, the study purpose is a little confusing. The title only mentions psychometric testing, however, the introduction says "This study was conducted to determine the validity and reliability of the GFS-A by adapting it to Turkish adults". Did the authors translate the scale and culturally adapt it? Looks like this study was just a simple validation, not translation or adaptation. Please clarify.

Also, the title is repetitive, Psychometric properties is the same with validity and reliability, could be revised as

Psychometric testing of the gratitude for food scale among Turkish adults

Authors' answer 1:

Dear reviewer,

Thank you for your careful review and suggestions. We adapted some items in the original version of the scale (especially item 1) to the Turkish language during the translation process in line with expert opinions due to differences in beliefs in Japanese nutrition culture. For this reason, we added the expression cultural adaptation to the purpose of the study. Detailed information about this is available in the method section. You are right about the title being repetitive, the term psychometric means validity and reliability. However, some traditional readers have difficulty understanding the aim of the study without directly seeing the "validity and reliability" part. We directly encountered this situation in our previous study. However, in accordance with your suggestion, we rearranged the title as "Psychometric properties of the gratitude for food scale among Turkish adults: a validity and reliability study" to make it more understandable for the reader.

Reviewer' comment 2:

1. Abstract , instead of saying "In this study, it was aimed", the authors could directly use "This study aimed to "

2. Method, better provide the Cronbach alpha coefficients of the scales in this study, not in previous studies.

Authors' answer 2:

We have edited the abstract and method sections in accordance with your suggestions. We have expanded the Cronbach alpha coefficient parts in both the method and results sections (page 1 line 5-7) (page 7 line 3-7) and (page 8 line 21-26).

-The Turkish version of GFS-A is a valid and reliable tool to measure gratitude for food in Turkish adults.

-According to BMI classification, GFS-A score was higher in normal than in obese.

-GFS-A showed a significant relationship with EDE-Q-13 total and MEQ-total scores.

Psychometric properties of the gratitude for food scale among Turkish adults: a validity and reliability study

Abstract

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Keywords: Eating behavior, gratitude for food, mindfulness, obesity.

Title Page (with Author Details)

Psychometric properties of the gratitude for food scale among Turkish adults: a validity and reliability study

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Declarations of interest: None.

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Abstract

This study aimed to adapt the Gratitude for Food Scale (GFS) into Turkish and evaluate the psychometric properties of the GFS for adults (GFS-A), considering the need for culturally sensitive and reliable tools. The study was conducted web-based with 421 adults (41.8% male, 58.2% female). Translation-back translation method was applied in language validity and pilot test (n=50) was performed to evaluate the clarity of the items. Then, construct (exploratory factor analysis (EFA; n=208) and confirmatory factor analysis (CFA; n=213)) validity and convergent validity were tested. In reliability analysis, Cronbach's α coefficient was calculated for internal consistency and test–retest method was applied. As a result of EFA, factor loadings of items in single factor structure were between 0.729 – 0.893 (variance explained=68.88%). According to CFA, fit indices (χ^2/sd=1.866, RMSEA=0.045, TLI=0.992, CFI=0.996, GFI=0.992, AGFI=0.975) were acceptable. Average variance extracted (AVE=0.689) and composite reliability (CR=0.917) were found to be sufficient for convergent validity. Cronbach's α coefficient (0.856) was highly reliable. According to test-retest analysis, intraclass correlation coefficient was found to be 0.613 ($p<0.01$). The Turkish version of GFS-A, with 5 items and one factor, is a valid and reliable tool to measure gratitude for food in Turkish adults.

Keywords: Eating behavior, gratitude for food, mindfulness, obesity.

1. Introduction

Recognizing the effort and resources that go into producing our meals is not just a matter of courtesy, this can significantly affect our eating habits and overall well-being. Therefore, our need for food to sustain life has long given rise to the concept of gratitude for these foods (Fritz et al., 2019). Gratitude, in its general sense, is a sincere feeling of thanks for a favor, gift, help or a good situation (Schlosser, 2015). The concept of gratitude, which has become more prevalent in our lives with the spread of mindful living practices, is associated with many diseases such as obesity, diabetes, hypertension, in addition to its cognitive aspect (Cousin et al., 2021; Fritz et al., 2019; Makhmur & Rath 2023).

Gratitude is a very old behavior in Western societies and different beliefs. In widespread religions such as Islam and Christianity, the teachings of being grateful for food, preserving it, and not wasting it are frequently repeated with religious rituals (Krause, 2009). This education, which first begins in the family and school, is reinforced with the practices of being respectful of food and not leaving food on the plate. Religious fasting rituals performed to respect food are other type of gratitude practices in adulthood (Brumberg-Kraus, 2020). It has been shown in many different studies that these rituals have a preventive role in diseases such as obesity, hypertension, and hyperlipidemia (Hammoud et al., 2021; Hassanein et al., 2022; Zouhal et al., 2020). The origin of intermittent fasting and mindful eating practices, which are especially popular nutrition trends in recent years, is also based on gratitude for food (Ring et al., 2022). Also, gratitude for food may promote healthy eating habits by increasing awareness of the value of food and fostering an appreciation for the effort involved in its preparation (Kawasaki et al. 2024).

Gratitude towards food refers to the feeling of gratitude for both the food itself and those who contributed to its production, transportation, and preparation (Kawasaki et al., 2024). First, a scale was developed on gratitude for food in a study conducted by Akamatsu and Izuchi et al. (2009) on children in Japan (Akamatsu & Izuchi, 2009). Later, Kawasaki et al. developed the revised form of the scale for adults. In Japan, where Buddhism and Shintoism are widespread, gratitude for food is a very old belief in accordance with Asian culture. In this belief, it is assumed that foods (such as fruits, vegetables, and meat) are also alive and that food sacrifices its own life for the continuation of human life (Kawasaki et al., 2024). For this reason, preventing food waste and being grateful for the food are common teachings taught from childhood (Akamatsu & Izuchi, 2009). In different studies, it has been shown that gratitude towards food prevents food waste and reduces the rate of obesity (Kawasaki & Akamatsu, 2022).

Gratitude can also play a protective role against behavioral disorders by increasing psychological well-being with its positive and conscious approaches. Food gratitude increases the compassionate

approach towards both food and our body with its spiritual satisfaction and enlightenment (Kawasaki et al., 2024; Krause, 2009). It keeps away from eating disorders such as binge eating, purging, etc. by increasing positive behaviors and focus. It has been shown in studies that gratitude behaviors increase healthy eating attitudes and reduce eating disorders (Boggiss et al., 2020; Fritz et al., 2019).

Although mindful eating practices are one aspect of gratitude, mindful eating inventories do not fully measure gratitude for food. The GFS-A, which was first developed in Japan by Kawasaki et al. and consists of one factor and five items, can subjectively assess gratitude for food for adults (Kawasaki et al., 2024). This study was conducted to determine the validity and reliability of the GFS-A by adapting it to Turkish adults. Thus, the cultural validity of the GFS-A in the Turkish population shall be ensured and its applicability shall increase.

2. Material and methods

2.1. Research design and sampling

This study was conducted with adults between July and December 2024. The survey form was prepared as web-based in order to reach out to more people and was sent to the individuals via Google forms. Participants were recruited using the snowball sampling method. Those who spoke native Turkish, were between the ages of 20-65, did not have internet access issues, and were competent to read and understand the online survey were included in the study. Those with psychiatric diseases that would affect the responses, those who gave incomplete or misleading answers in cross-questions were excluded from the study. The survey form was sent to a total of 600 people in two separate groups of 300 people each. The responses of a total of 421 people from both groups who responded in accordance with the inclusion and exclusion criteria were evaluated (Figure 1). In scale adaptation studies, it is recommended that the approximate sample size to be at least 5-10 times the number of scale items (Rouquette & Falissard, 2011). However, according to the literature, if the number of items in the scale is low, a sample of at least 200 people is more appropriate (Sürücü & Yıkılmaz, 2022). This study was completed with a total of 421 adults, covering the sampling conditions in the literature.

2.2. Data collection tools

The survey form of the research consisted of socio-demographic information, anthropometric measurements, Gratitude for Food Scale for Adults (GFS-A), Mindful Eating Questionnaire (MEQ), and Eating Disorder Examination Questionnaire (EDE-Q-13) items (Esin & Ayyıldız, 2022; Kawasaki et al., 2024; Köse et al., 2016).

