Nor. Afr. J. Food Nutr. Res. 2024; Vol. 8, No. 18, 217–228

https://doi.org/10.51745/najfnr.8.18.217-228

AfAc Publisher
With Knowledge We Publish

ORIGINAL ARTICLE

Nutrition Education and Dietetics | Infant, Child, and Adolescent Nutrition

Sex and income level can be determinants for meat attachment behavior among Turkish university students

Elif Günalan [1,2], **Ayhan Parmaksiz** [3], **Hayrettin Mutlu** [1]

[1] İstanbul Health and Technology University, Faculty of Health Science, Department of Nutrition and Dietetics. İstanbul, Türkiye elif.gunalan@istun.edu.tr / hayrettin.mutlu@istun.edu.tr

[2] İstanbul Health and Technology University, Institute of Graduate Education, İstanbul, Türkiye

[3] İstanbul Health and Technology University, Faculty of Medicine, Department of Bioistatistics. İstanbul, Türkiye ayhan.parmaksiz@istun.edu.tr

ABSTRACT

Background: The Meat Attachment Questionnaire (MAQ) is a scale to measure the positive bond in meat consumption.

Aims: This study aimed to validate and assess reliability of the Turkish version of the MAQ and to explore its relationship with various factors, including sociodemographic characteristics, meat consumption habits, and subscales of the Green Eating Survey (GES).

Subjects and Methods: The study was carried out with 214 university students. Participants completed the MAQ, the Food Frequency Questionnaire, and the GES. Statistical analyses including item analysis, Cronbach's alpha, intraclass correlation coefficient test - retest reliability, one-way ANOVA, Welch ANOVA, *t*-test, Pearson's correlation, and post hoc tests (Tukey's HSD and Games-Howell), were performed using SPSS (version 26). Confirmatory factor analysis (CFA) was conducted with the lavaan (version 0.6 – 13) and semPlot (version 1.1.6) R packages.

Results: All factor loadings were statistically significant, and high fit indices were obtained for the model tested in the second-order CFA model. (χ^2/df = 151,93/101 = 1.50; RMSEA = 0.05; SRMR = 0.08; NFI = 0.97; NNFI = 0.99; CFI = 0.99; GFI = 0.98; AGFI = 0.97). Significant differences were found in several MAQ subscale scores: hedonism, entitlement, dependence, and global scores were higher among men ($p < 0.05$). The entitlement score was significantly higher in the "income < expenses "group compared to the "income = expenses "group ($p < 0.05$). Participants with higher red meat and poultry consumption exhibited significantly higher hedonism, dependence, and global MAQ scores ($p < 0.05$).

Conclusions: The Turkish version of the MAQ can be accepted as a reliable and valid scale for use among university students. While factors such as sex, income level, and meat consumption appear to influence MAQ scores, body mass index and green eating behaviors do not have a direct effect.

Keywords: Green eating, meat, reliability, sustainability, validity.

ARTICLE INFORMATION

✉ **Corresponding author:** Elif Günalan
E-mail: elif.gunalan@istun.edu.tr / gunalanelif92@gmail.com
Tel. +90 (505 089 3812)

Received: July 05, 2024
Revised: August 16, 2024
Accepted: December 08, 2024
Published: December 08, 2024

Article edited by:
Prof. Khaled Méghit Boumédiène
Article reviewed by:
Dr. İsmail Hakkı Tekiner
Dr. Hatice Merve Bayram

Cite this article as: Günalan, E., Parmaksiz, A., Mutlu, H. C., (2024). Sex and income level can be determinants for meat attachment behavior among Turkish university students. *The North African Journal of Food and Nutrition Research, 8* (18): 217 – 228. https://doi.org/10.51745/najfnr.8.18.217-228

Supplemental material: https://doi.org/10.51745/najfnr.8.18.217-228.supp

1 Introduction

Meat is a vital component of a healthy and balanced diet due to its rich nutritional profile. In this context, meat provides essential nutrients, including iron, selenium, zinc, and vitamin B12, as well as highly bioavailable protein. Organ meats such as liver, are particularly rich in vitamin A and folic acid (Biesalski, 2005). In addition, meat and meat products contribute to the absorption of fatty acids and fat-soluble vitamins, helping to prevent deficiencies in these nutrients (Boada et al., 2016). On the other hand, red meat and processed meat products are high in saturated fats and cholesterol. Excessive consumption of these products has been associated with the development of various metabolic diseases, such as obesity, insulin resistance, type 2 diabetes, hypertension, atherosclerosis, metabolic syndrome, and certain cancers (Battaglia-Richi et al., 2015). Beyond health implications, excessive meat consumption negatively impacts environmental sustainability. The increasing global demand for meat has led to expanded livestock farming, land degradation, biodiversity loss, and the depletion of freshwater resources (Clonan et al., 2015; Meier et al., 2022; Reynolds et al., 2014).

Avoiding excessive use and degradation of natural resources and preserving biodiversity and ecosystems bring up a nutrition system defined as Green Eating (GE). High levels of meat consumption constitute a significant obstacle to achieving sustainable living (Clonan et al., 2015; Hallström et al., 2014; Meier et al., 2022; Pekcan, 2019; Reynolds et al., 2014). Numerous studies have explored the environmental impacts of meat consumption and the role of GE in promoting sustainable nutrition (Austgulen, 2014; Austgulen et al., 2018; Godfray et al., 2018; Lacroix, & Gifford, 2020; Mann, 2018; Macdiarmid et al., 2016; Önal et al., 2022; Sanchez-Sabate, & Sabaté, 2019). In this context, Tobler et al. (2011) determined that consumers perceived avoiding excessive packaging as the most effective behavior for environmental benefit while reducing meat consumption and purchasing organic food were deemed less impactful. Despite these perceptions, participants were reluctant to reduce their meat consumption or purchase organic food. In a study conducted by Jallinoja et al. (2016) vegetable protein sources remained less preferred than animal protein in several European countries. A web-based population survey conducted in Finland in 2013, involving participants aged 15 – 64 years (n = 1048), demonstrated that bean and soy-based plant proteins have been seldom consumed. In societies with high meat consumption, various strategies have been proposed to encourage the adoption of plant-based protein foods to foster sustainability.

