An examination of food addiction in a racially diverse sample of obese patients with binge eating disorder in primary care settings

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Abstract

Objective: The concept of food addiction in obesity and binge eating disorder (BED) continues to be a hotly debated topic yet the empirical evidence on the relationship between addictive-like eating and clinically relevant eating disorders is limited. The current study examined the association of food addiction as assessed by the Yale Food Addiction Scale (YFAS) with measures of disordered eating, dieting/weight history, and related psychopathology in a racially diverse sample of obese patients with binge eating disorder (BED).

Method: A consecutive series of 96 obese patients with BED who were seeking treatment for obesity and binge eating in primary care were given structured interviews to assess psychiatric disorders and eating disorder psychopathology and a battery of self-report measures including the YFAS to assess food addiction.

Results: Classification of food addiction was met by 41.5% ($n=39$) of BED patients. Patients classified as meeting YFAS food addiction criteria had significantly higher levels of negative affect, emotion dysregulation, and eating disorder psychopathology, and lower self-esteem. Higher scores on the YFAS were related to an earlier age of first being overweight and dieting onset. YFAS scores were also significant predictors of binge eating frequency above and beyond other measures.

Discussion: Compared to patients not classified as having food addiction, the subset of 41.5% of BED patients who met the YFAS food addiction cut-off appears to have a more severe presentation of BED and more associated pathology.

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Introduction

Evidence for the concept of food addiction has been steadily growing, but there is still limited research in clinical populations. Specifically, the food addiction hypothesis suggests that some forms or aspects of problematic eating behavior are the result of an addiction to highly processed foods that are typically high in added sugar, fat, and salt [1,2]. Animal models of feeding behavior provided some of the initial evidence for food addiction. In these studies, rats given intermittent access to sugar began to show signs of additive behaviors (e.g., binge eating tolerance, withdrawal) [3]. Neuroimaging work has also identified that the consumption of either highly palatable foods or drugs

activate similar neural systems (e.g., endogenous opiate system) [4] and obese and addicted participants exhibit similar patterns of neural activation [5,6]. Similarities between disordered eating and substance dependence have also provided some support for the food addiction hypothesis. For example, both binge eating disorder (BED) and substance dependence diagnoses include constructs reflecting loss of control over intake and an inability to cut down on consumption despite a desire to do so [7]. Other factors, such as increased cravings, continued use or consumption despite negative consequences, and emotionally triggered episodes, are also associated with clinically relevant eating and addictive disorders [8].

The similarities between addiction and disordered eating have raised the questions of (1) whether an addictive process may be playing a role in disordered eating and (2) whether food addiction provides any additional meaningful clinical information above and beyond existent eating disorder

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concepts. Until recently, there were no validated measurement tools to operationalize "food addiction," which limited the ability to test the aforementioned questions. Gearhardt and colleagues [9] developed the Yale Food Addiction Scale (YFAS) to fill this gap in the literature. The YFAS applies the diagnostic criteria for substance dependence to eating behavior and provides two scoring options: (1) a food addiction "symptom" count and (2) a food addiction "diagnosis." This measure appears to have appropriate psychometric characteristics [9] and higher scores on the YFAS are related to patterns of neural activation implicated in other addictive disorders [10]. Thus, the YFAS provides an important tool to explore the role of addiction in clinically relevant eating problems.

To our knowledge, only one study has examined food addiction in a clinical sample of eating disorder participants. Gearhardt and colleagues [11] assessed a consecutive series of 81 obese patients with BED seeking treatment for binge eating at a specialty research clinic. Fifty-one percent of participants met the YFAS food addiction "diagnosis" and food addiction was associated with elevated depression, negative affect, emotion dysregulation, eating disorder psychopathology and lower self-esteem. The YFAS also proved to be a significant predictor of binge eating frequency above and beyond other measures of eating disorder psychopathology and depression. Thus, BED patients that also exhibit signs of food addiction may be exhibiting a more disturbed variant of the disorder.

