ORİJİNAL ARAŞTIRMA ORIGINAL RESEARCH

DOI: 10.5336/healthsci.2021-86816

Impulsivity as a Determinant of Food Intake: A Cross-Sectional Study of its Role in Eating Attitudes and Behaviors

Besin Alımının Bir Belirleyicisi Olarak Dürtüsellik: Yeme Tutum ve Davranışlarındaki Rolüne Yönelik Kesitsel Bir Çalışma

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ABSTRACT Objective: This study aims to examine the possible relationships between impulsivity and eating attitudes and behaviors. **Material and Methods:** In this cross-sectional study, 129 female and 111 male participants, with a mean age of 34.50±12.14 years, were categorized as obese and non-obese according to their body mass index. They were subjected to the Barratt Impulsivity Scale 11, the Three-Factor Eating Questionnaire-Revised 21 and the Eating Attitude Test 26. Their impulsivity, eating attitudes and behaviors were compared, and possible relationships between impulsivity and nutritional behaviors were examined. **Results:** Emotional eating and uncontrolled eating scores of obese individuals were higher compared to those of non-obese individuals, and obese individuals showed a lower Eating Attitude Test score and level of cognitive restriction. No difference was observed in all subscales of Barratt Impulsivity Scale in obese and non-obese individuals. There were positive correlations between all subscales of Barratt Impulsivity Scale and uncontrolled eating score and emotional eating score. **Conclusion:** Our results demonstrate that impulsivity is not higher in obese individuals, but that all sub-dimensions of impulsivity determined by Barratt Impulsivity Scale 11 are associated with uncontrolled and emotional eating behaviors. In the treatment of obesity, determining impulsivity levels and using approaches to reduce impulsivity may increase effectiveness and sustainability of treatment.

Keywords: Impulsive behavior; feeding behavior; attitude

ÖZET Amaç: Bu çalışma, dürtüsellik ile yeme tutum ve davranışları arasındaki olası ilişkileri incelemeyi amaçlamaktadır. **Gereç ve Yöntemler:** Kesitsel türdeki bu çalışmada, ortalama yaşı 34,50±12,14 yıl olan 129 kadın ve 111 erkek katılımcı, beden kitle indekslerine göre obez ve obez olmayan olarak sınıflandırılmıştır. Araştırmada, Barratt Dürtüsellik Ölçeği 11, Üç Faktörlü Yeme Ölçeği-Revize 21 ve Yeme Tutum Testi 26 kullanılmıştır. Bireylerin dürtüsellikleri, yeme tutum ve davranışları karşılaştırılmış; dürtüsellik ile beslenme davranışları arasındaki olası korelasyonlar incelenmiştir. **Bulgular:** Obez bireylerin, duygusal yeme ve kontrolsüz yeme puanları obez olmayanlara göre daha yüksek; Yeme Tutum Testi puanı ve bilişsel kısıtlama düzeyi ise daha düşük bulunmuştur. Obez ve obez olmayan bireylerin Barratt Dürtüsellik Ölçeği alt ölçek puanları arasında hiçbir farklılık gözlenmemiştir. Barratt Dürtüsellik Ölçeği'nin tüm alt ölçekleri ile kontrolsüz yeme ve duygusal yeme arasında pozitif korelasyonlar bulunmuştur. **Sonuç:** Sonuçlarımız obez bireylerde dürtüselliğin daha yüksek olmadığını, ancak Barratt Dürtüsellik Ölçeği 11 ile belirlenen dürtüselliğin tüm alt boyutlarının kontrolsüz ve duygusal yeme davranışları ile ilişkili olduğunu göstermektedir. Obezite tedavisinde bireylerin dürtüsellik düzeylerinin belirlenmesi ve dürtüselliği azaltmaya yönelik yaklaşımların kullanılması tedavinin etkinliğini ve sürdürülebilirliğini artırabilir.

Anahtar Kelimeler: Dürtücü davranış; beslenme davranışı; tutum

Due to its multidimensional nature, impulsivity is defined in many different ways in the literature. When considered in the context of the behavioral impulsivity model, impulsivity is reported to include the elements of rapid and unplanned reactions to stimuli before the information is fully processed, inability to consider long-term consequences, and decreased sensitivity to the negative consequences of the behavior.[1]

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Peer review under responsibility of Turkiye Klinikleri Journal of Health Sciences.