2.2.1. Gratitude for food scale for adults (GFS-A)

GFS-A was developed by revising the Gratitude for Food Scale (GFS), developed for children by Japanese researchers, for adults (Akamatsu & Izuchi, 2009). GFS consists of 8 items with 2 factors: cognitive (5 items) and behavioral (3 items), and each item is scored between 1-4. In the adaptation process conducted by Kawasaki et al. (2024), the items in the scale were arranged for adults and 3 items were removed from the scale. GFS-A was adapted for Japanese adults as a single factor and 5 items. Each item is evaluated as strongly disagree, disagree, agree, and strongly agree. The mean score to be obtained from the scale is obtained by dividing it by the number of questions and is between 1-4. An increasing score indicates an increase in the gratitude for food. Cronbach's *a* value, which assesses the internal consistency of the scale, is 0.92 (Kawasaki et al., 2024).

2.2.2 Mindful eating questionnaire (MEQ)

The Mindful Eating Questionnaire (MEQ), originally developed by Framson et al. (2009), was adapted into Turkish by Köse et al. (2016). The scale consists of 30 items and 7 factors including disinhibition (unconscious eating), mindfulness, conscious eating, emotional eating, eating control, eating discipline and interference. Likert-type scale items are scored from 1 to 5 (1: never, 2: rarely, 3: sometimes, 4: often, 5: always). Items other than 1, 7, 9, 11, 13, 15, 18, 24, 25 and 27 are reverse scored. The total score is obtained by dividing the number of items. An increase in the score obtained from each factor on the scale indicates an increase in the relevant eating behavior. Cronbach's *a* coefficient value showing the internal consistency of the MEQ is 0.73 (Framson et al., 2009; Köse et al., 2016).

2.2.3 Eating disorder examination questionnaire (EDE-Q-13)

The original Eating Disorder Examination Questionnaire (EDE-Q-13), developed by Lev et al. (2021), was adapted into Turkish by Esin and Ayyıldız (2022). The scale consists of 13 items and 5 factors including eating restraint (ER), shape and weight over-evaluation (SWO), body dissatisfaction (BD), bingeing, and purging. Each item of the 7-point likert-type scale evaluating the last 28 days is scored between 0 and 6. EDE-Q-13 scoring is evaluated according to the total score of the items in the entire scale and each factor. Factor scores are calculated by dividing the number of items, while total score is calculated by dividing the number of factors. A high score indicates higher eating-related psychopathology. The Cronbach's *a* coefficient value showing the internal consistency of the EDE-Q-13 is 0.89 (Esin & Ayyıldız, 2022; Lev-Ari et al., 2021).

2.3. Anthropometric measurements

Individuals' body weight and height were recorded based on their self-reports. Body mass index (BMI) was calculated by dividing body weight (kg) by height (m) squared (kg/m2) and evaluated according to the World Health Organization (WHO) classification (Jan & Weir, 2021).

2.4. Procedure

2.4.1. The translation and adaptation process

Before the study, the necessary permission for the Turkish adaptation study was acquired from the developers of the original GFS-A scale via e-mail. The study was completed in 3 steps. Language validity was performed in the first step. In the adaptation process of GFS-A to Turkish, the translation-back translation method was used in accordance with the standard method. The scale was first translated from English to Turkish by academicians who are experts in their fields and who are fluent in English and Turkish (two from English Language and Literature, and five from Nutrition and Dietetics). The draft scale, which included the evaluation of each expert, was presented to the researchers and experts in the field of Nutrition and Dietetics to be checked in terms of semantics, consistency and grammar. The translated form of the scale was translated back into English by an expert committee consisting of academicians. The World Health Organization (WHO) recommends checking all forms of the scale after back translation (Ozolins et al., 2020). Accordingly, the translated items were sent to the expert committee to be evaluated together with the original. Using the Davis technique, the experts were asked to score each item between 1 and 4 by comparing the Turkish translated form of the scale with the original (1: not appropriate, 2: much correction, 3: little correction, 4: very appropriate) (Bobov & Capik, 2020). The necessary adjustments were made to the items according to the obtained scores and expert comments and the final form was given to the scale. A pilot test was conducted on a sample of 50 individuals to check the applicability of the scale. As a result of the testing process, it was determined that each item was understandable, and the total response time was approximately 3 minutes. The 50 individuals who were pilot tested were not included in the research sample.

In the second step, the construct validity of the scale was evaluated. For this purpose, the survey form was sent to 300 individuals for exploratory factor analysis (EFA). In adaptation studies, the number of samples is required to be 5-10 times the number of items in the scale. In cases where the number of items is low, such as GFS-A (total 5 items), at least 200 participants are recommended. In this study, EFA was completed with 208 individuals. Then, the dimensional structure created with EFA was checked with confirmatory factor analysis (CFA). Since it would not be appropriate to test CFA with

EFA sample, the survey form was sent to 300 different individuals for CFA. According to the answers obtained, the CFA of the research was completed with the participation of 211 individuals.

In the third step, the test-retest method was applied to control reliability. In this method, it is recommended that the retest be performed approximately 2-4 weeks later. Therefore, the scale was repeated with 50 people selected from the total sample pool after 4 weeks (Hänninen et al., 2021).

2.4.2. Content validity and construct validity

Content validity was performed using the Lawshe Technique based on the evaluation of the items in the draft scale by academicians. Content Validity Rate (CVR) and Content Validity Index (CVI) were calculated in accordance with the opinions of 5 academicians who are experts in the field of Nutrition and Dietetics. In the literature, it is required that CVR and CVI > 0.90 and for the evaluation of 5 people (Almanasreh et al., 2019). The construct validity of GFS-A was evaluated with exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). The number of factors was determined according to scree plot and factor structures. The adequacy of the sample size was tested with Kaiser-Meyer-Olkin (KMO) analysis. Bartlett's sphericity test was applied for the multivariate normal distribution assumption of the sample. KMO value ≥0.60 and Bartlett sphericity test significance level <0.05 were taken as reference. If the eigenvalue of the factor was over 1, the analysis was continued. The items with a factor load over 0.40 and an extraction value over 0.3 were evaluated. In the process of creating the theoretical structure with EFA, the varimax method was used to increase the factor load of each item (Williams et al., 2010).

Confirmatory Factor Analysis (CFA) tests the verification of the factor structure created by EFA and the model of the items loaded on these factors. As fit indices, chi-square/degree of freedom ($\chi 2$/df), root mean square error of approximation (RMSEA), Tucker–Lewis Index (TLI), comparative fit index (CFI), goodness of fit index (GFI), and adjusted goodness of fit index (AGFI) were performed with the maximum likelihood method. $\chi 2$/df value of <5, RMSEA values of <0.08, TLI, CFI, GFI, and AGFI values of >0.90 were considered acceptable (Brown, 2015).

For convergent validity, average variance extracted (AVE) and composite reliability (CR) values were examined. In order to ensure convergent validity, the CR value of the scale is expected to be greater than 0.70 and the AVE value is expected to be greater than 0.50 (Hair et al., 2019). In addition, the correlation of the mindfulness factor of the MEQ inventory, which has similar items to the GFS-A, with the GFS-A was also examined.

2.4.3. Reliability

To determine the internal consistency and reliability of the GFS-A, Cronbach's *a* coefficient was used. Cronbach's *a* coefficient of 0.60-0.79 is considered reliable and 0.80-1.00 is considered highly reliable (Chan and Idris 2017). In addition, the scale was re-applied to 50 individuals after 4 weeks by using the test-retest method to determine the intraclass correlation coefficient. The intraclass correlation coefficient between 0.50 and 0.75 was considered moderate and between 0.75 and 0.90 was considered good reliability (Koo & Li, 2016).

2.5. Data analysis

SPSS, AMOS and R programs were used in the analysis of the data. Descriptive variables were shown as numbers and percentages. In the validity analysis, exploratory factor analysis (EFA) was performed using the SPSS program, and the varimax rotation method was applied to enhance the factor loadings of the items. The structure derived from EFA was then tested using confirmatory factor analysis (CFA) with the AMOS program. In CFA, the fit of the model was evaluated with $\chi 2/sd$, root mean square of approximation (RMSEA), adjusted goodness of fit index (AGFI), goodness of fit index (GFI), comparative fit index (CFI), Tucker-Lewis index (TLI). In the reliability process, the internal consistency of the scale was evaluated with Cronbach's *a* coefficient and test-retest method. The impartiality of the scale was tested with Hotelling T2 test, and its additivity with Tukey test. Independent t-test and one way ANOVA analyses were performed for the comparison of independent groups. Pearson correlation coefficient analysis was performed to compare the relationship between the data. The statistical significance level of the analyses was determined as $p<0.05$.