Worldwide per capita meat consumption (kg/person/year) increased significantly from 23.1 kg in 1961 to 42.2 kg in 2011 (Sans & Combris, 2015). This situation can be attributed to the urbanization, improved income levels, and population growth in developing countries (Daniel et al., 2011). In Türkiye, the average daily red meat consumption is reported as 34.9 g/day for individuals aged 15 – 18 and 39.5 g/day for those aged 19 years and older (Türkiye Nutrition Guideline, 2022). Addressing the health and environmental challenges posed by excessive meat consumption requires identifying the personal and societal factors influencing meat consumption. The Meat Attachment Questionnaire (MAQ) serves as a valuable tool for evaluating individuals' psychological attachment to meat consumption (Graça et al., 2015). According to existing literature, factors such as sex, income level, meat consumption frequency, body mass index, and GE behavior are significant determinants of meat attachment behavior (Daniel et al., 2011; Rosenfeld et al., 2021). The relationship between meat attachment and GE behavior is particularly relevant in higher education participants such as university students, who are key drivers of dietary trends. Validating the Turkish version of MAQ offers an opportunity to explore the psychological dimensions of meat consumption among Turkish individuals, shedding light on barriers to sustainable nutrition. This includes the challenges posed by high meat consumption and unwillingness to adopting plant-based diets. The Turkish MAQ can serve as a foundational tool in future sustainable nutrition research to avoid meat attachment behavior (Graça et al., 2015). This study aimed to: (1) validate and address the reliability of the Turkish version of the MAQ; (2) explore its relationship with sociodemographic characteristics; (3), evaluate its association with meat consumption frequency; and (4) examine its correlation with scores from the Green Eating Survey (GES) among university students.

2 Methods

2.1 Study design

This cross-sectional survey study was carried out with university students aged 18 and above, adhering to the principles of the Declaration of Helsinki. The required sample size was determined based on the criterion of having 10 participants per questionnaire item. As the MAQ consists of 16 questions, the minimum required sample size was calculated to be 160 participants. To account for a potential 10% dropout rate, a minimum of 176 participants was deemed sufficient (Gündüzoğlu et al., 2014).

The adequacy of the n sample size was further confirmed using Hoelter's critical N, which determine the minimum sample size necessary for a specified level of statistical power in structural equation modeling (SEM). In this study, the Hoelter's critical N value indicates the minimum sample size at which the model's chi-square statistic reaches statistical significance at the desired power level. In our study, Hoelter's critical N was calculated to be 176.88 for 80% power at a 5% significance level. A total of 258 university students completed the data collection form. After excluding 44 surveys due to incomplete responses, data from 214 participants were analyzed. This sample size was sufficient to validate the model.

Ethical approval for the involvement of human subjects in this study was granted by Istanbul Esenyurt University Human Research Ethics Committee (reference number 2023 / 02 – 2, dated 26/01/2023). Informed consent was obtained from participants through the statement: "*I am aware that my responses are confidential, and I agree to participate in this survey*," with affirmative confirmation required to proceed. Participants were also assured of their right to withdraw from the survey at any time without providing a reason.

2.2 Study design

The data collection form constituted four parts are detailed as follows:

- **Sociodemographic Properties:** The participants' weight, marital status, height, sex, age, class grade, chronic disease status, use of medication, income level, accommodation, and nutritional status were addressed.

- **Meat Attachment Questionnaire (MAQ):** The MAQ was designed to assess consumers' willingness to reduce meat consumption and transition toward a plant-based diet. It is a 5 – point Likert scale questionnaire consisting of 16 items, measuring positive attachment to meat consumption. Response options range from 1 (strongly disagree) to 5 (strongly agree), with reverse scoring applied to items 4, 6, 9, 13, and 14 (for instance, 1 = 5; 2 = 4; 3 = 3; 4 = 2; 5 = 1). The MAQ evaluates four dimensions: *hedonism, affinity, entitlement, and dependence*. In addition, a second-order global score represents an overall measure of positive attachment to meat. Scores for each dimension and the global scale range from 1 to 5, with higher scores indicate higher levels of attachment toward meat consumption. Internal reliability analysis yielded Cronbach's alpha (CA) values of 0.77 – 0.90 for the factors and 0.92 for the global score (Graça et al., 2015).
- **Green Eating Survey (GES):** The GES evaluates environmentally conscious eating behaviors (BEH) and incorporates constructs from the GE transtheoretical model, including the *Stage of Change* (SOC), *Decisional Balance* (DB), and *Self-Efficacy* (SE). The survey consists of 25 items divided into four subscales, with Cronbach's alpha values ranging from 0.72 to 0.85 (Weller et al., 2014). The Turkish adaptation and validation of the GES were conducted by Cambaz et al. (2021), reporting CA values between 0.72 – 0.84.
- **Food Frequency Questionnaire (FFQ):** The FFQ was included to examine the relationship between meat consumption frequency and MAQ subscale scores. The participants were asked to report their consumption of specific foods, such as red meat and poultry, over the past 30 days. Frequency options included: *at least 5–6 times a week*, *3–4 times a week*, *1–2 times a week*, and *at most once every 15 days*.

3.3 Turkish adaptation protocol

The Turkish adaptation of the questionnaire was carried out following the standardized application procedure proposed by Brislin (1986). Initially, the questionnaire items were translated into Turkish by the primary researcher fluent in both languages. Subsequently, the translated items were back-translated into English by a team of independent academics proficient in both languages. This iterative translation process continued until the questionnaire was free of inconsistencies, errors, biases, or incompatibilities (Brislin, 1986).

3.4 Adaptation protocol

The cultural adaptation of MAQ was completed through a pilot study involving 20 university students. During this phase, participants confirmed that the questionnaire was clear and comprehensible. Minor modifications based on participant feedback were incorporated into the final version.

3.5 Test-retest procedure

To evaluate the test-retest reliability of the MAQ, a second application was conducted two weeks after the initial administration. This procedure involved a randomly selected subset of 40 participants from the original sample (Bakır et al., 2021).

3.6 Statistical analysis

Descriptive statistics were used to summarize the data: quantitative variables were reported as mean ($\bar{x}$), standard deviation (SD), minimum, and maximum values, while categorical variables were expressed as numbers (n) and percentages (%). One-way ANOVA, Welch's ANOVA, t-test, Tukey's Honest Significant Difference (HSD), and Games-Howell Post Hoc tests were used to compare MAQ and GES factors with sex, body mass index (BMI), income level, and meat consumption. Pearson's correlation analysis was performed to determine the correlation between MAQ and GES factors.

Reliability of the MAQ was assessed using CA coefficient, item analysis, and the intraclass correlation coefficient (ICC). CA was used to measure internal consistency, with the following interpretative ranges:

- $0.00 \leq \alpha < 0.40$: Unreliable
- $0.40 \leq \alpha < 0.60$: Low reliability
- $0.60 \leq \alpha < 0.80$: Reliable
- $0.80 \leq \alpha < 1.00$: Highly reliable

The ICC mainly evaluated test-retest reliability, with interpretative thresholds as follows:

- ICC < 0.5: Poor reliability
- 0.5 ≤ ICC < 0.75: Moderate reliability
- 0.75 ≤ ICC < 0.9: Good reliability
- ICC > 0.9: Excellent reliability (Koo & Li, 2016).