Received: 28 Oct 2021 ***Received in revised form:*** 07 Dec 2021 ***Accepted:*** 29 Dec 2021 ***Available online:*** 05 May 2022

Eating behavior is an in-depth concept that includes food selection, nutritional practices and various problems associated with eating (obesity, eating disorders, etc.). Eating behavior is complex and can be affected by various factors.[2] Specifically, it has been observed that individuals with high impulsivity exhibit more eating disorder behaviors compared to individuals with low impulsivity and reported that psychological evaluation of impulsivity can be a preventive tool for disordered eating behaviors.[3,4]

Although it has been shown that impulsivity is associated with eating behavior, body mass index (BMI) and food intake, the relationship between impulsivity and its dimensions (motor impulsivity-attention and impulsivity-non-planning) remains indeterminate.[5-9] Studies examining the relationship between impulsivity dimensions [determined by Barratt Impulsivity Scale (BIS)] and eating behavior (determined by Perceived Self-Regulatory Success in Dieting Scale, Yale Food Addiction Scale and/or Eating Disorder Examination-Questionnaire) have reported that an increase in both attention impulsivity and motor impulsivity may affect eating behavior.[10-12]

In the light of all this information, it is important to determine the function of impulsivity, which is thought to serve as a risk factor for the onset of eating disorders, in the eating behavior spectrum. The aim of this research is to examine the possible relationships between impulsivity and eating attitudes and behaviors.

The H_0 hypotheses of the study are:

I. There is no difference between the eating attitudes and behaviors of obese and non-obese individuals.

II. There is no difference between the impulsivity of obese individuals and non-obese individuals.

III. There is no correlation between eating attitudes and behaviors and impulsivity dimensions.

MATERIAL AND METHODS

STUDY DESIGN

This cross-sectional study was carried out with the participation of 240 adult individuals between January 1 and May 1, 2021. The sample size was calculated as 118 using the findings of the research by Sarısoy et al. in 2015 (using the Power and Sample Size Program; power 90%; Type 1 error 0.05).[13] Exclusion criteria for the study included food allergies or intolerance; alcohol or substance abuse; pregnancy or lactation; and receiving medical nutrition therapy for any reason in the preceding 3 months.

DATA COLLECTION

Research data were collected through a face-to-face questionnaire consisting of 5 parts: I. General Information; II. Anthropometric Measurements; III. Three-Factor Eating Questionnaire-Revised 21 (TFEQ-R21); IV. Eating Attitude Test 26 (EAT-26); V. BIS-11.

The first part records marital status, gender, age and educational status of the individuals.

The second part records height and body weight values; self-reported anthropometric data were used. The BMI (body weight/height^2) value was calculated using the height and body weight values of the participants. By conventional standards, a BMI value less than 18.5 kg/m^2 for adults is classified as "underweight", a BMI value between 25-29 kg/m^2 as "overweight", and a BMI value greater than 30 kg/m^2 as "obese". A healthy BMI for adults is considered to be 18.5-24.9 kg/m^2.[14]

The third part is the TFEQ, first developed by Stunkard and Messick in 1985 to measure the behavioral and cognitive components of eating; Turkish validity and reliability study carried out by Karakuş et al.[15,16] The TFEQ measures the level of people's conscious restriction of eating, their level of uncontrolled eating, and their tendency to eat according to their emotional state. This scale has three subscales (uncontrolled eating, cognitive restriction and emotional eating) and consists of 21 items with four-Likert-type responses (1=Absolutely wrong, 2=Mostly wrong, 3=Mostly true, and 4=Absolutely true).

EAT is a self-report developed by Garner and Garfinkel in 1979. The scale evaluates possible disorders and the total score is directly related to the level of psychopathology.[17,18]

BIS-11 was developed by Barratt (Turkish validity and reliability study performed by Güleç et al.,

2008). It consists of 30 items addressing attention impulsivity (14 items; 1, 2, 5, 8, 11, 12, 13, 14, 17, 19, 20, 28, 29, 30), motor impulsivity (7 items; 4, 6, 15, 16, 21, 22, 25) and non-planning (9 items; 3, 7, 9, 10, 18, 23, 24, 26, 27) subscales. All items were measured on a 4-point Likert scale (1=rarely/never; 2=occasionally; 3=often; 4=almost always/always). Eleven items (1, 7, 8, 9, 10, 12, 13, 15, 20, 29, 30) were reversed scored (as 4, 3, 2, 1 point). A high BIS-11 scale score is correlated to high levels of impulsivity.[19,20]

ETHICAL CONSIDERATIONS

This research was conducted in accordance with the principles of the Helsinki Declaration. All participants provided written informed consent and the study was approved by İstinye University Human Research Ethics Committee (Meeting date: 22.12.2020; Protocol number: 147).

