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The impact of impulsivity and night eating syndrome on treatment outcomes in obese patients

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Summary

Background: *This study sought to explore the correlation between impulsiveness and night eating habits of patients with obesity, as well as to assess the impact of this correlation on the variations in other anthropometric measurements and laboratory parameters during the course of treatment in order to reveal the etiology and risk factors associated with obesity.*

Subjects and Methods: *The study involved 50 patients who visited the Obesity Centre of Antalya Training and Research Hospital, University of Health Sciences, for the first time, met the inclusion criteria, and were followed up for a period of 3-6 months. Participants were interviewed face-to-face during the initial evaluation and were administered the Barratt Impulsiveness Scale-11 (BIS-11) and the Night Eating Questionnaire (NEQ) with further survey questions to obtain socio-demographic data.*

Results: *Of the patients included in the study, 45 (90%) were female and 5 (10%) were male, with the mean age of 53,6 years. At the end of the treatment, body weight, body mass index (BMI), and waist circumference values decreased significantly. A non-significant decrease was noted in total cholesterol, low density lipoprotein cholesterol (LDL-C), and triglyceride levels, whereas a non-significant increase was identified in high density lipoprotein cholesterol (HDL-C) level. Moreover, a statistically significant, moderate positive correlation was found between the 'Attentional Impulsiveness' score and the NEQ score. However, no significant correlation was found between night eating habit and impulsiveness along with its sub-dimensions in relation to weight loss, BMI, and changes in waist circumference.*

Conclusion: *The study found that night eating and impulsiveness did not affect treatment-related anthropometric changes, likely due to improved awareness and behavior through psychologist support during treatment. Obesity management requires an individualised treatment plan. For individuals with impulsive tendencies or diverse eating habits, it is essential to consider these circumstances and develop a treatment plan, bolstered by a multidisciplinary approach that is crucial for effective treatment.*

Keywords: *Obesity, impulsiveness, night eating syndrome, eating disorders, treatment process*

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INTRODUCTION

Obesity, recognised as a complex and multifactorial condition that adversely affects human health, is an important public health issue with a rapidly increasing prevalence, conventionally defined as excess body fat (Piché et al., 2020, VanderBroek-Stice et al., 2017).

Investigating the factors that lead to obesity is crucial for identifying preventable conditions. For this reason, research aimed at detecting psychiatric disorders that may predispose to obesity has increased in recent years. Psychological characteristics and personality are regarded as significant factors influencing food choice and diet over a lifetime (VanderBroek-Stice et al. 2017). Impulsivity, characterized by the inability to inhibit automatic behaviours and the tendency to disregard future consequences and prefer more immediate and proximate rewards, has been found to be positively correlated with energy intake and negatively correlated with diet quality. In addition, inadequacy of dietary inhibition is considered one of the determining factors in the emergence of obesity (Zebi et al., 2024).

Night eating syndrome (NES) is a type of eating disorder characterised by a tendency to have symptoms of cravings for food between dinner and sleep, as well as morning appetite loss, problems maintaining or initiating sleep, depressed mood, worsening of mood in the evenings, and by the belief that one cannot sleep without eating before going to sleep, which involves waking up to eat at night, at least twice a week, with more than 25% of daily calorie intake after dinner (Salman&Kabir, 2024).

In order to combat obesity as a prevalent condition across societies, it is essential to know the factors leading to it and take necessary actions accordingly. The connection between obesity and night eating habits, besides impulsiveness, has long been studied individually in the literature; however, research addressing both is limited. With the purpose of examining the etiology and risk

factors of obesity, this study, therefore, has sought to explore the relationship between impulsiveness and night eating habit in obese patients, and how it influences the weight loss process.

SUBJECTS AND METHODS

Nature of the study

This cross-sectional, descriptive, and prospective study took place from November 2023 to June 2024 at the Obesity Centre of Antalya Training and Research Hospital.

Ethical approval

Prior to the onset of the study, approval was obtained from the Clinical Research Ethics Committee of Antalya Training and Research Hospital on 02.11.2023 under decision number 15/5, and the study was conducted following the Declaration of Helsinki and the Principles of Good Clinical Practice.

Sample

The population of the study comprised 131 obesity patients who presented to Antalya Training and Research Hospital Obesity Centre for the first time between November 2023 and December 2023. The study was completed with 50 patients with the characteristics specified in the following research criteria:

- Being over 18 years of age,
- Having the BMI ≥30 at the beginning of obesity follow-up and treatment programme,
- Regularly participating in obesity follow-up and treatment programme for at least 3 months,
- Agreeing to participate in the study,

Data collection and Implementation

The participants were interviewed face-to-face in the first evaluation to obtain a written consent form indicating that they volunteered to participate in the study, and were then administered the survey questions to obtain socio-demographic data, Barratt Impulsiveness Scale-11 (BIS-11), and Night Eating Questionnaire (NEQ).

