



The effect of emotional eating on body weight and eating habits in adults

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Abstract

The aim of this study is to evaluate the effect of emotional nutrition on body weight and eating habits in adults. 2461 volunteers between the ages of 18-and 65 (40.7±13.6 years) participated in this cross-sectional study (M=677, F=1784). Research data were collected with a face-to-face questionnaire. The participants' nutritional habits and status were evaluated with the three-factor eating questionnaire (TFEQ) and a 24-hour dietary recall form. The "International Physical Activity Assessment Questionnaire - Short Form" was used to determine the physical activity level of individuals. Body mass index was calculated by measuring height and body weight. At the end of the study, it was found that 34.5% of the participants were overweight, and 25.1% were obese. The uncontrolled eating and hunger score were significantly higher, whereas it was low in cognitive restraint in individuals who consumed grains as much or more than recommended ($p<0.05$). And higher cognitive restraint score was found in those who stated that they consumed the milk and dairy products, vegetable and fruit groups as much or more than recommended and the grains less than recommended ($p<0.05$). In addition, dietary disinhibition (OR=1.142, 95% CI=1.097-1.189), cognitive restriction (OR=1.076, 95% CI=1.050-1.103) and fasting (OR=1.084, 95% CI=1.033-1.137) scores of TEFQ sub-factors been shown to significantly increase the risk of being overweight/obese ($p<0.001$). These results show that emotional eating has a significant effect on body weight. For this reason, a multidisciplinary approach is required to evaluate the effect of diet therapy and nutrition on the patient and take into account the patient's emotional state, especially in the treatment and control of obesity.

Keywords: Emotional eating, body weight, eating habits, body mass index (BMI)

Introduction

Obesity, which is the etiology of many chronic diseases, is one of the health problems increasing day by day. It has been determined that approximately 107.7 million children and 603.7 million adults worldwide are obese, and the prevalence of obesity has doubled in more than 70 countries since 1980 [1]. Although the World Health Organization has aimed to reduce the prevalence of obesity by 2025, it does not seem possible to reach this target at the current rate of increase [2]. Obesity is an important health problem in our country. In the Turkey Nutrition and Health Survey (TBSA-2017), it was determined that the rate of overweight or obese individuals increased compared to the previous study and reached 69.1% [3].

Obesity, which is a multifactorial disease in which genetic, biological, and environmental factors are involved in its etiology,

basically develops with an increase in adipose tissue due to the energy taken with the diet more than the expenditure [4-7]. Various types of eating behaviors, such as the loss of control over food intake, and the tendency to overeat, which often develops in the presence of emotional stress, are associated with obesity. In addition, it is claimed that dietary restriction, which is common in modern societies today, plays a role in the development of obesity [8]. Studies show that positive or negative emotional state in people changes the amount of food consumption and often causes an increase [9, 10]. In addition, the types of foods consumed may change depending on the mood change [11]. It was determined that negative mood affects the type of food consumed more [11], and positive mood affects the amount of food consumed [10]. These show that eating has a psychological aspect, and emotional eating shapes eating habits.

Emotional eating often leads to higher consumption of foods high in fat and sugar, called "palatable foods," and overeating [9]. This situation has an essential role in developing adipose tissue increase and obesity. Understanding body weight-related eating behaviors allows the development of behavioral interventions to prevent the development of obesity. The Three-Factor Eating Questionnaire

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(TFEQ) was also developed by Stunkard et al [12]. In studies conducted with the three-factor nutrition questionnaire, it has been shown that emotional eating, uncontrolled eating, and cognitive eating restriction scores vary according to obesity in individuals [13,14]. This study, it was aimed to evaluate the relationship between emotional eating status and body weight and eating habits in adults.

Materials and Methods

This study was conducted with 2461 adult individuals who applied to 15 Family Health or Community Health Centers in Ankara. Ethical approval of the study was obtained from Ankara University Ethics Committee (19/06/2017-11/197). The general information of the participants who agreed to participate in the study and signed the consent form was recorded with a questionnaire prepared by the researchers. Volunteer adult individuals between the ages of 18-and 65 were included in the study, and those with eating disorders or any psychiatric diagnosis and pregnant women were not included. In the questionnaire, there are questions to determine the general knowledge and nutritional habits of the participants, as well as food consumption and physical activity registration form. In addition, the height and body weight of the participants were measured.

Nutrition habits

The participants' dietary habits were questioned by using the questions prepared by the researchers and TFEQ. In order to determine the consumption of milk and dairy products, meat and products, eggs and legumes, bread and grains, and fresh vegetables and fruits, the participants were asked questions prepared in line with the portion recommendations for adults in the Turkish Nutrition Guide [15]. Participants stated their daily consumption amounts for each food group as "less than the recommended amount," "up to the recommended amount," or "more than the recommended amount." Portion examples for food groups are also included to make the questions more descriptive.

