ARAŞTIRMA MAKALESİ / *RESEARCH ARTICLE*

Food Neophobia and Disgust Sensitivity in Medical Students

Tıp Fakültesi Öğrencilerinde Gıda Neofobisi ve Tiksinme Duyarlılığı

Meltem Pusuroglu, Begum Aydin Tasli, Mehmet Baltacioglu, Cicek Hocaoglu

Department of Psychiatry, Faculty of Medicine, Recep Tayyip Erdogan University, Rize, Türkiye

ABSTRACT

Aim: *Food neophobia, the avoidance of trying new flavours, is increasingly observed in the globalised world. There may be different reasons underlying food neophobia, which can be considered both as a personality trait and a symptom. In our study, we aimed to explore the relationship between food neophobia and disgust sensitivity in medical students.*

Material and Method: *A total of 163 Recep Tayyip Erdoğan University Faculty of Medicine students who were continuing their education in the 2022–2023 academic year between 01.04.2023 and 01.07.2023 were included in the research. Sociodemographic data form, Food Neophobia Scale (FNS), Disgust Sensitivity Scale Revised Form (DSS-R) were applied online to all participants*

Results: *DSS-R (mean=48.07±10.447) in females was statistically significantly higher than male gender (mean=43.8±9.57). (p=0.01). There was no significant difference between the FNS levels of the female and male genders (p=0.911). A significant positive correlation was found between DSS-R and FNS (p=0.08 r=0.208).*

Conclusions: *There is a positive relationship between disgust sensitivity and food neophobia. It is important to explore the underlying factors of food neophobia, which may lead to significant nutritional problems. Disgust sensivity can be a cause of food nephobia. New research is needed on food neophobia leading to malnutrition and obesity in older age.*

Keywords: *food neophobia; disgust sensitivity; medical students*

ÖZET

Amaç: *Yeni tatları denemekten kaçınma olarak tanımlanan gıda neofobisi küreselleşen dünya ile birlikte giderek daha fazla gözlenmektedir. Hem bir kişilik özelliği hem de bir semptom olarak ele alınabilecek olan gıda neofobisinin altında yatan farklı sebepler bulunabilir. Araştırmamızda tıp fakültesi öğrencilerinde gıda neofobisi ile tiksinme duyarlılığının ilişkisinin araştırılması amaçlanmıştır.*

Materyal ve Metot: *Araştırmaya 01.04.2023 – 01.07.2023 tarihleri arasında 2022–2023 eğitim ve öğretim döneminde eğitimlerini sürdürmekte olan toplam 163 Recep Tayyip Erdoğan Üniversitesi Tıp Fakültesi öğrencisi dâhil edilmiştir. Tüm katılımcılara Sosyodemografik özellikler veri formu, Gıda Neofobisi Ölçeği (GNÖ), Tiksinme Duyarlılığı Ölçeği Revize Formu (TDÖ-R) çevrimiçi olarak uygulanmıştır*

Bulgular: *Kadın cinsiyette TDÖ-R (ort=48,07±10,447) erkek cinsiyetten (ort=43,8±9,57) istatistiksel olarak anlamlı olarak yüksek saptanmıştır. (p=0,01). Kadın ve erkek cinsiyette GNÖ düzeyleri arasında anlamlı farklılık elde edilmemiştir (p=0,911). TDÖ-R ile GNÖ arasında pozitif yönde anlamlı bir ilişki saptanmıştır (p=0,08 r=0,208).*

Sonuç: *Tiksinme duyarlılığı ile gıda neofobisi arasında pozitif bir ilişki mevcuttur. Önemli beslenme sorunlarına yol açabilecek olan gıda neofobisinin altta yatan faktörlerinin araştırılması önemlidir. Tiksinme duyarlılığı gıda nefobisinin bir nedeni olarak ele alınabilir. Özellikle yetişkinlik döneminde beslenme yetersizliği, obezite gibi sağlık sorunlarına yol açabilen gıda neofobisi ile ilgili yeni araştırmalara ihtiyaç duyulmaktadır.*