The construct validity of the questionnaire was tested using confirmatory factor analysis (CFA). Goodness-of-fit indices employed included:

- Chi-square difference statistics (χ^2/df)
- Root Mean Square Errors of Approximate (RMSEA)
- Standardized Root Mean Square Residuals (SRMR)
- Normed Fit Index (NFI)
- Non-Normed Fit Index (NNFI)
- Comparative Fit Index (CFI)
- Goodness of Fit Index (GFI)
- Adjusted Goodness of Fit Index (AGFI) (Akyüz, 2018).

Descriptive statistics, item analysis, CA, ICC test-retest reliability, one-way ANOVA, Welch ANOVA, t-test, Pearson's correlation, Tukey HSD, or Games-Howell Post

Hoc tests were performed using IBM SPSS (version 26). CFA was conducted using *lavaan* (version 0.6 – 13) and semPlot (version 1.1.6) packages in R. A *p*-value of < 0.05 was considered statistically significant.

3 Results

3.1 Characteristics of the study participants

The socio-demographic characteristics of participants are summarized in Table 1. Of the participants, 75.7% were female, and 24.3% were male. Among female participants, 96.9% were single, and 3.1% were married, whereas 98.1% of male participants were single, and 1.9% were married. In terms of BMI classification, 17.3% of the participants were underweight, 67.8% were within the normal range, 13.6% were overweight, and 1.4% were obese. Among females, the distribution was as follows: 18.5% underweight, 72.2% normal, 8% overweight, and 1.2% obese, while the distribution of male participants was 13.5% underweight, 53.8% normal, 30.8% overweight, and 1.9% obese. The mean age (± standard deviation) of female participants was 20.9 ± 2.6 years, while that of male participants was 20.6 ± 1.4 years. The mean BMI for females was 21.2 ± 3.5, and for males, 23.1 ± 3.8.

3.2 Validity and reliability of Turkish version of MAQ

The CA and ICC values of the MAQ factors are presented in Table 2. Accordingly, the CA values for the subscales of the questionnaire were as follows: hedonism (0.91), affinity (0.74), entitlement (0.76), dependence (0.83), and global score (0.91). In the test-retest reliability analysis, the ICC value for the subscales ranged from 0.78 – 0.92, except for one factor where the ICC value was below 0.5. The ICC value for the global score was 0.92, demonstrating excellent reliability.

Item analyses results for the MAQ factors are detailed in Supplemental Table S1. Among all item correlation data, the lowest value was observed for the fourth item in the global score group (0.32). When the fourth item was excluded, the CA value for the global score increased to 0.92, indicating improved internal consistency. The second-level measurement model statistics are summarized in Table 3 and

Table 2. CA and ICC values of Turkish version of MAQ

	CA	ICC
Hedonism	0.91	0.92
Affinity	0.74	0.45
Entitlement	0.76	0.78
Dependence	0.83	0.91
Global Score	0.91	0.92

Table 1. Sociodemographic characteristics of participants

	Female n(%)	Male n(%)	All Participants n(%)
Marrital Status			
- Single	157 (96.9)	51 (98.1)	208 (92.7)
- Married	5 (3.1)	1 (1.9)	6 (2.8)
Body Mass Index			
- Underweight	30 (18.5)	7 (13.5)	37 (17.3)
- Normal	117 (72.2)	28 (53.8)	145 (67.8)
- Overweight	13 (8)	16 (30.8)	29 (13.6)
- Obese	2 (1.2)	1 (1.9)	3 (1.4)
Income Level			
- Income = Expenses	79 (48.8)	23 (44.2)	102 (47.7)
- Income < Expenses	60 (37)	20 (38.5)	80 (37.4)
- Income > Expenses	23 (14.2)	9 (17.3)	32 (15)
Accommodation			
- Dormitory	27 (16.7)	14 (26.9)	41 (19.2)
- Family House	125 (77.2)	32 (61.5)	157 (73.4)
- Student House with Friends	7 (4.3)	4 (7.7)	11 (5.1)
- Alone	3 (1.9)	2 (3.8)	5 (2.3)
Nutrition Status			
- Omnivorous	152 (93.8)	50 (96.2)	202 (94.4)
- Semi-vegetarian	8 (4.9)	2 (3.8)	10 (4.7)
- Ovo-vegeterian	0 (0)	0 (0)	0 (0)
- Pescatarian	1 (0.6)	0 (0)	1 (0.5)
- Vegetarian	1 (0.6)	0 (0)	1 (0.5)

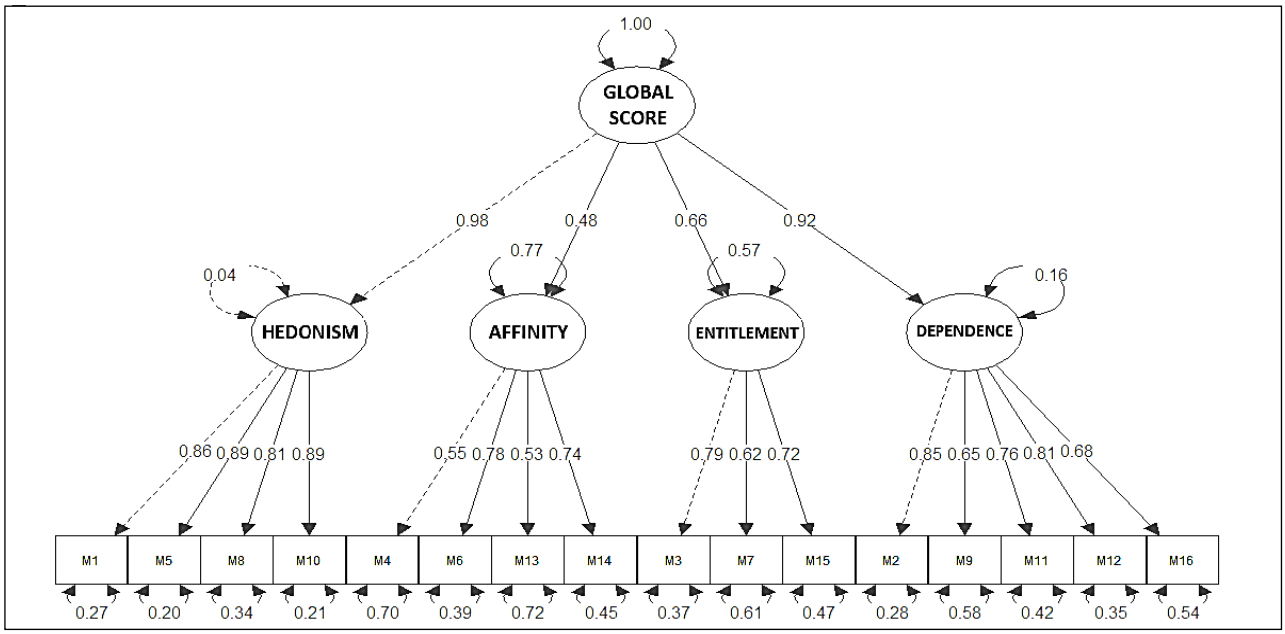

Figure 1. Second-order confirmatory factor analysis

illustrated in Figure 1. All factor loadings were statistically significant, and the model demonstrated high goodness-of-fit indices: χ^2/df = 1.50, RMSEA = 0.05, SRMR = 0.08, NFI = 0.97, NNFI = 0.99, CFI = 0.99, GFI = 0.98, and AGFI = 0.97).

