MAUNSagBil.Derg. 2024;4(3) 16-27
https://dergipark.org.tr/tr/pub/maunsbd

Araştırma Makalesi/ Research Article

Yeme Alışkanlıkları Hedonik Açlığı Etkiler Mi? Akdeniz Diyet Modeli ve Batı Tipi Diyet Modeli

Do Eating Habits Affect Hedonic Hunger? Mediterranean Diet Model and Western-Type Diet Model

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Özet: Günümüzde, yüksek enerjili ve yüksek lezzetli gıdalara kolay erişimin bir sonucu olarak, bireylerin diyetleri Akdeniz diyet modelinden Batı tarzı diyete kaymıştır. Bu tür sağlıksız gıdaların tüketimi hedonik açlık riskinde artış ile pozitif ilişkilidir. Bu çalışma, diyet paternlerinin hedonik açlık üzerindeki etkisini incelemek amacıyla gerçekleştirilmiştir. Bu tanımlayıcı, kesitsel çalışmaya 617 üniversite öğrencisi katılmıştır. Çalışma verileri web tabanlı bir anket formu aracılığıyla elde edilmiştir. Anket formunda bireylerin sosyo-demografik özellikleri, antropometrik ölçümleri, Akdeniz Diyet Kalitesi Ölçeği (KIDMED), Akdeniz Diyeti Bağlılık Ölçeği (MEDAS) ve Besin Gücü Ölçeği (PFS) yer almaktadır. İstatistiksel analizler SPSS versiyon 22 yazılımı kullanılarak gerçekleştirilmiştir. Çalışmaya 503 kadın, 114 erkek katılmıştır. Fazla kilolu/obez bireylerin besin bulunabilirliği alt ölçek puan ortalaması, zayıf bireylere göre anlamlı derecede yüksek bulunmuştur ($p<0.05$). MEDAS puanları ile PFS toplam puanları ($r=-0.081$, $p=0.045$), besin bulunabilirliği ($r=-0.111$, $p=0.006$) ve besin mevcudiyeti ($r=-0.088$, $p=0.028$) puanları arasında istatistiksel olarak anlamlı düşük düzeyde negatif korelasyon gözlenmiştir. Ancak, MEDAS puanları ile besinin tadına bakılması alt ölçek puanları arasında istatistiksel olarak anlamlı bir ilişki bulunmamıştır ($p>0.05$). Bu çalışmanın sonuçları, hedonik açlık ile Akdeniz diyetine bağlılık arasında düşük düzeyde negatif korelasyon olduğunu göstermiştir. Bu alanda daha derin bir bakış açısı elde etmek için çalışmaya farklı coğrafi bölgelerde ikamet eden bireylerin dahil edildiği daha kapsamlı ve uzunlamasına araştırmalara ihtiyaç vardır.

Anahtar Kelimeler: Hedonik açlık, KIDMED, MEDAS, Obezite, PFS

Abstract: Today, as a result of easy access to high-energy and high-taste foods, individuals' diets have shifted from the Mediterranean dietary pattern to a Western-style diet. Consumption of such unhealthy foods is positively associated with an increased risk of hedonic hunger. This study was conducted to examine the effect of dietary patterns on hedonic hunger. In this descriptive, cross-sectional study, 617 university students participated. The study data were obtained through a web-based questionnaire. The questionnaire included socio-demographic characteristics, anthropometric measurements, the Mediterranean Diet Quality Scale (KIDMED), the Mediterranean Diet Adherence Scale (MEDAS) and the Power of Food Scale (PFS). Statistical analyses were performed using SPSS version 22 software. 503 women and 114 men participated in the study. The mean food availability subscale score of overweight/obese individuals was significantly higher than that of underweight individuals ($p<0.05$). A statistically significant low level negative correlation was observed between MEDAS scores and PFS total scores ($r=-0.081$, $p=0.045$), food available ($r=-0.111$, $p=0.006$) and food present ($r=-0.088$, $p=0.028$). However, there was no statistically significant relationship between MEDAS scores and food tasted subscale scores ($p>0.05$). The results of this study showed a low level of negative correlation between hedonic hunger and adherence to the Mediterranean diet. To gain a deeper insight in this area, more comprehensive and longitudinal research including individuals residing in different geographical regions is needed.

Keywords: Hedonic hunger, KIDMED, MEDAS, Obesity, PFS

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Geliş tarihi/Received date: 05.09.2024
Düzeltme tarihi/Revision date: 25.10.2024
Kabul tarihi/Accepted date: 05.11.2024

Atıf: ÜLKER İ, ÇAMLI A, FOROUDI POURDEH E, AKSU Z. (2024) Yeme Alışkanlıkları Hedonik Açlığı Etkiler Mi? Akdeniz Diyet Modeli ve Batı Tipi Diyet Modeli. MAUNSagBil.Derg.: 2024;4(3) 16-27

