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Prevalence and Psychosocial Correlates of Food Addiction in Persons with Obesity Seeking Weight Reduction

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Abstract

Introduction—Food addiction is a controversial concept. The potential influence of food addiction on patients' psychosocial functioning and well-being has not been well established. The purpose of this study was to examine the relationships between psychosocial functioning (depressive symptoms and health-related quality of life [HRQOL]) and food addiction as measured by the Yale Food Addiction Scale (YFAS). We also explored whether food addiction contributed additional variance in explaining psychosocial functioning, beyond demographic and clinical factors (e.g., binge eating).

Methods—The sample included 178 participants (mean age=44.2±11.2 years; BMI=40.9±5.9 kg/m^2; 88.2% female; 70.8% Black) with obesity seeking treatment for weight loss. Participants completed the Medical Outcomes Study 36-Item Short-Form Health Survey, Impact of Weight on Quality of Life-Lite, Patient Health Questionnaire, YFAS, and Questionnaire on Eating and Weight Patterns-5.

Results—Twelve (6.7%) participants met criteria for food addiction, with 4 (33.3%) of these participants having co-occurring binge eating disorder. After adjusting for covariates, the number of food addiction symptoms accounted for 6.5% to 16.3% of additional variance in general HRQOL, 5.0% to 21.5% in weight-related HRQOL, and 19.1% in symptoms of depression.

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Conclusions—In this treatment-seeking sample of participants, we found a low prevalence of food addiction, suggesting that additive-like eating is unlikely to be a causal mechanism for most people with obesity. However, individuals who met criteria for food addiction had reduced psychosocial functioning compared to those who did not meet criteria. Individuals with addictive-like eating may require additional psychosocial support.

Keywords

Food addiction; quality of life; binge eating; depression

1. Introduction

Food addiction is a popular yet highly controversial construct that was first introduced in the scientific literature as term to describe abnormal eating behaviors. However, it is now commonly used to explain the etiology and maintenance of some forms of obesity [1]. Food addiction is most commonly measured and operationalized using the Yale Food Addiction Scale (YFAS) [2]. As originally developed, this measure applies the seven criteria for substance dependence, taken from the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV-TR), to food and eating behaviors [2]. Criteria include wanting to cut down or stop using the substance but not managing to; taking the substance in larger amounts or over a longer period; giving up important social, occupational, or recreational activities because of substance use; and continued use of the substance despite knowledge of having a persistent or recurrent physical or psychological problem. Using the YFAS, estimates of the prevalence of food addiction in the general population ranges from 0 to 10% [3,4]. Results from a meta-analysis suggest that the prevalence of food addiction is 11.1% among individuals who are normal weight, compared with 24.9% among those who are overweight/obese [5]. The prevalence has been reported to be as high as 56.8% in individuals with both obesity and binge eating disorder [6]. A growing number of studies have sought to demonstrate the validity and clinical utility of the construct of food addiction.

Food addiction is associated with several clinical conditions, one of which is binge eating disorder (BED). BED is characterized by the consumption of an objectively large amount of food in a discrete period of time (i.e., 2 hours), with an accompanying sense of loss of control over eating [7]. Among participants with clinically diagnosed BED, the co-occurrence of food addiction ranges from 41.5% [8] to 72.2% [9]. Like persons with BED, those with a diagnosis of food addiction tend to have a higher body mass index (BMI) [10,11] than unaffected individuals, as well as more symptoms of depression [12–14] and eating disorder psychopathology (i.e., shape and weight concerns [6,15]) than unaffected individuals. However, among individuals who are obese, some studies have demonstrated no difference in BMI between those with and without food addiction or binge eating disorder [16].

The present study had two primary goals, the first of which was to examine the relation of food addiction to health-related quality of life (HRQOL). Reduced HRQOL is common in individuals with substance use disorders [17,18], as it is in persons with BED [19]. However, the impact of food addiction on HRQOL has not been established. We hypothesized that

among persons with obesity, those with food addiction, compared to individuals without this latter diagnosis, would report poorer general and weight-related HRQOL. The study's second goal was to examine whether the diagnosis of food addiction accounted for unique variance in psychosocial functioning (i.e., HRQOL and symptoms of depression) above and beyond that associated with BED. The discovery of additional variance would suggest the potential usefulness of the diagnosis of food addiction in capturing the behavioral and psychosocial characteristics of a subset of individuals with obesity.