3. Results

3.1. Demographic characteristics

The study was completed with 421 individuals (41.8% male, 58.2% female). The ages of the individuals in the EFA, CFA and test-retest groups were 25.3±9.2, 27.1±8.9, and 25.7±8.8 respectively. The majority of individuals in all groups were university graduates and had normal BMI (23.7±2.9, 22.6±2.3, and 22.8±2.1 kg/m^2 respectively). The highest MEQ-total score was in the EFA group, and the highest EDE-Q-13 total score was in the CFA group (Table 1).

3.2. Content validity and construct validity

According to the evaluations of academicians, the CVR and CVI values of the scale were found to be 1. As a result of the KMO analysis, the sample size of the study was sufficient (KMO=0.860). In

Bartlett's Test of Sphericity, the correlation between the items was found to be significant ($\chi 2$=573.43, p<0.01).

In the EFA results, the factor loadings of the items were between 0.729 and 0.893. The extraction values of each item were above 0.3 (Williams et al., 2010). The responses given to the scale items were mostly in the "I agree" option and the total scores received were between 2.9±0.7 and 3.2±0.6. According to the factor structure, the scale was loaded on a single factor with an eigenvalue of 3.44. In the scree plot evaluation, the scale was also determined to have a single factor. The current factor explained 68.88% of the variance (Table 2, Fig).

The dimensional structure of GFS-A created with EFA was checked with CFA. The fit indices of the scale were found as $\chi 2$/sd=1.866, RMSEA=0.045, TLI=0.992, CFI=0.996, GFI=0.992, AGFI=0.975. According to the path analysis results based on CFA, the factor loadings of the items were between 0.57-0.88. The single-factor 5-item structure of the scale showed good fit (Table 3). According to the convergent validity results, AVE=0.689 and CR=0.917. In addition, a positive and significant relationship was found between GFS-A and MEQ-mindfulness scores (r=0.447 p<0.01). According to the results obtained, the Turkish validity of the scale was provided.

3.3. Reliability

After the validation of GFS-A in Turkish, Cronbach's *a* coefficient was checked for reliability. Cronbach's *a* value of the scale (0.856) was found to be excellent. Corrected item-total correlation values of all items were greater than 0.30. In the scale, if the items were deleted, Cronbach's α values ranged from 0.798 to 0.875 (Table 4). The responses given after the retest of the scale with 50 people were similar to the responses given at the beginning. The intraclass correlation coefficient between test-retest was found to be r=0.613 (p<0.01).

3.4. GFS-A, MEQ and EDE-Q-13 scores according to gender and BMI classification

There was no difference in the comparison of GFS-A total score between genders (p>0.05). Among the MEQ factors, emotional eating score was higher in women than in men (p<0.05). EDE-Q-13 total and bingeing scores were higher in men than in women (p<0.05). According to BMI classification, GFS-A and MEQ-mindfulness scores were higher in individuals with normal BMI than in individuals with obesity (p<0.05). MEQ-emotional eating, EDE-Q-13 body dissatisfaction, and binge eating scores were higher in individuals with obesity than in those with normal BMI (p<0.05) (Table 5).

The relationship between GFS-A, MEQ, and EDE-Q-13 scores was shown in Figure 2. The most significant relationship among MEQ factors was observed between MEQ-mindfullness and GFS-A ($r=0.447$, $p<0.01$). In addition, a positive significant relationship was found with MEQ-total ($r=0.166$, $p<0.01$), MEQ-controlled eating ($r=0.283$, $p<0.01$) and MEQ-emotional eating ($r=0.139$, $p=0.004$). When compared with EDE-Q-13, a negative significant relationship was found with EDE-Q-13 total ($r=-0.193$, $p<0.01$), bingeing ($r=-0.192$, $p<0.01$) and body dissatisfaction scores with GFS-A score (Table 5).

4. Discussion

Gratitude for food expresses a valuable concept that has a long history, as it reflects the respect felt for food, its producers, carriers and those who cook it (Kawasaki et al., 2024). In its holistic aspect, gratitude for food is a message we convey spiritually to the food we need for our survival and all stages of food production. In its physical aspect, it is a behavior that aims to protect and not waste food. With these aspects, it has become quite popular in recent years and supports the concepts of sustainability and mindfulness, which are necessary for all living things (Kawasaki et al., 2024; Krause, 2009). Family meals, traditional ceremonies, schools, and other educational institutions are among the places where food gratitude is taught. Additionally, the fact that gratitude for food has a place in many beliefs, applied in practice or rituals, shows that this behavior has timeless and global value (Septianto et al., 2020). The first scales for measuring gratitude for food were first developed by the Japanese for children (GFS) and then for adults (GFS-A) (Kawasaki et al., 2022; Kawasaki et al., 2024). This study aimed to evaluate the psychometric properties of the GFS-A for adults in Turkish society, where the concept of food gratitude is widespread both culturally and as a belief.

In the validity process of the Turkish adaptation of GFS-A, construct (EFA and CFA) and convergent validity were checked with analyses (Brown, 2015; Sürücü et al., 2022). As a result of EFA, the factor loadings of 5 items of the scale were found to be above the reference value of 0.40 and between 0.729-0.893. All items were loaded on a single factor as in the original scale (eigenvalue=3.44). The explained variance of the single-factor structure of the scale was 68.88%. The results obtained showed similar results with the original version (Kawasaki et al., 2024). However, the factor loadings of the items indicating gratitude towards people who cook and transport the food were found to be higher in the Turkish version (respectively; 0.848 and 0.893) than in the original (respectively; 0.690 and 0.860). This was an expected result since gratitude towards people who cook and transport the food is quite common in Turkish culture (Yüksel & Oguz Duran, 2012). Despite these results, the psychometric properties of the GFS-A in both cultures showed similar results. Since this scale, which is very new, has not been adapted to another language, the data obtained could not be compared with different versions other than the original.

The structure of the scale created with EFA was checked with CFA (Brown, 2015). The goodness of fit indices of the single factor structure showed appropriate values as in the original ($\chi 2/sd=1.866$, RMSEA=0.045, TLI=0.992, CFI=0.996, GFI=0.992, AGFI=0.975). For convergent validity, AVE (0.689) and CR (0.917) values of the scale factor were calculated and were found to be quite sufficient according to the reference values (AVE>0.50, CR>0.70) (Hair et al. 2019). In addition, for convergent validity, the MEQ-mindfulness factor, which is similar to GFS-A, was compared and a positive and statistically significant relationship was found ($r=0.447$ $p<0.01$). According to all these evaluations, the Turkish version of GFS-A showed high validity.

In the reliability assessment of GFS-A, Cronbach's *a* coefficient reflecting internal consistency was found to be 0.856. As a result of retesting the scale with 50 adults after 4 weeks, the intraclass correlation coefficient was found to be 0.613 ($p<0.01$). According to all these results, GFS-A was a reliable tool for Turkish adults. The Cronbach's *a* value of the original scale was 0.920, but retest evaluation for reliability was not performed on the original scale (Kawasaki et al., 2024).

The effect of gender on nutrition is affected by many factors and may show different results depending on the evaluated eating behavior (Grzymisławska et al., 2020). In this study, GFS-A score did not show any difference between genders ($p>0.05$). This was an expected result since food gratitude does not discriminate between genders and is expected from every individual in Turkish society. In the study conducted by Bozkurt et al. (2024), the interconnectedness factor of the mindful eating inventory (MEI), which includes items similar to GFS-A, also did not show a difference between genders ($p>0.05$) (Bozkurt et al. 2024). In MEQ and EDE-Q-13 tools, emotional eating score was higher in women, while EDE-Q-13 total and bingeing scores were higher in men ($p<0.05$). This is a result consistent with the literature, as emotional eating scores are higher in women and emotional fluctuations are greater (Bilici et al., 2020; Smith et al., 2020). However, the effect of gender shows different results in studies evaluating eating disorder behaviors such as bingeing (Ellis et al., 2020; Nagata et al., 2020).

According to BMI classification, GFS-A and mindfulness scores were higher in those with normal BMI, while emotional eating scores were higher in individuals with obesity ($p<0.05$). Studies have also shown that gratitude and mindfulness reduce obesity by reducing excessive food consumption with positive focused approaches (de Lara Perez & Delgado-Rios, 2022; Peitz et al., 2021). Such conscious practices provide an earlier satiety point as they give the person an opportunity to think about what and how much they eat (Peitz et al., 2021). Recent studies have also shown that gratitude and mindfulness practices protect against eating disorders by providing appetite control (Fritz et al., 2019; Kristeller, 2015). In this study, EDE-Q-13 total, body dissatisfaction, and bingeing scores were higher in individuals with obesity ($p<0.05$). This was a normal result due to increased food consumption and

obesity creating a vicious cycle with eating disorders. Other studies on the subject also found that body dissatisfaction and bingeing scores are higher in individuals with obesity (Weinberger et al., 2017). According to the results provided above, gratitude practices can help increase healthy eating habits through early satiety, appetite control, and reduced food intake. Integrating these practices into daily eating routines may be beneficial in reducing food waste and obesity.