Developed by Ernest S. Barratt in 1959, the BIS is one of the most widely used self-report questionnaires for the assessment of impulsiveness as a trait (Meule 2023). Items are rated on a four-point Likert scale. Although the fourth one usually indicates the most rational response, some items are reversely scored to avoid potential errors. A minimum of 30 and a maximum of 120 points can be obtained from the scale, which has 3 subscales, namely, Non-Planning (NP), Motor Impulsiveness (MI), and Attentional Impulsiveness (AI), each demonstrating good reliability and no overlap. The higher the total BIS-11 score, the higher the impulsiveness tendency of the patient is considered. Güleç et al. conducted the Turkish validity and reliability study of the BIS-11 in 2008 (Güleç et al., 2008).

The NEQ was developed by Allison et al. to consist of four sub-dimensions: night eating habit, evening hyperphagia, morning anorexia, and sleep disturbance and mood, along with a total of 14 questions rated from 0 to 52 points. In general, the first 9 items in the survey are directed at all participants, while the next 5 items are targeted only at those who wake up from sleep at night. Items 10, 11 and 12 are administered to participants with night waking, while items 13 and 14 are to participants who consume night snacks. In the questionnaire, every item except for Item 7 is rated using a five-point Likert scale, and for the seventh item, regarding the mood changes during the day, respondents who experience no mood change receive '0 points'. Items 1, 4 and 14 are scored inversely according to the Likert scale, whereas Item 13 assesses the participants' awareness of night snacking but is excluded from the scoring. Values of twenty-five and higher indicate diagnostic significance in terms of the NES. Atasoy et al. conducted Turkish validity and reliability study in 2014 (Atasoy et al., 2014).

Demographic features, anthropometric measurements, as well as clinical and laboratory data of the patients involved in the obesity treatment programme were sourced from electronic and physical patient records. Anthropometric measurements were made by the same staff using standard methods, weekly in the first four phases of the programme and fortnightly in the subsequent stages. Height was measured with a TESS instrument, body weight and body mass index were determined with a TANITA MC 580, and waist circumference was recorded with a tape measure at standard anatomical points. Biochemical parameters (FBG, HbA1c, fasting insulin, HOMA-IR, TC, HDL-C, LDL-C, triglycerides) were analysed from blood samples collected after at least 8 hours of fasting. Measurements were performed with Beckman Coulter AU5800 analyzer along with associated commercial kits. HbA1c levels were determined by commercially available high-performance liquid chromatography (Tosoh HLC 723 G8; Tosoh Bioscience, Japan), LDL-C

levels by Friedewald formula, and insulin resistance by HOMA-IR formula. Anthropometric measurements and routine laboratory data to be used within the scope of the study were evaluated as standard at the beginning of the programme and at the end of the follow-up and treatment.

Monitoring at the obesity centre

Established in Turkey in 2018, obesity centres significantly contribute to combating obesity and employ a multidisciplinary approach that aligns with international benchmarks. The programme, conducted in collaboration with a doctor, dietician, psychologist, physiotherapist, and nurse in the operation of obesity centres, consists of six modules and lasts for six months. During the initial phase of the programme, obese individuals are identified and included in the programme to perform comprehensive medical evaluations. The on-going modules focus on promoting permanent changes in nutrition and physical activity habits by raising awareness of healthy living through group trainings. Conducting behavioural therapy research with a psychologist through group sessions and/or individual interviews of the patients followed up in the obesity centre, while arranging medical treatment in this direction when necessary by the psychiatrist consulted at the beginning of the programme supports the psychological transformation of the patients alongside the diet and exercise components of the programme. The programme seeks to create a holistic and sustainable approach in the fight against obesity, with the final stage aimed at weight maintenance and raising social awareness (Nur-Eke, 2021).

Statistical analysis

Data analysis was conducted using the IBM SPSS 23.0 software. The Kolmogorov Smirnov and Shapiro-Wilk tests were used to analyse the normal distribution. Numerical data were presented as mean, standard deviation, minimum, and maximum, while distribution data were provided as n (number of people) and % (percentage). Values for categorical variables were presented as frequency and percentage (%). Paired sample t test was used for comparing dependent variables showing normal distribution, whereas Wilcoxon test was utilized for dependent variables lacking normal distribution. Spearman's rho correlation test was used to analyse the correlations between the scales, anthropometric measurements, and laboratory results due to the non-normal distribution of the variables. Statistical significance level was taken as $p<0.05$.

