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Food Addiction and Cravings across Obesity Classes in Candidates for Metabolic and Bariatric Surgery.

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Abstract

Background

Food addiction refers to the need to regularly consume one or more specific foods and craving consists of an intense desire or impulse to consume a substance. Both lead to negative consequences such as loss of control over food intake.

Objective

This study aimed to evaluate the level of food addiction and food craving, and their correlations in candidates for bariatric surgery with different levels of obesity.

Methods

This was a cross-sectional, and exploratory study, in which the samples were contacted via telephone survey and digital media. Individuals over 18 years of age, with more than five years of education, a BMI ≥ 30 kg/m², and candidates for bariatric surgery were selected. The Yale Food Addiction Scale 2.0 (YFAS 2.0) and The Food Craving Questionnaire – Trait-reduced (FCQ-T-r) were used to measure these constructs.

Results

A total of 434 individuals with BMIs from ≥ 30 kg/m² to ≥ 50 kg/m² were evaluated. Domains 9 and 12 of YFAS 2.0 showed statistical significance regarding the obesity degrees. The correlations between BMI, food addiction, and cravings were not statistically significant (YFAS 2.0: $p = 0.268$ and FCQ-Tr: $p = 0.539$). Despite this, a high prevalence of these comorbidities was found across different BMI levels. Note that the severity of food addiction in individuals with superobesity was even more prevalent than that found at lower BMI levels. The results indicated that food cravings are more prominent in young women with higher education, with little or no influence of the BMI variable on the degree of food addiction or cravings.

Conclusion

Although the study did not find correlations between BMI, food addiction, and cravings, there was a high prevalence of these comorbidities across different BMI levels. The severity of dietary addiction was even more present in individuals with superobesity than that found in lower BMI levels, demonstrating the importance of prior and systematic evaluation of these comorbidities in the preoperative phase of BMS.

Introduction

Obesity is a disease with multifactorial causes, associated with numerous comorbidities, and is often related to compulsive behaviors or addiction to certain types of food [1–3].

Food addiction refers to the need to regularly consume one or more specific foods, which leads to negative consequences such as a loss of control over eating [1, 4, 5]. This addiction is caused both by the composition of highly processed foods and by the individualities and behaviors of the individual, which can lead to obesity or other disorders associated with the consumption of addictive foods [1, 6].

The Yale Food Addiction Scale-2.0 (YFAS 2.0) is widely used to assess and identify the likelihood of individuals developing a continuous craving for foods high in fat and sugar. [7, 8] This has been validated for Brazilians with severe obesity and has become a viable tool for assessing bariatric patients [9].

Craving is an intense desire or urge to consume a substance, and frequent experiences of this desire are characteristic of substance use disorders [10, 11, 12]. However, “craving” refers not only to drug-related substances, but also to other substances, such as food or non-alcoholic beverages [13]. When related to food, it refers to the intensity and specificity of certain foods; craving typically refers to highly palatable foods, such as sweets and foods that are high in fat [14, 15].

The short version of the Food Craving Questionnaire-Trait, the FCQ-T-reduced, assesses the development of certain characteristics of individuals with food craving disorders. The FCQ-T-reduced is a succinct, valid, and reliable self-report measure for efficiently assessing food craving experiences as a trait [11, 12].

Preoperative rates of food addiction among candidates for bariatric and metabolic surgery range from 14% to 57.8%. Although the number of post-operative studies remains limited, the prevalence of food addiction symptoms after surgery may reach up to 13.7%. Evidence indicates that the presence of food addiction symptoms in the postoperative period is associated with reduced weight loss, increased risk of weight regain, persistence of maladaptive eating behaviors, transfer of addiction to other substances or compulsive behaviors, poor adherence to nutritional recommendations, and impaired quality of life. [16–19]

This study aimed to assess the level of food addiction and food craving, and their correlations, in individuals with different levels of obesity.