This study has some limitations. The data obtained were collected web based. Web based data collection may have limited a wide and homogeneous sample size by increasing the participation of those with internet access and computer literacy and may have introduced selection bias. Although snowball sampling is useful for reaching a larger sample, it can be challenging to achieve a demographically homogeneous distribution. Although the survey was sent to people of all age groups, the participation rate was higher among younger people. This result may be due to the decrease in access and use of online tools with age and may limit the generalizability of the study to different age groups. BMI was calculated based on individuals' self-reported body weight and height. Despite these, the study has several strengths. In order to evaluate the responses of independent samples, EFA and CFA were performed with different groups in the validation process. The use of independent samples for EFA and CFA strengthened the reliability of the results by reducing the risk of oversimilarity the data. In addition to the content and construct validity, the scale was also evaluated with convergent validity which provided further support for the general validity of the GFS-A. In order to obtain a stronger result, reliability analysis was checked with the test-retest method. The online application of the survey provided participants from different places and a more homogeneous data set. In future studies evaluating nutritional status, the effect of food gratitude can be observed by comparing GFS-A with different tools and anthropometric measurements. The possible positive contents of food gratitude can be compiled, and these contents can be included in nutrition education processes.

5. Conclusion

According to the comprehensive content and construct validity results obtained, the GFS-A tool is valid for Turkish adults. Intraclass correlation coefficient between test-retest results (r=0.613) and Cronbach's *a* coefficient (0.856) results showed that adapted version of the GFS-A is reliable. As a result, the 5 item of GFS-A's adapted structure can be used to measure gratitude for food behavior. Comparison of GFS-A with current tools that include mindful eating, intuitive eating or sustainable nutrition may bring a different perspective to the food consumption-obesity relationship. In future studies, GFS-A can be compared with different tools to observe the effect of food gratitude, and based on the results obtained, food gratitude content can be integrated into nutrition education processes. The effect of GFS-A score on food consumption may reveal new solutions in reducing the prevalence of obesity.

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CRediT authorship contribution statement

U.O.Y: conceptualization; data collection; data analysis; methodology; visualization; draft writing, and editing. G.H: conceptualization; data collection, and editing. F.T: conceptualization; data collection, and editing. M.Y: methodology; data collection; data analysis, visualization; review and editing.

Data Availability

Study data can be obtained from the corresponding author upon appropriate request.

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Declaration of competing interest

The authors declare that they have no conflicts of interest.

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Psychometric properties of the gratitude for food scale among Turkish adults: a validity and reliability study

Abstract

This study aimed to adapt the Gratitude for Food Scale (GFS) into Turkish and evaluate the psychometric properties of the GFS for adults (GFS-A), considering the need for culturally sensitive and reliable tools. The study was conducted web-based with 421 adults (41.8% male, 58.2% female). Translation-back translation method was applied in language validity and pilot test (n=50) was performed to evaluate the clarity of the items. Then, construct (exploratory factor analysis (EFA; n=208) and confirmatory factor analysis (CFA; n=213)) validity and convergent validity were tested. In reliability analysis, Cronbach's α coefficient was calculated for internal consistency and test–retest method was applied. As a result of EFA, factor loadings of items in single factor structure were between 0.729 – 0.893 (variance explained=68.88%). According to CFA, fit indices (χ^2/sd=1.866, RMSEA=0.045, TLI=0.992, CFI=0.996, GFI=0.992, AGFI=0.975) were acceptable. Average variance extracted (AVE=0.689) and composite reliability (CR=0.917) were found to be sufficient for convergent validity. Cronbach's α coefficient (0.856) was highly reliable. According to test-retest analysis, intraclass correlation coefficient was found to be 0.613 ($p<0.01$). The Turkish version of GFS-A, with 5 items and one factor, is a valid and reliable tool to measure gratitude for food in Turkish adults.

Keywords: Eating behavior, gratitude for food, mindfulness, obesity.

1. Introduction

Recognizing the effort and resources that go into producing our meals is not just a matter of courtesy, this can significantly affect our eating habits and overall well-being. Therefore, our need for food to sustain life has long given rise to the concept of gratitude for these foods (Fritz et al., 2019). Gratitude, in its general sense, is a sincere feeling of thanks for a favor, gift, help or a good situation (Schlosser, 2015). The concept of gratitude, which has become more prevalent in our lives with the spread of mindful living practices, is associated with many diseases such as obesity, diabetes, hypertension, in addition to its cognitive aspect (Cousin et al., 2021; Fritz et al., 2019; Makhmur & Rath 2023).

Gratitude is a very old behavior in Western societies and different beliefs. In widespread religions such as Islam and Christianity, the teachings of being grateful for food, preserving it, and not wasting it are frequently repeated with religious rituals (Krause, 2009). This education, which first begins in the family and school, is reinforced with the practices of being respectful of food and not leaving food on the plate. Religious fasting rituals performed to respect food are other type of gratitude practices in adulthood (Brumberg-Kraus, 2020). It has been shown in many different studies that these rituals have a preventive role in diseases such as obesity, hypertension, and hyperlipidemia (Hammoud et al., 2021; Hassanein et al., 2022; Zouhal et al., 2020). The origin of intermittent fasting and mindful eating practices, which are especially popular nutrition trends in recent years, is also based on gratitude for food (Ring et al., 2022). Also, gratitude for food may promote healthy eating habits by increasing awareness of the value of food and fostering an appreciation for the effort involved in its preparation (Kawasaki et al. 2024).

Gratitude towards food refers to the feeling of gratitude for both the food itself and those who contributed to its production, transportation, and preparation (Kawasaki et al., 2024). First, a scale was developed on gratitude for food in a study conducted by Akamatsu and Izuchi et al. (2009) on children in Japan (Akamatsu & Izuchi, 2009). Later, Kawasaki et al. developed the revised form of the scale for adults. In Japan, where Buddhism and Shintoism are widespread, gratitude for food is a very old belief in accordance with Asian culture. In this belief, it is assumed that foods (such as fruits, vegetables, and meat) are also alive and that food sacrifices its own life for the continuation of human life (Kawasaki et al., 2024). For this reason, preventing food waste and being grateful for the food are common teachings taught from childhood (Akamatsu & Izuchi, 2009). In different studies, it has been shown that gratitude towards food prevents food waste and reduces the rate of obesity (Kawasaki & Akamatsu, 2022).

Gratitude can also play a protective role against behavioral disorders by increasing psychological well-being with its positive and conscious approaches. Food gratitude increases the compassionate

approach towards both food and our body with its spiritual satisfaction and enlightenment (Kawasaki et al., 2024; Krause, 2009). It keeps away from eating disorders such as binge eating, purging, etc. by increasing positive behaviors and focus. It has been shown in studies that gratitude behaviors increase healthy eating attitudes and reduce eating disorders (Boggiss et al., 2020; Fritz et al., 2019).

Although mindful eating practices are one aspect of gratitude, mindful eating inventories do not fully measure gratitude for food. The GFS-A, which was first developed in Japan by Kawasaki et al. and consists of one factor and five items, can subjectively assess gratitude for food for adults (Kawasaki et al., 2024). This study was conducted to determine the validity and reliability of the GFS-A by adapting it to Turkish adults. Thus, the cultural validity of the GFS-A in the Turkish population shall be ensured and its applicability shall increase.

2. Material and methods

2.1. Research design and sampling

This study was conducted with adults between July and December 2024. The survey form was prepared as web-based in order to reach out to more people and was sent to the individuals via Google forms. Participants were recruited using the snowball sampling method. Those who spoke native Turkish, were between the ages of 20-65, did not have internet access issues, and were competent to read and understand the online survey were included in the study. Those with psychiatric diseases that would affect the responses, those who gave incomplete or misleading answers in cross-questions were excluded from the study. The survey form was sent to a total of 600 people in two separate groups of 300 people each. The responses of a total of 421 people from both groups who responded in accordance with the inclusion and exclusion criteria were evaluated (Figure 1). In scale adaptation studies, it is recommended that the approximate sample size to be at least 5-10 times the number of scale items (Rouquette & Falissard, 2011). However, according to the literature, if the number of items in the scale is low, a sample of at least 200 people is more appropriate (Sürücü & Yıkılmaz, 2022). This study was completed with a total of 421 adults, covering the sampling conditions in the literature.