Anahtar kelimeler: *gıda neofobisi; tiksinme duyarlılığı; tıp öğrencileri*

Introduction

Food neophobia (FN) is defined as the fear of trying new foods. People with FN avoid trying new and unfamiliar foods[1]. Humans are classified as both carnivores and herbivores. People who are defined as omnivores always tend to reject new foods. This may be due to factors such as the appearance, colour, smell, shape of the food source, as well as the possibility that it may be harmful. These factors create an emotion towards the food source, which leads to the acceptance or rejection of the food[2]. However, in addition to these feelings, omnivores also desire to feed and have the instinct to maintain the continuity of life. This has been described as the 'omnivore' s paradox', which is the desire

İletişim/Contact: *Cicek Hocaoglu, Department of Psychiatry, Faculty of Medicine, Recep Tayyip Erdogan University, Rize, Türkiye* •
Tel: *0464 212 30 09* • ***E-mail:*** *cicekh@gmail.com* • ***Geliş/Received:*** *21.01.2024* • ***Kabul/Accepted:*** *21.03.2024*

ORCID: *Meltem Puşuroğlu: 0000-0002-1970-3262* • *Begüm Aydın Taslı: 0000-0003-1700-6081* • *Mehmet Baltacıoğlu: 0000-0003-3332-7117* • *Çiçek Hocaoğlu: 0000-0001-6613-4317*

Kafkas J Med Sci 2024; 14(2):170–176
doi: 10.5505/kjms.2024.29805

to avoid new foods as well as the desire to find new foods[3]. FN is observed in its most severe form between 2–6 years of age. It is common for babies to exhibit negative attitudes towards new flavours, especially when they are weaned from breast milk and switched to additional foods. These negative attitudes decrease with age. Sometimes, however, rejection of new foods can persist into adulthood. Although FN is frequently observed in childhood, it may also be encountered as a nutritional problem in adulthood[4]. Knowledge about the aetiology of FN is still limited. Although it is defined as a personality trait, it has been suggested that genetic factors also play a role in its aetiology[5]. There are no specific diagnostic criteria for FN and it is not included in any diagnostic system. For this reason, it increases the risk of FN being overlooked[6,7].

Disgust sensitivity can be defined as the feeling of discomfort and disgust when a person comes into contact with a certain situation or object[8]. This feeling protects people from the unknown, such as neophobia. It is more related to physical transmission. It is caused by stimuli such as odour, food, body parts, insects, sexuality. However, in addition to physical contamination, there was also a social and moral aspect[9]. Disgust sensitivity has been associated with mental illnesses, mostly eating disorders. This disturbing unpleasant feeling can affect food preferences[10]. There are studies indicating that there is a relationship between FN and disgust sensitivity. In a recent study, factors related to the decision to taste a new food were examined. Accordingly, emotional, sensory and cognitive factors associated with FN were identified. It has been suggested that reactions to food are combined with cognitive associations based on negative memories and negative beliefs[4]. Food neophobia has been well explored in children but not sufficiently in adults. Studies on FN have mostly been carried out with children in the early age group, and information on adulthood is limited in the literature[4,11,12]. In recent studies conducted with different countries and groups, it is remarkable that FN has increased rapidly[13,14].

Food neophobia may cause nutritional problems, depressive symptoms, inability to participate in tourism activities, inability to visit new places to try new flavours. While the increase in gastronomy tourism provides the opportunity to meet different flavours for many people, this situation is considered as a limitation for people with FN[15]. On the other hand, the global population, which is expected to reach 10 billion by 2050, climate crisis, scarcity of resources for natural food production have led to changes in nutrition and lifestyle[16]. Especially with the development of gastronomy science, eating habits are changing daily. However, it is not clear whether consumers are ready for changes in the food industry. To date, there are studies investigating FN involving tourism and hotel management students and tourists[17,18]. Therefore, there is a need for studies investigating the attitudes and behaviours of different professional and cultural groups towards FN.

In our study, we hypothesized that there might be a relationship between GN and disgust sensitivity. Faculty of Medicine students were preferred as the research sample. It is assumed that medical faculty students are more open to innovation, use more social media, and interact more with the world. Also health-related lectures may influence food choices[19,20]. As far as we know, although there are studies conducted with similar samples in the world, our research is a first in Türkiye[21]. The study is thought to will significantly contribute to the literature on FN, which is a new definition and of increasing importance.