Materials and Methods

This is a cross-sectional and exploratory study, in which the sample was selected via a telephone survey and digital media administered to the Brazilian population with obesity in pre-bariatric surgery. Individuals over 18 years and with a Body Mass Index (BMI) greater than 30 kg/m2 were included. Exclusion criteria were individuals who refused to participate or had difficulty understanding the

questions, as well as those with less than five years of education, due to the increased risk of not understanding the questions.

Participants

This experiment opted for the convenience sampling method. The final sample consisted of 434 individuals, of which 377 were women (86.9%), all classified as individuals with obesity (BMI > 30 kg/m²), between 18 and 72 years old, and with a mean age of 44.1 + 11.2 years. We designated a BMI between 30 and 34.9 kg/m² as class I obesity, between 35 and 39.9 kg/m² as class II, 40 to 49.9 kg/m² as class III, and above 50 kg/m² as class IV.

Assessments and Measurements

Data on demographic, anthropometric, and clinical variables were recorded. Demographic variables included age, sex, race (white or non-white), and educational level (the highest grade the individual attended, even if incomplete). Weight and height were self-reported, and BMI was calculated as weight in kilograms divided by the square of height in meters (kg/m2). Use of alcohol and frequency of physical activity were assessed and reported by the patient via self-report, assuming potential information biases related to the objectivity and honesty of self-assessment.

The Yale Food Addiction Scale Version 2.0 (YFAS 2.0) aims to assess the presence of food addiction in individuals by analyzing their food consumption in the previous 12 months via a self-reported questionnaire with 35 items [8], which are based on the 11 diagnostic criteria of the DSM-5 for Substance Use and Addictive Disorders [20]. Patients must answer the questions using the Likert scale, which ranges between 0 (never) and 7 (every day) [8]. The 11 diagnostic criteria were considered met if one or more relevant questions related to each criterion reached the scale limit. Two different summary scores were created: one counting the symptoms (0–11) and one indicating the diagnosis of the patient with its severity level (mild, moderate, or severe). Patients were also required to show clinically significant distress (assessed by separate items) to be effectively diagnosed with food addiction [8, 9, 20].

The Food Cravings Questionnaire-Trait-reduced (FCQ-T-r) comprises 15 items and five subscales that measure the continuous states of the patients: lack of control or over eating (five items), thoughts or concerns about food (five items), intentions and plans to consume food (two items), emotions before or during food cravings (two items), and cues that can trigger food cravings (one item). Response scores on the instrument ranged from 1 to 5 points (“strongly disagree” to “strongly agree”), meaning that results can range from 15 to 75 points [12]. In this study, the validated version of the instrument for Brazil was chosen [21].

Statistical Analysis

The power to test whether there was an association between obesity levels and food addiction was 63%. The calculation was performed using the online version of the PSS Health tool and considered a significance level of 5%, a sample size of 434 subjects, a Cohen's W effect size of 0.11, and 1 degree of freedom, as obtained by Borges (2021).[22]

Correlations between BMI, food addiction, and cravings were assessed using the One-Way ANOVA test, and the Chi-square test was used to assess the association between the YFAS 2.0 domains and BMI classifications (grades I, II, III, and IV). The YFAS 2.0 and FCQ-Tr instruments were evaluated with sociodemographic categories and self-reported quality of life information, such as frequency of physical activity and smoking, using the nonparametric Spearman correlation test.