2.2. Data collection tools

The survey form of the research consisted of socio-demographic information, anthropometric measurements, Gratitude for Food Scale for Adults (GFS-A), Mindful Eating Questionnaire (MEQ), and Eating Disorder Examination Questionnaire (EDE-Q-13) items (Esin & Ayyıldız, 2022; Kawasaki et al., 2024; Köse et al., 2016).

2.2.1. Gratitude for food scale for adults (GFS-A)

GFS-A was developed by revising the Gratitude for Food Scale (GFS), developed for children by Japanese researchers, for adults (Akamatsu & Izuchi, 2009). GFS consists of 8 items with 2 factors: cognitive (5 items) and behavioral (3 items), and each item is scored between 1-4. In the adaptation process conducted by Kawasaki et al. (2024), the items in the scale were arranged for adults and 3 items were removed from the scale. GFS-A was adapted for Japanese adults as a single factor and 5 items. Each item is evaluated as strongly disagree, disagree, agree, and strongly agree. The mean score to be obtained from the scale is obtained by dividing it by the number of questions and is between 1-4. An increasing score indicates an increase in the gratitude for food. Cronbach's *a* value, which assesses the internal consistency of the scale, is 0.92 (Kawasaki et al., 2024).

2.2.2 Mindful eating questionnaire (MEQ)

The Mindful Eating Questionnaire (MEQ), originally developed by Framson et al. (2009), was adapted into Turkish by Köse et al. (2016). The scale consists of 30 items and 7 factors including disinhibition (unconscious eating), mindfulness, conscious eating, emotional eating, eating control, eating discipline and interference. Likert-type scale items are scored from 1 to 5 (1: never, 2: rarely, 3: sometimes, 4: often, 5: always). Items other than 1, 7, 9, 11, 13, 15, 18, 24, 25 and 27 are reverse scored. The total score is obtained by dividing the number of items. An increase in the score obtained from each factor on the scale indicates an increase in the relevant eating behavior. Cronbach's *a* coefficient value showing the internal consistency of the MEQ is 0.73 (Framson et al., 2009; Köse et al., 2016).

2.2.3 Eating disorder examination questionnaire (EDE-Q-13)

The original Eating Disorder Examination Questionnaire (EDE-Q-13), developed by Lev et al. (2021), was adapted into Turkish by Esin and Ayyıldız (2022). The scale consists of 13 items and 5 factors including eating restraint (ER), shape and weight over-evaluation (SWO), body dissatisfaction (BD), bingeing, and purging. Each item of the 7-point likert-type scale evaluating the last 28 days is scored between 0 and 6. EDE-Q-13 scoring is evaluated according to the total score of the items in the entire scale and each factor. Factor scores are calculated by dividing the number of items, while total score is calculated by dividing the number of factors. A high score indicates higher eating-related psychopathology. The Cronbach's *a* coefficient value showing the internal consistency of the EDE-Q-13 is 0.89 (Esin & Ayyıldız, 2022; Lev-Ari et al., 2021).

2.3.Anthropometric measurements

Individuals' body weight and height were recorded based on their self-reports. Body mass index (BMI) was calculated by dividing body weight (kg) by height (m) squared (kg/m2) and evaluated according to the World Health Organization (WHO) classification (Jan & Weir, 2021).

2.4.Procedure

2.4.1. The translation and adaptation process

Before the study, the necessary permission for the Turkish adaptation study was acquired from the developers of the original GFS-A scale via e-mail. The study was completed in 3 steps. Language validity was performed in the first step. In the adaptation process of GFS-A to Turkish, the translation-back translation method was used in accordance with the standard method. The scale was first translated from English to Turkish by academicians who are experts in their fields and who are fluent in English and Turkish (two from English Language and Literature, and five from Nutrition and Dietetics). The draft scale, which included the evaluation of each expert, was presented to the researchers and experts in the field of Nutrition and Dietetics to be checked in terms of semantics, consistency and grammar. The translated form of the scale was translated back into English by an expert committee consisting of academicians. The World Health Organization (WHO) recommends checking all forms of the scale after back translation (Ozolins et al., 2020). Accordingly, the translated items were sent to the expert committee to be evaluated together with the original. Using the Davis technique, the experts were asked to score each item between 1 and 4 by comparing the Turkish translated form of the scale with the original (1: not appropriate, 2: much correction, 3: little correction, 4: very appropriate) (Bobov & Capik, 2020). The necessary adjustments were made to the items according to the obtained scores and expert comments and the final form was given to the scale. A pilot test was conducted on a sample of 50 individuals to check the applicability of the scale. As a result of the testing process, it was determined that each item was understandable, and the total response time was approximately 3 minutes. The 50 individuals who were pilot tested were not included in the research sample.

In the second step, the construct validity of the scale was evaluated. For this purpose, the survey form was sent to 300 individuals for exploratory factor analysis (EFA). In adaptation studies, the number of samples is required to be 5-10 times the number of items in the scale. In cases where the number of items is low, such as GFS-A (total 5 items), at least 200 participants are recommended. In this study, EFA was completed with 208 individuals. Then, the dimensional structure created with EFA was

checked with confirmatory factor analysis (CFA). Since it would not be appropriate to test CFA with EFA sample, the survey form was sent to 300 different individuals for CFA. According to the answers obtained, the CFA of the research was completed with the participation of 211 individuals.

In the third step, the test-retest method was applied to control reliability. In this method, it is recommended that the retest be performed approximately 2-4 weeks later. Therefore, the scale was repeated with 50 people selected from the total sample pool after 4 weeks (Hänninen et al., 2021).

2.4.2. Content validity and construct validity

Content validity was performed using the Lawshe Technique based on the evaluation of the items in the draft scale by academicians. Content Validity Rate (CVR) and Content Validity Index (CVI) were calculated in accordance with the opinions of 5 academicians who are experts in the field of Nutrition and Dietetics. In the literature, it is required that CVR and CVI > 0.90 and for the evaluation of 5 people (Almanasreh et al., 2019). The construct validity of GFS-A was evaluated with exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). The number of factors was determined according to scree plot and factor structures. The adequacy of the sample size was tested with Kaiser-Meyer-Olkin (KMO) analysis. Bartlett's sphericity test was applied for the multivariate normal distribution assumption of the sample. KMO value ≥0.60 and Bartlett sphericity test significance level <0.05 were taken as reference. If the eigenvalue of the factor was over 1, the analysis was continued. The items with a factor load over 0.40 and an extraction value over 0.3 were evaluated. In the process of creating the theoretical structure with EFA, the varimax method was used to increase the factor load of each item (Williams et al., 2010).

Confirmatory Factor Analysis (CFA) tests the verification of the factor structure created by EFA and the model of the items loaded on these factors. As fit indices, chi-square/degree of freedom ($\chi 2$/df), root mean square error of approximation (RMSEA), Tucker–Lewis Index (TLI), comparative fit index (CFI), goodness of fit index (GFI), and adjusted goodness of fit index (AGFI) were performed with the maximum likelihood method. $\chi 2$/df value of <5, RMSEA values of <0.08, TLI, CFI, GFI, and AGFI values of >0.90 were considered acceptable (Brown, 2015).

For convergent validity, average variance extracted (AVE) and composite reliability (CR) values were examined. In order to ensure convergent validity, the CR value of the scale is expected to be greater than 0.70 and the AVE value is expected to be greater than 0.50 (Hair et al., 2019). In addition, the correlation of the mindfulness factor of the MEQ inventory, which has similar items to the GFS-A, with the GFS-A was also examined.

2.4.3. Reliability

To determine the internal consistency and reliability of the GFS-A, Cronbach's *a* coefficient was used. Cronbach's *a* coefficient of 0.60-0.79 is considered reliable and 0.80-1.00 is considered highly reliable (Chan and Idris 2017). In addition, the scale was re-applied to 50 individuals after 4 weeks by using the test-retest method to determine the intraclass correlation coefficient. The intraclass correlation coefficient between 0.50 and 0.75 was considered moderate and between 0.75 and 0.90 was considered good reliability (Koo & Li, 2016).

