The Interrelationship of Eating Behaviors in Overweight and Obese Adults

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ABSTRACT

Objective: Nutrition is a complex behavior influenced by homeostatic and non-homeostatic processes. Emotional and environmental triggers can affect non-homeostatic processes, leading to hedonistic, emotional, and night eating. This study aimed to investigate the relationship between hedonistic eating, emotional eating, and night eating syndrome in overweight and obese adults. **Materials and Methods:** 562 overweight and obese adults participated in the study. The data were collected using a general information and anthropometric measurements form, the Hedonistic Eating Scale (HES), the Emotional Eater Questionnaire (EEQ), and the Night Eating Questionnaire (NEQ). **Results:** Results showed that 8.2% of participants had emotional eating syndrome, and 25.6% had night eating syndrome. Obese participants were found to have higher rates of emotional eating and night eating syndrome than overweight participants. There were positive correlations between EEQ with HES (r=0.468, p<0.001); NEQ with HES (r=0.231, p<0.001); NEQ with EEQ (r=0.416, p<0.001); BMI and EEQ (r=0.128, p<0.01). Also, emotional eating increases night eating syndrome risk by 9%, while hedonic eating increases by 2%. The progression from overweight to obese was increased by 5.7% for emotional eating and 3.3% for night eating. **Conclusion:** The results suggest that there are significant associations between eating behaviors in overweight and obese individuals. This study provides insights and a better understanding of factors that trigger overeating in overweight and obese individuals.

Keywords: Eating Behaviors, Emotional Eating, Hedonistic Eating, Night Eating Syndrome, Obesity.

Fazla Kilolu ve Obez Yetişkinlerde Yeme Davranışları İlişkisi

ÖZ

Amaç: Beslenme homeostatik ve homeostatik olmayan süreçlerden etkilenen karmaşık bir davranıştır. Duygusal ve çevresel tetikleyiciler homeostatik olmayan süreçleri etkileyerek hedonistik, duygusal ve gece yemeye yol açabilir. Bu araştırmanın amacı fazla kilolu ve obez yetişkinlerde hedonistik yeme, duygusal yeme ve gece yeme sendromu arasındaki ilişkiyi araştırmaktır. **Gereç ve Yöntem:** Araştırmaya toplam 562 fazla kilolu ve obez yetişkin katılmıştır. Veriler genel bilgi ve antropometrik ölçüm formu, Hedonistik Yeme Ölçeği (HES), Duygusal Yeme Ölçeği (DYÖ) ve Gece Yeme Anketi (GYA) kullanılarak toplanmıştır. **Bulgular:** Araştırma sonuçları katılımcıların %8,2'sinin duygusal yeme sendromuna, %25,6'sının ise gece yeme sendromuna sahip olduğunu göstermiştir. Obez katılımcıların fazla kilolu katılımcılara göre daha yüksek oranda duygusal yeme ve gece yeme sendromuna sahip olduğu bulunmuştur. DYÖ ile HES arasında (r=0,468, p<0,001); HES ile GYA arasında (r=0,231, p<0,001); DYÖ ile GYA arasında (r=0,416, p<0,001); BKİ ve DYÖ arasında (r=0,128, p<0,01) pozitif korelasyon saptanmıştır. Duygusal yeme sendromu gece yeme sendromu riskini %9 oranında artırırken, hedonik yeme ise %2 oranında artırmaktadır. Fazla kiloluluktan obeziteye geçiş duygusal yemede %5,7, gece yemede ise %3,3 artmaktadır. **Sonuç:** Araştırma sonuçları fazla kilolu ve obez bireylerde yeme davranışları arasında anlamlı ilişkiler olduğunu göstermektedir. Bu araştırma, fazla kilolu ve obez bireylerde aşırı yemeyi tetikleyen faktörlerin daha iyi anlaşılmasını sağlamaktadır.

Anahtar Kelimeler: Yeme Davranışları, Duygusal Yeme, Hedonistik Yeme, Gece Yeme Sendromu, Obezite.