Results

The convenience sample consisted of 434 individuals with a BMI greater than 30 kg/m2, in preoperative BMS, with a mean age of 44.2 (SD = 11.24), ranging from 18 to 72 years, and 73.7% of the sample was Caucasian. A total of 108 individuals evaluated had BMI between 30 and 34.9 kg/m2 (class I), 107 between 35 and 39.9 kg/m2 (class II), 165 between 40 and 40.9 kg/m2 (class III), and 54 above 50 kg/m2 (class IV). Overalll, 248 participants (47.1%) had some degree of AA, which showed 7.1 (SD = 2.49) symptoms on average (Table 1). Regarding the degrees of obesity, there were no significant differences between gender, age, ethnicity, level of education, and marital status ($p > 0.05$). The YFAS 2.0 showed degrees of significance with the variables age ($r = -0.23$), sex ($r = 0.16$), and level of education ($r = 0.17$). Similar results were found between the FCQ-Tr instrument and the same variables analyzed, namely age ($r=-0.29$), sex ($r = 0.18$), and education ($r = 0.27$). According to the results, food cravings are more prominent in young women with higher education, with little or without interference of the BMI variable in the degree of food addiction or cravings. The YFAS 2.0 and FCQ-Tr instruments showed a significant ($p = 0.01$), positive, and moderate correlation ($r = 0.68$).

Table 1
Characteristics of the sample (n = 434)

Feminino (%)	**IMC 30-34.9** **n = 108**	**IMC 35-39.9** **n = 107**	**IMC 40-49.9** **n = 165**	**IMC 50+** **n = 54**
	92 (85.1)	**96 (89.7)**	**144 (87,2)**	**45 (83,3)**
Weight (Kg, SD)	89.4 (± 9.3)	100.4 (± 10.5)	119.2 (± 13.4)	152.7 (± 26.1)
Age (years) μ (SD)	44 (± 10.6)	44.4 (± 11.9)	44.4 (± 11.1)	43.4 (± 11.8)
Marital Status (%)				
Single	36 (33.3)	40 (37.3)	56 (33.9)	28 (51.8)
Married	63 (58.3)	57 (53.2)	91 (55.1)	22 (40.7)
Separated	7 (6.4)	8 (7.4)	13 (7.8)	3 (5.5)
Widowed	2 (1.8)	2 (1.8)	5 (3.0)	1 (1.8)
Education Level (%)				
Elementary	8 (7.4)	12 (11.2)	30 (18.1)	19 (35.1)
High School	21 (19.4)	29 (27.1)	57 (34.5)	19 (35.1)
Higher and postgraduate education	79 (73.1)	66 (61.6)	78 (47.2)	16 (29.6)
Frequency of physical activity (weekly) (n,%)				
None	8 (16)	17 (36.2)	52 (50)	31 (64.6)
1 time	1 (2)	4 (8.5)	12 (11.5)	3 (6.3)
2 time	9 (18)	6 (12.8)	15 (14.4)	5 (10.4)
3 time	13 (26)	10 (21.3)	12 (11.5)	6 (12.5)
4 time or more	19 (38)	10 (21.3)	13 (12.5)	3 (6.3)
Tabagismo (%)				
No	37 (94.9)	38 (97.4)	91 (94.8)	40 (85.1)
Yes	2 (5.1)	1 (2.6)	5 (5.2)	7 (14.9)

SD: standard deviation. BMI: Body Mass Index. Frequency of physical activity was assessed in 249 (57.4%) participants, with 185 absences. Smoking was assessed in 221 (50.9%) participants, with 213 absences.

There was statistical significance in domains 9 and 12 when comparing the YFAS 2,0 diagnostic criteria and obesity levels (Table 2), referring to failure to fulfill important obligations, such as work, school or home (I = 39.8%, II = 43.9%, III = 46.1%, IV = 66.7%; p = 0.006), and inadequate food intake causing harm or suffering, respectively (I = 58.3%, II = 53.3%, III = 57%, IV = 75.9%; p = 0.044). (Table 2)