The 3-Factor Eating Questionnaire, which was developed to measure the behavioral and cognitive components of eating, was reduced to 18 items by Karlsson et al [16]. Turkish validity and reliability of TFEQ were performed by Kırac et al [17]. All of the items in the questionnaire are in 4-point Likert type. The answers are scored as "definitely wrong," "1", "mostly wrong," 2, "absolutely right," 3, and "mostly right" 4. A high score from any of the sub-factors in the questionnaire indicates that the eating behavior related to that factor is more dominant. As suggested by Kırac et al., the sub-factors of conscious eating restriction, uncontrolled eating, emotional eating, and sensitivity to hunger are evaluated in the questionnaire [17]. At least 6 and a maximum of 24 points can be obtained from the conscious eating restriction factor in the scale, at least 5 and maximum 20 points from the uncontrolled eating factor, at least 3 and maximum 12 points from the emotional eating factor, and at least 1 and maximum 16 points from the hunger sensitivity factor. Since the scores obtained from the scale did not have a cut-off point, the participants' scores were evaluated by dividing them into quarters.

Food consumption record

The food consumption record of the participants was taken via a 24-hour dietary recall. While questioning the retrospective

consumption, the Food and Food Photo Catalogue was used to determine the portions [18]. The contents of the meals included in the participants' consumption were questioned one by one, and in cases where no answer could be obtained, the recipes in the Standard Food Tariffs book were used [19]. The obtained food consumption record was analyzed with the help of the BEBIS program.

Anthropometric measurements

The height and body weight of the participants were measured following the technique [20]. Body mass indexes (BMI) were calculated from the individuals' measured body weight and height values, and they were evaluated as <18.5 underweight, 18.5-24.99 normal, 25.0-29.99 overweight, and ≥ 30.0 obese, according to the World Health Organization's BMI classification [21].

Physical Activity

In the study, the "International Physical Activity Assessment Questionnaire - Short Form (IPAQ-SF)" was used to determine the physical activity level of individuals [22]. The Turkish validity and reliability study of the form was performed by Sağlam et al. in 2010. At the end of the questionnaire, the participants' physical activity levels are classified as "low, medium, and high" [23].

Statistical analysis

Statistical analyzes were performed using the SPSS (IBM SPSS Statistics 21) package program. Mean and standard deviation for numerical variables, percentage values, and frequency tables for categorical variables were used. The scores obtained from the three-factor nutrition questionnaire subscales were divided into quarters, and energy and macronutrient intake were evaluated. Risk factors affecting individuals' being overweight or obese were determined by binary logistic regression analysis. The backward Elimination Method (Backward: LR) was used to determine statistically significant variables. The Hosmer-Lemeshow test was also applied to evaluate the goodness of fit of the obtained model. The statistical significance level was accepted as $p < 0.05$.

Results

Sociodemographic information

A total of 2461 people, including 677 men (27.5%) and 1784 women (72.5%), participated in the study, and the mean age of the participants was 40.7 ± 13.6 years. It was determined that 72.1% of the participants were married, 38.8% were university graduates, 23% were high school graduates, 38.2% were primary school graduates (average 11.1 ± 4.5 years), and 64.3% were unemployed, and 43.3% had chronic diseases. 38.6% of the participants were sedentary, 49.2% were moderately active. The mean BMI of the participants participating in the study was 26.8 ± 5.4 kg/m² and 36.9% of them were normal weight, 34.5% were overweight (M=48.3%, F=29.3%) and 25.1% were obese (M=16.2, F=28.5).

Eating habits of participants and TFEQ sub-factor scores

66.2% of the participants in the study stated that they consume three main meals a day, 32.2% have two main meals a day, and 89.5% of them have a habit of snacking outside of meals. Table 1 shows the relationship between the participants' dietary habits and the mean scores of the TFEQ sub-factors. The uncontrolled eating

score was significantly higher in individuals who consumed meat and grains as much or more than recommended ($p<0.05$). The hunger score was significantly higher in those who consumed the grains more than recommended ($p<0.05$). It was determined that those who stated that they consumed the milk and dairy products, vegetable and fruit groups as much or more than recommended and

the grains less than recommended had a higher cognitive restraint score ($p<0.05$). It was found that individuals who consume fast food and sugary drinks at least once a week have higher scores for uncontrolled eating, emotional eating, and hunger, except for the cognitive restraint score.