STATISTICAL EVALUATION

Statistical Package for the Social Sciences program (IBM SPSS Statistics for Windows, Version 22.0, USA) was used for data analysis in the study. Data distribution was analyzed with the Kolmogorov-Smirnov test. Since the data obtained from the scales used in the research were normally distributed, the significance of the differences between the 2 groups (obese and non-obese groups) was analyzed with the Student's t-test, and the direction and degree of the relationship between the 2 variables was analyzed with the Pearson correlation test. In all analyses, $p<0.05$ was considered statistically significant.

RESULTS

A total of 240 people, 129 of whom were women and 111 of whom were men, participated in the study, and the mean age of the participants was 34.50±12.14 (18-63) years. Other data on sociodemographic characteristics and anthropometric measurements of individuals are presented in Table 1.

Comparisons of the eating attitudes and behaviors of obese and non-obese individuals and their impulsivity levels found that obese individuals had higher emotional eating and uncontrolled eating scores (p=0.00, p=0.00, respectively) and lower EAT-26 and cognitive restriction scores (p=0.00, p=0.00, respectively). Despite these differences in eating attitudes and behaviors, no significant difference was found between the impulsivity of the two groups ($p>0.05$) for all BIS-11 subscales (analyzed by Student t-test) (Figure 1).

Analyses to determine eating behaviors specifically associated with individuals' impulsivity levels indicate positive correlations among all BIS-11

TABLE 1: Participant's sociodemographic characteristics and anthropometric measurements.

	value
Age (years) [(mean±standard deviation) (minimum-maximum)]	34.50±12.14 (18-63)
Gender [n (%)]	
Female	129 (53.75%)
Male	111 (46.25%)
Marital status [n (%)]	
Married	122 (50.80%)
Single	108 (45.00%)
Divorced/Widow (er)	10 (4.20%)
Body weight (kg) [mean±standard deviation (minimum-maximum)]	81.22±19.79 (47-140)
Body height (m) [mean±standard deviation (minimum-maximum)]	1.70±0.10 (1.50-1.93)
BMI (kg/m^2) [mean±standard deviation (minimum-maximum)]	28.00±6.32 (18.51-62.22)
BMI classification [n (%)]	
BMI <30 kg/m^2	144 (60.00%)
BMI ≥30 kg/m^2	96 (40.00%)

BMI: Body mass index.

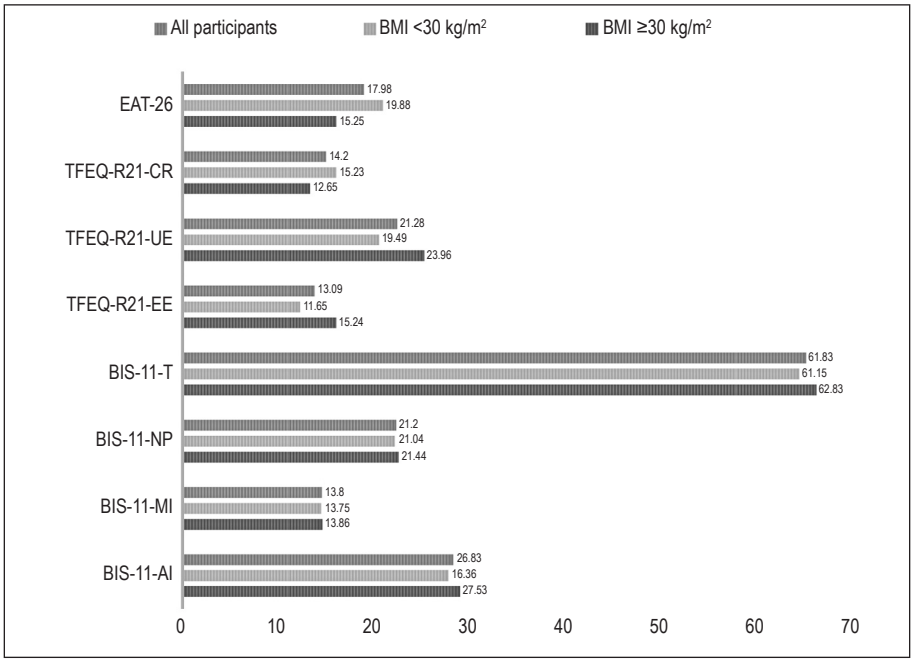

FIGURE 1: Differences between the eating attitudes and behaviors and impulsivity of obese and non-obese individuals.