2. Methods

2.1. Study Design and Participants

This was a cross-sectional study of baseline data from 178 participants enrolled in a randomized controlled trial for weight reduction. Inclusion criteria were: BMI≥33 kg/m^2 and ≤55 kg/m^2 (or ≥30 kg/m^2 with an obesity-related comorbidity); age ≥21 and ≤65 years; and having a primary care provider who was responsible for providing routine medical care. Exclusion criteria were: clinically significant medical or psychiatric conditions that would contraindicate weight loss; diabetes; pregnant or nursing; current major depressive episode, active suicidal ideation, or history of suicide attempts; use in the past 14 days of antidepressants or antipsychotics; loss of ≥10 lbs of body weight within the past 3 months; history or plans for bariatric surgery; or inability to walk 5 blocks.

2.2. Procedures

This study was approved by the University of Pennsylvania Institutional Review Board. Participants were recruited from newspaper, internet, and radio advertisements, as well as flyers. Eligibility was assessed using a phone screen and follow-up in-person evaluation. During the in-person visit, individuals completed informed consent, a behavioral evaluation, and a medical history and physical exam. The behavioral evaluation, conducted by a psychologist or nurse practitioner, included a review of the participants' responses to the Weight and Lifestyle Inventory [20], which contains the Questionnaire on Eating and Weight Patterns (QEWP) [21], used to assess the presence of BED using DSM-5 criteria. Assessors queried participants on their responses to the QEWP to determine whether they consumed an objectively large amount of food (in a 2-hour period); experienced loss of control and marked distress related to their eating; and met frequency criteria for BED (≥1 binge episode per week, on average, for the past 3 months), as well as at least 3 of 5 associated features (e.g., eating faster than usual, eating in secret, etc). Participants were classified as either meeting diagnostic thresholds for BED or for subclinical BED (<1 binge eating episode a week or <3 associated features) or as not having BED. Weight was measured on an electronic scale (Detecto, model 6800A), with applicants dressed in light clothing, and height was assessed using a wall-mounted stadiometer (Veeder-Root, Elizabethtown, NC). These measures were used to calculate BMI.

Applicants who met all eligibility criteria were enrolled in the study and completed a set of questionnaires approximately 1 to 2 weeks before starting the weight loss program. Most participants completed the questionnaires on-line, in REDCap; 27 (15.2%) participants elected to complete paper-and-pencil forms (later entered in REDCap).

2.3. Measures

2.3.1. YFAS—Food addiction was measured by the YFAS, a 25-item instrument that assesses addictive-like eating behaviors using the DSM-IV-TR criteria for substance use [2]. Participants were asked about their eating behaviors during the past 12 months. The measure was scored using a symptom count ranging from 0 to 7, indicating the number of dependence symptoms (i.e., consumed more than planned; desire or repeated failed attempts to reduce or stop consumption; great deal of time spent in activities necessary to obtain, use, or recover; giving up other important activities; continued use despite physical or psychologic problems; tolerance; withdrawal). Following the YFAS scoring guidelines, a diagnosis of food addiction was given to persons who endorsed three or more symptoms of dependence and reported impairment or distress in association with these behaviors. For the current study, the Kuder-Richardson's alpha was 0.71.

2.3.2. Medical Outcomes Study 36-Item Short-Form Health Survey (SF-36)—General HRQOL was assessed using the SF-36 [22]. The items are divided into eight subscales: vitality; physical functioning; body pain; general health perceptions; physical role functioning; emotional role functioning; social role functioning; and mental health. The survey also yields two summary scores: a physical health component score and a mental health component score. Lower scores on all subscales indicate lower HRQOL. Scores are norm-based, with a mean of 50 and standard deviation of 10, based on sampling of the general population. The Cronbach's alphas for the SF-36 subscales were acceptable (alpha=0.72 to 0.90), with the exception of the general health subscale (alpha=0.63).