INTRODUCTION

Obesity is a growing problem worldwide and a significant risk factor for non-communicable diseases (Boutari & Mantzoros, 2022). Obesity fundamentally arises as a manifestation of a positive energy balance, where in the caloric intake from food and beverages surpasses the energy expenditure (Amin & Mercer, 2016). Homeostatic and non-homeostatic mechanisms represent crucial processes responsible for initiating, regulating, and terminating eating behavior (Berthoud et al., 2017). Homeostatic mechanisms are based on physiological processes that maintain energy balance in the absence of food consumption, These mechanisms achieve this by either reducing energy expenditure or augmenting nutrient intake. Non-homeostatic mechanisms, on the other hand, are processes that lead to food consumption due to reasons such as emotional comfort or the rewarding properties of food (Yu, 2017). The main element capable of meeting an organism's energy requirements is the intake of nutrients. But for some individuals, nutrition has evolved into much more than merely fulfilling metabolic needs (Timper & Brüning, 2017; Şarahman Kahraman & Akçil Ok, 2022). Nowadays, nutrition is seen by many individuals as a coping mechanism for dealing with negative situations or emotions, or as a rewarding method (Bilici et al., 2020). The consumption of food driven by the desire or urge for pleasure, in the absence of physiological hunger, is referred to as "hedonic hunger" (Lowe & Butryn, 2007). General thoughts about food, the individual's desire for consumption of food they can directly access, and the evaluation of the pleasure derived from the first taste of food can determine a person's susceptibility to hedonic hunger (Ulker et al., 2021). Hedonic eating motives are guided by the components of "liking," which reflect the hedonic reaction to pleasure, and "wanting," which represents the incentive motivation (Lowe & Butryn, 2007). The components of "liking" and "wanting" for rewards are associated with distinct neuroanatomical and neurochemical brain reward systems (Berridge, 2009; Berridge et al., 2009). The hedonic effect of processed foods, especially those high in fat and sugar content, is regulated by the μ-opioid system (Sakamoto et al., 2015). It has been reported that individuals at risk of hedonic hunger consume more fatty foods, sweets, and unhealthy snacks (Stok et al., 2015; Bejarano & Cushing, 2018; Stone et al., 2020). It is known that opioid μ-agonists increase food consumption by enhancing the hedonic properties of food (Peciña & Berridge, 2005). While some studies could not find a relationship between hedonic hunger and body mass index (BMI) (Burger et al., 2016; Lipsky et al., 2016). Recent studies have reported that obese individuals are more at risk in terms of hedonic hunger compared to individuals with normal body weight (Rabiei et al., 2019; Chmurzynska et al., 2021; Taş & Gezer, 2022).

Nowadays, as a result of easy access to high-energy and highly delicious foods, individuals' diets have shifted from the Mediterranean diet model to the Western-style diet. It is well known that university students, in particular, show lower adherence to the Mediterranean diet, characterized by high fat and sugar intake and low consumption of fruits, vegetables, and legumes (Hadjimbei et al., 2016). The Mediterranean diet encourages the consumption of primarily unprocessed foods, including vegetables, fruits, whole grains, legumes, nuts, beans, fish, and olive oil, while limiting the intake of red meat and dairy products (Davis et al., 2015). The Mediterranean diet, which plays a crucial role in preventing obesity and non-communicable chronic diseases, has been reported to reduce the risk of stress, anxiety, and depression (Sánchez-Villegas et al., 2016; Zurita-Ortega et al., 2018; Lotfi et al., 2022; Osorio-Conles et al., 2022; Rumbo-Rodríguez et al., 2022). It is argued that due to negative moods such as stress and anxiety, individuals with a lower adherence to the Mediterranean diet tend to have higher levels of food consumption (Carlos et al., 2020; López-Moreno et al., 2021; Buja et al., 2022). It is known that emotions are significant factors affecting food choices. Individuals with depressive symptoms

tend to consume foods that are particularly high in fat and sugar content (Mooreville et al., 2014). The excessive consumption of such foods has been found to be associated with poor diet quality and increased body weight (Poti et al., 2017). It is suggested that individuals with high hedonic hunger lose their eating control during the consumption of such foods (Espel-Huynh et al., 2018). It has been reported that there is a positive association between the consumption of unhealthy food and beverage intake and hedonic hunger (Stok et al., 2015; Bejarano & Cushing, 2018; Mason et al., 2020). The number of studies correlating nutritional patterns with hedonic hunger is quite low in the literature. It is thought that this study will make a significant contribution to clinicians by evaluating whether the nutritional model is a factor affecting the hedonic hunger state. The aim of this study is to examine the impact of university students' nutritional habits on hedonic hunger.

Hypotheses of the study;

H1. Nutritional habits affect hedonic hunger.

H2. Power of food scale scores are lower in individuals with Mediterranean model nutritional habits than in individuals with Western-Type Dıet Model nutritional habits.

MATERIALS AND METHOD

Study Design and Setting

This cross-sectional study was carried out with 617 individuals (18.5% male, 81.5% female, mean age 22.14±4.31 years) who consented to participate and were selected by the snowball sampling method in Erzurum/Turkiye.

Data Collection

The study data were collected from university students between April 1, 2023 and May 1, 2023. The sample selection was made randomly. The study data were obtained through a web-based survey form. The participant was sent the URL of the study form, and after agreeing to participate, the study form was opened.

Data Collection Tools

In the survey form, individuals' socio-demographic characteristics, anthropometric measurements, Mediterranean Diet Quality Scale (KIDMED), Mediterranean Diet Adherence Scale (MEDAS), and Power of Food Scale (PFS) are included.

Mediterranean diet quality scale (KIDMED)

In this study, the Turkish version of the KIDMED (Mediterranean Diet Quality Index) was used to assess adherence to the Mediterranean diet in evaluating the Mediterranean-type dietary pattern. The Mediterranean diet quality scale was developed by Serra-Majem et al (Serra-Majem et al., 2004). The validity and reliability study in Turkey was conducted by Şahingöz et al (Akar Sahingoz et al., 2019). The scale consists of 16 questions. In the original scale scoring, items 6, 12, 14, and 16 are scored as -1 when completed, while the remaining 12 items are scored as +1. Based on this, the evaluation of scores from the control list results in obtaining a low level of 3 or below, a moderate level between 4 and 7, and a high level at 8 points or above. It is reported that as the score increases, there will be a higher adherence to the optimal Mediterranean diet (Ayaz et al., 2018).