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INTRODUCTION

The regulation of nutrition involves both homeostatic and non-homeostatic processes that are influenced by physiological needs and psychological factors. Hedonic hunger, for instance, refers to an increased appetite and pleasure derived from food consumption, typically driven by the taste, smell, and other sensory properties of foods, rather than by physiological need (Gunduz et al., 2020; Köse & Şanlıer, 2015; Yu et al., 2015). Hedonic mechanisms can override homeostatic signals, leading to excessive food intake (Köse & Şanlıer, 2015). This type of eating behavior is often associated with emotional eating and eating disorders, particularly in cases where there are disruptions to the hedonic system (Lutter & Nestler, 2009).

Nutrition is a complex behavior affected by a range of environmental and emotional triggers. Environmental triggers, such as the sight and smell of food, or the presence of others consuming food, can all impact an individual's food choices and intake, while emotional triggers, such as stress or fluctuations in mood, can also influence eating behavior (Gunduz et al., 2020). These triggers are at the core of hedonic eating, which involves the consumption of food for pleasure rather than for physiological needs. The relationship between mental state and nutrition is complex: while negative emotional states like depression, anxiety, and anger can sometimes lead to loss of appetite and aversion to eating (Demirel et al., 2014; Ibrahim et al., 2016; Meule et al., 2014), in emotional eating, excessive amounts of food are consumed in response to negative emotions (Barnhart et al., 2020; Bourdier et al., 2018; Braden et al., 2018). Emotional eating often involves the consumption of high-carbohydrate, high-fat, and energy-dense foods (Nolan & Geliebter, 2012), and can lead to binge eating, weight gain, and obesity over time (Braden et al., 2018; Erkaya et al., 2020; Nolan & Geliebter, 2012).

When evaluating nutrition, it is important to consider the distribution of food intake throughout the day and the reasons for consumption (Sevincer et al., 2016). Increased food consumption in the evening, also known as night eating syndrome (NES), can develop into a disorder characterized by a lack of appetite in the morning, excessive food intake in the evening, and sleep disturbances (Civil Arslan et al., 2015). NES was initially identified in individuals with treatment-resistant obesity and is marked by recurrent eating episodes that occur either upon waking from sleep or after dinner (Konttinen et al., 2010). Individuals with NES also report experiencing negative mood states in the evening and are more likely to experience depression at night (Atasoy et al., 2014).

Numerous studies have demonstrated that psychological factors may affect nutrition, including appetite and food consumption (Bourdier et al., 2018; Braden et al., 2018). With the increased availability of delicious foods, overeating can occur in a non-homeostatic way due to motivational processes (Braden et al., 2018). Factors such as pleasure from food consumption, changes in mood, and negative emotions, especially in the evening, can trigger overeating (Escandón-Nagel et al., 2018; Nolan & Geliebter, 2012). This study aims to examine the relationships between hedonic eating, emotional eating, night eating syndrome, and BMI and sociodemographic characteristics in overweight and obese adults who exhibit symptoms and behaviors consistent with these conditions. Specifically, this research hypothesizes that hedonic and emotional eating increases the risk of night eating syndrome and obesity in this population.

MATERIALS AND METHODS

Study type

This cross-sectional study was conducted online from January to December 2021.

Study group

The study included a sample of 562 overweight and obese adults (257 women, 305 men) who volunteered to participate. Participants were asked to fill out a data collection form online via Google Forms. Out of 878 individuals who completed the form, we excluded 63 individuals under the age of 18 and 56 or over 65. Body Mass Index (BMI) calculations were based on height and body weight information provided by participants, using the World Health Organization's BMI classification for adults (WHO, 2000), our study included individuals with a BMI higher than 25 kg/m2. Therefore, we further excluded 197 participants with a BMI less than 25 kg/m2. The remaining sample size of 562 individuals was deemed sufficient based on the unknown universe sample account, with a minimum of 385 participants needed for a confidence level of 95% and a margin of error of 5%.

Dependent and independent variables

The independent variables of this research are hedonic eating, emotional eating, and night eating syndrome. The dependent variables are overweight and obesity.