In the current study, we plan to add to the limited clinical literature on food addiction and BED by examining this relationship further in obese patients with BED patients recruited from generalist primary care settings. The vast majority of the existing BED literature is based primarily on clinical samples of treatment seekers from specialist research clinics and findings may not generalize adequately due to potential confounds associated with various clinic biases [12,13]. Moreover, the existing BED literature is based on study groups comprised predominately of Caucasian participants and findings may not be representative of more diverse groups comprising different ethnic composition [14] that tend to seek treatment in generalist settings [15]. Thus, we aimed to replicate and extend initial findings [11] regarding the frequency of YFAS "food addiction" and its correlates in an ethnically/racially diverse obese patient group with BED in generalist primary care settings.

Method

Participants

Participants were a consecutive series of 96 obese (body mass index (BMI > 30 kg/m^2)) patients with BED (based on proposed Diagnostic and Statistical Manual of Mental Disorders [DSM]-5 [16] criteria for BED) who were respondents for a treatment study being performed in primary care centers in an urban setting for obese persons who binge eat. Exclusion criteria included current antidepressant therapy, severe psychiatric problems (schizophrenia, bipolar disorders, and current substance use dependence), severe medical problems (cardiac, liver disease), and uncontrolled hypertension, thyroid conditions, or diabetes. Participants who completed the YFAS were aged 19 to 65 years (mean=44.88 years, SD=12.82), 75.8% ($n=$ 72) were female, 45.3% ($n=43$) were Caucasian, 32.6% ($n=$ 31) were Black/African-American, 12.6% ($n=12$) were Hispanic, 7.4% ($n=7$) were "Other" and 2.1% ($n=1$) were Asian. Approximately 74.7% ($n=71$) reported at least some college education. Mean body mass index (BMI) was 38.30 kg/m^2 (SD=5.73).

Procedures and assessment measures

The study was approved by the Yale Institutional Review Board and all participants provided written informed consent. Assessment procedures were performed by trained doctoral-level research clinicians. Axis I psychiatric disorder diagnoses, including BED, were determined using the Structured Clinical Interview for DSM-IV Axis I Disorders [17] and the BED diagnosis was confirmed with the Eating Disorder Examination interview [18]. Participants also completed a battery of self-report questionnaires described later. Participants' height and weight were measured at the initial assessment appointment using a high-capacity digital scale.

Eating Disorder Examination (EDE)

The EDE [18] is a well-established investigator-based interview method for assessing eating disorder psychopathology [19,20] with established reliability [21]. Except for diagnostic items that have specific duration criteria, the EDE queries the previous 28 days. Items are rated on a 7-point scale (0–6) with higher scores indicating greater frequency or severity of symptoms. The EDE assesses the frequency of different forms of overeating, including objective bulimic episodes (OBEs; i.e., consumption of unusually large quantities of food with a subjective sense of loss of control), which correspond to the DSM-IV definition of binge eating. The EDE also has four subscales (Restraint, Eating Concern, Shape Concern, and Weight Concern) and an overall global score.

Yale Food Addiction Scale (YFAS)

The YFAS [11] is a 25-item self-report measure of addictive eating behaviors with high-fat/sugar foods. Respondents are asked about the occurrence of eating behaviors during the past 12 months that are analogous to the diagnostic criteria for substance dependence. The YFAS "symptom" count version indicates the number of dependence symptoms experienced in the past 12 months. The YFAS "diagnostic" threshold is met when three or more "symptoms" and clinically significant impairment/distress are present in the last year. Scores (i.e., symptom counts) can range from 0 to 7. The YFAS appears to have adequate

internal reliability, convergent validity and incremental validity in predicting binge eating behavior [9,11].

Beck Depression Inventory-II (BDI-II)

The BDI-II [22] is a 21-item measure of symptoms of depression such as sadness and feelings of guilt. Higher scores reflect higher levels of depression and negative affect. The BDI-II is a widely used and well-established measure with excellent reliability and validity [21].