Table 1. Participants' eating habits and TFEQ sub-factor mean scores

	Uncontrolled eating	Dietary disinhibition	Cognitive restraint	Hunger
	mean±sd	mean±sd	mean±sd	mean±sd
Milk and dairy products				
<3 portion/day	9.4±3.2	5.6±2.8	14.7±3.9*	7.2±2.8
≥3 portion/day	9.4±3.4	5.6±2.9	15.9±4.2	7.2±2.9
Meat, poultry, fish and egg				
<3 portion/day	9.2±3.3*	5.5±2.9	15.0±4.1	7.1±2.9
≥3 portion/day	9.6±3.3	5.5±2.7	15.2±4.1	7.2±2.9
Vegetables – Fruits				
-Vegetables				
<2 portion/day	9.7±3.3*	5.4±2.7	14.5±4.1*	7.3±2.9
≥2 portion/day	9.3±3.2	5.5±2.8	15.5±4.1	7.1±2.9
-Fruits				
<3 portion/day	9.4±3.3	5.4±2.8	14.8±4.1*	7.1±2.8
≥3 portion/day	9.4±3.2	5.5±2.7	15.3±4.1	7.2±2.9
Grains				
<3 portion/day	8.9±3.1*	5.4±2.8	16.5±4.2*	6.7±2.7*
≥3 portion/day	9.5±3.3	5.5±2.8	14.8±4.0	7.3±2.9
Fastfood consumption frequency				
<1 time/week	9.1±3.2*	5.3±2.8*	15.5±4.1*	7.0±2.9*
≥1 time/week	10.0±3.3	5.8±2.8	14.3±3.9	7.5±2.9
Sugary drinks consumption frequency				
<1 time/week	8.9±3.2*	5.3±2.7	15.9±4.1*	6.9±2.8*
≥1 time/week	10.0±3.3	5.8±2.8	14.3±3.9	7.6±2.9
Total score	9.4±3.3	5.5±2.8	15.1±4.1	7.2±2.9

* $p<0.05$, The sub-factor score for each food group consumption was analyzed in itself using the Student's T-test

Participants' 3-Factor eating questionnaire sub-factor scores and energy and macronutrient intakes

The mean energy and macronutrient intakes of the individuals participating in the research according to the sub-factor scores of the TFEQ divided into quarters are given in Table 2. It was determined that energy, protein, carbohydrate (CHO), and fat intake were significantly higher in the quarter with the highest uncontrolled eating score than in the lowest ($p<0.05$). The energy and carbohydrate intake of the participants in the group with the highest cognitive restraint score was significantly lower ($p<0.05$). It was determined that the participants' energy, CHO, and fat intake increased with the increase in the hunger score, and the energy, CHO, and fat intakes of those in the highest score group were found to be significantly higher ($p<0.05$).

Participants' BMI and 3-Factor Eating Habits questionnaire sub-factor scores

In Figure 1, TFEQ sub-factor scores are given according to the participants' normal or overweight/obese. It was determined that all mean sub-factor scores of overweight/obese individuals were significantly higher ($p<0.001$).

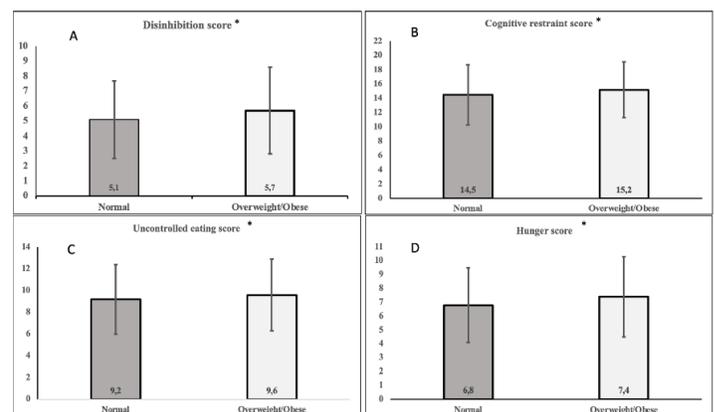


Figure 1. A-D. Sub-factor scores of the TFEQ according to the participants' being normal or overweight/obese * $p<0.05$

The risk factors affecting the overweight/obese status of the participants are given in Table 3. Each unit increased participants' dietary disinhibition (OR=1.142 95%CI=1.097-1.189), cognitive restraint (OR=1.076, 95%CI=1.050-1.103), and hunger (OR=1.084, 95%CI=1.033-1.137) scores have been shown to significantly increase the risk of being overweight/obese ($p<0.001$).