2.5.Data analysis

SPSS, AMOS and R programs were used in the analysis of the data. Descriptive variables were shown as numbers and percentages. In the validity analysis, exploratory factor analysis (EFA) was performed using the SPSS program, and the varimax rotation method was applied to enhance the factor loadings of the items. The structure derived from EFA was then tested using confirmatory factor analysis (CFA) with the AMOS program. In CFA, the fit of the model was evaluated with $\chi 2$/sd, root mean square of approximation (RMSEA), adjusted goodness of fit index (AGFI), goodness of fit index (GFI), comparative fit index (CFI), Tucker-Lewis index (TLI). In the reliability process, the internal consistency of the scale was evaluated with Cronbach's *a* coefficient and test-retest method. The impartiality of the scale was tested with Hotelling T2 test, and its additivity with Tukey test. Independent t-test and one way ANOVA analyses were performed for the comparison of independent groups. Pearson correlation coefficient analysis was performed to compare the relationship between the data. The statistical significance level of the analyses was determined as $p<0.05$.

3. Results

3.1. Demographic characteristics

The study was completed with 421 individuals (41.8% male, 58.2% female). The ages of the individuals in the EFA, CFA and test-retest groups were 25.3±9.2, 27.1±8.9, and 25.7±8.8 respectively. The majority of individuals in all groups were university graduates and had normal BMI (23.7±2.9, 22.6±2.3, and 22.8±2.1 kg/m^2 respectively). The highest MEQ-total score was in the EFA group, and the highest EDE-Q-13 total score was in the CFA group (Table 1).

3.2.Content validity and construct validity

According to the evaluations of academicians, the CVR and CVI values of the scale were found to be 1. As a result of the KMO analysis, the sample size of the study was sufficient (KMO=0.860). In Bartlett's Test of Sphericity, the correlation between the items was found to be significant ($\chi 2$=573.43, $p<0.01$).

In the EFA results, the factor loadings of the items were between 0.729 and 0.893. The extraction values of each item were above 0.3 (Williams et al., 2010). The responses given to the scale items were mostly in the "I agree" option and the total scores received were between 2.9±0.7 and 3.2±0.6. According to the factor structure, the scale was loaded on a single factor with an eigenvalue of 3.44. In the scree plot evaluation, the scale was also determined to have a single factor. The current factor explained 68.88% of the variance (Table 2, Fig).

The dimensional structure of GFS-A created with EFA was checked with CFA. The fit indices of the scale were found as $\chi 2$/sd=1.866, RMSEA=0.045, TLI=0.992, CFI=0.996, GFI=0.992, AGFI=0.975. According to the path analysis results based on CFA, the factor loadings of the items were between 0.57-0.88. The single-factor 5-item structure of the scale showed good fit (Table 3). According to the convergent validity results, AVE=0.689 and CR=0.917. In addition, a positive and significant relationship was found between GFS-A and MEQ-mindfulness scores ($r=0.447$ $p<0.01$). According to the results obtained, the Turkish validity of the scale was provided.

3.3. Reliability

After the validation of GFS-A in Turkish, Cronbach's *a* coefficient was checked for reliability. Cronbach's *a* value of the scale (0.856) was found to be excellent. Corrected item-total correlation values of all items were greater than 0.30. In the scale, if the items were deleted, Cronbach's α values ranged from 0.798 to 0.875 (Table 4). The responses given after the retest of the scale with 50 people were similar to the responses given at the beginning. The intraclass correlation coefficient between test-retest was found to be $r=0.613$ ($p<0.01$).

3.4. GFS-A, MEQ and EDE-Q-13 scores according to gender and BMI classification

There was no difference in the comparison of GFS-A total score between genders ($p>0.05$). Among the MEQ factors, emotional eating score was higher in women than in men ($p<0.05$). EDE-Q-13 total and bingeing scores were higher in men than in women ($p<0.05$). According to BMI classification, GFS-A and MEQ-mindfulness scores were higher in individuals with normal BMI than in individuals with

obesity ($p<0.05$). MEQ-emotional eating, EDE-Q-13 body dissatisfaction, and binge eating scores were higher in individuals with obesity than in those with normal BMI ($p<0.05$) (Table 5).

The relationship between GFS-A, MEQ, and EDE-Q-13 scores was shown in Figure 2. The most significant relationship among MEQ factors was observed between MEQ-mindfullness and GFS-A ($r=0.447$, $p<0.01$). In addition, a positive significant relationship was found with MEQ-total ($r=0.166$, $p<0.01$), MEQ-controlled eating ($r=0.283$, $p<0.01$) and MEQ-emotional eating ($r=0.139$, $p=0.004$). When compared with EDE-Q-13, a negative significant relationship was found with EDE-Q-13 total ($r=-0.193$, $p<0.01$), bingeing ($r=-0.192$, $p<0.01$) and body dissatisfaction scores with GFS-A score (Table 5).

4. Discussion

Gratitude for food expresses a valuable concept that has a long history, as it reflects the respect felt for food, its producers, carriers and those who cook it (Kawasaki et al., 2024). In its holistic aspect, gratitude for food is a message we convey spiritually to the food we need for our survival and all stages of food production. In its physical aspect, it is a behavior that aims to protect and not waste food. With these aspects, it has become quite popular in recent years and supports the concepts of sustainability and mindfulness, which are necessary for all living things (Kawasaki et al., 2024; Krause, 2009). Family meals, traditional ceremonies, schools, and other educational institutions are among the places where food gratitude is taught. Additionally, the fact that gratitude for food has a place in many beliefs, applied in practice or rituals, shows that this behavior has timeless and global value (Septianto et al., 2020). The first scales for measuring gratitude for food were first developed by the Japanese for children (GFS) and then for adults (GFS-A) (Kawasaki et al., 2022; Kawasaki et al., 2024). This study aimed to evaluate the psychometric properties of the GFS-A for adults in Turkish society, where the concept of food gratitude is widespread both culturally and as a belief.

In the validity process of the Turkish adaptation of GFS-A, construct (EFA and CFA) and convergent validity were checked with analyses (Brown, 2015; Sürücü et al., 2022). As a result of EFA, the factor loadings of 5 items of the scale were found to be above the reference value of 0.40 and between 0.729-0.893. All items were loaded on a single factor as in the original scale (eigenvalue=3.44). The explained variance of the single-factor structure of the scale was 68.88%. The results obtained showed similar results with the original version (Kawasaki et al., 2024). However, the factor loadings of the items indicating gratitude towards people who cook and transport the food were found to be higher in the Turkish version (respectively; 0.848 and 0.893) than in the original (respectively; 0.690 and 0.860). This was an expected result since gratitude towards people who cook and transport the food is quite common in Turkish culture (Yüksel & Oguz Duran, 2012). Despite these results, the psychometric

properties of the GFS-A in both cultures showed similar results. Since this scale, which is very new, has not been adapted to another language, the data obtained could not be compared with different versions other than the original.

The structure of the scale created with EFA was checked with CFA (Brown, 2015). The goodness of fit indices of the single factor structure showed appropriate values as in the original ($\chi 2/sd=1.866$, RMSEA=0.045, TLI=0.992, CFI=0.996, GFI=0.992, AGFI=0.975). For convergent validity, AVE (0.689) and CR (0.917) values of the scale factor were calculated and were found to be quite sufficient according to the reference values (AVE>0.50, CR>0.70) (Hair et al. 2019). In addition, for convergent validity, the MEQ-mindfulness factor, which is similar to GFS-A, was compared and a positive and statistically significant relationship was found ($r=0.447$ $p<0.01$). According to all these evaluations, the Turkish version of GFS-A showed high validity.

In the reliability assessment of GFS-A, Cronbach's *a* coefficient reflecting internal consistency was found to be 0.856. As a result of retesting the scale with 50 adults after 4 weeks, the intraclass correlation coefficient was found to be 0.613 ($p<0.01$). According to all these results, GFS-A was a reliable tool for Turkish adults. The Cronbach's *a* value of the original scale was 0.920, but retest evaluation for reliability was not performed on the original scale (Kawasaki et al., 2024).

The effect of gender on nutrition is affected by many factors and may show different results depending on the evaluated eating behavior (Grzymisławska et al., 2020). In this study, GFS-A score did not show any difference between genders ($p>0.05$). This was an expected result since food gratitude does not discriminate between genders and is expected from every individual in Turkish society. In the study conducted by Bozkurt et al. (2024), the interconnectedness factor of the mindful eating inventory (MEI), which includes items similar to GFS-A, also did not show a difference between genders ($p>0.05$) (Bozkurt et al. 2024). In MEQ and EDE-Q-13 tools, emotional eating score was higher in women, while EDE-Q-13 total and bingeing scores were higher in men ($p<0.05$). This is a result consistent with the literature, as emotional eating scores are higher in women and emotional fluctuations are greater (Bilici et al., 2020; Smith et al., 2020). However, the effect of gender shows different results in studies evaluating eating disorder behaviors such as bingeing (Ellis et al., 2020; Nagata et al., 2020).