Material and Method

Our study was conducted at Faculty of Medicine between 01.04.2023 and 01.07.2023. A total of 163 students studying in the 2022–2023 academic year were included in the study. An online form containing the scales to be used in the study was sent to the medical faculty students together with a consent document indicating that they approved to participate in the study. The students approved to participate in the study and filled out the forms online. People with any mental illness, alcohol and substance abuse, chronic internal diseases such as diabetes and hypertension were excluded from the study. Four students were excluded from the study because they reported a diagnosis of mental illness. The ethics committee approval of the research was obtained. In addition, all practices in the study were conducted in accordance with the ethical standards of the institutional and/or national research committee and the 1964 Declaration of Helsinki and its subsequent revisions or comparable ethical standards.

Data Collection Tools

Sociodemographic Data Form: It is a form created by the researchers that questions basic sociodemographic data such as name, age and gender. In addition to sociodemographic data, medical information such as the

presence of mental illness, medication use, family history of mental illness, presence of chronic illness and regular medication use were also questioned.

Food Neophobia Scale (FNS): It is a Likert-type scale consisting of 10 items developed to determine the level of food neophobia. Scale answers are scored as "strongly disagree" 1 and "strongly agree" 5. Increasing scores were considered as increasing level of food neophobia and developed by Pliner and Hobden in 1992[22]. Turkish validity and reliability was performed by Duman et al. In the validity and reliability analysis conducted in the Turkish sample, Cronbach's alpha value was found to be 0.614 and the scale was reported usable in the Turkish sample. In our research sample, the Cronbach's alpha value of the scale was calculated as 0.72[23].

Disgust Sensitivity Scale Revised Form (DSS-R): It is a 16-question scale developed by Overveld et al. to examine the feeling of disgust and the level of reaction. It is calculated as never 1 point, rarely 2 points, sometimes 3 points, often 4 points and always 5 points. Increasing scores are associated with increasing levels of disgust sensitivity[24]. Turkish validity and reliability was performed by Arusoğlu and Cronbach's alpha was calculated as 0.916 in the Turkish sample. In our sample, Cronbach's alpha value was calculated as 0.82[25].

Statistical Analysis

Statistical evaluation of the research data was performed with IBM Statistical Package for Social Sciences (SPSS) program version 25. Descriptive statistics are presented with mean and standard deviation values and percentages, minimum maximum values. The normality of the data was evaluated by Kolmogorow Smirnow test. The comparison between two normally distributed groups was evaluated by Independent Sample t test. The comparison between more than two not normally distributed groups was evaluated by kruskal wallis test. Spearman Correlation test was performed in the correlation of continuous data that are not normally distributed and statistical significance level was accepted as $p<0.05$.

Results

A total of 163 participants, 103 (63.2%) female and 60 (36.8%) male, were included in the study and all participants were medical faculty students. The research sample consists of 57 (35%) term 1, 29 (17.8%) term 2, 9 (5.5%) term 3, 24 (14.7%) term 4, 18 (11%) term 5, 26 (16%) term 6 students. One hundred thirty seven (84.1%) participants had no family history of mental illness, while 26 (15.9%) participants had a family history of mental illness (Table 1). When the relationship between the sociodemographic data of the participants and the scale scores was analysed, FNS total score of the female gender (mean=48.07±10.447) was statistically significantly higher than the total score of the male gender (mean=43.8±9.57) (p=0.01). No statistically significant relationship was found between other sociodemographic data and scale scores (Table 2). When the relationship between DSS-R and FNS scores is analysed, there is a significant positive relationship between the total scores obtained from DSS-R and total scores obtained from FNS (p=0.008; r=0.208). While there was a significant positive correlation between the total scores obtained from the DSS-R and the scores obtained from the FNS-confidence new foods subdimension (p=0.001; r=0.269), no significant correlation was found between the scores obtained from the DSS-R and the FNS-willingness to try new foods subdimension (p=0.25; r=0.091) (Table 3).