Mediterranean diet adherence scale (MEDAS)

In the PREDIMED study, Martínez-González MA et al. used the 14-item Mediterranean Diet Adaptation Scale to assess adherence to Mediterranean dietary habits for primary prevention of cardiovascular disease (Martínez-González et al., 2012). The validity of the questionnaire form was later assessed by Schröder H et al (Schröder et al., 2011). The Mediterranean Diet Adherence Scale includes questions related to individuals' daily consumption of olive oil, their primary fat source, consumption of red meat and margarine/butter, portions of fruits and vegetables, preference for white meat over red meat, and weekly intake of olive oil-based tomato sauce, pasta, snacks, fish-seafood, nuts, legumes, and wine. The total score is calculated by assigning 0 or 1 point for each question based on the consumption

level. A total score of 9 and above indicates a strict adherence to the Mediterranean diet, and an acceptable degree of adherence to the Mediterranean diet is 7 and above (León-Muñoz et al., 2012). This scale is utilized to ascertain whether an individual possesses a Mediterranean-style dietary pattern (Pehlivanoğlu et al., 2020).

Power of food scale (PFS)

In this study, the Turkish version of the Power of Food Scale (PFS) was used to assess hedonic hunger and measure appetite status. The Power of Food Scale was developed by Lowe et al. (Lowe et al., 2009), validity and reliability study was also conducted in Turkey (Ulker et al., 2021). The scale consists of 13 questions. Four scores are obtained, including three subscale scores and one total scale score. The evaluation of PFS consists of a total score and three sub-evaluations: food availability, food presentation, and food tasting. The first one is the food availability scale, which evaluates general thoughts about foods (items 1, 2, 9, 10). The second one is the food presentation subscale, which consists of items (3, 4, 5, and 6) assessing attraction to food that the individual has direct access to. The third subscale is the food tasting subscale, consisting of items (7, 8, 11, 12, and 13) that evaluate the desire/pleasure obtained from foods when tasted for the first time. The total and subscale scores of PFS are obtained by summing the item scores and dividing by the number of items. It is reported that as the score increases, there will be a higher tendency towards hedonic hunger (Lowe et al., 2009).

Statistical Analysis

The statistical evaluation of the data obtained from the study was performed using SPSS version 22 software. The normal distribution suitability of the variables was examined through visual (histograms and probability plots) and analytical methods (Kolmogorov-Smirnov/Shapiro-Wilk tests). Qualitative variables were summarized as number (n) and percentage (%), while quantitative variables were summarized as mean and standard deviation ($\bar{X}$±SD). The pairwise group comparisons for quantitative variables were evaluated using the t-test in independent groups, and one-way analysis of variance for more than 2 group comparisons (Tukey HSD post hoc test was used to determine the source of differences when the analysis was significant). The comparison of group distributions for categorical variables was analyzed using Pearson's chi-square test and Fisher's exact test. Pearson correlation analysis was used in relational inferences. Statistical significance was evaluated as $p<0.05$.

Ethical Approval

"Ethics Committee Approval" was received from Erzurum Technical University Ethics Committee (Meeting Number: 04, Decision Number: 05, 30 March 2023) in order to carry out this research. The research was carried out in accordance with the Declaration of Helsinki. Before starting the survey form, an informed consent form was opened on the participants' screen. Informed consent have been obtained from all participants.

RESULTS

The study was completed with a total of 617 students, and the general characteristics of the individuals are provided in Table 1. The mean age of individuals is 22.14±4.31 years, with 18.5% being male and 81.5% being female. Moreover, 92.7% of them are single. Among the participants, 20.9% of individuals are cigarette smokers, and 11.8% consume alcohol. According to BMI classification, 10.5% of individuals are underweight, 69.5% are normal weight, and 19.9% are Overweight/obese. The mean scores of the individuals' KIDMED, MEDAS, PFS total scores, and sub-scales of food availability, food presentation, and food tasting, respectively, are 4.17 ± 2.47, 4.98 ± 1.48, 2.97 ± 1.11, 2.81 ± 1.19, 2.95 ± 1.16, and 3.11 ± 1.22. According to the KIDMED classification, 49.3% of individuals have low Adherence, 50.7% have moderate Adherence; according to the MEDAS classification, 86.5% of individuals are in the low adherence group, 11.7%

are in the moderate adherence group, and 1.8% are in the high adherence group.

Table 1. General Characteristics of Participants (n: 617).

Sex, n(%)	
Women	503 (81.5)
Men	114 (18.5)
Marital status, n(%)	
Single	572 (92.7)
Married	45 (7.3)
Smoking Status, n(%)	
Consumption	129 (20.9)
No consumption	488 (79.1)
Alcohol Consumption Status, n(%)	
Consumption	73 (11.8)
No consumption	544 (88.2)
Age (year), $\bar{X}$±SS	22.14±4.31
Body mass index (BMI) (kg/m^2), $\bar{X}$±SS	22.46±4.27
Number of Meals, $\bar{X}$±SS	3.18±1.16
Body Mass Index (BMI) Groups, n(%)	
Underweight (<18.5)	65 (10.5)
Normal weight (18.5-24.9)	429 (69.5)
Overweight/Obese (≥25.0)	123 (19.9)
Mediterranean Diet Quality Scale (KIDMED)	
Total Score, $\bar{X}$±SS	4.17±2.47
Low adherence, n(%)	304 (49.3)
Moderate adherence, n(%)	313 (50.7)
Mediterranean Diet Adherence Scale (MEDAS)	
Total Score, $\bar{X}$±SS	4.98±1.48
Low adherence, n(%)	534 (86.5)
Moderate adherence, n(%)	72 (11.7)
High adherence, n(%)	11 (1.8)
Power of Food Scale (PFS)	
Total Score, $\bar{X}$±SS	2.97±1.11
Food available, $\bar{X}$±SS	2.81±1.19
Food present, $\bar{X}$±SS	2.95±1.16
Food tasted, $\bar{X}$±SS	3.11±1.22