2.3.3. Impact of Weight on Quality of Life-Lite (IWQOL-Lite)—The IWQOL-Lite is a 31-item measure designed to measure weight-related HRQOL. The questionnaire yields a total score and five subscales, including physical function, self-esteem, sexual life, public distress, and work [23]. Scores range from 0 to 100, in which higher scores indicate better weight-related HRQOL. There was good to excellent internal reliability for the total score (alpha=0.95), as well as for all of subscales including: physical function (alpha=0.91); self-esteem (alpha=0.92); sexual life (alpha=0.94); public distress (alpha=0.90); and work (alpha=0.83).

2.3.4. Patient Health Questionnaire (PHQ-9)—The PHQ-9 [24] was used to assess depression severity. Scores range from 0 to 27, with scores <5 indicating minimal or no symptoms of depression. Scores of 5–9 and ≥10 indicate mild and moderate-to-severe symptoms of depression, respectively. The Cronbach's alpha was 0.85 for the measure.

2.4. Statistical Analysis

Analyses were conducted using SPSS version 23.0. Means and standard deviations were used to describe the study sample. We conducted univariate analyses of differences between individuals who did and did not meet criteria for food addiction using Mann-Whitney U and chi-squared tests. These pairwise comparisons were also repeated for individuals with and without clinical or subclinical BED. Zero-order correlation coefficients were used to examine the relationships between food addiction symptom count (continuous), measures of HRQOL, and symptoms of depression. The incremental variance in HRQOL and depressive

symptoms, accounted for by a diagnosis of food addiction, above and beyond that accounted for by demographic factors (age, sex, race), physical variables (comorbidities and BMI), and a clinical or subclinical diagnosis of BED, was investigated through hierarchical linear regression. In step 1, demographic and physical variables were entered (Model 1). In Model 2, meeting a clinical or subclinical BED diagnosis was added. In step 3, meeting criteria or not for food addiction was entered (Model 3a). We also repeated these analyses using the continuous value of food addiction symptoms in step 3 (Model 3b). The coefficient of determination (r^2) was used to compare how much variance was explained by the different sets of variables.

3. Results

3.1. Participant Characteristics

Participants had a mean age of 44.2±11.2 years and BMI of 40.9±5.9 kg/m^2. The majority of the sample was female (88.2%); 70.8% of participants self-identified as Black, 21.9% as White, and 7.3% as Other race/ethnicity. Participants had an average of 1.9±1.7 comorbidities, most commonly hypertension (35.4%), dyslipidemia (21.9%) and arthritis (19.7%). The average score on the PHQ-9 was 4.9±4.8, with 15.7% of participants endorsing moderate or greater depressive symptoms.

3.2. Prevalence of Food Addiction and BED

Twelve of 178 (6.7%) participants met criteria for food addiction. The mean number of food addiction symptoms was 2.3±1.6. The most commonly endorsed symptoms were persistent desire or reported unsuccessful attempts to quit (95.5%) and use despite knowledge of adverse consequences (34.8%; Table 1). Six (3.4%) individuals were diagnosed with BED and an additional 13 (7.3%) had subclinical BED. Of patients with BED, 3 (50.0%) also met criteria for food addiction, as did one patient with subclinical BED (7.7%). Among patients who met criteria for food addiction, 33.3% had subclinical or clinical BED. In the total sample, 151 (84.8%) participants had neither BED nor food addiction; 8 (4.5%) had food addiction only; 15 (8.4%) had subclinical or clinical BED only; and 4 (2.2%) had both food addiction and clinical or subclinical BED. Demographic characteristics (i.e., age, sex, race), weight, BMI, and number of comorbidities did not differ between individuals who did and did not meet criteria for food addiction (ps>0.05; Table 2).

3.3. Food Addiction, HRQOL, and Symptoms of Depression

In univariate analyses, participants who met criteria for food addiction, as compared with those who did not, scored significantly lower on both the physical and mental components of general HRQOL (Table 2). These participants scored lower on all SF-36 subscales (p<0.05), except for general health and role-emotional (Table 2). Similarly, participants diagnosed with food addiction had lower weight-related HRQOL, as measured by the IWQOL-Lite, in all domains including physical functioning, self-esteem, sexual life, public distress, and work (Table 2). Participants with food addiction also had higher depressive symptoms than those without this diagnosis.