Discussion

In our study, the relationship between FN and disgust sensitivity in medical school students was explored. 63.2% of the participants are female. While the sensitivity of disgust was found to be higher in women, there was no difference in FN levels between male and

Table 1. *Sociodemographic data of participants*

		min-max	med ± SD
Age		18–26	21.39±1.9
		n	%
Gender	Female	103	63.2
	Male	60	36.8
Term	Term 1	57	35
	Term 2	29	17.8
	Term 3	9	5.5
	Term 4	24	14.7
	Term 5	18	11
	Term 6	26	16
Presence of mental illness in the family	No	137	84.1
	Yes	26	15.9
Diagnosis of mental illness in the family	Depression	10	6.1
	Anxiety disorder	9	5.5
	Schizophrenia	1	0.6
	Bipolar disorder	3	1.8
	Obsessive-compulsive disorder	3	1.8
Total		163	100

Table 2. *Relationship between sociodemographic characteristics and scale scores*

			FNS Total	FNS confidence new foods	FNS willingness to try new foods	FNS Total
Age		r	-0.098	-0.09	-0.057	-0.053
		p	0.212	0.254	0.469	0.499
Gender	Female	n	103	103	103	103
		Mean ± SD	28.03±4.94	16.77±2.78	11.26±2.762	48.07±10.447
	Male	n	163	163	163	163
		Mean ± SD	28.12±4.574	16.72±2.669	11.4±2.546	43.8±9.57
		Test stat.	-0.112	0.113	-0.316	2.593
		p	0.911	0.91	0.752	**0.01***
Presence of mental illness in the family	Yes	n	26	26	26	26
		Mean ± SD	27.96±5.024	16.81±2.994	11.15±3.029	48.96±9.084
	No	n	137	137	137	137
		Mean ± SD	28.08±4.768	16.74±2.691	11.34±2.616	46.03±10.494
		Test stat.	0.115	-0.12	0.329	-1.332
		p	0.908	0.904	0.742	0.185
Term	1	n	57	57	57	57
		med (IQR)	28(6)	17(4)	12(3)	46(15)
	2	n	29	29	29	29
		med (IQR)	29(5)	18(4)	11(3)	47(15)
	3	n	9	9	9	9
		med (IQR)	25(10)	17(6)	11(5)	54(19)
	4	n	24	24	24	24
		med (IQR)	30(8)	17.5(3)	11.5(4)	48(16)
	5	n	18	18	18	18
		med (IQR)	26.5(7)	16(4)	11(3)	45(13)
	6	n	26	26	26	26
		med (IQR)	26(7)	15.5(4)	11(2)	45.5(15)
		test stat.	6.125	4.68	2.899	1.774
		p	0.294	0.456	0.716	0.879

Independent sample t-test, Kruskal-Wallis test, Spearman Correlation, *p<0.05.
FNS: Food Neophobia Scale, IQR: Interquartile range

Table 3. *The relationship between disgust sensitivity and food neophobia*

		FNS total	FNS confidence new foods	FNS willingness to try new foods
DSS-R total	r	**0.208**	**0.269**	0.091
	p	**0.008***	**0.001***	0.25

Spearman Correlation, *p<0.01.
FNS: Food Neophobia Scale, DSS-R: Disgust Sensitivity Scale Revised Form

female genders. In studies similar to our study, a higher level of disgust sensitivity was found in the female gender. While disgust sensitivity in women is more associated with eating disorders, it has also been suggested that another reason why disgust sensitivity is higher than in men may be related to progesterone[26,27]. When studies investigating the relationship of GN with sociodemographic characteristics and gender are examined in the literature, there are inconsistencies between genders. In a study by Smith et al., higher FN levels were found in women[28]. In another study conducted in the same way, higher levels of FN were reported in women [21]. Although studies are reporting that men have high levels of avoidance of new foods, there are also studies stating that there is no relationship between FN and gender[29,30]. However, it has been suggested that women may be genetically predisposed to FN to protect their offspring from foreign foods since they are evolutionarily carrying and nurturing the offspring[31]. Our study, no relationship was found between age and FN and disgust sensitivity. As a result of research, it is thought that FN symptoms decrease with increasing age[32,33]. In a study by Sahrin et al., it was stated that age did not affect FN levels[21]. In another study conducted in the