Procedures

A comprehensive online data collection form consisting of four parts was created to collect data for the study using Google Forms. The first section of the form included questions related to participants' general information, such as age, educational status, and employment status, as well as anthropometric measurements such as height and weight. BMI was then calculated using this information, and participants were classified as overweight (BMI between 25.00-29.99 kg/m²) or obese (BMI 30.00 kg/m² or higher) according to the World Health Organization's BMI classification for adults (WHO, 2000). The following three sections include scales.

Hedonistic Eating Scale (HES): The second part of the form has the Hedonistic Eating Scale (HES), a tool developed by Atik et al. (2019) to evaluate hedonistic eating behaviors. The HES consists of 15 items designed to assess situations that reflect hedonistic eating habits. The scale has been reported to have high internal consistency, with a coefficient of 0.968. Scores

on the scale can range from 15-75, with higher scores indicating a greater tendency toward hedonistic eating. This study's Cronbach's alpha value of the HES found 0.935.

Emotional Eater Questionnaire (EEQ): The third part of the form has the Emotional Eater Questionnaire (EEQ), developed by Garaulet et al. (2012) to assess emotional eating behaviors and Arslantaş et al. (2019) conducted the Turkish validity and reliability study of the scale, reporting an internal consistency coefficient of 0.84. The total score on the scale ranges from 0-30, with higher scores indicating a higher level of emotional eating behavior. In the Turkish adaptation, the cutoff score was determined as 21, indicating the presence of emotional eating behavior if the score was 21 and above. In this study, Cronbach's alpha value of the EEQ was found to be 0.880.

Night Eating Questionnaire (NEQ): Allison et al. (2008) developed the Night Eating Questionnaire (NEQ) for the screening of night eating syndrome, and its Turkish validity and reliability study was conducted by Atasoy et al. (2014). The internal consistency coefficient of the Turkish adaptation of the NEQ is reported as 0.69. The NEQ consists of 14 items, and the total score that can be obtained from the questionnaire is between 0-52 (Allison et al., 2008). In the Turkish adaptation of NEQ, a cutoff score of 18 was determined, and a questionnaire score of 18 and above was suggested as a diagnosis of the night-eating syndrome (Atasoy et al., 2014). In this study, Cronbach's alpha value of the NEQ was 0.714.

Statistical analysis

Statistical analyses were conducted using IBM SPSS Version 20.0 for Windows (SPSS, Chicago, IL, USA). The analysis involved several statistical tests, each tailored to specific aspects of the data. Spearman's Correlation was employed to assess the strength and direction of associations between continuous, non-normally distributed variables such as eating behavior scores and BMI. For comparing differences between two independent groups, particularly in cases of non-parametric data, the Mann-Whitney U test was utilized. When comparing more than two groups, the Kruskal Wallis H test was applied, especially useful for evaluating variables like age categories or different BMI classifications. In the post-hoc analysis, evaluation was conducted using Dunn's test following the H test. Logistic regression was utilized to ascertain the effect. The significance of the model was evaluated using the Omnibus test through the chi-square statistic, while the Hosmer and Lemeshow test was employed to determine the model's goodness of fit, ensuring that the predicted observations were not significantly different from the actual values. Additionally, the explanatory power of the variance was understood through the Nagelkerke R square value. The data were interpreted at a 95% confidence level.

Ethical considerations

Before the study, we obtained ethical approval from the Istanbul Okan University Ethics Committee (Date: 09.12.2020, Number: 129-18) under the Helsinki Declaration. Research participation was voluntary. Data were collected within a year following the ethics committee's approval.

RESULTS

A total of 562 participants took part in the study, comprising 257 women (45.7%) and 305 men (54.3%). The mean age of the participants was 34.15 ± 12.87 years, with no significant difference observed between females (35.52 ± 13.12 years) and males (33.01 ± 12.56 years) (p> 0.05). Descriptive statistics of the participants are presented in Table 1.

Table 1. Descriptive statistics of the participant.