A higher food addiction symptom count was negatively correlated with all SF-36 (r= −0.30 to −0.44, ps<0.001) and IWQOL-Lite scores (r=−0.31 to −0.51, ps<0.001; Table 3). Individuals who endorsed more food addictions symptoms had more depressive symptoms (r=0.48, p<0.001).

3.4. BED, HRQOL, and Symptoms of Depression

Participants with and without subclinical/clinical BED did not differ in age, weight, BMI, comorbidities, or sex (ps>0.05). Six percent of individuals who identified as Black were diagnosed with subclinical/clinical BED, which was a significantly lower percentage compared to individuals who identified as White (17.9%) or other (33.3%; p=0.004). Individuals with subclinical/clinical BED had significantly greater depressive symptoms (7.5±5.7) compared to those without BED (4.6±4.6; p=0.02). Individuals with and without BED did not differ on general physical or mental health components of the SF-36 (ps=0.06, 0.07, respectively). Participants with BED scored significantly lower relative to those without BED on four of the SF-36 subscales. On the physical function and mental health subscales, individuals with BED had average scores of 40.3±11.5 and 48.1±52.6, compared to those without BED who scored 47.3±9.7 and 52.6±8.5 (p=0.01, 0.02, respectively). For the role-physical and role-emotional subscales, participants with BED had an average of 41.3±13.3 and 41.7±13.5 compared to participants without BED who had an average of 49.0±10.2 and 49.3±10.5 (ps=0.01, 0.01, respectively). Participants with BED scored significantly lower than those without BED on total weight-related quality of life (58.5±21.5 vs 69.3±18.6, p=0.04), weight-related self-esteem (44.9±24.1 vs 58.4±26.5, p=0.03) and weight-related work (70.1±26.2 vs 82.3±21.2, p=0.03). Participants with and without BED did not differ on the other IWQOL-Lite subscales (ps>0.05).

3.5. Variance Accounted for by Food Addiction

After adjusting for demographic factors and physical variables, a diagnosis of subclinical or clinical BED accounted for a significant amount of variance in the SF-36 physical and mental health component scores (3.4% and 5.4%, respectively), as well as, the domains for mental health (6.5%), role emotional (8.0%), body pain (5.4%), role physical (5.8%), and physical functioning (5.6%; Table S1, Table 4). The further addition of meeting criteria for food addiction accounted for a significant amount of variance in the SF-36 physical health component score (3.4%), and the domains of vitality (2.4%), mental health (3.1%), physical functioning (3.0%), role physical (3.7%), and social functioning (5.3%). Meeting criteria for food addiction did not contribute a statistically significant amount of variance to other domains or the mental health component score (ps>0.05; Table 4). The number of food addiction symptoms accounted for a statistically significant amount of variance above and beyond covariates in all models. The additional variance explained ranged from 6.5% (body pain) to 16.3% (vitality; Table 4).

After adjusting for demographic factors and physical variables, a diagnosis of subclinical or clinical BED accounted for a significant amount of variance in the weight-related HRQOL (as measured by the IWQOL-Lite) for the total score (6.7%) as well as physical function (4.2%), public distress (6.0%), and work (5.4%; ps<0.05; Table S2; Table 5). Meeting criteria for food addiction was significantly related to weight-related HRQOL for all

domains and explained 1.8% (public distress) to 6.6% (work) of unique variance (Table 5). When the continuous measure of symptoms of food addiction was substituted into the model, the number of food addiction symptoms explained 5.0% (public distress) to 21.5% (self-esteem) of unique variance in weight-related HRQOL scores (ps<0.05; Table 5). After accounting for demographic factors and physical variables, a diagnosis of BED accounted for 4.5% of variance in symptoms of depression (p=0.02). Meeting criteria for food addiction accounted for another 3.1% of variance (p=0.02). The number of food addiction symptoms accounted for 19.1% of variance in depressive symptoms (p<0.001) when added to the model.

4. Discussion

As hypothesized, participants who met criteria for food addiction reported poorer general and weight-related HRQOL than individuals who did not meet criteria. A norm-based, group mean score of less than 47 on the SF-36 indicates a value below average for the general population [25]. The group means for individuals who did not meet food addiction criteria were all above 47. However, all of the SF-36 group mean scores for participants who met criteria for food addiction were below 47, indicating below average HRQOL. Scores in all domains of the IWQOL-Lite were significantly lower among individuals who met criteria for food addiction. Similar to other study findings [8,26,27], we found that food addiction was associated with more depressive symptoms. Taken together, these results suggest that psychosocial functioning is worse in individuals with obesity who meet criteria for food addiction than in those who do not meet criteria but are comparably obese.