BMI: Body mass index; EAT-26: Eating Attitudes Test 26; TFEQ-R21: Three-Factor Eating Questionnaire 21; CR: Cognitive restriction; UE: Uncontrolled eating; EE: Emotional eating; BIS-11: Barratt Impulsiveness Scale 11; T: Total; NP: Non-planning; MI: Motor impulsivity; AI: Attention impulsivity.

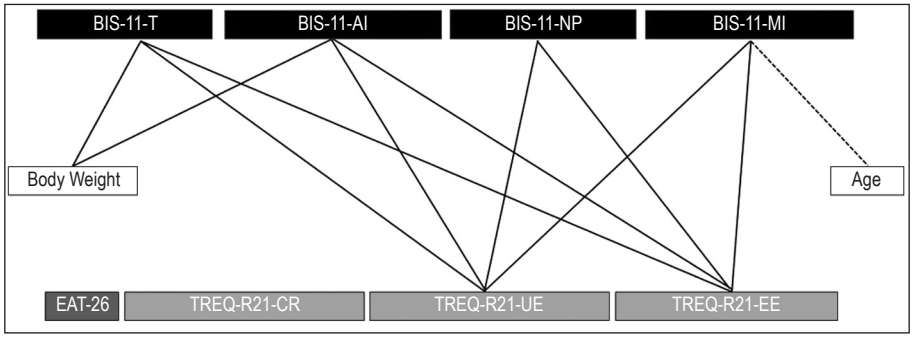

FIGURE 2: Relationships between participants' eating attitudes and behaviors and impulsivity.

BIS-11: Barratt Impulsiveness Scale 11; T: Total; AI: Attention impulsivity; NP: Non-planning; MI: Motor impulsivity; TFEQ-R21: Three-Factor Eating Questionnaire 21; EE: Emotional eating; UE: Uncontrolled eating; CR: Cognitive restriction; EAT-26: Eating Attitudes Test 26. Solid lines indicate positive correlation and dashed line indicates negative correlation. The correlations between UE and impulsivity sub-dimensions are as follows: UE & BIS-11-T r=0.37, p=0.00; UE & BIS-11-AI r=0.33, p=0.00; UE & BIS-11-NP r=0.25, p=0.00; UE & BIS-11-MI r=0.31, p=0.00. The correlations between EE and impulsivity sub-dimensions are as follows: EE & BIS-11-T r=0.27, p=0.00; EE & BIS-11-AI r=0.22, p=0.001; EE & BIS-11-NP r=0.21, p=0.001; EE & BIS-11-MI r=0.26, p=0.00).

scores (total, non-planning, motor impulsivity, attention impulsivity); and uncontrolled and emotional eating scores, as shown below (analyzed by Pearson correlation test) (Figure 2).

DISCUSSION

This study compared impulsivity and eating attitudes and behaviors in obese and non-obese individuals and used a face-to-face questionnaire to investigate the possible relationship between impulsivity and eating attitudes and behaviors.

To examine the possible effects of obesity on eating behaviors, our study analyzed whether restrictive eating, uncontrolled eating and emotional eating, all sub-dimensions of TFEQ-R21, differ in obese and non-obese individuals. We determined that obese individuals had significantly lower scores on the cognitive restriction subscale of TFEQ-R21. Yet other

evidence for restrictive eating behavior in obese individuals differs from the results of our study.[21-23] Lowe et al. suggested that dieting and restrictive eating affect feeding behavior differently, and Guerrieri et al., in their study, proved that these two conditions are structures that affect eating regulation differently. The lack of questioning the current diet status in studies on restrictive eating may explain this difference in the results of the studies.[24] Our study reports that emotional and uncontrolled eating behaviors are more common in obese individuals, findings consistent with those of a study by Munguia-Lizárraga et al. in which higher uncontrolled eating scores were obtained in overweight/obese children.[25] Contrary to our study, other studies have observed no significant relationship between uncontrolled eating and BMI. Our study obtained significantly higher scores in the TFEQ-R21 emotional eating subscale of obese individuals compared to non-obese individuals; this is consistent with the association of higher BMI and higher emotional eating score in young females reported by Anglé et al. and the positive relationship between BMI and the TFEQ-R21 emotional eating subscale in adults reported by Bénard et al.[23,26] However, there are also studies observing no significant relationship between BMI and emotional eating.[21,22]