Table 2
Prevalence of YFAS 2.0 criteria by BMI category

Critério Diagnóstico	**BMI 30-34.9** **n = 108 (%)**	**BMI 35-39.9** **n = 107 (%)**	**BMI 40-49.9** **n = 165 (%)**	**BMI 50+** **n = 54 (%)**
1. Consumed more than intended	75 (69.4)	66 (61.6)	103 (62.4)	34 (62.9)
2. Unable to cut down or stop	74 (68.5)	66 (61.6)	109 (66.0)	38 (70.3)
3. Great deal of time spent	41 (37.9)	42 (39.2)	59 (35.7)	23 (42.5)
4. Important activities given up	39 (36.1)	43 (40.2)	72 (43.6)	29 (53.7)
5. Use despite physical/emotional consequences	50 (46.2)	54 (50.4)	83 (50.3)	30 (55.5)
6. Tolerance	39 (36.1)	40 (37.3)	59 (35.7)	25 (46.2)
7. Withdrawal	73 (67.5)	81 (75.7)	113 (68.4)	41 (75.9)
8. Use despite interpersonal/social problems	55 (50.9)	54 (50.4)	88 (53.3)	37 (68.5)
9. Failure in role obligation	43 (39.8)	47 (43.9)	76 (46.1)	36 (66.7)
10. Use in physically hazardous situations	48 (44.4)	55 (51.4)	95 (57.5)	29 (53.7)
11. Craving	44 (40.7)	56 (52.3)	65 (39.3)	28 (51.8)
12. Impairment/distress	63 (58.3)	57 (53.2)	94 (56.9)	41 (75.9)

Items that showed statistical significance ($p < 0.001$), assessed by the Chi-square test, are highlighted in gray.

There were no significant correlations when assessing correlations between BMI, food addiction, and cravings (YFAS 2.0: p = 0.268 and FCQ-Tr: p = 0.539). (Table 3)

When analyzing the weekly physical activity frequency variable, answered by 249 participants, 57.4% of the sample showed an inversely proportional correlation with BMI (r=-0.397), but there were no significant correlations with the constructs of food addiction and cravings. Overall, 15 of 221 individuals analyzed reported being current smokers, and tobacco use was associated with food cravings (r = 0.134).

Table 3
FCQ-Tr and YFAS 2.0 results by BMI category

FCQ–Tr	BMI 30-34.9 n = 108 (n,%)	BMI 35-39.9 n = 107 (n,%)	BMI 40-49.9 n = 165 (n,%)	BMI 50+ n = 54 (n,%)	Total n = 434 (n,%)
Score do FCQ-Tr ($\bar{x}$, DP)	44 (17)	46 (17.1)	44.4 (17.1)	45.7 (18.2)	44.9 (17.2)
Diagnosis of Food Addiction (BR-YFAS 2.0-Obes)					
No FA	46 (42.5)	52 (48.5)	73 (44.2)	15 (27.7)	186 (42.9)
Mild FA	9 (8.3)	6 (5.6)	4 (2.4)	5 (9.2)	24 (5.5)
Moderate FA	10 (9.2)	8 (7.5)	23 (13.9)	5 (9.3)	46 (10.6)
Severe FA	43 (39.8)	41 (38.3)	65 (39.4)	29 (53.7)	178 (41)

Discussion

This study aimed to further explore the relationship between BMI, food addiction, and cravings by analyzing correlations between BMI categories and levels of food addiction in candidates of BMS.

The food addiction hypothesis posits that exposure to highly palatable foods alters the reward circuitry of the brain, resulting in a behavioral phenotype like substance addiction and facilitating dysfunctional eating behaviors, such as binge eating. Neuroendocrine changes, emotional homeostatic factors, and the reward circuitry are associated with exposure to highly palatable foods, loss of control over eating, increased impulsivity, and the inability to change eating behavior, despite the negative consequences associated with overweight and obesity [23].

In individuals with obesity, prevalence rates of food addiction diagnoses assessed by the YFAS 2.0 typically range between 20 and 50% [24]. In our findings, there was a variation of 51.4% in individuals with a BMI between 35 and 39.9 kg/m2 and 72.2% in participants with a BMI greater than 50 kg/m2. The hypothesis that the prevalence of food addiction and cravings was so much higher than in other studies due to the high BMI of the participants was discarded due to the homogeneity of the data from the YFAS 2.0 and FCQ-Tr questionnaires when distributed by BMI (Figs. 1 and 2).