Difficulties in Emotion Regulation Scale (DERS)

The DERS [23] is a 36-item measure of emotion dysregulation. Subscales from this measure tap into six different aspects of emotion dysregulation: (1) nonacceptance of emotional responses (nonacceptance), (2) difficulties engaging in goal-directed behaviors (goals), (3) impulse control difficulties (impulse), (4) lack of emotional awareness (awareness), (5) limited access to emotion regulation strategies (strategies) and (6) lack of emotional clarity (clarity). The DERS uses Likert scoring on a 5-point scale, with higher scores reflecting greater emotion dysregulation.

Questionnaire on Eating and Weight Problems-Revised (QWEP-R)

The QWEP-R [24] is a psychometrically sound measure that assesses features associated with obesity and disordered eating. The questions regarding age of onset for dieting and becoming overweight were selected from this measure to provide information on the developmental history of dieting and overweight status.

Data analytic plan

The association between the YFAS categorization and demographic characteristics (e.g., age, gender, race/ethnicity) was examined through the use of chi-square and analysis-of-variance (ANOVA) tests. Chi-square analyses were then used to investigate the relation between the YFAS and lifetime Axis I psychiatric diagnoses. Additionally, correlations between the YFAS symptom scale and measures of general psychopathology and eating psychopathology were examined, as well as age of first becoming overweight and dieting. Finally, the incremental validity of the YFAS in predicting binge eating episodes (OBEs) above and beyond other measures of eating pathology was explored through the use of hierarchical multiple regression.

All measures were examined for normality and outliers. No outliers were identified for removal, but the total EDE score, the frequency of OBE episodes, the DERS non-acceptance subscale, and the DERS strategies subscale exhibited moderately positively skewed distributions. Analyses were conducted using the log-transformed data for these variables [25].

Results

YFAS food addiction classification: associated demographic and clinical features

The diagnostic threshold for food addiction based on the YFAS (i.e., three or more "symptoms" and clinically significant impairment or distress) was met by 41.5% of participants. Table 1 summarizes the frequency of the seven "symptoms" assessed by the YFAS separately for participants classified with and without YFAS "food addiction." In the overall sample, the mean number of food addiction "symptoms" met on the YFAS was 4.33 (SD = 1.81). Age, race/ethnicity, sex, and education did not differ significantly between participants classified with versus without YFAS food addiction (see Table 2).

YFAS food addiction classification: associations with psychiatric co-morbidity

Table 2 shows the relation between food addiction based on the YFAS and lifetime Axis I psychiatric diagnoses. Chi-square analyses revealed that YFAS food addiction classification was not significantly related to mood, anxiety, alcohol, or drug use disorder diagnoses.

YFAS food addiction: associations with measures of general psychopathology

Table 3 summarizes the associations between YFAS scores (i.e., YFAS symptom counts) and other measures of general psychopathology. YFAS scores were significantly correlated with higher negative affect, higher emotion dysregulation, and lower self-esteem.

YFAS food addiction: associations with measures of eating psychopathology

Table 4 summarizes the associations between YFAS scores and measures of eating disorder psychopathology. YFAS scores were significantly positively correlated with frequency of binge eating (OBEs) and with the EDE eating concern, EDE shape concern, and EDE weight concern subscales and with the global EDE summary score.

YFAS scores were associated with an earlier age of first being overweight ($r^2 = -.24$, $p = .015$) and age of dieting

Table 1
Endorsement rates for Yale Food Addiction Scale "symptoms."

	Did not meet symptom criteria	Met symptom criteria
Consumed more than planned	39 (41.1%)	56 (58.9%)
Unable to cut down or stop	0 (0.0%)	95 (100.0%)
Great deal of time spent	31 (32.6%)	64 (67.4%)
Important activities given up	58 (61.1%)	37 (38.9%)
Use despite consequences	37 (39.4%)	57 (60.6%)
Tolerance	36 (38.3%)	58 (61.7%)
Withdrawal	53 (55.8%)	42 (44.2%)
Impairment or distress	54 (57.4%)	40 (42.6%)

Table 2
Demographics and Axis I disorders by "food addiction diagnosis."