In our study, the EAT-26 score was statistically significantly lower in obese individuals than in non-obese individuals. A study by Abdalla et al. to examine the relationship between eating behaviors and BMI in 300 university students found a significant positive correlation between the EAT-26 score and BMI.[27] Similar findings have been reported in various other studies.[28,29]

In this study, obese individuals had higher scores in all sub-dimensions of the BIS-11 (total score, non-planning, motor impulsivity, attention impulsivity) compared to non-obese individuals, but these differences were not statistically significant. This finding is consistent with the study that did not find a direct relationship between BIS-11 and BMI.[30] Meule emphasizes that impulsivity may have an indirect effect through a mediator rather than a direct effect on BMI.[31] Meule and Blechert reported that eating behaviors affect impulsivity and BMI indirectly rather than directly, showing that when both attention and motor impulsivity levels are high, self-regulation regarding eating is low.[10] Our study also analyzed BIS-11 and TFEQ-R21 sub-dimension scores to examine possible correlations between impulsivity and eating behaviors. While we observed positive correlations between all dimensions of impulsivity (total, non-planning, motor impulsivity, attention impulsivity) and uncontrolled eating and emotional eating scores, we did not find impulsivity to be associated with cognitive restriction and eating attitudes. The study by Yeomans et al. to examine the relationship between impulsivity and eating behavior showed that the total BIS-11 score and the motor and non-planning subscale scores were higher in participants who scored high on the TFEQ uncontrolled eating subscale; any impulsivity measures were not associated with TFEQ restriction subscale scores.[32] In a study by Garcia-Garcia et al., published in 2021, they showed that the difference in impulsivity may be related to BMI through uncontrolled eating.[33] Leitch et al. examined the relationship between the three subscales of impulsivity and the restriction and uncontrolled eating subscales of the TFEQ. Studies have reported that participants who scored higher on the TFEQ's uncontrolled eating subscale were significantly more impulsive in total BIS-11. No correlation was found between the restriction subscale of the TFEQ and the BIS-11.[34] The study of Jasinska et al. of young adults reported that increased level of impulsivity (BIS-11) is associated with increased emotional eating behavior.[35] The results of our research are consistent with the results of similar studies in the literature.

There are many determinants of nutritional behaviors, and the coronavirus disease-2019 (COVID-19) pandemic experience of 2019 can be included as an unexpected one. Other limitation of our study include that the anthropometric measurements of the participants could not be measured directly by the researcher due to the COVID-19 pandemic, such that the measurement values are based solely on participant statements.

The strengths of the study are that the number of participants is higher than the calculated sample size, the research data handles obesity-impulsivity-eating attitudes and behaviors in a multi-dimensional man-

ner, and the perspectives of researchers from different disciplines are multidisciplinary.

CONCLUSION

Obesity is an important health problem at the global level. Recent evidence indicates that impulsivity may mediate the development of obesity by affecting nutritional behaviors and food selection and intake. Overeating and recurrent binge eating episodes accompanied by feelings of loss of control are associated with increased consumption of energy-dense foods and weight gain and uncontrolled eating may play a mediating role between impulsivity and obesity. Impulsivity itself is considered one of the determinants of emotional eating and triggers unhealthy food choices in response to negative mood states. Our study examines the relationship between different sub-dimensions of impulsivity and different eating behaviors, offering new perspective to experts. The main results of this study are emotional eating, uncontrolled eating, cognitive restriction and eating attitude were affected by BMI, impulsivity was not affected by BMI, and impulsivity level was associated with uncontrolled eating and emotional eating. To prevent and treat obesity and reduce its incidence, we recommend evaluating and mitigating impulsivity. However, there is insufficient evidence to evaluate the effectiveness of the use of impulsivity- reducing therapies in addition to conventional diet therapy. Future research also should explore the mechanisms by which impulsivity exerts its effects on feeding behaviors.

Acknowledgment

We thank Hande Zeynep Bingöl, Büşra Tokuç, Aydan Kozmanlı, Simay Güney, Ceren Gençer, İlayda Aydoğdu, Selin Dıvrak, who took part in the data collection process of the research.

Source of Finance

During this study, no financial or spiritual support was received neither from any pharmaceutical company that has a direct connection with the research subject, nor from a company that provides or produces medical instruments and materials which may negatively affect the evaluation process of this study.

Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

All authors contributed equally while this study preparing.

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