Table 1. Socio-demographic characteristics of the patients

Variables		**Mean±SD**	**Med (IQR)**
Age (years)		53.96±11.305	56 (19-74)
		Frequency	**%**
Gender	Female	45	90
	Male	5	10
Marital status	Single	2	4
	Married	38	76
	Widowed/ separated	10	20
Educational status	Illiterate	1	2
	Primary school	24	48
	Secondary school	4	8
	High school	11	22
	Undergraduate	9	18
	Master's	1	2
Tobacco use	No	39	78
	Yes	11	22
Alcohol consumption	No	45	90
	Yes	5	10
Chronic disease	No	15	30
	Yes	35	70
HT	No	32	64
	Yes	18	36
DM	No	41	82
	Yes	9	18
Dyslipidemia	No	47	94
	Yes	3	6
CVD	No	43	86
	Yes	7	14
Pulmonary disease	No	47	94
	Yes	3	6
Rheumatic disease	No	49	98
	Yes	1	2
Hypothyroidism	No	42	84
	Yes	8	16
Cancer	No	49	98
	Yes	1	2
Other	No	40	80
	Yes	10	20

HT: Hypertension, DM: Diabetes mellitus, CVD: Cardiovascular disease

RESULTS

The mean age of the 50 patients, 45 (90%) female and 5 (10%) male, was 53.96±11.305 (19-74) years. The proportion of those with primary school education was 48%, while the proportion with high school education was 22%. The most common chronic disease was hypertension with 36%. Diabetes mellitus (18%) and hypothyroidism (16%) were the other two of the three most common diseases. Table 1 presents detailed socio-demographic data of the participants.

When the body weight, BMI and waist circumference values of the patients at the beginning and the end of the treatment were compared, a statistically significant decrease was observed in all of the mentioned parameters at the end of the treatment ($p<0.001$). The median value of body weight before treatment was 94.7 kg, while after treatment it was 85.2 kg, along with the mean weight

Table 2. Comparison of laboratory measurements before and after treatment

Laboratory parameters	Pre-treatment		Post-treatment		r	p
	Mean±SD	Med (IQR)	Mean±SD	Med (IQR)		
FBG (mg/dL)	99.6 ± 14.09 (n=47)	97 (77- 151)	90.16 ± 10.62 (n=31)	91 (65- 112)	-3.961	**<0.001**[x]
Fasting insulin (mU/L)	11.71 ± 9.78 (n=41)	9.21 (3.99- 51.72)	6.89 ± 3.04 (n=29)	6.4 (1.68- 16.27)	-3.431	**0.001**[x]
HOMA-IR	3.35 ± 3.03 (n=38)	2.53 (0.84- 13.66)	1.56 ± 0.73 (n=29)	1.49 (0.27- 3.66)	-3.861	**<0.001**[x]
HbA1c (%)	5.85 ± 0.48 (n=42)	5.7 (5.1- 7.1)	5.6 ± 0.34 (n=30)	5.6 (5.1- 6.3)	4.251	**<0.001**[y]
Total cholesterol (mg/dL)	203.92 ± 36.19 (n=38)	214 (126- 276)	196.72 ± 34.68 (n=35)	203 (131- 271)	1.930	0.065[y]
LDL-cholesterol (mg/dL)	125.2 ± 30.06 (n=44)	124 (66- 191)	117.88 ± 26.06 (n=29)	115 (71- 179)	2.031	0.054[y]
HDL-cholesterol (mg/dL)	55.6 ± 10.19 (n=44)	55 (42- 78)	56.88 ± 10.14 (n=29)	54 (42- 78)	-1.318	0.188[x]
Triglyceride (mg/dL)	115.04 ± 36.9 (n=44)	104 (76- 213)	106.92 ± 44.18 (n=29)	99 (34- 222)	-0.654	0.513[x]

[x] Wilcoxon test; [y] the Paired Samples t test, HOMA-IR: Homeostasis model assessment of insulin resistance, HbA1c: Glycosylated haemoglobin, LDL-C: Low density lipoprotein cholesterol, and HDL-C: High density lipoprotein cholesterol