The mean age was 44.2 years (SD = 11.2), with an inversely proportional correlation being found with the presence of food addiction and cravings. Similar proportional results were found by Zielińska et al [25], in which a sample with a mean age of 60 years (SD = 11.93) demonstrated a relationship between age and food addiction, indicating that the older the respondent, the less common food addiction was. Correlation analyses between sociodemographic data in patients with obesity and food addiction and

cravings are still not unanimous in the literature. Som et al [26], in a sample similar to our study, composed only of patients with obesity (BMI > 35), with a mean age of 42.6 years (SD = 13.0), gender composed of 80% women, and relationship status categorized as single or in a relationship, did not find significant differences related to food addiction, also assessed by the YFAS 2.0.

The most representative domains of the YFAS 2.0 were “Withdrawal” and “Presented Deficiencies/Distresses,” both with a prevalence of 75.9%. This finding is like the findings of a study on food addiction using the Chilean version of the YFAS 2.0 in patients undergoing weight loss programs. This study observed that the most prevalent symptomatic criterion was also withdrawal [27].

Considering the sample of participants with class I obesity (BMI between 30 and 34.9%), domains A, “Consumed more food than intended,” and B, “Unable to reduce or stop food consumption,” were, on average, the most representative, with 69.4% and 68.5%, respectively. Manzoni et al [28], had similar findings when analyzing the structural validity of the YFAS 2.0 items in samples of individuals with and without obesity. In this study, domains A and B were also the most representative in individuals with severe obesity, but in items #3 of domain A (“I ate to the point of feeling physically ill”) and #32 of domain B (“I tried and failed to reduce or stop eating certain foods”).

Despite the lack of statistical significance between BMI and food addiction, 57.1% of participants in our study had some degree of ED. Note that at least 39.8% of participants had severe ED across all degrees of obesity. Severe food addiction was present in more than 53.7% of individuals with a BMI > 50. Similar results were only found in studies that also included patients with obesity grade III or higher, such as the study by Som et al [26], in which 37% of participants were diagnosed with AF, of which 58% had severe AF. In a study evaluating 1,061 individuals with a mean BMI of 46.9 kg/m², Koball et al [29], found some degree of AF in 18% of the participants, of which 56% were severe. This difference between AF levels in the obesity groups raises the hypothesis that addiction shows discrepantly. Although we did not find statistically significant differences, this finding is clinically relevant and may influence preoperative treatment protocols. This discrepancy in the AF score and BMI classifications was not observed in the mean food craving score (Table 3).

Physical activity was analyzed in only 57.4% of the sample, and, in contrast to the extensive literature, our study did not find significant correlation between AA and physical activity. However, observing data found in patients with grade III and IV obesity, more than 50% did not exercise weekly, while 38% of participants in the lower BMI category reported exercising four or more times a week.

Such data reinforce a correlation described in the literature, showing an inversely proportional relationship, in which the more frequent the physical exercise, the lower the level of obesity, and physical exercise can be a protective factor [30–33].

This study found evidence that food addiction is a construct frequently comorbid with obesity. Therefore, addressing food addiction in the preoperative phase of bariatric surgery is critical for optimizing surgical outcomes and long-term weight management. Bariatric procedures primarily induce anatomical and

hormonal changes but do not directly modify the underlying neurobiological mechanisms associated with addictive-like eating behaviors, such as heightened reward sensitivity, impaired inhibitory control, and emotion-driven food intake. [34] Evidence suggests that preoperative food addiction is associated with poorer adherence to dietary recommendations, reduced engagement in lifestyle modifications, and an increased risk of maladaptive eating patterns after surgery, including grazing and loss-of-control eating. [16] Moreover, untreated food addiction prior to surgery has been linked to a higher likelihood of addiction transfer in the postoperative period, particularly to alcohol use disorders. [18, 35]

The limitations of the study include data on physical activity and smoking, which were self-reported and may be subject to misinterpretation or data manipulation. The main shortcoming of this study was the failure to assess psychiatric illnesses potentially associated with the constructs of obesity, food addiction, and food cravings.