The total and subscale scores of the PFS for individuals participating in the study, based on their BMI Groups, are presented in Table 2. When comparing the PFS total and subscale mean scores among different BMI groups, there were no statistically significant differences in terms of PFS total, food presentation, and food tasting subscale scores ($p>0.05$). However, there was a statistically significant difference in the food availability subscale score ($p<0.05$) among the groups. The mean score of the food availability scale of Overweight/Obese individuals (2.99±1.26) was approximately 0.49 points higher than the mean score of Underweight individuals (2.50±1.11) ($p=0.018$).

There was no statistically significant difference between underweight, normal weight and Overweight/Obese individuals based on BMI classification in terms of adherence to the Mediterranean diet according to KIDMED and MEDAS ($p>0.05$) (Table 2).

Table 2. PFS scores according to participants' BMI groups and the distribution of participants for KIDMED and MEDAS groups.

	BMI groups			
	Underweight	**Normal weight**	**Overweight/Obese**	**p**
PFS Total; ($\bar{X}$ ±SS)	2.80±1.06	2.97±1.11	3.07±1.14	0.304
Food available; ($\bar{X}$ ±SS)	2.50±1.11[a]	2.80±1.16	2.99±1.26 [b]	**0.025**[*]
Food present ($\bar{X}$ ±SS)	2.78±1.08	2.94±1.16	3.11±1.20	0.157
Food tasted ($\bar{X}$ ±SS)	3.07±1.29	3.12±1.22	3.10±1.18	0.951
KIDMED				
Low adherence; n (%)	33 (50.8)	209 (48.7)	62 (50.4)	0.917[c]
Moderate adherence; n (%)	32 (49.2)	220 (51.3)	61 (49.6)	
MEDAS				
Low adherence	54 (83.1)	371 (86.5)	109 (88.6)	0.232[d]
Moderate adherence	11 (16.9)	51 (11.9)	10 (8.1)	
High adherence	0 (0,0)	7 (1.6)	4 (3.3)	

*p<0.05, Data were evaluated by One-Way Analysis of Variance.
[ab] Values shown with different letters on the same row are statistically different from each other (Tukey HSD test was applied).
[c]Pearson's chi-square test , [d]Fisher's exact test were applied.

The scores of KIDMED, MEDAS, and the total and subscale scores of PFS based on individuals' sex are provided in Table 3. There was no statistically significant difference between women and men in terms of the mean KIDMED and MEDAS scores, as well as the total and subscale mean scores of PFS (p>0.05).

Table 3. The scores of KIDMED, MEDAS, and PFS according to sex.

	Sex		
	Woman $\bar{X}$ **±SS**	**Man** $\bar{X}$ **±SS**	**p**
KIDMED	4.22±2.47	3.93±2.47	0.260
MEDAS	4.98±1.53	4.96±1.28	0.876
PFS total	2.98±1.13	2.90±1.04	0.493
Food available	2.83±1.19	2.72±1.13	0.381
Food present	2.96±1.18	2.92±1.08	0.756
Food tasted	3.13±1.24	3.04±1.12	0.479

The t-test was applied to independent groups

PFS total and subscale scores in the Mediterranean diet adherence groups according to KIDMED are given in Table 4. There was no statistically significant difference in terms of the mean total and subscale scores of PFS between the groups with low and moderate adherence to the Mediterranean diet (p>0.05).

Table 4. The PFS scores according to KIDMED groups.

	Mediterranean Diet Quality Scale		
	Low adherence $\bar{X}$ **±SS**	**Moderate adherence** $\bar{X}$ **±SS**	**p**
PFS total	2.98±1.13	2.96±1.10	0.832
Food available	2.80±1.20	2.82±1.16	0.733
Food present	2.98±1.16	2.93±1.17	0.651
Food tasted	3.13±1.25	3.09±1.19	0.673

The t-test was applied to independent groups

The relationship between individuals' KIDMED and MEDAS scores with PFS total and subscale scores is provided in Table 5. There is no statistically significant relationship between

individuals' KIDMED scores and PFS total and subscale scores (p>0.05). There is a low-level statistically significant negative correlation between MEDAS scores and PFS total (r=-0.081, p=0.045), food available (r=-0.111, p=0.006), and food present (r=-0.088, p=0.028) subscale scores. However, there is no statistically significant relationship between MEDAS scores and the subscale score for food tasted (p>0.05).

Table 5. The relationship between KIDMED and MEDAS scores with PFS scores

	Mediterranean Diet Quality Scale		**Mediterranean Diet Adherence Scale**	
PFS total	r	-0.051	r	**-0.081***
	p	0.202	p	0.045
Food available	r	-0.057	r	**-0.111****
	p	0.158	p	0.006
Food present	r	-0.070	r	**-0.088***
	p	0.081	p	0.028
Food tasted	r	-0.024	r	-0.038
	p	0.549	p	0.340

*p<0.05 **p<0.01, r: Correlation coefficient, Pearson correlation analysis was applied.