same way, no relationship was found between age and FN[30]. These results are consistent with our research. Although data such as economic level, education level, and living space are found to be related to FN in studies, there are also data indicating that FN may have a genetic basis[5,34,35]. However, these parameters were not analysed in detail in our study. In this case, it was thought that FN might also be associated with a mental disorder. The mental disorder in which FN was most explored as a symptom was autism spectrum disorders (ASD). In many studies, FN was found to be high in individuals with ASD[12,36,37]. Individuals diagnosed with ASD have common eating problems, including refusal to eat, dietary restrictions, and behavioral problems while eating. It has been reported that individuals with ASD and FN prefer spices, candies with a strong mint flavor, and foods with a similar texture such as applesauce, cheese, peanut butter. In addition, individuals with a diagnosis of ASD with FN had a lower daily living skill score than individuals with a diagnosis of ASD without a FN. Another study showing that children with ASD are more selective than other children stated that FN seems to be a sensory feature most associated with atypical oral sensitivity, eating disorders[34]. Another medical condition for which FN has been explored is obesity. Food neophobia is considered both a cause and a consequence of the development of obesity. Obese individuals have higher FN levels and obese men have lower taste sensitivity. Obese individuals with high FN levels prefer to consume traditional foods with high energy density compared to individuals with normal weight, and this results in weight gain. Although FN reduces diet diversity, it increases the risk of obesity, especially due to vitamin and mineral deficiencies. Obese individuals are also more prone to foods high in fat and sugar. As a result of obesity, individuals preferred traditional high-calorie foods and decreased their desire to try new foods and developed FN[35,36].

In our study, a significant positive correlation was also found between FN and disgust sensitivity. In the studies conducted, a positive correlation was found between FN and disgust sensitivity, similar to our study[37,38]. Food neophobia is associated with sensory responses to foods that are considered particularly repulsive. In addition, individuals with high levels of disgust are more cautious about new foods[39]. In the light of all the literature, it can be thought that the sensitivity of disgust plays an important role in the development of FN. The appearance, colour and smell of food affect the disgust sensitivity. In adults, the sense most strongly involved in the development of FN is smell. People with FN are less developed than the general population to perceive odors (either related to food or not) as pleasant and intense. There are also studies that mention possible relationships between FN olfactory performances and oral microbiota[40].

Food neophobia can cause nutritional deficiencies or social exclusion. It is known that individuals with high FN levels prefer less healthy foods such as fruits, vegetables, protein and have low dietary quality. This can cause serious nutritional disorders over time. Food neophobia in adults appears to be affected by different factors. Delayed perception of satiety in adults is associated with failures in the regulation of energy intake. Dietary diversity and fruit and vegetable consumption decrease with FN[15]. Investigation of FN, which can cause important nutritional problems, systematization of its clinical findings, is valuable in terms of symptom recognition.

In our study, the relationship between FN and disgust sensitivity was explored in a specific population. Geography of individuals, culinary culture, eating habits, experiences and country conditions affect FN levels and may cause changes in FN levels. In the globalizing world, people are now able to reach much more new tastes. Food neophobia may also cause situations such as not preferring more sustainable and ecological foods developed with the help of technology. Attitudes towards a new food; Although FN is characterized as an individual condition that can affect food choice and consumption, FN can also be considered as a symptom of mental disorders. Studies investigating the relationship between mental disorders and FN are limited in the literature. In particular, its relationship with mental disorders still remains confidential.

Our study has some limitations. The findings of the study cannot be generalized to all medical school students since the participants were selected from only one medical school. In addition, the relatively small sample size, the online application of questionnaires and scales to the participants, and the lack of structured psychiatric interviews are also among the limitations of the study. In addition, not questioning the body mass index, eating habits and food preferences of the participants can also be considered as a limitation. However, the fact that the relationship between FN and disgust sensitivity was explored in a specific group

is the strength of the study and may guide future studies in terms of its results.

As a result, FN, which is generally observed as fear, withdrawal and reluctance to try new foods in individuals, is increasing rapidly all over the world. Although fear of novelty in food protects the individual against the potential harms of the new food, over time it can limit the individual's nutritional cycle and cause serious nutritional problems and psychosocial problems. More research is needed to elucidate the cultural, genetic aspects, risk factors and neurobiology of FN. Studies investigating whether FN is associated with certain food groups and its relationship with developmental periods will provide a better understanding of the subject. In addition, it is important to be noticed about prevention and precautions, especially in childhood, to make the necessary appropriate interventions, to inform individuals about food, and to increase the awareness of those working in the food sector about FN. Providing adults with education on FN and quality of life can prevent FN behavior disorder and gain a wide range of dietary habits.