A criticism of the food addiction diagnosis is its potential overlap with BED [28]. Both conditions, for example, are characterized by loss of control over eating and recurrent engagement in the behavior despite negative physical and/or psychological consequences. However, BED and food addiction also appear to differ in significant ways. For example, BED requires consumption of a large amount of food within a discrete amount of time (2 hours), while food addiction does not require these criteria. Eating episodes could potentially occur throughout the day (e.g., grazing) and without meeting criteria for an objectively large amount of food or loss of control over eating for any one episode. Food addiction also includes assessment of tolerance to food and symptoms of withdrawal when trying to reduce eating [6,28].

Consistent with previous results demonstrating correlations between binge eating and YFAS scores [5,8,9], 50% of individuals who met criteria for full-threshold BED also meet criteria for food addiction. In a recently conducted study utilizing an internet-based sample of participants with overweight/obesity, 61.7% of those who met criteria for BED also met criteria for food addiction [27]. In the current sample, food addiction contributed to additional variance, above a diagnosis of BED, in general HRQOL related to mental health, social functioning, vitality, role physical, and physical functioning, as well as all domains of weight-related HRQOL. Endorsing a greater number of food addiction symptoms accounted for unique variance in all general and weight-related HRQOL models. This suggests that the diagnosis of food addiction, as well as the symptom count, contributes novel information in

explaining HRQOL. Food addiction may represent a distinct phenotype or one potentially associated with as much or more personal distress than BED.

A small minority of persons with obesity (6.7%) reported meeting criteria for food addiction. In other samples of participants with overweight/obesity seeking weight reduction, estimates of food addiction range from 15.2% [29] to 19.6% [26]. Among individuals who are overweight, a recent study demonstrated that 26.7% of participants met criteria for food addiction [27]. Thus, food addiction is unlikely to be a causal mechanism for obesity among most people. While we believe that the construct of food addiction potentially may capture behavioral and psychosocial characteristics of a subset of individuals with obesity, we agree with others who have highlighted the theoretical and empirical difficulties with the “food addiction” construct [30,31]. Food addiction has conceptual overlaps with behavioral and substance-based addictions. All humans must eat to survive, just as they must drink, breathe, and sleep. The vast majority will display behaviors consistent with the description of food addiction when deprived of sustenance for extended periods. Thus, the term food addiction potentially is applicable to all humans. The same is not true of other addictive disorders. There is no absolute biological need to initiate drinking alcohol, smoking cigarettes, or using other drugs, and only a minority of persons who try these substances develop a substance use disorder [32–34]. Once developed, many of these individuals do appear to have a biological need or compulsion to consume the desired substance and will go to great lengths to do so. Further, there is not clear evidence that specific foods can be considered addictive. To label food as addictive would suggest that it has components or an inherent ability to make vulnerable individuals addicted to it, as seen in substance use disorders [31]. There are no universally agreed upon addictive elements of food, and the physiological processes that would make food addictive have yet to be elucidated. Thus, we believe that “food addiction” is not an optimal term to describe this possible phenotype. We propose the term “addictive-like behavior concerning food”, in lieu of the overly broad label of food addiction. We believe that the more limited term will help to ensure that not all persons with obesity are diagnosed with food addiction and to emphasize that there are dissimilarities between addictions towards food and other substances.

In addition to the low prevalence of addictive-like eating behavior concerning food in this sample, only 3.4% of the sample met a clinical diagnosis of binge eating disorder. Individuals with significant major depressive disorder (MDD) and diabetes were excluded from this study. Depression and metabolic abnormalities are common comorbidities with BED [35,36], thus the exclusion criteria used in this study may have contributed to the low prevalence of addictive-like eating behaviors concerning food and BED. The current sample was 70.8% Black, and 6.3% of individuals who self-identified as Black were diagnosed with subclinical or clinical BED. In comparison, 17.9% of participants who were White and 33.3% of participants who identified as “other” were diagnosed with subclinical/clinical BED. The prevalence of BED is similar across racial/ethnic groups [36,37]. However, racial and ethnic minorities with BED often differ in treatment-seeking behaviors [37,38]. This may also extend to addictive-like eating behavior concerning food. Thus the low prevalence of these conditions in this weight loss seeking sample may be related to racial differences or social, cultural, or economic factors. Further research is needed to distill the effects of racial,

social, cultural, and economic factors on differences and similarities in clinical presentation and treatment seeking among individuals with BED or addictive-like eating behavior concerning food.