DISCUSSION

This study is the first evaluation of the relationship between hedonic hunger status and adherence to the Mediterranean diet among university students. As a result of the study, it was observed that the sub-scale scores of the food availability, in which general thoughts about food were evaluated, were higher in overweight/obese individuals than in underweight individuals. A low-level negative correlation was found between individuals' hedonic hunger status and adherence to the Mediterranean diet.

It is stated that appetite and eating behavior are not solely controlled by energy needs, but also hedonic/reward brain systems play a significant role in obesity. In today's modern environment, which is filled with high-energy, high-sugar, and high-fat foods, especially young people are prompted to consume such foods for reasons like reducing negative emotions and thoughts, seeking pleasure, and feeling better (Espel-Huynh et al., 2018). Although there is no homeostatic need, the increased consumption of these foods can lead to significant changes in energy intake and give rise to hedonic hunger. This situation provides a partial explanation for the increase in obesity prevalence by disrupting body weight balance in the long term (Lee & Dixon, 2017). However, studies investigating the relationship between hedonic hunger and BMI show inconsistent results (Espel-Huynh et al., 2018). While some studies show a positive relationship between hedonic hunger and BMI (Rabiei et al., 2019; Fox et al., 2021; Taş & Gezer, 2022). Another cross-sectional study with adolescents as the sample showed that higher BMI values were associated with lower hedonic hunger (Stone et al., 2020). Furthermore, some studies have reported no correlation between hedonic hunger and BMI (Burger et al., 2016; Lipsky et al., 2016). Besides studies that have correlated the total score of the power of food scale with BMI, there are also studies showing associations between some of the subscales of the scale and BMI. In this study, it was found that the food availability subscale score was higher in overweight/obese individuals compared to underweight individuals, and this result supported the findings of the study conducted by Lipsky et al. with young adults (Lipsky et al., 2016). Similarly, Ribeiro et al. Reported that a one-unit increase in the food availability scale score doubled the likelihood of being obese (Ribeiro et al., 2018). Chmurzynska et al. showed that the food presentation subscale score had a positive correlation with BMI, while the food tasting subscale score had a negative correlation with BMI, and this finding could explain the inconsistent results regarding the correlations between BMI and

hedonic hunger (Chmurzynska et al., 2021). The evaluation of the relationship between hedonic hunger and sex is based on several foundations. It is stated that brain signals and hormones, which are effective in regulating energy intake and body weight, may vary according to sex. Neurological analyzes have shown that women have more sensitive neural responses than men to visual perceptions of delicious foods that stimulate hedonic hunger (Novelle & Diéguez, 2019). In this regard, In a study aimed at determining the factors influencing hedonic hunger in adults, it was found that hedonic hunger levels were higher in women than in men (Şarahman Kahraman & Akçil Ok, 2022). In another study, only the food presentation subscale score was found to be higher in women than in men (Taş & Gezer, 2022). In this study, no difference was found between men and women in terms of power of food scale scores.

The relationship between the Mediterranean diet, which is an effective dietary pattern for reducing the risk of obesity and other non-communicable diseases, has been studied in numerous researches. A recent meta-analysis of cohort studies examined the relationship between adherence to the Mediterranean diet and the risk of overweight or obesity. The analysis showed that higher adherence to the Mediterranean diet was significantly associated with a 9% reduction in the risk of overweight and/or obesity (Lotfi et al., 2022). However, similar to another study conducted with university students, a significant relationship between BMI and adherence to the Mediterranean diet was not found in this study (López-Moreno et al., 2021). This situation can be attributed to various factors other than nutrition in the etiology of obesity, such as genetics, physical activity habits, and more. An intervention study aimed at assessing the effectiveness of a two-year intervention based on the Mediterranean diet for the treatment of overweight and obesity on psychological health showed that the experimental group received educational sessions, personalized diet therapy based on the Mediterranean diet, and a physical activity program, while the control group received written instructions on the Mediterranean diet. The study results indicated that the experimental group exhibited significant reductions in body weight, fat mass, BMI, and waist circumference. Additionally, it was observed that depression levels decreased in the experimental group at the end of the intervention (Rumbo-Rodríguez et al., 2022). In studies conducted with university students, it was found that a lower adherence to the Mediterranean diet was associated with higher levels of negative emotions such as stress and anxiety, and higher adherence to the Mediterranean diet reduced the risk of depression by approximately 50% (Zurita-Ortega et al., 2018; Backhaus et al., 2020). It is stated that hedonic food consumption in university students arises as a response to various emotional states or as a way to suppress these emotional states. Additionally, it is mentioned that unlike the Mediterranean dietary model, there is an increasing prevalence of the Western-style diet, which involves consuming foods with low nutritional value and high energy, fat, and sugar content (Hadjimbei et al., 2016; Taş & Gezer, 2022). In line with this, in this study examining the relationship between adherence to the Mediterranean diet and hedonic hunger, a low-level negative correlation was found between adherence to the Mediterranean diet and hedonic hunger status. Similarly, in some studies conducted with adolescents, it has been shown that there is a positive relationship between hedonic hunger and consumption of unhealthy foods such as fast food and processed foods rich in added sugars and saturated fats, which do not reflect the Mediterranean dietary pattern (Stok et al., 2015; Bejarano & Cushing, 2018; Mason et al., 2020).