According to BMI classification, GFS-A and mindfulness scores were higher in those with normal BMI, while emotional eating scores were higher in individuals with obesity ($p<0.05$). Studies have also shown that gratitude and mindfulness reduce obesity by reducing excessive food consumption with positive focused approaches (de Lara Perez & Delgado-Rios, 2022; Peitz et al., 2021). Such conscious practices provide an earlier satiety point as they give the person an opportunity to think about what and how much they eat (Peitz et al., 2021). Recent studies have also shown that gratitude and mindfulness

practices protect against eating disorders by providing appetite control (Fritz et al., 2019; Kristeller, 2015). In this study, EDE-Q-13 total, body dissatisfaction, and bingeing scores were higher in individuals with obesity ($p<0.05$). This was a normal result due to increased food consumption and obesity creating a vicious cycle with eating disorders. Other studies on the subject also found that body dissatisfaction and bingeing scores are higher in individuals with obesity (Weinberger et al., 2017). According to the results provided above, gratitude practices can help increase healthy eating habits through early satiety, appetite control, and reduced food intake. Integrating these practices into daily eating routines may be beneficial in reducing food waste and obesity.

This study has some limitations. The data obtained were collected web based. Web based data collection may have limited a wide and homogeneous sample size by increasing the participation of those with internet access and computer literacy and may have introduced selection bias. Although snowball sampling is useful for reaching a larger sample, it can be challenging to achieve a demographically homogeneous distribution. Although the survey was sent to people of all age groups, the participation rate was higher among younger people. This result may be due to the decrease in access and use of online tools with age and may limit the generalizability of the study to different age groups. BMI was calculated based on individuals' self-reported body weight and height. Despite these, the study has several strengths. In order to evaluate the responses of independent samples, EFA and CFA were performed with different groups in the validation process. The use of independent samples for EFA and CFA strengthened the reliability of the results by reducing the risk of oversimilarity the data. In addition to the content and construct validity, the scale was also evaluated with convergent validity which provided further support for the general validity of the GFS-A. In order to obtain a stronger result, reliability analysis was checked with the test-retest method. The online application of the survey provided participants from different places and a more homogeneous data set. In future studies evaluating nutritional status, the effect of food gratitude can be observed by comparing GFS-A with different tools and anthropometric measurements. The possible positive contents of food gratitude can be compiled, and these contents can be included in nutrition education processes.

5. Conclusion

According to the comprehensive content and construct validity results obtained, the GFS-A tool is valid for Turkish adults. Intraclass correlation coefficient between test-retest results ($r=0.613$) and Cronbach's *a* coefficient (0.856) results showed that adapted version of the GFS-A is reliable. As a result, the 5 item of GFS-A's adapted structure can be used to measure gratitude for food behavior. Comparison of GFS-A with current tools that include mindful eating, intuitive eating or sustainable nutrition may bring a different perspective to the food consumption-obesity relationship. In future studies, GFS-A can be compared with different tools to observe the effect of food gratitude, and based on the results obtained, food gratitude content can be integrated into nutrition education processes. The

effect of GFS-A score on food consumption may reveal new solutions in reducing the prevalence of obesity.

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CRediT authorship contribution statement

U.O.Y: conceptualization; data collection; data analysis; methodology; visualization; draft writing, and editing. G.H: conceptualization; data collection, and editing. F.T: conceptualization; data collection, and editing. M.Y: methodology; data collection; data analysis, visualization; review and editing.

Data Availability

Study data can be obtained from the corresponding author upon appropriate request.

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Declaration of competing interest

The authors declare that they have no conflicts of interest.

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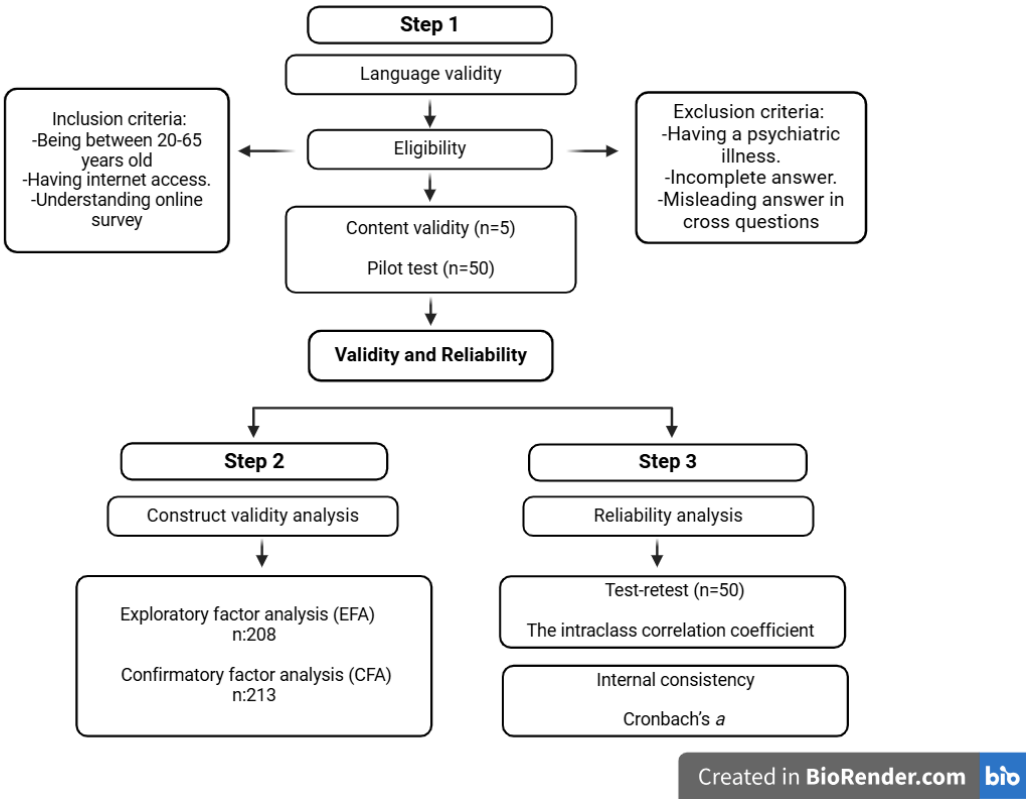


Figure 1. Flowchart followed in determining the psychometric properties of the GFS-A

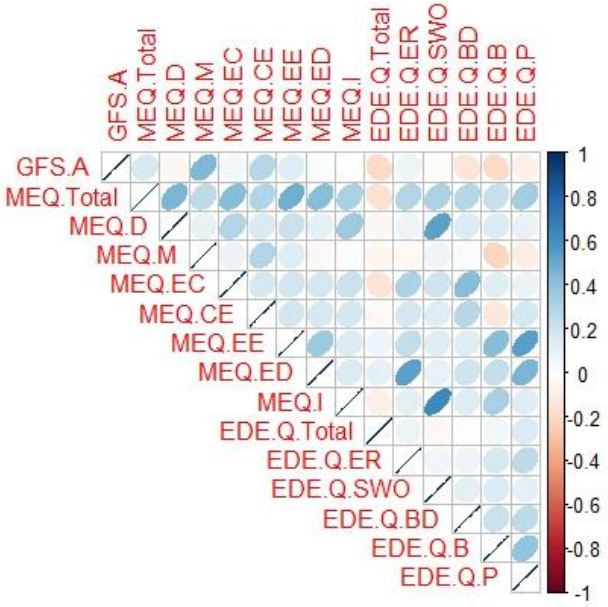
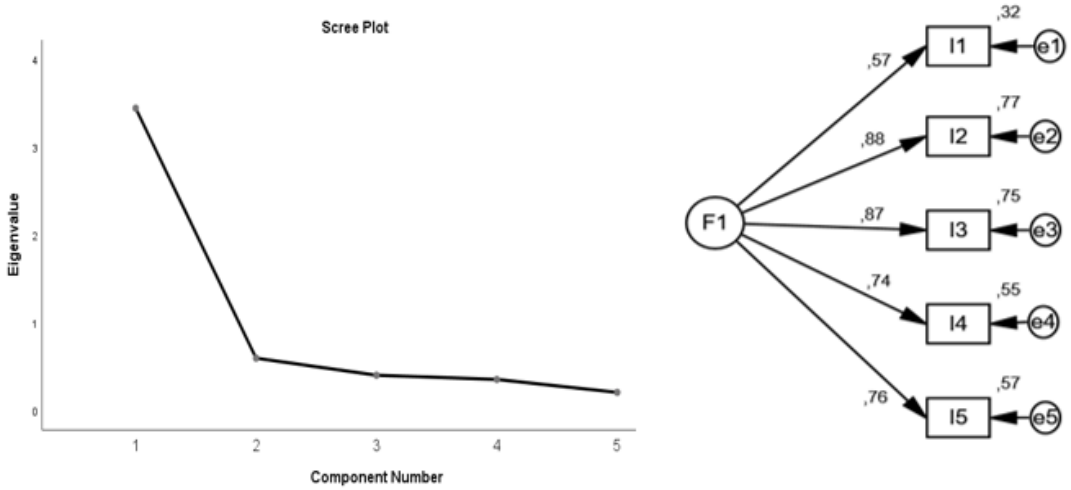


Figure 2. Correlations of GFS-A, MEQ, and EDE-Q-13 factor scores. GFS-A: Gratitute for Food Scale for Adults. MEQ: Mindful Eating Questionairre (D; disinhibition, EE; emotional eating, EC; eating control, CE; conscious eating, M; mindfulness, ED; eating discipline, I; interference. EDE-Q-13: Eating Disorder Examination Questionnaire (ER; eating restraint, SWO; shape and weight over-evaluation, BD; body dissatisfaction, B; bingeing, P; purging).



a) b)

Figure 3. a) Scree plot of the exploratory factorial analysis of the GFS-A. b) Path diagram of the confirmatory factorial analysis.