Table 2. The energy and macronutrient intake of the participants according to the TFEQ sub-factor scores

	Energy (kcal)	Protein (g)	Carbohydrate (g)	Fat (g)
	mean±sd	mean±sd	mean±sd	mean±sd
Uncontrolled eating				
<7 score	1560,3±533.7 ¹	57.4±26.1 ⁵	168.4±76.8 ⁹	70.7±27.5 ¹³
7-9 score	1681,8±608.5 ²	66.2±23.8 ⁶	188.3±44.2 ¹⁰	80.3±23.9 ¹⁴
9-11 score	1688,9±622.7 ³	61.4±31.2	189.3±80.2 ¹¹	76.8±34.3
>11 score	1893,3±722.6 ⁴	67.2±31.6 ⁷	217.5±104.5 ¹²	81.1±36.0 ¹⁵
F	33.132	3.210	25.637	3.522
p	<0.001	0.02	<0.001	0.01
Dietary disinhibition				
<3 score	1673.9±615.1	61.6±31.2	183.9±87.8	74.5±31.7
3-5 score	1687±603.6	68.4±30.3	191.7±70.0	83.7±54.5
5-7 score	1746.9±633	63.9±30.1	192.4±87.3	77.6±33.4
>7 score	1697±671.6	60.2±28.7	189.5±93.9	75.4±34.3
F	1.425	1.375	0.954	1.802
p	0.23	0.25	0.41	0.15
Cognitive restraint				
<12 score	1893,2±710.9 ^a	65.8±31.3	219.0±106.3 ^e	81.1±34.0
12-15 score	1714,8±636.7 ^b	61.4±31.3	191.4±85.1 ^f	75.3±33.4
15-18 score	1595,8±558.8 ^c	63.2±16.5	174.2±130.1 ^g	77.5±41.5
>18 score	1541,9±523.2 ^d	59.3±27.4	161.6±75.1 ^h	71.4±26.9
F	41.311	11.123	23.717	14.452
p	<0.001	0.36	<0.001	0.08
Hunger				
<5 score	1607,6±556.2 ^α	58.9±28.9 ^ε	174.3±75.7 ^λ	72.5±29.4 ^w
5-7 score	1673,1±587.9 ^β	60.9±26.8 ^η	183.6±85.7 ^μ	75.0±31.5 ^x
7-9 score	1733,5±671.1 ^γ	69.4±31.0 ^θ	194.3±52.0 ^π	78.9±34.3
>9 score	1830,5±726.1 ^δ	63.8±31.1	210.3±106.5 ^φ	83.1±31.5 ^y
F	13.938	2.909	13.099	3.028
p	<0.001	0.03	<0.001	0.03

There is a significant difference between a-b, a-c, a-d, b-c, and b-d. There is a significant difference between e-f, e-g, e-h, f-g, f-h, and g-h.

There is a significant difference between 1-2, 1-3, 1-4, 2-4, 3-4. There is a significant difference between 5-6 and 5-7. There is a significant difference between 9-10, 9-11, 9-12, 10-12, 11-12. There is a significant difference between 13-14 and 13-15.

There is a significant difference between α-γ, α-δ, β-δ, γ-δ There is a significant difference between ε-θ, η-θ. There is a significant difference between λ-π, λ-φ, μ-φ, π-φ. There is a significant difference between w-y and x-y

Table 3. Factors affecting the overweight/obese status of the participants

	B	S.E.	Wald	p	Exp (B)	95%CI
Dietary disinhibition	0.133	0.021	41.505	<0.001	1.142	1.097-1.189
Cognitive restraint	0.073	0.013	33.645	<0.001	1.076	1.050-1.103
Uncontrolled eating	0.037	0.021	3.169	0.08	1.038	0.996-1.081
Hunger	0.081	0.024	10.933	<0.001	1.084	1.033-1.137

Adjusted variables to the model: gender, age, education period (years), diagnosis of chronic disease, physical activity level, number of main meals

Discussion

Eating meets not only physiological needs but also psychological needs. The main findings of this study demonstrated significant effect of emotional eating behavior on BMI. It was determined that the participants' energy, CHO, and fat intake increased with the increase in the hunger score, and the energy, CHO, and fat intakes of those in the highest score group were found to be significantly higher ($p<0.05$). The uncontrolled eating and hunger scores were significantly higher in individuals who consumed grains as much or more than recommended ($p<0.05$). It was also found

that individuals who consume fast food and sugary drinks at least once a week have higher scores for uncontrolled eating, emotional eating, and hunger, except for the cognitive restraint score. These results show the relationship between emotional eating and food choice.