Limitations

This study does have some limitations. Firstly, the fact that all participants included in the research were university students studying in Erzurum province may have led to the lack of a strong relationship between adherence to the Mediterranean diet and hedonic hunger, as they might have similar dietary habits. Secondly, height and body weight data were obtained based on the

individuals' self-reports. This situation could be the reason for the lack of a relationship between BMI and hedonic hunger and adherence to the Mediterranean diet, due to potential inaccuracies in individuals' self-reports. Despite all these limitations, the significance of this study is heightened by being the first research into the relationship between hedonic hunger and the Mediterranean dietary pattern.

CONCLUSION

Consumption of energy-dense, high-fat, and high-sugar unhealthy foods is common among university students. In contrast to the Mediterranean dietary pattern, this type of Western-style diet containing such foods can result in hedonic hunger in the long term. According to the results obtained from this study, the power of food scale's subscale for food availability is higher in overweight/obese individuals compared to underweight individuals. There is a low level of negative correlation between hedonic hunger and adherence to the Mediterranean diet. In future studies examining the relationship between dietary patterns and hedonic hunger, it is recommended to increase the sample size by including individuals from different regions. Also longitudinal studies needed.

REFERENCES

Akar Sahingoz, S., Ozgen, L., & Yalçın, E. (2019, 02-06 October). Akdeniz Diyet Kalitesi Ölçeğinin (Mediterranean Diet Quality- KIDMED) Geçerlik ve Güvenirlik Çalışması (Validity and Reliability of the Mediterranean Diet Quality Scale (KIDMED)). Proceedings Book of 5th International Eurasian Congress on Natural Nutrition, Healthy Life & Sport, Ankara, Turkey.

Amin, T., & Mercer, J. G. (2016). Hunger and Satiety Mechanisms and Their Potential Exploitation in the Regulation of Food Intake. Curr Obes Rep, 5(1), 106-112. https://doi.org/10.1007/s13679-015-0184-5

Ayaz, A., Nergiz-Unal, R., Dedebayraktar, D., Akyol, A., Pekcan, A. G., Besler, H. T., & Buyuktuncer, Z. (2018). How does food addiction influence dietary intake profile? PLoS One, 13(4), e0195541. https://doi.org/10.1371/journal.pone.0195541

Backhaus, I., D'Egidio, V., Saulle, R., Masala, D., Firenze, A., De Vito, E., Mannocci, A., & La Torre, G. (2020). Health-related quality of life and its associated factors: results of a multi-center cross-sectional study among university students. J Public Health (Oxf), 42(2), 285-293. https://doi.org/10.1093/pubmed/fdz011

Bejarano, C. M., & Cushing, C. C. (2018). Dietary Motivation and Hedonic Hunger Predict Palatable Food Consumption: An Intensive Longitudinal Study of Adolescents. Ann Behav Med, 52(9), 773-786. https://doi.org/10.1093/abm/kax051

Berridge, K. C. (2009). 'Liking' and 'wanting' food rewards: brain substrates and roles in eating disorders. Physiol Behav, 97(5), 537-550. https://doi.org/10.1016/j.physbeh.2009.02.044

Berridge, K. C., Robinson, T. E., & Aldridge, J. W. (2009). Dissecting components of reward: 'liking', 'wanting', and learning. Curr Opin Pharmacol, 9(1), 65-73. https://doi.org/10.1016/j.coph.2008.12.014

Berthoud, H. R., Münzberg, H., & Morrison, C. D. (2017). Blaming the Brain for Obesity: Integration of Hedonic and Homeostatic Mechanisms. Gastroenterology, 152(7), 1728-1738. https://doi.org/10.1053/j.gastro.2016.12.050

Bilici, S., Ayhan, B., Karabudak, E., & Koksal, E. (2020). Factors affecting emotional eating and eating palatable food in adults. Nutr Res Pract, 14(1), 70-75. https://doi.org/10.4162/nrp.2020.14.1.70

Boutari, C., & Mantzoros, C. S. (2022). A 2022 update on the epidemiology of obesity and a call to action: as its twin COVID-19 pandemic appears to be receding, the obesity and dysmetabolism pandemic continues to rage on. Metabolism, 133, 155217. https://doi.org/https://doi.org/10.1016/j.metabol.2022.155217

Buja, A., Manfredi, M., Zampieri, C., Minnicelli, A., Bolda, R., Brocadello, F., Gatti, M., Baldovin, T., & Baldo, V. (2022). Is emotional eating associated with behavioral traits and Mediterranean diet in children? A cross-sectional study. BMC Public Health, 22(1), 1794. https://doi.org/10.1186/s12889-022-14192-8

Burger, K. S., Sanders, A. J., & Gilbert, J. R. (2016). Hedonic Hunger Is Related to Increased Neural and Perceptual Responses to Cues of Palatable Food and Motivation to Consume: Evidence from 3 Independent Investigations. J Nutr, 146(9), 1807-1812. https://doi.org/10.3945/jn.116.231431

Carlos, M., Elena, B., & Teresa, I. M. (2020). Are Adherence to the Mediterranean Diet, Emotional Eating, Alcohol Intake, and Anxiety Related in University Students in Spain? Nutrients, 12(8). https://doi.org/10.3390/nu12082224

Chmurzynska, A., Mlodzik-Czyzewska, M. A., Radziejewska, A., & Wiebe, D. J. (2021). Hedonic Hunger Is Associated with Intake of Certain High-Fat Food Types and BMI in 20- to 40-Year-Old Adults. J Nutr, 151(4), 820-825. https://doi.org/10.1093/jn/nxaa434