Variable	n (%)	Variable	n (%)
Sex		**BMI Classification**	
Women	257 (45.7)	Overweight	416 (74.0)
Men	305 (54.3)	Obese	146 (26.0)
Marital Status		**Emotional Eating**	
Single	268 (47.7)	Present (<21)	46 (8.2)
Married	294 (52.3)	Absent (≥21)	516 (91.8)
Educational Status		**Night Eating Syndrome**	
Elementary School	48 (8.5)	Present (<18)	144 (25.6)
Secondary School	32 (5.7)	Absent (≥18)	418 (74.4)
High School	120 (21.4)		**Mean ± SD**
University	362 (64.4)	**Age (year)**	34.15 ± 12.87
Employment Status		**BMI (kg/m²)**	28.62 ± 3.21
Housewife	66 (11.7)	**HES**	46.47 ± 13.05
Student	159 (28.3)	**EEQ**	11.37 ± 6.50
Employed	255 (45.4)	**NEQ**	14.65 ± 6.58
Unemployed	49 (8.7)		
Retired	33 (5.9)		

SD: Standard Deviation; HES: Hedonistic Eating Scale; EEQ: Emotional Eater Questionnaire; NEQ: Night Eating Questionnaire; BMI: Body Mass Index

The study found that 70.4% (n=181) of the women were overweight, while 29.6% (n=76) were obese. Among the men, 77.0% (n=235) were overweight and 23.0% (n=70) were obese. No significant difference was observed between BMI classification and sex (p> 0.05).

The prevalence of emotional eating and night eating syndrome was found to be significantly higher in the obese group compared to the overweight group (13.7% vs. 6.3% and 34.2% vs. 22.6%, respectively) (all p <0.01).

In Table 2, HES, EEQ, and NEQ scores based on the participants' socio-demographic characteristics and BMI classification were shown. Median HES scores were found to be significantly higher among singles compared to married individuals (p <0.01) and among students compared to other groups (p <0.001). Median EEQ scores were significantly higher among women compared to men (p <0.01), singles compared to married individuals, university graduates compared to other groups, and students compared to other groups (all p <0.001). Median NEQ scores were significantly higher among singles compared to married individuals (p <0.001). Median EEQ and NEQ scores were found to be significantly higher among obese individuals compared to those who were overweight (p <0.001 and p <0.01, respectively).

Table 2. Relationship between socio-demographic characteristics and BMI classification with HES, EEQ, and NEQ scores.

Variable	HES Median (Q1-Q3)	z/χ2	p	EEQ Median (Q1-Q3)	z/χ2	p	NEQ Median (Q1-Q3)	z/χ2	p
Sex									
Women (n=257)	45.00 (36.50-52.00)	-1.818$_z$	0.069	12.00 (8.00-16.00)	-3.335$_z$	**0.001***	13.00 (11.00-18.00)	-0.765$_z$	0.444
Men (n=305)	46.00 (38.50-57.00)			10.00 (6.00-15.00)			13.00 (10.00-18.00)		
Marital Status									
Single (n=268)	47.50 (40.00-58.00)	-3.415 $_{χ2}$	**0.001***	12.00 (8.00-17.00)	-4.456$_z$	**<0.001****	14.00 (11.00-19.00)	-4.519$_z$	**<0.001****
Married (n=294)	44.00 (36.00-52.00)			10.00 (5.00-14.00)			12.00 (10.00-16.00)		
Educational Status									
Elementary School (n=48)	45.50 (32.00-51.50)	7.195 $_{χ2}$	0.066	7.00 (3.00-12.75)	22.795 $_{χ2}$	**<0.001****	12.00 (9.00-15.00)	6.550 $_{χ2}$	0.088
Secondary School (n=32)	42.00 (34.25-50.00)			9.00 (4.00-13.50)			13.00 (9.00-16.00)		
High School (n=120)	44.00 (37.00-54.75)			10.00 (5.00-15.00)			13.00 (10.00-17.00)		
University (n=362)	46.00 (38.00-55.25)			11.00 (8.00-16.00)			14.00 (10.00-18.00)		
Employment Status									
Housewife (n=66)	44.50 (34.75-51.25)	20.409 $_{χ2}$	**<0.001****	9.00 (5.00-13.00)	26.747 $_{χ2}$	**<0.001****	13.00 (10.75-18.00)	7.722 $_{χ2}$	0.102
Student (n=159)	48.00 (40.00-59.00)			13.00 (9.00-18.00)			14.00 (11.00-19.00)		
Employed (n=255)	44.00 (36.00-53.00)			10.00 (6.00-14.00)			13.00 (10.00-17.00)		
Unemployed (n=49)	51.00 (42.00-62.00)			12.00 (7.50-17.50)			13.00 (11.00-18.50)		
Retired (n=33)	42.00 (35.50-49.50)			10.00 (5.00-13.50)			12.00 (10.00-15.50)		
BMI Classification									
Overweight (n=416)	46.00 (37.00-54.75)	-0.879$_z$	0.379	11.00 (6.00-15.00)	-3.853$_z$	**<0.001****	13.00 (10.00-17.00)	-2.653$_z$	**0.008***
Obese (n=146)	46.50 (37.75-55.25)			11.50 (9.00-18.00)			14.00 (11.00-21.00)		