Author Contributions

Idea: ÇH, MP; Design And Design: ÇH, MP, BAT; Counselling: MP, BAT; References: MP, MB; Data Collection: BAT; Analysis And Comment: MP, BAT, ÇH; Literature Review: MP, ÇH; Final Review: MP, ÇH

References

1. Rozin P, Vollmecke TA. Food likes and dislikes. Annu Rev Nutr. 1986;6:433–56.
2. Martins Y, Pelchat ML, Pliner P. "Try it; it's good and it's good for you": effects of taste and nutrition information on willingness to try novel foods. Appetite. 1997;28(2):89–102.
3. Laureati M, Bergamaschi V, Pagliarini E. Assessing childhood food neophobia: Validation of a scale in Italian primary school children. Food Qual Prefer. 2015;40:8–15.
4. Coulthard H, Aldridge V, Fox G. Food neophobia and the evaluation of novel foods in adults;the sensory, emotional, association (SEA) model of the decision to taste a novel food. Appetite. 2022;168:105764.
5. Dotson CD, Babich J, Steinle NI. Genetic predisposition and taste preference: impact on food intake and risk of chronic disease. Curr Nutr Rep. 2012;1:175–83.
6. Karaağaç Y, Bellikci-Koyu E. A narrative review on food neophobia throughout the lifespan: relationships with dietary behaviours and interventions to reduce it. Br J Nutr. 2022:1–34.
7. Greggor AL, Thornton A, Clayton NS. Neophobia is not only avoidance: improving neophobia tests by combining cognition and ecology. Curr Opin Behav Sci. 2015;6:82–9.
8. Ekman P. An argument for basic emotions. Cognition & Emotion. 1992;6(3–4):169–200.
9. Luppino OI, Tenore K, Mancini F, Mancini A. The role of childhood experiences in the development of disgust sensitivity: A preliminary study on early moral memories. Clin Neuropsychiatry. 2023;20(2):109–21.
10. Brassard SL, Laliberte M, MacKillop J, Balodis IM. Disgust sensitivity and behavioural inhibitory systems in binge eating disorder: associations with eating pathology. Eat Weight Disord. 2023;28(1):15.
11. Białek-Dratwa A, Szczepańska E, Szymańska D, Grajek M, Krupa-Kotara K, Kowalski O. Neophobia-A natural developmental stage or feeding difficulties for children?. Nutrients. 2022;14(7).
12. Kozak A, Czepczor-Bernat K, Modrzejewska J, Modrzejewska A, Matusik E, Matusik P. Avoidant/Restrictive Food Disorder (ARFID) , Food Neophobia, other eating-related behaviours and feeding practices among children with autism spectrum disorder and in non-clinical sample: A Preliminary Study. Int J Environ Res Public Health. 2023;20(10):5822.
13. Jaeger SR, Hedderley D, Prescott J. High arousal as the source of food rejection in food neophobia. Food Res Int. 2023;168:112795.
14. Jaeger SR, Rasmussen MA, Prescott J. Relationships between food neophobia and food intake and preferences: Findings from a sample of New Zealand adults. Appetite. 2017;116:410–22.
15. Karaağaç Y, Bellikci-Koyu E. A narrative review on food neophobia throughout the lifespan: Relationships with dietary behaviours and interventions to reduce it. Br J Nutr. 2023:13(5):793–826.
16. Ranganathan J, Waite R, Searchinger T, Hanson C. How to sustainably feed 10 billion people by 2050, in 21 charts. 2018.
17. Dönmez ÖÇ, Sevim B. Yükseköğretim kurumlarının gıda ile ilgili bölümlerindeki öğrencilerin neofobi düzeylerinin belirlenmesi. GSI Journals Serie A. Advancements in Tourism Recreation and Sports Sciences. 2023;6(2):288–300.
18. Lee S, Park H, Ahn Y. The influence of tourists' experience of quality of street foods on destination's image, life satisfaction, and word of mouth: the moderating impact of food neophobia. Int J Environ Res Public Health. 2019;17(1):163.
19. Mancinelli E, Bassi G, Salcuni S. Predisposing and Motivational Factors Related to Social Network Sites Use: Systematic Review. JMIR Form Res. 2019;3(2):e12248.
20. Özgür E. Yaşa göre değer farklılıkları ve siyasi kuşak aidiyeti. İstanbul University Journal of Sociology. 2013;3(26):45–76.
21. Sahrin S, Banna MHA, Rifat MA, Tetteh JK, Ara T, Hamiduzzaman M, et al. Food neophobia and its association with sociodemographic factors and food preferences among Bangladeshi university students: Evidence from a cross-sectional study. Heliyon. 2023;9(5):e15831.
22. Pliner P, Hobden K. Development of a scale to measure the trait of food neophobia in humans. Appetite. 1992;19(2):105–20.