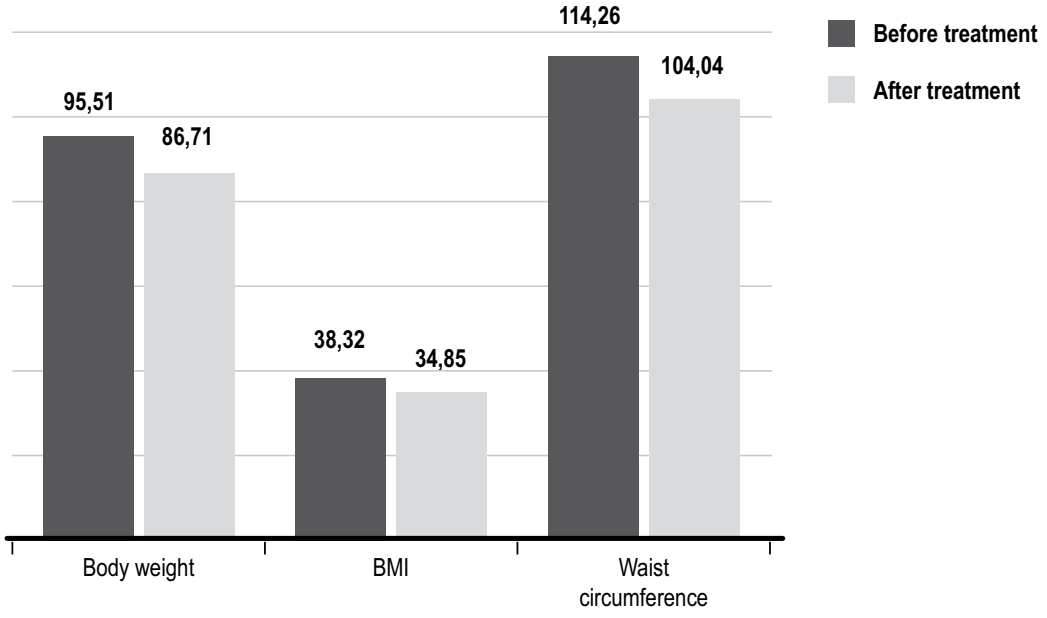

Figure 1. Comparison of anthropometric measurements before and after treatment

loss being 9.5 kg. Figure 1 displays anthropometric alterations prior to and following treatment. The median values of fasting blood glucose, HbA1c, fasting insulin and HOMA-IR before treatment were 97 mg/dL, 5.7%, 9.21 mU/L, and 2.53, respectively, while the median values after treatment were 91 mg/dL, 5.6%, 6.4 mU/L and 1.49, respectively (Table 2).

The mean total score in Barratt Impulsiveness Scale-11 at the beginning of the obesity programme was 56.92 ± 0.35. The impulsiveness sub-dimensions were as follows: The mean score of the Non-Planning was 25.7 ± 5.42, the mean score of the Motor Impulsiveness was 17.06 ± 3.45, and that of the Attentional Impulsiveness was 14.42 ± 4.04. The mean Night Eating Questionnaire score was calculated as 10.74 ± 3.98. There was only one patient with a Night Eating Questionnaire score of 25, though no patient was found with a NEQ score more than 25 (Table 3).

Table 3. Results of Barratt Impulsiveness Scale and Night Eating Questionnaire Scores

	Mean±SD	**Med (IQR)**
BIS-11 total score	56.92 ± 10.35	55 (36- 95)
– NP score	25.7 ± 5.42	25.5 (13- 36)
– MI score	17.06 ± 3.45	17 (12- 29)
– AI score	14.42 ± 4.04	14 (8- 32)
NEQ score	10.74 ± 3.98	10 (3- 25)

*Spearman's rho correlation

BIS: Barratt Impulsiveness Scale, NP: Non-Planning, MI: Motor Impulsiveness, AI: Attentional Impulsiveness, NEQ: Night Eating Questionnaire score

Table 4. Analysis of the Correlation between Barratt Impulsiveness Scale and Night Eating Questionnaire scores

Variable	**BIS-11 total score**		**NP score**		**MI score**		**AI score**	
	r	**p**	**R**	**p**	**r**	**p**	**r**	**P**
NEQ score	0.138	0.341	0.062	0.667	0.067	0.644	0.444	**0.001***

BIS Barratt Impulsiveness Scale, NP: Non-Planning, MI: Motor Impulsiveness, AI: Attentional Impulsiveness, NEQ: Night Eating Questionnaire

Table 5. Analysis of the Correlation between Night Eating Questionnaire Scores and Changes in Anthropometric Measurements

Changes in anthropometric measurements	**NEQ score**	
	r	P
Changes in body weight	-0.007	0.964
Changes in BMI	-0.008	0.954
Changes in waist circumference	0.027	0.852

*Spearman's rho correlation, NEQ: Night Eating Questionnaire, BMI: Body Mass Index

Table 6. Analysis of the Correlation between the Total Score of the Barratt Impulsiveness Scale-11 and its Sub-dimensions, and the Changes in Anthropometric Measurements

Changes in anthropometric measurements		**Total score of BIS-11**	**NP**	**MI**	**AI**
Changes in body weight	R	-0.188	-0.106	-0.188	-0.261
	P	0.192	0.464	0.192	0.067
Changes in BMI	R	-0.168	-0.094	-0.184	-0.264
	p	0.243	0.517	0.202	0.064
Changes in waist circumference	r	-0.192	-0.093	-0.146	-0.248
	p	0.181	0.519	0.311	0.083

*Spearman's rho correlation
BIS: Barratt Impulsiveness Scale, NP: Non-Planning, MI: Motor Impulsiveness, AI: Attentional Impulsiveness, BMI: Body Mass Index

There was a statistically significant moderate positive correlation between the Night Eating Questionnaire score and the Attentional Impulsiveness score (r=0.444; p=0.001). No statistically significant relationship was found between the other variables (Table 4).