This study also used the criteria for food addiction per the DSM-IV-TR. Recently, the YFAS has been revised (YFAS 2.0) to match the DSM-5 criteria for substance-related and addictive disorders [39]. The YFAS 2.0 includes craving, merges abuse and dependence criteria, and uses a diagnostic continuum of severity (none, mild, moderate, severe). Since it assesses food dependence and not abuse, use of the YFAS 2.0 would have likely lead to a greater prevalence of food addiction in this sample; however, this measure was not available when this study began. Replication of the present findings, with more diverse samples and with the new YFAS 2.0 is clearly needed. This is particularly necessary for confirming the results of our regression models.

There are a number of limitations to this study in addition to the exclusion of individuals with MDD and diabetes. The means on the IWQOL-Lite for some of the subscales (sexual life, public distress, work), as well as the IWQOL total score, were higher than reported in previous studies of individuals seeking weight loss [40]. Self-administered measures were used, which can potentially be biased. Scores on self-administered measures of health-related quality of life are typically lower (demonstrating greater impairment) than interviewer-administered questionnaires [41]. This study is cross-sectional which precludes inferences about causal relationships between variables. Our study participants were also treatment-seeking and predominantly female and Black, which may limit the generalizability of our findings.

In conclusion, participants classified as having food addiction appear to have poorer psychosocial functioning. This relationship appears to be independent of demographic covariates, BMI, comorbidities, and a diagnosis of BED. Future studies are needed to further examine how addictive-like behavior concerning food and BED differ.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

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Table 1

Percent of sample meeting criteria for each of the seven symptoms of food addiction

Symptom	N (%)
Persistent desire or repeated unsuccessful attempts to quit	170 (95.5%)
Use despite knowledge of adverse consequences	62 (34.8%)
Tolerance (marked increase in amount; marked decrease in effect)	57 (32.0%)
Much time/activity to obtain, use, recover	51 (28.7%)
Important social, occupational, or recreational activities given up or reduced	23 (12.9%)
Characteristic withdrawal symptoms; substance taken to relieve withdrawal	22 (12.4%)
Substance taken in larger amount and for longer period than intended	21 (11.8%)
Use causes clinically significant impairment or distress	15 (8.4%)

Table 2

Means (SD) or N (%) for study variables and results of pairwise comparisons between individuals

	No food addiction (n=166)	Food addiction (n=12)	*z*-score	*P*-value
Age	44.2 (11.3)	46.1 (10.6)	−0.45	0.65
Weight (kg)	114.2 (21.0)	118.6 (15.1)	−1.45	0.15
BMI	40.9 (5.9)	42.6 (5.8)	−1.28	0.20
Female	145 (87.3)	12 (100)		0.37
Race-				
Black	118 (71.1)	8 (66.7)		0.61
White	37 (22.3)	4 (33.3)		
Comorbidities	1.9 (1.7)	1.7 (1.4)	−0.34	0.73
SF-36-				
Physical component	47.2 (8.6)	38.6 (7.9)	−3.26	0.001
Mental component	51.3 (9.2)	44.7 (12.1)	−2.01	0.045
Physical function	47.4 (9.6)	37.1 (10.5)	−3.08	0.002
Role physical	49.6 (9.8)	38.2 (12.8)	−3.08	0.002
Body pain	49.6 (9.7)	41.3 (10.6)	−2.44	0.02
General health	47.9 (9.0)	44.5 (10.3)	−1.24	0.22
Vitality	48.9 (9.4)	41.9 (9.8)	−2.22	0.03
Social functioning	49.5 (10.1)	38.2 (10.2)	−3.36	0.001
Role emotional	49.3 (10.6)	43.1 (13.0)	−1.85	0.06
Mental health	52.9 (8.3)	44.8 (10.1)	−2.66	0.01
IWQOL-				
Total	69.8 (17.9)	44.4 (20.4)	−3.80	<0.001
Physical functioning	66.2 (21.6)	42.4 (18.5)	−3.42	0.001
Self-esteem	58.7 (25.7)	32.1 (26.1)	−3.06	0.002
Sex	73.0 (27.5)	44.8 (43.7)	−2.24	0.03
Public distress	79.6 (24.1)	57.5 (30.5)	−2.28	0.02
Work	83.0 (20.3)	54.2 (27.7)	−3.59	<0.001
PHQ-9	4.4 (4.6)	9.2 (5.2)	−3.16	0.002