3.3 Relationship between meat consumption frequency and MAQ factors

Participants with higher frequencies of red meat and poultry consumption demonstrated significantly higher scores in the *hedonism*, *dependence*, and *global* subscales of the MAQ (p < 0.05). Specifically, participants who consumed red meat at least 5 – 6 times a week exhibited significantly higher *hedonism* and *global* scores compared to those who consumed red meat 1 – 2 times a week or once every 15 days at most (p < 0.05). Additionally, *dependence* scores were significantly higher among participants consuming red meat at least 5 – 6 times per week compared to those consuming red meat 1 – 2 times per week (p < 0.05). Participants who consumed red meat once every 15 days at most had significantly lower *affinity* score than all other groups. For poultry consumption, participants who consumed poultry once every 15 days at most demonstrated significantly lower *hedonism*, *dependence*, and *global* scores compared to participants who consumed poultry at least 5 – 6 times per week and 3 – 4 times per week (p < 0.05) (Table 4).

3.4 Comparison of MAQ factors by groups of sex, BMI, and income level

The MAQ factors were compared across groups based on sex, BMI, and income level. Accordingly, Male participants exhibited significantly higher *hedonism*, *entitlement*, *dependence*, and *global* scores compared to female participants (p < 0.05) (Table 5). Regarding income level, participants whose expenses exceeded their income (*income* < *expenses*) exhibited significantly higher *entitlement* scores than those whose income equaled their expenses (*income* = *expenses*) (p < 0.05).

3.5 Relationship between GES and MAQ

The GES scales were compared by sex, BMI, and income level. Accordingly, the DB_Pros scores of female participants were significantly higher than that those of male participants (p < 0.05). No significant differences in GES scales were observed concerning BMI or income level (p > 0.05) (Supplemental Table S2).

Correlations between MAQ and GES scores were also examined. Although statistically significant differences were observed among various subscales of the questionnaire, no meaningful correlation was identified, as the correlation coefficients were below 0.2 (Table 6).

Table 3. Two-level measurement model statistics

	Estimate	Std. Err	z-value	P(>|z|)	Std. all	R-Square
Hedonism=~						
- @1	1.00	1.15	0.86	-	-	0.73
- @5	1.03	0.05	20.07	0.00	0.89	0.80
- @8	1.00	0.05	19.51	0.00	0.81	0.66
- @10	1.15	0.06	20.30	0.00	0.89	0.79
Affinity=~						
- @4	1.00	0.64	0.55			0.30
- @6	1.25	0.16	7.69	0.00	0.78	0.61
- @13	0.75	0.11	6.78	0.00	0.53	0.28
- @14	1.30	0.17	7.69	0.00	0.74	0.55
Entitlement=~						
- @3	1.00	0.83	0.79	-	-	0.63
- @7	1.00	0.08	11.95	0.00	0.62	0.39
- @15	1.05	0.09	12.31	0.00	0.73	0.53
Dependence=~						
- @2	1.00	1.15	0.85			0.72
- @9	0.68	0.04	16.58	0.00	0.65	0.42
- @11	0.94	0.05	19.25	0.00	0.76	0.58
- @12	1.09	0.06	19.53	0.00	0.81	0.65
- @16	0.87	0.05	17.93	0.00	0.68	0.46
Global Score=~						
- Hedonism	1.00	0.98	0.98	-	-	0.96
- Affinity	0.27	0.03	8.71	0.00	0.48	0.23
- Entitlement	0.48	0.03	14.97	0.00	0.66	0.43
- Dependence	0.94	0.05	17.37	0.00	0.92	0.84

Note. Estimation Method: Diagonally Weighted Least Squares; Model Fit Statistics: χ^2/df=1.50; RMSEA = 0.05; SRMR=0.08; NFI = 0.97; NNFI = 0.99; CFI = 0.99; GFI = 0.98; AGFI = 0.97; Hoelter's critical N (α = .05) =176.88.

Table 4. Comparison of MAQ factors by red meat and poultry consumption frequency

	Hedonism	Affinity	Entitlement	Dependence	Global Score
Red Meat					
- at least 5-6 times a week	4.07 ± 1.03 [a]	4.29 ± 0.69 [a]	4.14 ± 1.15	3.7 ± 0.88 [a]	4.05 ± 0.74 [a]
- 3 – 4 times a week	3.79 ± 1.09 [a, b]	4.4 ± 0.66 [a]	4.21 ± 0.96	3.39 ± 1.11 [a,b]	3.93 ± 0.8 [a,b]
- 1 – 2 times a week	3.39 ± 1.15 [b]	4.33 ± 0.77 [a]	3.93 ± 0.85	2.98 ± 0.97 [b,c]	3.63 ± 0.76 [b]
- 1 time in 15 days at most	2.74 ± 1.36 [c]	3.72 ± 1.07 [b]	3.72 ± 1.1	2.45 ± 1.28 [c]	3.15 ± 0.9 [c]
p-value	***< 0.001****	***0.005****	*0.110*	***< 0.001****	***< 0.001****
Poultry					
- at least 5 – 6 times a week	3.8 ± 1.15 [a]	4.33 ± 0.69 [a]	3.96 ± 1.17	3.55 ± 1 [a]	3.91 ± 0.78 [a]
- 3 – 4 times a week	3.78 ± 1.13 [a]	4.46 ± 0.64 [a,b]	4.16 ± 0.88	3.36 ± 1.08 [a,b]	3.92 ± 0.78 [a]
- 1 – 2 times a week	3.23 ± 1.19 [a,b]	4.13 ± 0.87 [a]	3.9 ± 0.95	2.83 ± 1.03 [b,c]	3.51 ± 0.8 [a,b]
- 1 time in 15 days at most	2.88 ± 1.45 [b]	3.72 ± 1.11 [a]	3.76 ± 1.16	2.56 ± 1.36 [c]	3.2 ± 0.98 [b]
p-value	***0.001****	***0.004****	*0.229*	***< 0.001****	***< 0.001****