No statistically significant correlation was found between the variations in the NEQ score or the overall BIS-11 score and the impulsiveness sub-dimensions of 'Non-Planning', 'Motor Impulsiveness', 'Attentional Impulsiveness' and anthropometric measurements before and after treatment. Table 5 and Table 6 present data on the correlation between the NEQ score and the total score of BIS-11 and the changes in impulsiveness sub-dimensions in anthropometric measurements before and after the treatment.

A statistically significant positive weak correlation existed between the total score of the Barratt Impulsiveness Scale-11 and changes in fasting insulin, as well as between Motor Impulsiveness and changes in fasting insulin, HOMA-IR, and triglyceride levels (Table 7).

DISCUSSION

Conducted with the aim of investigating the relationship between impulsiveness and night eating habit in obesity patients and the effect of these conditions on the weight loss process in order to examine the etiology and risk factors of obesity, our study noted significant variations in the patients' anthropometric data throughout the 3-6 months follow-up timeline, and that our patients lost weight effectively. Moreover, NES and impulsiveness, two factors that we thought to influence the etiopathogenesis of obesity, turned out to have no impact on anthropometric changes at the end of treatment.

A contemporary approach to obesity acknowledges the multifactorial determinants contributing to weight gain and the health benefits that come with losing weight. Weight loss methods are based on lifestyle changes, including a diet consisting of healthy and adequate nutrition, alongside increased physical activity (Bray et al., 2016).

Many studies have examined the impact of the process on weight loss in centres where calorie-reducing diets and increased physical activity are applied either individually or together. For example, Çoşkun et al. reported that in 243 patients who were followed up in an obesity outpatient clinic for one year, the mean annual weight loss was 6.9±5.9 kg and the mean annual weight loss rate was 7.12±5.75%. At the end of one year, 63.4% of the patients achieved at least a 5% of weight loss through lifestyle changes focused on diet and physical activity (Çoşkun et al., 2020). In our sample group, it was found that 76% of the patients achieved a weight loss of more than 5% in only 3-6 months follow-up.

A randomized controlled trial conducted by Ross et al. demonstrated that even with the same amount of energy deficit (700 kcal/day), weight loss achieved through exercise was more effective than weight loss achieved

Table 7. The Effect of Barratt Impulsiveness Scale and Night Eating Questionnaire Scores on Changes in Laboratory Parameters

Changes in laboratory parameters	NEQ scores		BIS-11 total scores		NP		MI		AI	
	r	P	R	p	r	p	r	p	r	p
Changes in FBG	0.066	0.651	-0.076	0.601	-0.001	0.992	-0.093	0.521	-0.016	0.910
Changes in Fasting Insulin	0.101	0.485	0.282	**0.047**	0.156	0.279	0.444	**0.001**	0.186	0.196
Changes in HOMA-IR	0.098	0.498	0.250	0.080	0.092	0.526	0.438	**0.001**	0.159	0.270
Changes in HBA1c	-0.017	0.904	0.058	0.688	0.048	0.740	0.218	0.128	0.031	0.833
Changes in Total Cholesterol	0.043	0.768	0.028	0.846	0.065	0.654	0.157	0.276	0.031	0.829
Changes in LDL-C	0.083	0.568	0.026	0.857	0.066	0.650	0.171	0.236	0.048	0.739
Changes in HDL-C	0.081	0.575	-0.032	0.824	0.011	0.938	0.121	0.401	0.023	0.876
Changes in Triglyceride	-0.102	0.481	0.139	0.335	0.121	0.403	0.301	**0.033**	-0.077	0.594

*Spearman's rho correlation
NP: Non-Planning, MI: Motor Impulsiveness, AI: Attentional Impulsiveness, FBG: Fasting Blood Glucose, HOMA-IR: Homeostasis model assessment for insulin resistance, HbA1c: glycosylated haemoglobin, LDL-C: low-density lipoprotein cholesterol, HDL-C: high-density lipoprotein cholesterol

through diet in terms of its impact on body composition. Although both groups experienced an average weight loss of 7.5 kg over three months, the exercise group recorded a total fat loss of 1.3 kg greater than the diet group. This finding suggests that physical activity plays a critical role, independent of calorie restriction, particularly in reducing central obesity (Ross et al., 2000). In our study, the contribution of diet and exercise, which have a significant impact on weight loss, was also considered as part of a multidisciplinary treatment approach.

Moreover, Villareal et al. evaluated the independent and combined effects of weight loss and exercise in 107 obese individuals. The study reported that body weight dropped by 10% in the diet group and 9% in the diet-exercise group, but not in the exercise-only group or the control group. Moreover, lean body mass and hip bone mineral density decreased less in the diet-exercise group compared to the diet group (3% and 1% decrease in the diet-exercise group and 5% and 3% decrease in the diet group, respectively), with statistically significant results (Villareal et al., 2011).