*p<0.01; **p<0.001; z: Mann Whitney U Test; χ2: Kruskal Wallis H Test; Q1-Q3: 25th-75th percentile. HES: Hedonistic Eating; EEQ: Emotional Eating; NEQ: Night Eating; BMI: Body Mass Index

In Table 3, The Hedonistic Eating Score (HES) exhibited a positive correlation with the Emotional Eating Quotient (EEQ; r = 0.468, p < 0.001) and the Night Eating Quotient (NEQ; r = 0.231, p < 0.001). However, HES did not show a significant correlation with BMI (r = -0.009, p = 0.834). Notably, there was a

significant negative correlation between HES and age (r = -0.224, p < 0.001). The EEQ also displayed a significant positive correlation with NEQ (r = 0.416, p < 0.001), a small but significant positive correlation with BMI (r = 0.128, p = 0.002), and a negative correlation with age (r = -0.221, p < 0.001). NEQ was

negatively correlated with age (r = -0.189, p < 0.001) but showed no significant correlation with BMI (r = -0.051, p = 0.226). Additionally, a significant positive correlation was observed between BMI and age (r = 0.237, p < 0.001).

Table 3. Relationship between HES, EEQ, NEQ scores, BMI levels, and age (n = 562).

		HES		EEQ		NEQ		BMI (kg/m^2)		Age (year)	
	r	**p**	**r**	**p**	**r**	**p**	**r**	**p**	**r**	**p**
HES	1	-	**0.468**	**<0.001****	**0.231**	**<0.001****	-0.009	0.834	**-0.224**	**<0.001****
EEQ			1	-	**0.416**	**<0.001****	**0.128**	**0.002***	**-0.221**	**<0.001****
NEQ					1	-	0.051	0.226	**-0.189**	**<0.001****
BMI (kg/m^2)							1	-	**0.237**	**<0.001****
Age (year)									1	-

*p<0.01; **p<0.001; Spearman's rho, HES: Hedonistic Eating; EEQ: Emotional Eating; NEQ: Night Eating; BMI: Body Mass Index

In Table 4, it was shown that the effect of EEQ and HES on NEQ and BMI classification as dependent variables. In Model 1, the impact of participants' emotional eating (EEQ) and hedonic eating (HES) tendencies on the presence of Night Eating Syndrome (NES) risk was examined. Model 1 met the assumptions and provided significant results, explaining 13.3% of the variance. In Model 2, there were three independent variables, including emotional eating (EEQ), hedonic eating (HES), and night eating behaviors, and their impact on BMI classification was investigated. Model 2 also produced significant results, explaining 5.2% of the variance, and met the assumptions.
In Model 1, it was found that emotional eating and hedonic eating have a significant effect on night eating

(p<0.05). Considering the positive Beta coefficient and coding, both emotional eating and hedonic eating are factors that increase the risk of night eating syndrome. The equations are provided below:

$$\ln\left(\frac{P(NE = Risk\ Present)}{P(NE = Risk\ Absent)}\right) = -3.086 + 0.087 \times (EEQ) + 0.020 \times (HES)$$

$$P(NE = Risk\ Present) = \frac{e^{-3.086+0.087\times(EEQ)+0.020\times(HES)}}{1 + e^{-3.086+0.087*(EEQ)+0.020*(HES)}}$$

$$P(NE = Risk\ Absent) = 1 - P(NE = Risk\ Present)$$

In Model 2, it was found that emotional eating, hedonic eating, and night eating have a significant effect on BMI classification in participants who are distributed in overweight and obese classes (p<0.05).