Note. *Welch ANOVA

Table 5. Comparison of MAQ factors by groups of sex, BMI, and income level

	Hedonism	Affinity	Entitlement	Dependence	Global Score
Sex					
- Female (n=162)	3.26 ± 1.23	4.17 ± 0.87	3.91 ± 0.97	2.9 ± 1.11	3.54 ± 0.84
- Male (n=52)	4.07 ± 1.03	4.39 ± 0.71	4.24 ± 1	3.63 ± 1	4.06 ± 0.75
p-value	***< 0.001****	*0.10*	***0.03****	***< 0.001****	***< 0.001****
Body Mass Index					
- Underweight (n=37)	3.58 ± 1.12	4.25 ± 0.79	4.14 ± 0.91	3.18 ± 0.99	3.77 ± 0.75
- Normal (n=145)	3.44 ± 1.25	4.22 ± 0.83	3.97 ± 0.97	3.04 ± 1.15	3.65 ± 0.84
- Overweight + Obese (n=32)	3.39 ± 1.32	4.2 ± 0.93	3.86 ± 1.11	3.15 ± 1.2	3.65 ± 0.96
p-value	*0.78*	*0.96*	*0.51*	*0.72*	*0.73*
Income Level					
- Income < Expenses (n=80)	3.69 ± 1.25	4.27 ± 0.97	4.21 ± 0.98 [a]	3.3 ± 1.18	3.84 ± 0.89
- Income = Expenses (n=102)	3.27 ± 1.17	4.24 ± 0.7	3.85 ± 0.89 [b]	2.9 ± 1.04	3.56 ± 0.75
- Income > Expenses (n=32)	3.45 ± 1.33	4.09 ± 0.89	3.85 ± 1.18 [a,b]	3.09 ± 1.2	3.6 ± 0.96
p-value	*0.07*	*0.63*	***0.04****	*0,06*	*0.08*

Table 6. Pearson correlation between scales of GES and MAQ

	Hedonism		Affinity		Entitlement		Dependence		Global Score	
	r	p	r	p	r	p	r	p	r	p
SOC	-0.09	0.20	-0.13	0.06	-0.12	0.07	-0.03	0.67	-0.10	0.15
BEH	0.12	0.09	0.12	0.09	0.02	0.74	0.16*	0.02	0.14*	0.05
DB_Pros	-0.17*	0.01	-0.13	0.06	0.02	0.80	-0.18**	0.01	-0.15*	0.03
DB_Cons	-0.01	0.91	-0.02	0.73	0.11	0.09	0.06	0.36	0.04	0.51
SE_at school	0.06	0.36	-0.04	0.52	-0.10	0.13	0.10	0.13	0.02	0.73
SE_at home	-0.10	0.14	-0.02	0.75	-0.06	0.35	-0.08	0.22	-0.09	0.20

4 Discussion

To the best of our knowledge, this study holds unique significance, standing apart from existing literature by integrating reliability and validity assessments with the synthesis of meat attachment and green eating behavior. From this aspect, it represents an innovative contribution to current literature on sustainable nutrition and lifestyle. Accordingly, individuals with a strong attachment to meat may exhibit either low or high green eating scores. Furthermore, public awareness regarding the environmental impact of meat consumption remains insufficient. Nevertheless, individuals with a strong attachment to meat should not necessarily be viewed as obstacles to achieving a and fostering GE practices.

This study was involved 214 university students, of whom 75.7% were female and 24.3% were male. The development and validation of the original MAQ were conducted in three distinct stages. In the first stage, the structure and item pool of the questionnaire were designed based on qualitative data obtained from 410 participants. In the second stage, data were collected from 1023 participants to refine item selection, evaluate the factor structure, and assess reliability, convergent and concurrent validity, and predictive ability. At this stage, 57.8% of the participants were female, and 42.2% were male. Finally, the validated version of the questionnaire, along with other measures, was applied to assess measurement invariance, reliability, and predictive ability across a culturally diverse sample of 318 participants, comprising 58.2% males and 41.8% females (Graça et al., 2015).

In the original version of MAQ, the distribution of men and women was approximately balanced. However, in the Turkish version of the MAQ, there was a noticeable disparity in the sex distribution. The age distribution of the participants was between 18 and 72 in the study of Graça et al. (2015) while the age of participants was limited to 18 to

32 in the current study. On the other hand, in the third stage of the original study of the MAQ, 64.4% of all participants were university graduates, 28.1% were high school graduates, 7.6% were primary school graduates, and 7.2% participants were students (Graça et al., 2015). By contrast, all participants in the current study were university students. This difference is primarily attributable to the broader societal scope of the original study of Graça et al. (2015) compared to the current study, which focused exclusively on validating and testing the reliability of the Turkish version of the MAQ among university students.

The internal reliability analysis indicated that the Turkish version of the MAQ demonstrated high reliability. In this context, the global score CA value was 0.91, with factor-specific CA values ranging from 0.74 to 0.91. Similarly, in the second stage of the original MAQ study of Graça et al. (2015) the global score CA value was 0.92, and factor-specific CA values ranged from 0.77 to 0.92.

The ICC value of the entitlement factor was 0.78, indicating good reliability. Finally, the test-retest reliability ICC values for *hedonism*, *dependence*, and *global* scores exceeded 0.90, indicating excellent reliability. The reason why the ICC value for the entitlement factor may be attributed to the reverse scoring of the items within this factor, which may have caused confusion or misinterpretation among participants.

The goodness-of-fit index values of the Turkish version of the MAQ were consistent with those reported in the original study. In this context, while the χ^2/df value was 1.5 in the current study, compared to 2.3 in the second phase and 2.7 in the third phase of the Graça et al. (2015) study (χ^2/df ≤ 5 is considered as acceptable fit) (Schermelleh-Engel et al., 2003). Similarly, the RMSEA value was 0.05 in the present study, 0.05 in the second stage, and 0.06 in the third stage in the study of Graça et al. (2015) (RMSEA ≤ 0.08 is considered as acceptable fit). Finally, the CFI value in the current study was 0.99, compared to 0.97 in both the second and third phases of the original study (CFI ≥ 0.90 indicates an acceptable fit) (Hu & Bentler, 1999; Marsh et al., 2004; Vandenberg & Lance, 2000). Apart from the original study, several high fit index values were obtained (SRMR = 0.08; NFI = 0.97; NNFI = 0.99; GFI = 0.98; AGFI = 0.97). These data confirm that the Turkish version of the MAQ is a valid and reliable instrument for assessing meat attachment among Turkish-speaking populations.

Hedonism, *entitlement*, *addiction*, and *global* scores were statistically significantly higher among male participants compared to female participants (p <0.05). This finding aligns with the study by Rosenfeld & Tomiyama, (2021), which revealed that males are more likely to consume meat and exhibit higher resistance to adopting vegetarian diets than females. Similarly, research by Dowsett et al., (2018) indicated that exposure to meat during meal increased meat addiction in males while reducing it in females. Moreover, Rosenfeld, (2020) suggested that vegetarian women exhibit stronger dietary adherence and motivation compared to men. Meat consumption has traditionally been associated with masculine identity, often linked to the notion that consuming meat aligns with traditional sex roles, reinforcing the perception of being a "real" man.