23. Duman E, Akçil Ok M, Keser A. Besin neofobisi ölçeğinin Türkçeye uyarlanması: geçerlik ve güvenirlik çalışması. Kocaeli Üniversitesi Sağlık Bilimleri Dergisi. 2020;6(2):157–61.
24. Van Overveld WJM, De Jong PJ, Peters ML, Cavanagh K, Davey GCL. Disgust propensity and disgust sensitivity: Separate constructs that are differentially related to specific fears. Pers Individ Dif. 2006;41(7):1241–52.
25. Arusoğlu G. The validity and reliability study of the disgust propensity and sensitivity scale –revised in Turkish. International Academic Social Resources Journal. 2021;6(25):888–95.
26. Aharoni R, Hertz MM. Disgust sensitivity and anorexia nervosa. Eur Eat Disord Rev. 2012;20(2):106–10.
27. Bressan P, Kramer P. Progesterone does raise disgust. Horm Behav. 2022;137:104937.
28. Smith WI, Powell EK, Ross S. Food aversions: some additional personality correlates. J Consult Psychol. 1955;19(2):145–9.
29. Ceylan V, Şahingöz SA. Determination of food neophobia level in adult individuals. Journal of Tourism & Gastronomy Studies. 2019;7(2):772–84.
30. Tian H, Chen J. Food neophobia and intervention of university students in China. Food Sci Nutr. 2021;9(11):6224–31.
31. Knaapila A, Silventoinen K, Broms U, Rose RJ, Perola M, Kaprio J, et al. Food neophobia in young adults: genetic architecture and relation to personality, pleasantness and use frequency of foods, and body mass index--a twin study. Behav Genet. 2011;41(4):512–21.
32. Pliner P, Melo N. Food neophobia in humans: effects of manipulated arousal and individual differences in sensation seeking. Physiol Behav. 1997;61(2):331–5.
33. Galloway AT, Fiorito LM, Francis LA, Birch LL. 'Finish your soup': counterproductive effects of pressuring children to eat on intake and affect. Appetite. 2006;46(3):318–23.
34. Rodrigues JVS, Poli MCF, Petrilli PH, Dornelles RCM, Turcio KH, Theodoro LH. Food selectivity and neophobia in children with autism spectrum disorder and neurotypical development: a systematic review. Nutr Rev. 2023;81(8):1034–50.
35. Sarin HV, Taba N, Fischer K, Esko T, Kanerva N, Moilanen L, et al. Food neophobia associates with poorer dietary quality, metabolic risk factors, and increased disease outcome risk in population-based cohorts in a metabolomics study. Am J Clin Nutr. 2019;110(1):233–45.
36. Proserpio C, Laureati M, Invitti C, Pagliarini E. Reduced taste responsiveness and increased food neophobia characterize obese adults. Food Qual Prefer. 2018;63:73–9.
37. Kutlu MB. Tüketicilerin tiksinme duyarlılığı ile riskten kaçınma ve marka sadakati arasındaki ilişki: huy temelli bir yaklaşım. Sivas Cumhuriyet Üniversitesi İktisadi ve İdari Bilimler Dergisi. 2019:212.
38. Ammann J, Hartmann C, Siegrist M. Development and validation of the food disgust picture scale. Appetite. 2018;125:367–79.
39. Rozin P, Tuorila H. Simultaneous and temporal contextual influences on food acceptance. Food Qual Prefer. 1993;4(1-2):11–20.
40. Valentino V, De Filippis F, Menghi L, Gasperi F, Ercolini D. Food Neophobia and scarce olfactory performances are linked to oral microbiota. Food Res Int. 2022;155:111092.