Davis, C., Bryan, J., Hodgson, J., & Murphy, K. (2015). Definition of the Mediterranean Diet; a Literature Review. Nutrients, 7(11), 9139-9153. https://doi.org/10.3390/nu7115459

Espel-Huynh, H. M., Muratore, A. F., & Lowe, M. R. (2018). A narrative review of the construct of hedonic hunger and its measurement by the Power of Food Scale. Obes Sci Pract, 4(3), 238-249. https://doi.org/10.1002/osp4.161

Fox, C. K., Northrop, E. F., Rudser, K. D., Ryder, J. R., Kelly, A. S., Bensignor, M. O., Bomberg, E. M., Bramante, C. T., & Gross, A. C. (2021). Contribution of Hedonic Hunger and Binge Eating to Childhood Obesity. Child Obes, 17(4), 257-262. https://doi.org/10.1089/chi.2020.0177

Hadjimbei, E., Botsaris, G., Gekas, V., & Panayiotou, A. G. (2016). Adherence to the Mediterranean Diet and Lifestyle Characteristics of University Students in Cyprus: A Cross-Sectional Survey. J Nutr Metab, 2016, 2742841. https://doi.org/10.1155/2016/2742841

Lee, P. C., & Dixon, J. B. (2017). Food for Thought: Reward Mechanisms and Hedonic Overeating in Obesity. Curr Obes Rep, 6(4), 353-361. https://doi.org/10.1007/s13679-017-0280-9

León-Muñoz, L. M., Guallar-Castillón, P., Graciani, A., López-García, E., Mesas, A. E., Aguilera, M. T., Banegas, J. R., & Rodríguez-Artalejo, F. (2012). Adherence to the Mediterranean diet pattern has declined in Spanish adults. J Nutr, 142(10), 1843-1850. https://doi.org/10.3945/jn.112.164616

Lipsky, L. M., Nansel, T. R., Haynie, D. L., Liu, D., Eisenberg, M. H., & Simons-Morton, B. (2016). Power of Food Scale in association with weight outcomes and dieting in a nationally representative cohort of U.S. young adults. Appetite, 105, 385-391. https://doi.org/10.1016/j.appet.2016.06.012

López-Moreno, M., Garcés-Rimón, M., Miguel, M., & Iglesias López, M. T. (2021). Adherence to Mediterranean Diet, Alcohol Consumption and Emotional Eating in Spanish University Students. Nutrients, 13(9). https://doi.org/10.3390/nu13093174

Lotfi, K., Saneei, P., Hajhashemy, Z., & Esmaillzadeh, A. (2022). Adherence to the Mediterranean Diet, Five-Year Weight Change, and Risk of Overweight and Obesity: A

Systematic Review and Dose-Response Meta-Analysis of Prospective Cohort Studies. Adv Nutr, 13(1), 152-166. https://doi.org/10.1093/advances/nmab092

Lowe, M. R., & Butryn, M. L. (2007). Hedonic hunger: a new dimension of appetite? Physiol Behav, 91(4), 432-439. https://doi.org/10.1016/j.physbeh.2007.04.006

Lowe, M. R., Butryn, M. L., Didie, E. R., Annunziato, R. A., Thomas, J. G., Crerand, C. E., Ochner, C. N., Coletta, M. C., Bellace, D., Wallaert, M., & Halford, J. (2009). The Power of Food Scale. A new measure of the psychological influence of the food environment. Appetite, 53(1), 114-118. https://doi.org/10.1016/j.appet.2009.05.016

Martínez-González, M., Corella, D., Salas-Salvadó, J., Ros, E., Covas, M. I., Fiol, M., Wärnberg, J., Arós, F., Ruíz-Gutiérrez, V., Lamuela-Raventós, R. M., Lapetra, J., Muñoz, M., Martínez, J. A., Sáez, G., Serra-Majem, L., Pintó, X., Mitjavila, M. T., Tur, J. A., Portillo, M. P., & Estruch, R. (2012). Cohort profile: design and methods of the PREDIMED study. Int J Epidemiol, 41(2), 377-385. https://doi.org/10.1093/ije/dyq250

Mason, T. B., Smith, K. E., Lavender, J. M., & Leventhal, A. M. (2020). Longitudinal Prospective Association between Hedonic Hunger and Unhealthy Food and Drink Intake in Adolescents. Int J Environ Res Public Health, 17(24). https://doi.org/10.3390/ijerph17249375

Mooreville, M., Shomaker, L. B., Reina, S. A., Hannallah, L. M., Adelyn Cohen, L., Courville, A. B., Kozlosky, M., Brady, S. M., Condarco, T., Yanovski, S. Z., Tanofsky-Kraff, M., & Yanovski, J. A. (2014). Depressive symptoms and observed eating in youth. Appetite, 75, 141-149. https://doi.org/10.1016/j.appet.2013.12.024

Novelle, M. G., & Diéguez, C. (2019). Updating gender differences in the control of homeostatic and hedonic food intake: Implications for binge eating disorder. Molecular and Cellular Endocrinology, 497, 110508. https://doi.org/https://doi.org/10.1016/j.mce.2019.110508

Osorio-Conles, Ó., Olbeyra, R., Moizé, V., Ibarzabal, A., Giró, O., Viaplana, J., Jiménez, A., Vidal, J., & de Hollanda, A. (2022). Positive Effects of a Mediterranean Diet Supplemented with Almonds on Female Adipose Tissue Biology in Severe Obesity. Nutrients, 14(13). https://doi.org/10.3390/nu14132617

Peciña, S., & Berridge, K. C. (2005). Hedonic hot spot in nucleus accumbens shell: where do mu-opioids cause increased hedonic impact of sweetness? J Neurosci, 25(50), 11777-11786. https://doi.org/10.1523/jneurosci.2329-05.2005

Pehlivanoğlu, E. F. Ö., Balcıoğlu, H., & Ünlüoğlu, İ. (2020). Akdeniz diyeti bağlılık ölçeği'nin türkçe'ye uyarlanması geçerlilik ve güvenilirliği. Osmangazi Tıp Dergisi, 42(2), 160-164.