In a Hungarian study involving 1053 participants, scores for *hedonism, affinity*, and *dependence* factors were significantly different across BMI groups (p < 0.05) for females (Dernóczy & Keller, 2017). However, in the present study, no significant differences were observed in MAQ factors or global scores across BMI groups. This discrepancy may be attributed to differences in the distribution of participants among BMI categories. Additionally, cultural variations may contribute in explaining these contradictions. In Western societies, most daily protein intake is derived from meat, whereas Turkish diets feature a higher proportion of plant-based proteins (Sanchez-Sabate & Sabaté, 2019; Önal et al., 2022). Consistent with this evidence, Turkish omnivorous cuisine has been reported to possess a lower carbon footprint compared to Italian and French cuisines (Üçtuğ et al., 2021). The relatively weak association between BMI and psychological parameters related to meat attachment in Türkiye may be explained by the lower overall levels of meat consumption in the population.

On the other hand, only the *entitlement* factor was significantly higher in the income<expenses group than in the income = expenses group (p <0.05). This situation indicates that low-income participants perceive themselves as having greater authority and rights regarding meat consumption. Similarly, previous studies have reported that individuals with lower income levels are less likely to adopt vegan or vegetarian diets (Tonstad et al., 2013; Cui et al., 2019; Önal et al., 2022).

In the current study, poultry and red meat consumption were strongly associated to MAQ factors and global scores. In this context, a higher frequency of meat consumption was statistically significantly associated with elevated MAQ scores (p < 0.05). These findings align with prior research (Dernóczy & Keller, 2017; Graça et al., 2015), which demonstrated that a strong preference for meat consumption is associated with high meat attachment scores. This significant association further supports the validity and reliability of the Turkish version of the MAQ among university students.

When comparing the GES scales across groups based on sex, BMI, and income level, the DB_Pros score was significantly higher in females than males (p < 0.05), consistent with results from Cambaz et al. (2021). Moreover, prior literature has frequently emphasized women' greater awareness and

preferences for environmentally friendly foods (Milfont & Sibley, 2016; Tobler et al., 2011; Xiao & McCright, 2015).

Notably, no significant correlation was observed between MAQ and GES scores in the current study. This lack of correlation may result from the homogeneity of the sample population, which consisted of university students with identical education background and age ranges. In addition, heterogeneity in variables such as sex, income level, and nutritional status, which are closely tied to GE behaviors, was limited. For instance, a clearer understanding of the relationship between meat consumption and GE may require comparative involving vegan and non-vegan populations. On the other hand, GR behavior is not only limited to consuming less meat but also consider various principles; it includes diverse practices such as minimizing packaged foods, prioritizing seasonal and locally sourced foods, reducing food transport, and purchasing organic products. Consistently, Lentz et al., (2018) demonstrated that meat consumption's contribution to GE was minimal compared to other behaviors. Therefore, meat attachment may not pose a significant barrier to GE behavior among Turkish university students.

Limitations of the study

Some limitations should be considered when interpreting the findings of this research. First, the present study relied on self-reported data, which depends on participants' recall and memory. There is a risk that some participants may not have read or fully understood the questions, contributing to significant statistical differences in inversely scored items during test-retest analyses.

Second, the sample's sex distribution was unequal, with a disproportionate number of female participants. This imbalance may have influenced findings related to meat consumption and GE behavior. Moreover, the study was conducted among university students, a group with relatively high social awareness, and the participants' age range was limited to 18 – 32 years. These factors restrict the generalizability of the findings to the broader adult population in Türkiye.

4 Conclusions

The Turkish version of the MAQ can be accepted as a reliable and valid tool for assessing meat attachment among university students. The findings indicate that sex, economic status, and meat consumption frequency are significant determinants of MAQ scores, whereas BMI and GE behavior do not directly influence these scores. This suggests that high MAQ scores do not inherently impede GE behavior. Nevertheless, sex and economic status should be considered when promoting sustainable eating behaviors within this population. In addition, factors such as cultural influences, circadian rhythms, emotional eating, and psychological states may also influence meat attachment. Further studies should explore these factors to provide a more comprehensive understanding of individual differences in meat consumption behavior.

Excessive meat consumption poses significant risks, not only as a potential environmental and sustainability but also as a factor accelerating the progression of chronic diseases. Early detection of such diseases is critical. Future research with the Turkish version of MAQ on meat consumption among university students, can incorporate molecular, biochemical, and epigenetic biomarkers to assess the risk of developing chronic diseases. This integrative approach would contribute to fostering healthier lifestyles and supporting sustainability for future generations by reducing risks associated with high meat attachment.

Acknowledgment: We were grateful to Burak Delibaş (Library Manager, İstanbul Health and Technology University) for language support.

Source of funding: This study has not been funded by any institution.

Previous submissions: A part of this research was presented at the 6th International Health Sciences and Lifestyle Congress under the title Turkish Validity and Reliability of Meat Attachment Questionnaire.

Authors' Contribution: Elif Günalan: Conceptualization, Methodology, Investigation, Resources, Writing-Original draft preparation. **Ayhan Parmaksız:** Data curation, Visualization, Software, Validation, Reviewing. **Hayrettin Mutlu:** Supervision and Reviewing

Conflicts of Interest: All authors declare that they have no conflicts of interest.

Preprint deposit: Authors did not share this manuscript as a preprint deposit.

References

Akyüz, H. E. (2018). Yapı Geçerliliği İçin Doğrulayıcı Faktör Analizi: Uygulamalı Bir Çalışma. *Bitlis Eren Üniversitesi Fen Bilimleri Dergisi*, *7*(2), 186–198. https://doi.org/10.17798/bitlisfen.414490 [Crossref] [Google Scholar] [Publisher]

Austgulen, M. H., Skuland, S. E., Schjøll, A., & Alfnes, F. (2018). Consumer readiness to reduce meat consumption for the purpose of environmental sustainability: Insights from Norway. *Sustainability*, *10*(9), 3058. https://doi.org/10.3390/su10093058 [Crossref] [Google Scholar] [Publisher]

Austgulen, M. H. (2014). Environmentally sustainable meat consumption: An analysis of the Norwegian public debate. *Journal of Consumer Policy*, *37*(1), 45–66. https://doi.org/10.1007/s10603-013-9246-9 [Crossref] [Google Scholar] [Publisher]

Bakır, B. O., Cebioğlu, İ. K., Günalan, E., & Bilgin, G. D. (2021). The association of fat preference with eating behavior and sex: Turkish version of the Fat Preference Questionnaire©. *Food Science & Nutrition*, *9*(5), 2754–2761. https://doi.org/10.1002/fsn3.2237 [Crossref] [PubMed] [Google Scholar] [Publisher]