Conclusion

The results reinforce suggestions of the literature about treatment approaches for obesity, which is a complex, multifactorial, and difficult-to-treat disease. Although the study did not find correlations between BMI, food addiction, and cravings, there was a high prevalence of these comorbidities at different BMI levels. The severity of food addiction was even more prevalent in individuals with extreme obesity than in those with lower BMI levels. Furthermore, the prevalence of food cravings was more prominent in young women, even those with a high level of education, so this population needed greater attention when evaluated. Early identification and treatment of food addiction in the preoperative setting allow for targeted psychological and behavioral interventions, improve patient preparedness, foster realistic expectations regarding surgical outcomes, and contribute to sustained weight loss and metabolic benefits following bariatric surgery. Therefore, incorporating food addiction assessment and treatment into preoperative care represents a clinically and ethically sound strategy to enhance the long-term effectiveness of bariatric surgery.

Declarations

Conflict of Interest

****: No conflict of interest, ****: No conflict of interest, ****: No conflict of interest, ****: No conflict of interest.

Ethical Procedures

The participants received the Free and Informed Consent Form (ICF), which was approved by the Scientific Committee and by the **** and ****, both in Brazil. CAEE **** was in accordance with the ethical aspects of research with human beings proposed by Resolution 510 of April 7, 2016 (CNS 510/2016). All participants signed the ICF before answering the questionnaire, thus consenting to participate in the research and acknowledging their ability to withdraw from it at any time.

Informed Consent

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

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Author Contribution

All authors participated in data collection and writing, and reviewed the manuscript.Authors LF and RP created the tables.Authors GM, LF, and RP reviewed the bibliographic references.Authors ERM and MSO coordinated the project and submitted it to the ethics committee.

Data Availability

All data supporting the findings of this study are available within the paper and its Supplementary Information.