Table 4. Logistic regression model for BMI classification, NEQ, EEQ, and HES.

	Dependent	Independent	β	SE	Wald	p	Exp(β)	Confidence Interval 95%	
								Lower	**Upper**
Model 1	NEQ Groups	EEQ	0.087	0.018	23.780	**<0.001**	1.090	1.053	1.130
		HES	0.020	0.009	5.060	**0.024***	1.020	1.002	1.039
		Constant	*-3.086*	*0.405*	*57.994*	*<0.001*	*0.046*		
		Omnibus Test of Model: χ2: 53.223; p<0.001; Nagelkerke R^2: 0.133 Hosmer and Lemeshow Test: χ2: 6.925; p=.545>.05							
Model 2	BMI Classification	EEQ	0.055	0.018	9.677	**0.002****	1.057	1.020	1.094
		HES	-0.011	0.009	1.668	0.197	0.989	0.971	1.007
		NEQ	0.032	0.015	4.451	**0.035***	1.033	1.003	1.063
		Constant	*-1.682*	*0.390*	*18.570*	*<0.001*	*0.186*		
		Omnibus Test of Model: χ2: 20.350; p<0.001; Nagelkerke R^2: 0.052 Hosmer and Lemeshow Test: χ2: 14.978; p=.060>.05							

Model 1 Codes: 0: NE Risk Absent, 1: NE Risk Present, Model 2: Codes: 1: Overweight, 2: Obese, *p<0.05; **p<0.01; ***: p<0.001; HES: Hedonistic Eating; EEQ: Emotional Eating; NEQ: Night Eating; BMI: Body Mass Index

The model showed that hedonic eating did not create a significant model on BMI classification, indicating that the shift from overweight to obese participants was not related to hedonic eating. However,

considering the positive Beta coefficient and coding, both emotional eating and night eating tendencies lead individuals from the overweight class to the obese class. The equations are provided below:

$$\ln\left(\frac{P(BMI = Overweight)}{P(BMI = Obese)}\right) = -1.682 + 0.055 \times (EEQ) - 0.011 \times (HES) + 0.032 \times (NEQ)$$

$$P(BMI = Overweight) = \frac{e^{-1.682+0.055\times(EEQ)-0.011\times(HES)+0.032\times(NEQ)}}{1 - 1.682 + 0.055 \times (EEQ) - 0.011 \times (HES) + 0.032 \times (NEQ)}$$

$$P(Obese) = 1 - P(Overweight)$$

It was observed that the explanatory coefficient of emotional eating and hedonic eating on night eating syndrome risk is 0.133, and the explanatory coefficient of emotional eating and night eating on the risk of progression from overweight to obese is 0.052. In both models, independent variables that have a significant effect contribute to the higher coding of the dependent variable. Based on this information, the effect ratios were calculated as follows:

$$Effect\ rate = (exp(\beta_i) - 1) * 100$$

It has been determined that emotional eating increases the risk of night eating syndrome by 9%, and hedonic eating increases it by 2%. The risk of progressing from overweight to obese is increased by 5.7% for emotional eating and by 3.3% for night eating.

DISCUSSION

The pleasure from eating, emotional state, and overeating especially in the evening may result in obesity (Escandón-Nagel et al., 2018). In this study, the relationship between hedonistic eating, emotional eating, and night eating of overweight and obese participants was evaluated. This research has shown that there were important associations between hedonistic eating, emotional eating, and night eating syndrome in overweight and obese individuals. At the end of the study, results supported our hypothesis as hedonistic eating and emotional eating caused an increase in night eating syndrome and obesity.