Poti, J. M., Braga, B., & Qin, B. (2017). Ultra-processed Food Intake and Obesity: What Really Matters for Health-Processing or Nutrient Content? Curr Obes Rep, 6(4), 420-431. https://doi.org/10.1007/s13679-017-0285-4

Rabiei, S., Sedaghat, F., & Rastmanesh, R. (2019). Is the hedonic hunger score associated with obesity in women? A brief communication. BMC Res Notes, 12(1), 330. https://doi.org/10.1186/s13104-019-4351-8

Ribeiro, G., Camacho, M., Santos, O., Pontes, C., Torres, S., & Oliveira-Maia, A. J. (2018). Association between hedonic hunger and body-mass index versus obesity status. Sci Rep, 8(1), 5857. https://doi.org/10.1038/s41598-018-23988-x

Rumbo-Rodríguez, L., Zaragoza-Martí, A., Sánchez-SanSegundo, M., Ferrer-Cascales, R., Laguna-Pérez, A., & Hurtado-Sánchez, J. A. (2022). Effectiveness of a Two-Year Multicomponent Intervention for the Treatment of Overweight and Obesity in Older People. Nutrients, 14(22). https://doi.org/10.3390/nu14224762

Sakamoto, K., Okahashi, T., Matsumura, S., Okafuji, Y., Adachi, S., Tsuzuki, S., Inoue, K., & Fushiki, T. (2015). The opioid system majorly contributes to preference for fat emulsions but not sucrose solutions in mice. Biosci Biotechnol Biochem, 79(4), 658-663. https://doi.org/10.1080/09168451.2014.991688

Sánchez-Villegas, A., Ruíz-Canela, M., Gea, A., Lahortiga, F., & Martínez-González, M. A. (2016). The association between the Mediterranean lifestyle and depression. Clinical Psychological Science, 4(6), 1085-1093.

Schröder, H., Fitó, M., Estruch, R., Martínez-González, M. A., Corella, D., Salas-Salvadó, J., Lamuela-Raventós, R., Ros, E., Salaverría, I., Fiol, M., Lapetra, J., Vinyoles, E., Gómez-Gracia, E., Lahoz, C., Serra-Majem, L., Pintó, X., Ruiz-Gutierrez, V., & Covas, M. I. (2011). A short screener is valid for assessing Mediterranean diet adherence among older Spanish men and women. J Nutr, 141(6), 1140-1145. https://doi.org/10.3945/jn.110.135566

Serra-Majem, L., Ribas, L., Ngo, J., Ortega, R. M., García, A., Pérez-Rodrigo, C., & Aranceta, J. (2004). Food, youth and the Mediterranean diet in Spain. Development of KIDMED, Mediterranean Diet Quality Index in children and adolescents. Public Health Nutr, 7(7), 931-935. https://doi.org/10.1079/phn2004556

Stok, F. M., De Vet, E., Wardle, J., Chu, M. T., De Wit, J., & De Ridder, D. T. (2015). Navigating the obesogenic environment: how psychological sensitivity to the food environment and self-regulatory competence are associated with adolescent unhealthy snacking. Eat Behav, 17, 19-22. https://doi.org/10.1016/j.eatbeh.2014.12.003

Stone, M. D., Matheson, B. E., Leventhal, A. M., & Boutelle, K. N. (2020). Development and validation of a short form Children's power of Food Scale. Appetite, 147, 104549. https://doi.org/10.1016/j.appet.2019.104549

Şarahman Kahraman, C., & Akçil Ok, M. (2022). Hedonic hunger status and related factors in adults. Perspect Psychiatr Care, 58(4), 2099-2106. https://doi.org/10.1111/ppc.13036

Taş, F., & Gezer, C. (2022). The relationship of hedonic hunger with food addiction and obesity in university students. Eat Weight Disord, 27(7), 2835-2843. https://doi.org/10.1007/s40519-022-01436-0

Timper, K., & Brüning, J. C. (2017). Hypothalamic circuits regulating appetite and energy homeostasis: pathways to obesity. Dis Model Mech, 10(6), 679-689. https://doi.org/10.1242/dmm.026609

Ulker, I., Ayyildiz, F., & Yildiran, H. (2021). Validation of the Turkish version of the power of food scale in adult population. Eat Weight Disord, 26(4), 1179-1186. https://doi.org/10.1007/s40519-020-01019-x

Yu, Y. H. (2017). Making sense of metabolic obesity and hedonic obesity. J Diabetes, 9(7), 656-666. https://doi.org/10.1111/1753-0407.12529

Zurita-Ortega, F., San Román-Mata, S., Chacón-Cuberos, R., Castro-Sánchez, M., & Muros, J. J. (2018). Adherence to the Mediterranean Diet Is Associated with Physical Activity, Self-Concept and Sociodemographic Factors in University Student. Nutrients, 10(8). https://doi.org/10.3390/nu10080966