Battaglia-Richi, E., Baumer, B., Conrad, B., Darioli, R., Schmid, A., & Keller, U. (2015). Health Risks Associated with Meat Consumption: A Review of Epidemiological Studies. *International journal for vitamin and nutrition research. Internationale Zeitschrift fur Vitamin- und Ernahrungsforschung. Journal International de Vitaminologie et de Nutrition*, *85*(1-2), 70–78. https://doi.org/10.1024/0300-9831/a000224 [Crossref] [PubMed] [Google Scholar] [Publisher]

Biesalski, H. K. (2005). Meat as a component of a healthy diet-are there any risks or benefits if meat is avoided in the diet? *Meat Science*, *70*(3), 509–524. https://doi.org/10.1016/j.meatsci.2004.07.017 [Crossref] [PubMed] [Google Scholar] [Publisher]

Boada, L. D., Henríquez-Hernández, L. A., & Luzardo, O. P. (2016). The impact of red and processed meat consumption on cancer and other health outcomes: Epidemiological evidences. *Food and Chemical Toxicology: An international journal published for the British Industrial Biological Research Association*, *92*, 236–244. https://doi.org/10.1016/j.fct.2016.04.008 [Crossref] [PubMed] [Google Scholar] [Publisher]

Brislin, R. W. (1986). The wording and translation of research instruments. In W. Lonner & J. Berry (Eds.), *Field Methods in Cross-Cultural Research* (pp. 137–164). Sage. [Google Scholar] [Publisher]

Cambaz, M. (2021). *Çevreye Duyarlı Beslenme Ölçeği'nin Türkçe Geçerlilik ve Güvenilirliği, Yüksek Lisans Tezi, Yeditepe Üniversitesi Sağlık Bilimleri Enstitüsü*.

Clonan, A., Wilson, P., Swift, J. A., Leibovici, D. G., & Holdsworth, M. (2015). Red and processed meat consumption and purchasing behaviours and attitudes: impacts for human health, animal welfare and environmental sustainability. *Public Health Nutrition*, *18*(13), 2446–2456. https://doi.org/10.1017/S1368980015000567 [Crossref] [PubMed] [Google Scholar] [Publisher]

Cui, X., Wang, B., Wu, Y., Xie, L., Xun, P., Tang, Q., Cai, W., & Shen, X. (2019). Vegetarians have a lower fasting insulin level and higher insulin sensitivity than matched omnivores: A cross-sectional study. *Nutrition, Metabolism, and Cardiovascular Diseases: NMCD*, *29*(5), 467–473. https://doi.org/10.1016/j.numecd.2019.01.012 [Crossref] [PubMed] [Google Scholar] [Publisher]

Daniel, C. R., Cross, A. J., Koebnick, C., & Sinha, R. (2011). Trends in meat consumption in the USA. *Public health nutrition*, *14*(4), 575–583. https://doi.org/10.1017/S1368980010002077 [Crossref] [PubMed] [Google Scholar] [Publisher]

Dernóczy, A., & Keller, V. (2017). A hússal szembeni attitűd a MAQ-skála alapján= Attitude towards meat based on MAQ scale, Élelmiszer, Táplálkozás és Marketing, 13(2), 3-8. https://doi.org/10.33567/etm.2289 [Crossref] [Google Scholar] [Publisher]

Dowsett, E., Semmler, C., Bray, H., Ankeny, R. A., & Chur-Hansen, A. (2018). Neutralising the meat paradox: Cognitive dissonance, gender, and eating animals. *Appetite*, *123*, 280–288. https://doi.org/10.1016/j.appet.2018.01.005 [Crossref] [PubMed] [Google Scholar] [Publisher]

Godfray, H. C. J., Aveyard, P., Garnett, T., Hall, J. W., Key, T. J., Lorimer, J., Pierrehumbert, R. T., Scarborough, P., Springmann, M., & Jebb, S. A. (2018). Meat consumption, health, and the environment. *Science (New York, N.Y.)*, *361*(6399), eaam5324. https://doi.org/10.1126/science.aam5324 [Crossref] [PubMed] [Google Scholar] [Publisher]

Graça, J., Calheiros, M. M., & Oliveira, A. (2015). Attached to meat? (Un)Willingness and intentions to adopt a more plant-based diet. *Appetite*, *95*, 113–125. https://doi.org/10.1016/j.appet.2015.06.024 [Crossref] [PubMed] [Google Scholar] [Publisher]

Gündüzoğlu, N. Ç., Fadıloğlu, Ç., & Yılmaz, C. (2014). Obezlere özgü yaşam kalitesi ölçeğinin geçerlilik ve güvenirliğinin incelenmesi, *Anadolu Psikiyatri Dergisi*, *15*, 63-68. https://doi.org/10.5455/apd.39822 [Google Scholar][Publisher]

Hallström, E., Röös, E., & Börjesson, P. (2014). Sustainable meat consumption: A quantitative analysis of nutritional intake, greenhouse gas emissions and land use from a Swedish perspective. *Food Policy*, *47*, 81–90. https://doi.org/10.1016/j.foodpol.2014.04.002 [Crossref] [Google Scholar] [Publisher]

Hu, L.-T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal*, *6*(1), 1–55. https://doi.org/10.1080/10705519909540118 [Crossref] [Google Scholar] [Publisher]

Jallinoja, P., Niva, M., & Latvala, T. (2016). Future of sustainable eating? Examining the potential for expanding bean eating in a meat-eating culture. *Futures*, *83*, 4–14. https://doi.org/10.1016/j.futures.2016.03.006 [Crossref] [Google Scholar] [Publisher]

Koo, T. K., & Li, M. Y. (2016). A Guideline of Selecting and Reporting Intraclass Correlation Coefficients for Reliability Research. *Journal of Chiropractic Medicine*, *15*(2), 155–163.

https://doi.org/10.1016/j.jcm.2016.02.012 [Crossref] [PubMed] [Google Scholar] [Publisher]

Lacroix, K., & Gifford, R. (2020). Targeting interventions to distinct meat-eating groups reduces meat consumption. *Food Quality and Preference*, *86*(103997), 103997. https://doi.org/10.1016/j.foodqual.2020.103997 [Crossref] [Google Scholar] [Publisher]

Lentz, G., Connelly, S., Mirosa, M., & Jowett, T. (2018). Gauging attitudes and behaviours: Meat consumption and potential reduction. *Appetite*, *127*, 230–241. https://doi.org/10.1016/j.appet.2018.04.015 [Crossref] [PubMed] [Google Scholar] [Publisher]