Given that the HES scale was specifically designed for individuals with obesity, it is crucial to focus on the high-BMI population in research. In our study, 74.0% of participants had a BMI above 25 kg/m2, with 26.0% classified as obese (BMI > 30 kg/m2). Notably, these BMI distributions closely resemble those reported in previous development studies of the HES, EEQ, and NEQ scales (Allison et al., 2008; Atik et al., 2019; Garaulet et al., 2012), thereby enabling a more rigorous evaluation of the scales. Our large sample size further enhances the statistical power of our findings.

The original HES study focused exclusively on obese patients and did not report any information on mean or cutoff scores (Atik et al., 2019). In our study, we calculated the mean HES score to be 46.47 ± 13.05. We found no significant relationships between HES scores and BMI, sex, or educational status. However, we did observe that single participants had higher HES scores than married ones, and students had higher scores than other groups. Additionally, a negative correlation between age and HES score was

stated. As the first investigation to employ HES, our study provides valuable insights into the literature on hedonistic eating. We believe that our results will contribute significantly to the field.

Given the close link between emotional eating and hedonistic eating (Meule et al., 2014), our study aimed to assess emotional eating behaviors alongside hedonistic eating. While previous research has typically used sub-factors of other scales to measure emotional eating (Erkaya et al., 2020; Meule et al., 2014; Nolan & Geliebter, 2012), we applied the EEQ in this study. Our objective was to identify the presence of emotional eating across various scoring groups on the EEQ. Although most studies have not provided explicit cutoff scores for the EEQ (Arslantas et al., 2019; Garaulet et al., 2012), higher EEQ scores have generally been reported in women (Rasouli et al., 2019). In the Turkish adaptation of the EEQ, emotional eating was observed in 10% of participants (Arslantas et al., 2019). In our study, we found that 8.2% of participants exhibited emotional eating behaviors, with a mean EEQ score of 11.37 ± 6.50. Women had higher EEQ scores than men, and median EEQ scores were higher among single, university graduated, and student participants compared to their respective comparison groups.

Numerous studies have documented the relationship between emotional eating and BMI (Meule et al., 2014; Nolan & Geliebter, 2012), highlighting its significance as a social issue (Konttinen et al., 2010). In the Turkish adaptation of the EEQ, no significant association was reported between emotional eating and BMI; however, when individuals with a BMI of 25 kg/m2 or higher were compared to those with lower BMIs, higher levels of emotional eating were observed in the former group (Arslantas et al., 2019). In a study focused on obese individuals, researchers identified a significant correlation between BMI and both EEQ scores and binge eating (Escandón-Nagel et al., 2018). Other research has shown that EEQ scores increased with higher BMI in both sex (Farhangi, 2019; Rasouli et al., 2019). Our study found that the median EEQ scores of obese individuals were higher than those of overweight individuals, and a positive correlation was observed between BMI and EEQ. Consistent with previous findings, we found a negative association between age and EEQ, as demonstrated in a study conducted in Spain (Escandón-Nagel et al., 2018).

Several studies have linked night eating to emotional eating (Konttinen et al., 2010; Nasirzadeh et al., 2018). In fact, one study found that poor sleep quality was strongly associated with emotional eating (Saleh-Ghadimi et al., 2019). As a concern, eating for pleasure or to avoid negative emotions can lead to problems with night eating (Meule et al., 2014). To assess night eating, the NEQ was used in this study. Previous research using NEQ has shown mean scores ranging from 13.09 ± 4.69 to 33.1 ± 7.5 (Allison et al., 2008; Atasoy et al., 2014; Civil Arslan et al.,

2015; Eray et al., 2019; He et al., 2018). Our study's mean NEQ score was 14.65 ± 6.58, which falls within this range. The relationship between night eating and demographic factors such as sex, marital status, education, and employment status has been studied in several previous studies, with mixed results. While some studies found no significant relationship between these factors and night eating (Atasoy et al., 2014; Civil Arslan et al., 2015; Sevincer et al., 2016), others found that night-eating syndrome was more prevalent in individuals with low education who live alone (He et al., 2018) or in men (Saleh-Ghadimi et al., 2019). In our study, we found that the median NEQ scores of singles were higher than those of married individuals.