Table 1. Demographic characteristics of EFA, CFA, and test-retest sample groups

	Sample group of EFA (n=208)		**Sample group of CFA (n=213)**		**Sample group of test-retest (n=50)**	
	n (%)	**mean±sd**	**n (%)**	**mean±sd**	**n (%)**	**mean±sd**
Age (years)		25.3±9.2		27.1±8.9		25.7±8.8
Gender						
Men	87 (41.8)		96 (45.0)		20 (40.0)	
Women	121 (58.2)		117		30 (60.0)	
Education level						
Elementary school	14 (6.7)		15 (7.1)		5 (10.0)	
High school	47 (32.6)		45 (31.1)		9 (18.0)	
University+	147 (60.7)		153 (61.8)		36 (72.0)	
BMI (kg/m2)		23.7±2.9		22.6±2.3		22.8±2.1
Normal	135 (64.9)		141 (66.2)		39 (78.0)	
Overweight	44 (21.2)		39 (18.3)		8 (16.0)	
Obese	29 (13.9)		33 (15.5)		3 (6.0)	
MEQ total score		3.6±3.3		3.4±3.0		3.2±2.7
EDE-Q-13 total score		**3.7**±0.3		3.8±0.3		3.6±0.6

Tablo 2. GFS-A item responses and factor analysis results of the EFA sample (n=208)

	Score	**Item responses n (%)**				**Factor loadings**	**Extraction Value**
Items	*mean±sd*	*Strongly disagree (1)*	*Disagree (2)*	*Agree (3)*	*Strongly agree (4)*		
1. When I eat food, I feel grateful for the food I eat.	3.0±.06	5 (2.4)	22 (10.6)	134 (64.4)	47 (22.6)	0.729	0.532
2. When I eat food, I feel gratitude towards the people who transported the food.	3.0±.06	5 (2.4)	30 (14.4)	127 (61.1)	46 (22.1)	0.893	0.798
3. When I eat food, I feel gratitude towards the fact that my meals exist thanks to many people's efforts.	3.0±0.6	4 (1.9)	27 (13.0)	125 (60.1)	52 (25.0)	0.882	0.778
4. When I eat food, I feel gratitude towards the food producers.	2.9±0.7	12 (5.8)	35 (16.8)	122 (58.7)	39 (18.8)	0.786	0.618
5. When I eat food, I feel gratitude towards the people who cooked my meals.	3.2±0.6	4 (1.9)	9 (4.3)	121 (58.2)	74 (35.6)	0.848	0.719
Eigenvalue						3.44	
Variance explained (%)						68.88	

Table 3. The fit statistics of the GFS-A according to confirmatory factor analysis

Fit statistic	GFS-T fit indices	Original	Criteria
χ^2/sd	1.866	-	<5
RMSEA	0.045	0.09	<0.08
TLI	0.992	-	>0.90
CFI	0.996	0.99	>0·90
GFI	0.992	0.98	>0.90
AGFI	0.975	0.94	>0.90

RMSEA; root mean square error of approximation, TLI; Tucker-Lewis index, CFI; comparative fit index, GFI; goodness of fit index, AGFI; adjusted goodness of fit index

Table 4. Item-total statistics and Cronbach's *α* values of the GFS-A

Item	Corrected item- Total correlation	Cronbach's *α* if item deleted	Cronbach's *α*
1.	0.474	0.875	
2.	0.777	0.798	
3.	0.762	0.803	0.856
4.	0.714	0.816	
5.	0.651	0.832	
The intraclass correlation coefficient = 0.613			

Table 5. Total and factor scores of GFS-A, MEQ, and EDE-Q-13 by gender and BMI classification

	Gender			BMI classification			
	Men	Women	p	Normal	Overweight	Obese	p
GFS-A total score	3.1±0.6	3.1±0.5	0.312	3.5±0.5	3.1±0.6	3.0±0.7	0.001*†
MEQ total score	3.7±0.2	3.7±0.3	0.058	3.7±0.3	3.7±0.2	3.8±0.3	0.834
Disinhibition	3.8±0.4	3.9±0.4	0.935	3.8±0.4	3.9±0.4	3.9±0.5	0.533
Emotional eating	4.1±0.4	4.2±0.5	0.035	4.0±0.5	4.1±0.5	4.5±0.5	0.001†‡
Eating control	3.9±0.5	3.9±0.5	0.902	3.9±0.5	3.9±0.4	4.0±0.6	0.728
Conscious eating	3.4±0.4	3.3±0.4	0.202	3.4±0.4	3.4±0.3	3.4±0.5	0.628
Mindfulness	3.9±0.5	4.0±0.5	0.822	4.3±0.4	3.8±0.5	3.9±0.6	0.015*†
Eating discipline	3.2±0.7	3.1±0.6	0.080	3.2±0.7	3.2±0.8	3.1±0.6	0.848
Interference	4.0±0.5	3.9±0.6	0.773	3.9±0.6	3.9±0.6	3.8±0.4	0.551
EDE-Q-13 total score	3.7±3.4	3.4±3.1	0.022	3.7±3.1	3.5±3.1	4.0±3.7	0.731
ER	3.7±0.5	3.6±0.5	0.323	3.6±0.5	3.7±0.4	3.7±0.5	0.097
SWO	4.0±0.6	4.0±0.6	0.552	4.0±0.6	4.0±0.6	3.9±0.5	0.707
BD	3.5±0.7	3.4±0.6	0.817	3.3±0.7	3.4±0.7	4.0±0.6	0.012‡
Bingeing	4.1±0.5	3.9±0.6	0.020	3.9±0.5	3.8±0.5	4.4±0.7	0.025‡
Purging	3.3±0.6	3.2±0.6	0.220	3.2±0.7	3.2±0.6	3.4±0.5	0.404

GFS-A: Gratitute for Food Scale for Adults. MEQ: Mindful Eating Questionairre. EDE-Q-13: Eating Disorder Examination Questionnaire (ER; eating restraint, SWO; shape and weight over-evaluation, BD; body dissatisfaction). *Normal x Obese group; †Normal x Overweight group; ‡Overweight x Obese group.

Implications for gastronomy

Gratitude for food represents an old and important concept. Being able to embody this concept can make it easier to measure our attitudes towards foods that are considered sacred in many cultures. Measuring gratitude for food from a gastronomic perspective also makes it easier to compare this concept across cultures. In this study, the Turkish adaptation of GFS-A and the demonstration of its psychometric properties revealed the approach of gratitude towards food in Turkish culture. At the same time, GFS-A supports the concepts of sustainability and awareness, which have become quite popular in recent years and are necessary for all living things. In this respect, observing the effect of gratitude for food on sustainable nutrition can increase the possibility of waste management in gastronomic environments where food waste is high.

Declaration of interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Ethics Statement

Before the study, the necessary ethical approval (approval number: TBAEK-553) was obtained from Akdeniz University Faculty of Medicine Clinical Research Ethics Committee. Individuals were informed about the study and their consent was obtained before participation. The research was conducted and completed in accordance with the provisions of the Ethical Principles of the Declaration of Helsinki.

CRediT authorship contribution statement

U.O.Y: conceptualization; data collection; data analysis; methodology; visualization; draft writing, and editing. G.H: conceptualization; data collection, and editing. F.T: conceptualization; data collection, and editing. M.Y: methodology; data collection; data analysis, visualization; review and editing.