Note. SF-36=Medical Outcomes Study 36-Item Short-Form Health Survey; IWQOL=Impact of Weight on Quality of Life-Lite; PHQ-9=Patient Health Questionnaire.

Table 3

Zero-order correlations between food addiction symptoms and health-related quality of life and symptoms of depression

	YFAS Symptoms
SF-36-	
Physical component	−0.35**
Mental component	−0.44**
Physical function	−0.34**
Role physical	−0.41**
Body pain	−0.30**
General health	−0.32**
Vitality	−0.43**
Social functioning	−0.42**
Role emotional	−0.42**
Mental health	−0.43**
IWQOL-	
Total	−0.50**
Physical Functioning	−0.33**
Self-Esteem	−0.51**
Sex	−0.39**
Public Distress	−0.31**
Work	−0.42**
PHQ-9	0.48**

Note.

** p<0.001.

SF-36=Medical Outcomes Study 36-Item Short-Form Health Survey; IWQOL=Impact of Weight on Quality of Life-Lite; PHQ-9=Patient Health Questionnaire.

Table 4

Coefficient of determination (R^2) from hierarchical regression models predicting general health-related quality of life (SF-36) from demographic and physical factors, binge eating disorder (BED), and food addiction

	Model 1	Model 2	Model 3a	Model 3b
Physical component	0.128 *	0.162 *	0.196 *	0.265 **
Mental component	0.060	0.114 *	0.130	0.262 **
Physical functioning	0.188 **	0.244 *	0.274 *	0.333 **
Role physical	0.029	0.087 *	0.124 *	0.216 **
Bodily pain	0.109 *	0.163 *	0.178	0.228 **
General health	0.089 *	0.091	0.097	0.181 **
Vitality	0.058	0.071	0.095 *	0.234 **
Social functioning	0.033	0.063	0.116 *	0.208 **
Role emotional	0.066	0.146 *	0.149	0.267 **
Mental health	0.059	0.124 *	0.155 *	0.253 **

Note. Model 1 included age, race, sex, BMI, and comorbidities. Model 2 included Model 1 variables and subclinical/clinical diagnosis of BED. Model 3a included Model 2 variables and meeting criteria for food addiction or not. Model 3b included Model 2 variables and the number of endorsed food addiction symptoms.

Asterisks indicate p-values for R^2 change value with $p<0.05$; $p<0.001$.

Table 5

Coefficient of determination (R^2) from hierarchical regression models predicting weight-related quality of life (IWQOL-Lite) and depressive symptoms (PHQ-9) from demographic and physical factors, binge eating disorder (BED), and food addiction

	Model 1	Model 2	Model 3a	Model 3b
Total	0.174**	0.241*	0.300**	0.440**
Physical function	0.237**	0.279*	0.311*	0.370**
Self-esteem	0.064	0.097	0.138*	0.312**
Sexual life	0.076*	0.102	0.138*	0.242**
Public distress	0.287**	0.347*	0.365*	0.397**
Work	0.071	0.125*	0.191**	0.262**
Depressive symptoms	0.039	0.084*	0.115*	0.275**

Note. Model 1 included age, race, sex, BMI, and comorbidities. Model 2 included Model 1 variables and subclinical/clinical diagnosis of BED. Model 3a included Model 2 variables and meeting criteria for food addiction or not. Model 3b included Model 2 variables and the number of endorsed food addiction symptoms.

Asterisks indicate p-values for R^2 change value with $p<0.05$; $p<0.001$.