The interaction between nutritional behaviors and mood changes the amount and type of food consumed, and as a result, the mood is affected [24]. Eating behavior that changes according to the person's emotional state is effective in the increase of obesity [25]. Seven et al. determined that obese individuals participating in their

study had higher emotional eating scores [26]. In a prospective study conducted by Kontinen et al., the eating behaviors of the participants were evaluated with the TFEQ, and it was shown that emotional eating behavior is effective in the development of obesity [14]. In this study, it was found that the average TFEQ sub-factor scores of individuals who were overweight or obese were significantly higher (Figure 1), and an increase in emotional nutrition scores increased the risk of being overweight or obese 1.142 times (95%CI:1.097-1.189, $p<0.05$). (Table 3). The relationship between emotional eating and obesity is bidirectional. A study on this subject showed that individuals with abdominal obesity (AO) who exhibit emotional eating behavior prefer to consume potatoes, sugar, sweets, chips, and fast food instead of healthy food groups such as vegetables, fruits, and legumes. In addition, this erroneous approach to food selection has led to insufficient intake of many vitamins and excessive intake of fat and sodium [27].

Contrary to main food groups, foods high in sugar and fat, called "palatable," have a more important place in emotional eating. In a study, it was determined that the daily hassles reduced participants' consumption of main food groups while increasing sugary and fatty foods [28]. Arslantaş et al., in a study conducted with young adults, revealed the relationship between emotions and emotional eating and showed that foods high in sugar and fat such as candy, chips, and fast food, are associated with emotional eating [29]. Similarly, in another study conducted with adolescents, there was determined a relationship between emotional eating and these foods [30]. In this study, it was found that individuals who consume both fast food and sugary drinks at least once a week have higher scores for uncontrolled eating, dietary disinhibition, and hunger. In addition, energy, CHO, and fat intake were significantly higher in individuals in the group with higher levels of both uncontrolled eating and hunger ($p<0.05$). Keskitalo et al. associated uncontrolled eating with salty and fatty foods and emotional eating with sweet and salty foods [31]. The positive effect of foods high in CHO and fat content, which are generally consumed in a negative mood, on mood is reversed by chronic diseases such as obesity and diabetes that it causes in the long term [24]. A study conducted with university students showed that emotional eating and uncontrolled eating behaviors of individuals could cause an increase in body weight and waist circumference [32]. In this study, it was determined that the risk of being overweight/obese increased 1.084 times with a 1-unit increase in hunger score (95%CI:1.033-1.137, $p<0.05$, Table 3).

Conclusion

Cognitive restraint refers to the conscious restriction of food intake by individuals to control or lose body weight. In their study, Anschutz et al. determined an inverse relationship between the cognitive restraint behavior of 475 participants and their energy, CHO, and fat intakes [33]. Another study showed that energy and fat intake were lower in individuals with high cognitive restraint behavior [34]. In this study, it was found that the energy and CHO intakes of the participants with the highest levels of cognitive restraint were significantly lower than the other groups ($p<0.05$). It is known that individuals who cognitive eating restraint behavior have more healthy eating habits [34]. In this study, the cognitive restraint score was significantly higher in individuals who consumed food groups except for the grains at least as much as

recommended (Table 1). In addition, it was determined that the cognitive restraint score was significantly higher in overweight/obese participants, and each 1-unit increase in this score increased the risk of being overweight/obese 1.076 times (95%CI=1.050-1.103, $p<0.05$). The relationship between dietary restriction and BMI was also shown in a study conducted with university students [34]. Cognitive eating restraint, which is observed more in individuals with high BMI, is estimated to increase body weight by causing binge eating attacks or uncontrolled consumption of foods that are thought to be healthy [34].

The effect of food choices on the increased risk of obesity in individuals exhibiting emotional eating behavior is essential. In this study, it was found that overweight/obese individuals had significantly higher scores on uncontrolled eating, emotional eating, cognitive restriction, and sensitivity to hunger than individuals with normal body weight. These results show that emotional eating has a significant effect on body weight. For this reason, a multidisciplinary approach is required to evaluate the effect of diet therapy and nutrition on the patient and take into account the patient's emotional state, especially in the treatment and control of obesity. This approach will be possible to apply an accurate and effective treatment.

Limitation

The participants' food consumption was taken with a 24-hour dietary recall in this study. However, in order to give more accurate results on food consumption, it would be helpful to take a three-day record and support it with a detailed food consumption frequency.

Conflict of interests

The authors declare that there is no conflict of interest in the study.

Financial Disclosure

The authors declare that they have received no financial support for the study.

Ethical approval

Ethical approval of the study was obtained from Ankara University Ethics Committee (19/06/2017-11/197).

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