Macdiarmid, J. I., Douglas, F., & Campbell, J. (2016). Eating like there's no tomorrow: Public awareness of the environmental impact of food and reluctance to eat less meat as part of a sustainable diet. *Appetite*, *96*, 487–493. https://doi.org/10.1016/j.appet.2015.10.011 [Crossref] [PubMed] [Google Scholar] [Publisher]

Mann N. J. (2018). A brief history of meat in the human diet and current health implications. *Meat science*, *144*, 169–179. https://doi.org/10.1016/j.meatsci.2018.06.008 [Crossref] [PubMed] [Google Scholar] [Publisher]

Marsh, H. W., Hau, K.-T., & Wen, Z. (2004). In search of golden rules: Comment on hypothesis-testing approaches to setting cutoff values for fit indexes and dangers in overgeneralizing Hu and bentler's (1999) findings. *Structural Equation Modeling: A Multidisciplinary Journal*, *11*(3), 320–341. https://doi.org/10.1207/s15328007sem1103_2 [Crossref] [Google Scholar] [Publisher]

Meier, J., Andor, M. A., Doebbe, F. C., Haddaway, N. R., & Reisch, L. A. (2022). Review: Do green defaults reduce meat consumption? *Food Policy*, *110*(102298), 102298. https://doi.org/10.1016/j.foodpol.2022.102298 [Crossref] [Google Scholar] [Publisher]

Milfont, T. L., & Sibley, C. G. (2016). Empathic and social dominance orientations help explain gender differences in environmentalism: A one-year Bayesian mediation analysis. *Personality and Individual Differences*, *90*, 85–88. https://doi.org/10.1016/j.paid.2015.10.044 [Crossref] [Google Scholar] [Publisher]

Önal, H. Y., Yüksel, A., Parmaksız, A., & Alpat, İ. (2022). Meat Consumption and Sustainability in Turkey. *Kahramanmaraş Sütçü İmam Üniversitesi Tarım ve Doğa Dergisi*, *25*, 1423–1433. https://doi.org/10.18016/ksutarimdoga.vi.992371 [Crossref] [Google Scholar] [Publisher]

Pekcan, A. G. (2019). Sürdürülebilir beslenme ve beslenme örüntüsü: bitkisel kaynaklı beslenme. *Beslenme ve Diyet Dergisi*, *47*, 1–10. [Crossref] [Google Scholar] [Publisher]

Reynolds, C. J., Buckley, J. D., Weinstein, P., & Boland, J. (2014). Are the dietary guidelines for meat, fat, fruit and vegetable consumption appropriate for environmental sustainability? A review of the literature. *Nutrients*, *6*(6), 2251–2265. https://doi.org/10.3390/nu6062251 [Crossref] [PubMed] [Google Scholar] [Publisher]

Rosenfeld, D. L. (2020). Gender differences in vegetarian identity: How men and women construe meatless dieting. *Food Quality and Preference*, *81*(103859), 103859. https://doi.org/10.1016/j.foodqual.2019.103859 [Crossref] [Google Scholar] [Publisher]

Rosenfeld, D. L., & Tomiyama, A. J. (2021). Gender differences in meat consumption and openness to vegetarianism. *Appetite*, *166*(105475), 105475. https://doi.org/10.1016/j.appet.2021.105475 [Crossref] [PubMed] [Google Scholar] [Publisher]

Sanchez-Sabate, R., & Sabaté, J. (2019). Consumer attitudes towards environmental concerns of meat consumption: A systematic review. *International Journal of Environmental Research and Public Health*, *16*(7), 1220. https://doi.org/10.3390/ijerph16071220 [Crossref] [PubMed] [Google Scholar] [Publisher]

Sans, P., & Combris, P. (2015). World meat consumption patterns: An overview of the last fifty years (1961–2011). *Meat Science*, *109*, 106–111. https://doi.org/10.1016/j.meatsci.2015.05.012 [Crossref] [PubMed] [Google Scholar] [Publisher]

Schermelleh-Engel, K., Moosbrugger, H., & Müller, H. (2003). Evaluating the fit of structural equation models: Tests of significance and descriptive goodness-of-fit measures. *Methods of Psychological Research Online*, *8*(2), 23–74. https://doi.org/10.23668/psycharchives.12784 [Crossref] [Google Scholar] [Publisher]

Tobler, C., Visschers, V. H. M., & Siegrist, M. (2011). Eating green. Consumers' willingness to adopt ecological food consumption behaviors. *Appetite*, *57*(3), 674–682. https://doi.org/10.1016/j.appet.2011.08.010 [Crossref] [PubMed] [Google Scholar] [Publisher]

Tonstad, S., Stewart, K., Oda, K., Batech, M., Herring, R. P., & Fraser, G. E. (2013). Vegetarian diets and incidence of diabetes in the Adventist Health Study-2. *Nutrition, Metabolism, and Cardiovascular Diseases: NMCD*, *23*(4), 292–299. https://doi.org/10.1016/j.numecd.2011.07.004 [Crossref] [PubMed] [Google Scholar] [Publisher]

Türkiye Nutrition Guideline. (2022). *Türkiye Nutrition Guide (TUBER) [Türkiye Beslenme Rehberi (TUBER)]*. Retrieved from https://hsgm.saglik.gov.tr/depo/birimler/saglikli-beslenen-ve-hareketli-hayat-

db/Dokumanlar/Rehberler/Turkiye_Beslenen_Rehber_TUBER_2022_min.pdf.

Üçtuğ, F. G., Günaydin, D., Hünkar, B., & Öngelen, C. (2021). Carbon footprints of omnivorous, vegetarian, and vegan diets based on traditional Turkish cuisine. *Sustainable Production and Consumption*, *26*, 597–609. https://doi.org/10.1016/j.spc.2020.12.027 [Crossref] [Google Scholar] [Publisher]

Vandenberg, R. J., & Lance, C. E. (2000). A review and synthesis of the measurement invariance literature: Suggestions, practices, and recommendations for organizational research. *Organizational Research Methods*, *3*(1), 4–70. https://doi.org/10.1177/109442810031002 [Crossref] [Google Scholar] [Publisher]

Weller, K. E., Greene, G. W., Redding, C. A., Paiva, A. L., Lofgren, I., Nash, J. T., & Kobayashi, H. (2014). Development and validation of green eating behaviors, stage of change, decisional balance, and self-efficacy scales in college students. *Journal of Nutrition Education and Behavior*, *46*(5), 324–333. https://doi.org/10.1016/j.jneb.2014.01.002 [Crossref] [PubMed] [Google Scholar] [Publisher]

Xiao, C., & Mccright, A. M. (2015). Gender Differences in Environmental Concern: Revisiting the Institutional Trust Hypothesis in the USA. *Environment and Behavior*, *47*(1), 17–37. https://doi.org/10.1177/0013916513491571 [Crossref] [Google Scholar] [Publisher]