The exercise programme recommended to almost all patients followed up in obesity centres, unless there are contraindications, consists of walking daily for 30 to 60 minutes, along with stretching and strength-resistance exercises that can be done at home. The diet programme consists of personalised nutritional prescriptions that focused on overall calorie reduction, primarily featuring a Mediterranean-style diet. Such findings and our centre's implementation plan suggest that, in general, the combination of diet and exercise leads to greater improvements in physical and biological functions as well as weight loss than either diet or exercise alone.

In the course of our study, an analysis of laboratory parameter changes during the follow-up period revealed a significant reduction in the levels of FBG, fasting insulin, HbA1c, and HOMA-IR. Even though there was an improvement noted in lipid parameters from pre- to post-treatment values, no substantial change was detected.

Çoşkun et al. found that weight loss positively influenced blood parameters in a group of patients followed up in an obesity outpatient clinic for a year. In particular, substantial reductions in triglyceride, FBG, HbA1c, C-peptide, and HOMA-IR levels were shown to indicate the improving effects of weight loss on metabolic health. In this study, although total-C and LDL-C values declined in the first year compared to admission values, the difference lacked statistical significance (Çoşkun et al., 2020). Similar results were noted in our study. The lack of statistical significance in the reduction of total-C and LDL-C indicates that the alterations in these parameters may be relatively constrained, or may not possess adequate statistical power. In addition, positive changes in laboratory parameters, which serve as diagnostic criteria for diabetes, seem to make the treatment process more meaningful for patients with the comorbidity of obesity and prediabetes/diabetes being monitored at the obesity centre.

Nowadays, as research on psychopathological factors contributing to obesity is increasing, it is essential to address these factors in order to achieve sustainable long-term eating behaviour changes, and consequently, weight loss and its maintenance.

Psychological elements are key determinants of food choices, and individual differences in certain psychological characteristics can lead to diverse eating habits (Rogers et al., 2010). In this context, impulsiveness and night eating habit could be considered among the factors worth exploring that trigger obesity and make the weight loss process difficult. In its simplest definition, impulsiveness refers to acting swiftly without consideration or conscious judgement, yet it is associated with inadequate inhibitory processes, causing impulsive individuals to make hasty food choices and exhibit poor eating habits leading to eating disorders (Rogers et al. 2010, Bernard et al. 2019). Despite the growing literature, NES, which still remains poorly understood and underdiagnosed, is a unique eating disorder characterised by evening hyperphagia and night overeating, causing significant distress and/or reduced functioning (Sakthivel et al., 2023). Despite the presence of studies investigating the link between impulsiveness and NES in various patient groups in the literature, research involving obesity patients included in a structured weight loss programme is limited, which can be regarded as a key strength of our research.

In our research, the connection between impulsiveness and NES indicates a statistically significant, moderate positive correlation between the NEQ scores and the 'Attentional Impulsiveness' score, which is one of the sub-dimensions of impulsiveness.

In a study conducted by Uncu et al., the relationship between impulsiveness and night eating habits were explored among 90 voluntary obese people seeking bariatric surgery at a general surgery clinic and 87 voluntary non-obese people matched by age and gender at the same clinic. When obese individuals and non-obese control group patients were compared, a significant difference was found between the overall BIS-11 scores, and the scores for the sub-dimensions- 'Attentional Impulsiveness', 'Motor Impulsiveness', and 'Non-Planning'. The NEQ score was found to be higher in obese participants compared to those in the non-obese control group. A statistically significant positive relationship was also found

between night eating syndrome and impulsiveness (Uncu et al., 2017).

In the study by Vinai et al., 30 patients with a night eating habit who were followed up for six months in a sleep disorders centre and a control group were evaluated to examine the link between personality traits, impulsiveness, and other psychological characteristics through various scales. Just like in our study, the evaluation results indicated that those who showed night eating habit had higher scores in the 'Attentional Impulsiveness' subscale (Vinai et al., 2015).

In our centre, impulsiveness status and night eating behaviour, assessed at the start of the obesity follow-up and treatment programme in our patients, showed no statistically significant impact on the weight loss process. This result may be associated with the behavioural therapy practices implemented with the involvement of a psychologist during group trainings and/or individual interviews integrated into obesity treatment programmes. Additionally, pharmacological interventions, which are initiated when deemed necessary upon a psychiatrist's advice during the treatment process, may also contribute to this process. Research suggests using such comprehensive interventions to attain significant improvements in patients' baseline impulsiveness and night eating habits. In our study, we were unable to determine the improvement in the process since we did not administer BIS-11 and NEQ at the end of the programme, which could be considered as a limitation of our study. This situation limits the interpretation of the findings and also reduces the strength of inferences regarding the effectiveness of the treatment. In future studies, evaluation at the beginning and end of treatment should be considered a critical requirement to demonstrate the effectiveness of similar intervention programs and to objectively document patient improvement.