Numerous studies have established a correlation between night-eating syndrome and elevated BMI (Bruzas & Allison, 2019; Calugi et al., 2009; Eray et al., 2019). For instance, Allison et al. (2008) and Atasoy et al. (2014) conducted studies with obese participants and found that 62% and 68.8% of them, respectively, met the diagnostic criteria for night-eating syndrome. Eray et al. (2019) found that 11.7% of their participants with a mean BMI of 40.5 ± 15.4 kg/m2 had night-eating syndrome. In contrast, He et al. (2018) reported a lower frequency of 2.8% for night-eating syndrome in a large student population in China after excluding those with binge-eating disorder. Similarly, Sevincer et al. (2016) found a frequency of 9.5% for night-eating syndrome in their study, which screened for eating disorders, and showed a higher prevalence in individuals with BMI above normal. Civil Arslan et al. (2015) found that 16.5% of their overweight and obese psychiatric patients had NEQ scores above 25 and 7.6% were diagnosed with night-eating syndrome according to diagnostic criteria. Calugi et al. (2009) also found a strong correlation between NEQ scores and class II and III obesity. However, Riccobono et al. (2020) did not observe a significant relationship between night-eating syndrome and BMI in a study of individuals with a normal BMI, although some participants achieved a cutoff score of 5.3%. Our study found that 25.6% of our participants had night-eating syndrome, and obese participants had higher median NEQ scores than those who were overweight. The varying frequency reported across studies may be attributed to differences in samples and cultural factors.

Limitations

The findings of this cross-sectional study, obtained through an online survey, are subject to several limitations that warrant consideration. The reliance on an online data collection method and self-reported data for height, weight, and eating behaviors may introduce selection and reporting biases, potentially impacting the generalizability and accuracy of the results. Additionally, it is critical to acknowledge that the strength of causal inferences in this study is inherently weaker when compared to longitudinal designs, as the cross-sectional design does not preclude causal

relationships but provides a less robust basis for such interpretations. Furthermore, the exclusion of individuals under the age of 18 and over 65, as well as those with a BMI below 25 kg/m², limits the applicability of the findings to a broader population. The relatively lower internal consistency coefficients of some scales, particularly the NEQ, might also affect the reliability of these measurements. Despite these limitations, the study is believed to provide valuable insights, highlighting the need for further research to deepen the understanding of the relationships between eating behaviors and obesity in diverse populations.

CONCLUSION

Our hypothesis was confirmed through regression analysis, which measured the impact of various factors on BMI classification, night eating syndrome, emotional eating, and hedonistic eating. The analysis revealed that an increase in individuals' hedonistic eating and emotional eating scores had an increasing effect on the likelihood of night-eating syndrome. Moreover, emotional eating and night eating behaviors were also found to have an increasing effect on an individual's risk of obesity. We also found that hedonistic eating behaviors did not directly affect BMI classification but could trigger night eating behavior. Additionally, night eating has been associated with a higher risk of obesity. Emotional eating behavior was found to have a direct impact on both night eating behavior and obesity. Overall, our findings suggest that addressing emotional eating behaviors may help reduce the likelihood of night eating syndrome and obesity.

Our research highlights the importance of understanding hedonic mechanisms, emotional states, and night eating behaviors that contribute to weight gain and obesity. This information provides valuable insights for future research on these issues.

This study is the first known study that examined the relationships between hedonistic eating, emotional eating, and night eating in overweight and obese individuals. The results demonstrate that these three states are interconnected and may contribute to increased food consumption and obesity beyond physiological satiety. The study's pioneering use of the newly developed hedonistic eating scale provides a unique contribution to the existing literature on this subject.

Author Contributions
Plan, design: HÖY; GK; AMG; BKA, SY; **Material, methods and data collection:** HÖY; GK; AMG; BKA, SY; **Data analysis and comments:** HÖY; GK; AMG; BKA, SY; **Writing and corrections:** HÖY; GK; AMG; BKA, SY.

Funding
None

Ethical considerations
Before the study, we obtained ethical approval from the Istanbul Okan University Ethics Committee (Date: 09.12.2020, Number: 129-18) under the Helsinki Declaration. Research participation was voluntary. Data were collected within a year following the ethics committee's approval.

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