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Figures

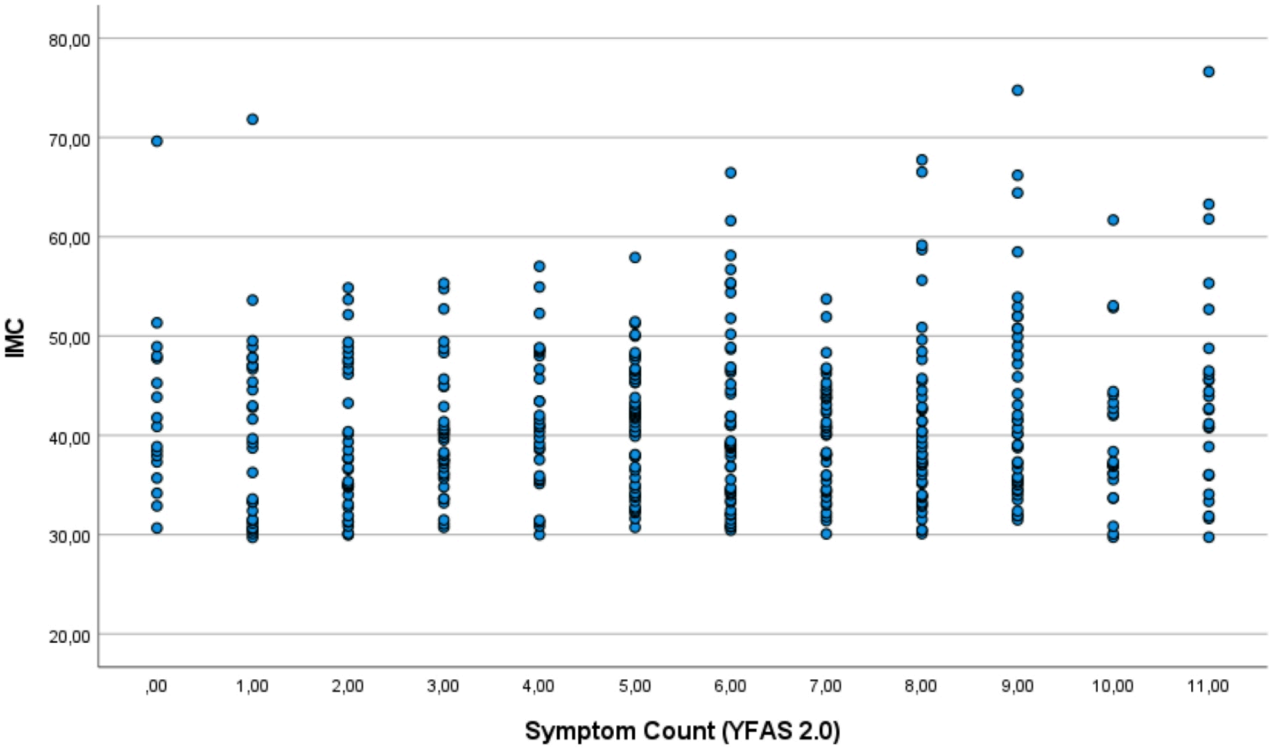


Figure 1

Simple Scatterplot with the Distribution of BMI in Symptom Counts from YFAS 2.0

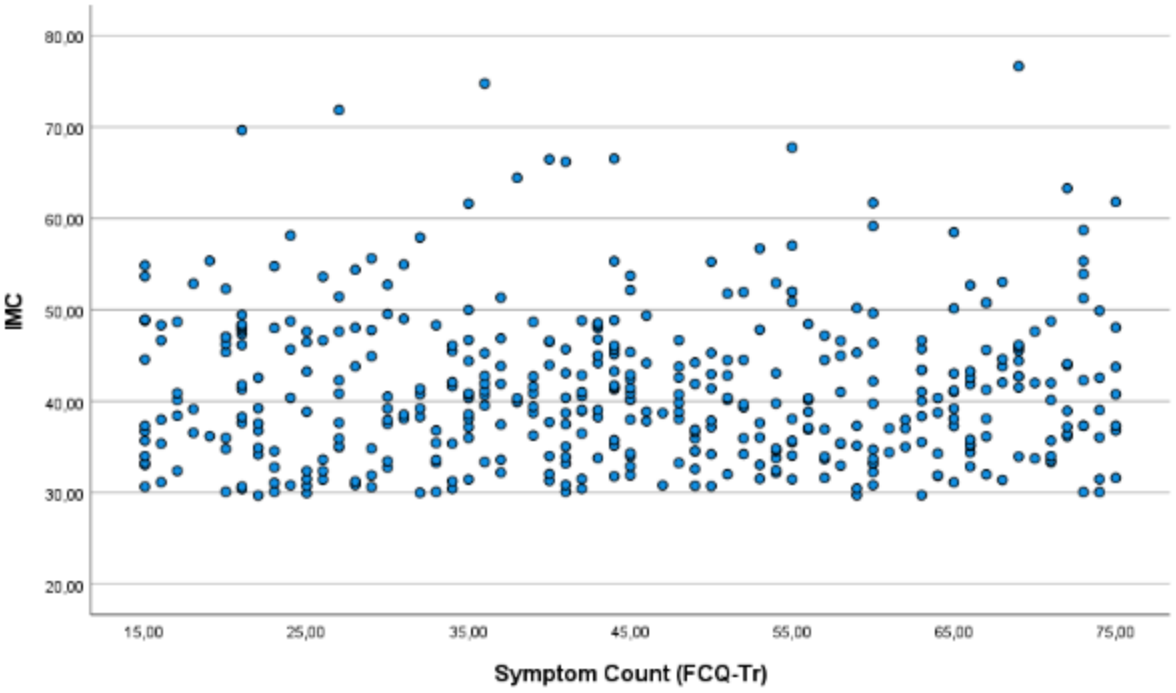


Figure 2

Simple Scatterplot with the Distribution of BMI and Food Craving assessed via FCQ-Tr