Manessa et al. proposed that impulsiveness and weight loss would be inversely proportional in a study involving 190 patients who underwent a behavioural weight loss treatment and were followed up for 12 months. The results of the study indicated that impulsiveness was associated with a lower percentage of weight loss over a 12-month period. The same study also recommended that future research should continue to examine the development of behavioural treatments for people with high levels of impulsiveness, along with associated protective and predictive factors for these treatment components so as to improve outcomes (Manessa et al., 2017). The result we obtained from our study, indicating that there was no statistical significance in the rate of weight loss in participants who seemed to be more risky in terms of impulsiveness and night eating at the beginning of the programme when compared to the less risky/non-risk group, seems to justify the suggestion of Manessa et al.

In an observational case-control study conducted by Grave et al., no significant difference in weight loss was found between obese individuals with and without NES following a 21-day inpatient low-calorie diet, exercise, and psychoeducation program, and a 6-month outpatient follow-up period (Dalle-Grave et al., 2011). It was also observed that the presence of night eating syndrome did not affect the outcome of weight loss, especially in an obesity treatment programme based on lifestyle modification including behavioural therapy approaches, as in our study.

Upon examining the impact of impulsiveness and NES on laboratory parameters in our study, we discovered a statistically significant positive weak correlation between the total BIS-11 scores and the changes in fasting insulin levels, and a statistically significant positive moderate correlation between the MI scores, one of the subcomponents of BIS-11, and the changes in fasting insulin and HOMA-IR values, as well as a statistically significant positive weak correlation between the MI scores and the change in triglyceride levels. In our study, we also noted that as the susceptibility to impulsiveness increased (BIS-11 total scores and MI sub-dimension scores), the change in laboratory values turned out to be higher. Emery et al. for instance, explored how impulsiveness influenced metabolic syndrome due to its connection with maladaptive health behaviours. The study found that those with greater impulsiveness scores consumed more saturated fat (Emery et al., 2020).

Pregnant women with NES tended to skip breakfast more frequently, and that higher NEQ scores were linked with more negative metabolic parameters (Deniz et al., 2019). The presence of such studies in the literature highlights the significance of impulsiveness and NES in the etiology of obesity.

CONCLUSION

In this study, we sought to emphasise that obesity treatment involves more than just weight loss, and that the etiopathology of obesity should be addressed from a broader perspective. For this reason, when we analysed the two factors that we believe could influence the obesity process, specifically, NES and impulsiveness, we discovered that these two factors did not impact anthropometric changes at the end of treatment. In the Obesity Centres model, effective management of obesity risk factors with the support of an effective psychologist may have played a role in this. It is a known fact that obesity treatment

requires a multidisciplinary approach. From this standpoint, it is clear that collaboration with physiotherapists, psychologists, dieticians, and other specialists will play a critical role in enabling patients to achieve sustainable weight loss and lead healthier lives.

Ethical considerations: This study was approved by the Ethics Committee of Antalya Training and Research Hospital.

Funding sources: This research received no external funding.

Conflict of interest: The authors declare no conflict of interest.

Informed consent: Informed consent was obtained from all individual participants included in the study.

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List of abbreviations

AI	Attentional Impulsiveness
BIS-11	Barratt Impulsiveness Scale-11
BMI	Body Mass Index
CVD	Cardiovascular disease
DM	Diabetes mellitus
FBG	Fasting Blood Glucose
HbA1c	Glycosylated haemoglobin
HDL-C	High density lipoprotein cholesterol
HOMA-IR	Homeostasis model assessment of insulin resistance
HT	Hypertension
NEQ	Night Eating Questionnaire
NES	Night eating syndrome
NP	Non-Planning
MI	Motor Impulsiveness
LDL-C	Low density lipoprotein cholesterol

References

Atasoy, N., Atik, L., Saraçlı, Ö., Konuk, N., Ankaralı, H., Güriz, O., et al. (2014). The reliability and validity of Turkish version of the Night Eating Questionnaire in psychiatric outpatient population. *Anadolu Psikiyatri Dergisi*, *15*(3), 238-247.

Bénard, M., Bellisle, F., Kesse-Guyot, E., Julia, C., Andreeva, V.A., Etilé, F., et al. (2019). Impulsivity is associated with food intake, snacking, and eating disorders in a general population. *The American Journal of Clinical Nutrition: Home Page, 109*(1), 117-126. https://doi.org/10.1093/ajcn/nqy255.

Bray, G.A., Frühbeck, G., Ryan, D.H., Wilding, J.P. (2016). Manegement of obesity. *Lancet, 87*, 1947-1956. https://doi.org/10.1016/S0140-6736(16)00271-3

Çoşkun, F.O., & Can, B. (2020). One-year weight follow-up results ın patientes followed in obesity clınıc and evaluation of the association between annual weight loss rate and the number of visits. *Ankara Medical Journal*, *3*, 694-706 https://doi.org/10.5505/amj.2020.23590

Dalle Grave, R., Calugi, S., Ruocco, A., Marchesini, G. (2011). Night eating syndrome and weight loss outcome in obese patients. *International Journal of Eating Disorders, 44*(2), 150-156. https://doi.org/10.1002/eat.20786.

Deniz, Ç.D., Özler, S., Sayın, F.K., Eryılmaz, M.A. (2019). Associations between night eating syndrome and metabolic parameters in pregnant women. *Turkish Journal of Obstetrics and Gynecology, 16*(2), 107-111. https://doi.org/10.4274/tjod. galenos.2019.77864.

Emery, R.L., Levine, M.D., Creswell, K.G., Wright, A.G.C., Marsland, A.L., Matthews, K.A., et al. (2020). Impulsivity and midlife cardiometabolic risk: The role of maladaptive health behaviors. *Health Psychology, 39*(8), 642-654. https://doi.org/10.1037/hea0000884.

Güleç, H., Tamam, L., Yazıcı, M. (2008). Psychometric properties of the Turkish version of the barratt impulsiveness scale-11. *Bulletin of Clinical Psychopharmacology*, *18*(4), 251-258.

Manasse, S.M., Flack, D., Dochat, C., Zhang, F., Butryn, M.L., Forman, E.M. (2017). Not so fast: The impact of impulsivity on weight loss varies by treatment type. *Appetite, 113*, 193-199. https://doi.org/10.1016/j.appet.2017.02.042.

Meule, A. (2023). Sorting the confusion about the numerous versions of the Barratt Impulsiveness Scale. *Neurol Sci, 44*(10), 3721-3722. https://doi.org/10.1007/s10072-023-06907-5.

Nur-Eke, R. (2021). The role of obesity centers in the fight against obesity: the case of Antalya Province. *Turkish Journal of Family Medicine and Primary Care*, *15*(1), 19-26.

Piché, M., Tchernof, A., Després, J. (2020). Obesity Phenotypes, Diabetes, and Cardiovascular Diseases. *Circulation Research, 126*(11), 1477-1500. https://doi.org/10.1161/CIRCRESAHA.120.316101

Rogers, R.D., Moeller, F.G., Swann, A.C., Clark, L. (2010) Recent research on impulsivity in individuals with drug use and mental health disorders: implications for alcoholism. *Alcohol, Clinical and Experimental Research, 34*(8), 1319-1333. https://doi.org/10.1111/j.1530-0277.2010.01216.x.

Ross, R., Dagnone, D., Jones, P.J., Smith, H., Paddags, A., Hudson, R., Janssen, I. (2000) Reduction in obesity and related comorbid conditions after diet-ınduced weight loss or exercise-ınduced weight loss in men. *Annals of Internal Medicine*, *133*, 92-103.

Sakthivel, S.J., Hay, P., Touyz, S., Currow, D., Mannan, H. (2023). Association of participants who screened positive for night eating syndrome with physical health, sleep problems, and weight status in an Australian adult popu-

lation. *Eating and Weight Disorders, 28*(1), 77. https://doi.org/10.1007/s40519-023-01603-x.

Salman, E.J., & Kabir, R. (2024). Night Eating Syndrome. *StatPearls,* StatPearls Publishing.

Uncu, F., Evcimen, H., Gülnaroğlu, B. (2017). Investigation of the Relationship Between Impulsivity and Night Eating Attitudes of Obese and Nonobese Individuals. *Bariatric Surgical Practice and Patient Care, 15*(2), 98-101. https://doi.org/10.1089/bari.2017.0058.

VanderBroek-Stice, L., Stojek, M.K., Beach, S.R.H., vanDellen M.R., MacKillop, J. (2017). Multidimensional assessment of impulsivity in relation to obesity and food addiction. *Appetite, 112*, 59-68. https://doi.org10.1016/j.appet.2017.01.009.

Villareal, D.T., Chode, S., Parimi, N., Sinacore, D.R., Hilton, T. (2011). Armamento-Villareal R, Napoli N, Qualls C, Shah K Weight loss, exercise, or both and physical function in obese older adults. *The New England Journal of Medıcıne. 364*(13), 1218-1229. https://doi.org/10.1056/NEJMoa1008234.

Vinai, P., Ferri, R., Anelli, M., Ferini-Strambi, L., Zucconi, M., Oldani, A., et al. (2015). New data on psychological traits and sleep profiles of patients affected by nocturnal eating. *Sleep Medicine, 16*(6), 746-753.

Zebi, L., Barbi, M., Toshi, D., Pastorino, L., Menculini, G., Raspa, V., et al. (2024) Impulsivity and Anger in Obese Patients Undergoing Bariatric Surgery. *Psychiatria Danubina*. *36*(2), 281-287

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