	Food addiction (n=39)	No food addiction (n=55)	Test statistic	p Value
Age (years)	44.13 (SD=13.41)	45.13 (SD=12.55)	.134	.715
Gender			3.102	.078
Male	10 (18.2%)	13 (34.2%)		
Female	45 (81.8%)	25 (65.8%)		
Race/Ethnicity			5.489	.359
African-American	11 (28.9%)	20 (36.4%)		
Hispanic	3 (7.9%)	9 (16.4%)		
Caucasian	21 (55.3%)	21 (38.2%)		
Other	3 (7.9%)	5 (9.0%)		
Educational attainment			.668	.881
Some high school	3 (7.7%)	4 (7.2%)		
High school	6 (15.4%)	11 (20.0%)		
Some college	13 (33.3%)	21 (38.2%)		
College	16 (41.0%)	19 (34.5%)		
All mood disorders			1.12	.290
No	17 (54.8%)	32 (66.7%)		
Yes	14 (45.2%)	16 (33.3%)		
All anxiety disorders			2.25	.133
No	19 (61.3%)	33 (68.8%)		
Yes	12 (38.7%)	15 (31.2%)		
Alcohol use disorders				
No	26 (83.9%)	44 (91.7%)	.207	.649
Yes	5 (16.1%)	4 (8.3%)		
Drug use disorders				
No	27 (87.1%)	40 (83.3%)	.031	.861
Yes	4 (12.9%)	8 (16.7%)		

onset ($r^2 = -.21$, $p = .037$). A diagnosis of food addiction as assessed by the YFAS was significantly associated ($F_{(1,75)} = 6.31$, $p = .014$) with an earlier age of first being overweight (16.41 versus 23.09 years of age), but not age of dieting onset ($F_{(1,73)} = 2.23$, $p = .140$).

Incremental validity of the YFAS was assessed using hierarchical multiple regression. YFAS scores were entered along with other measures that are theoretically related to BED, specifically negative/depressive mood (BDI scores) and eating disorder psychopathology (global EDE score), to predict the frequency of binge eating (OBE) episodes. These measures were entered in block 1 of the regression model with the YFAS entered in block 2. The EDE Global ($t = 2.43.$, $\beta = .33$, $p = .017$) was a significant predictor of the frequency of OBE episodes, but BDI ($t = -1.19$, $\beta = -.16$, $p = .238$) was not a significant predictor. This model accounted for 6.8% of the variance in binge eating episodes. After controlling for variance accounted for at step 1 of the model, the YFAS was a significant predictor in step 2 of the model ($t = 3.36$, $\beta = .40$, $p < .001$), accounting for 11.1% of unique variance in binge eating scores.

Discussion

The current study was designed to add to the limited literature on the role of food addiction in clinical samples of eating disorder patients. In this series of obese patients with BED who were respondents to a treatment study in primary care for obesity and binge eating, 41.5% met the cut point of the Yale Food Addiction Scale (YFAS) for food addiction, and endorsed an average of approximately four food addiction symptoms. This rate of 41.5% is quite similar to the 57% rate reported in our initial study of obese patients with BED performed in a specialty research clinic [11]. This suggests that roughly 40%–60% of treatment-seeking obese patients with BED report symptoms and features that are consistent with an addictive process. The present study's recruitment from a primary care setting and the ethnically/racially diverse study group, typically a limitation of eating disorder research [26], allow for greater generalizability of our findings. In the current study, rates of endorsing food addiction did not differ significantly by race/ethnicity.

Unlike the previous clinical study [11], the YFAS food addiction classification was not significantly associated with the presence of lifetime mood disorder diagnoses. This may potentially be due partly to the reduced rate of mood disorders in this study (41.6%) relative to the prior study (58.7%) or to other known treatment-seeking confounds that

Table 3
Correlations between the YFAS and general psychopathology.[a]

	Mean (SD)	YFAS Symptoms	BDI	RSES	DERS Non-accept	DERS Goals	DERS Impulse	DERS Aware	DERS Strategy	DERS Clarity
BDI	15.09 (9.78)	.50**	1							
RSES	29.34 (6.38)	−.50**	−.78**	1						
DERS Non-accept	11.54 (5.00)	.30**	.48**	−.52**	1					
DERS Goals	12.46 (4.56)	.50**	.62**	−.59**	.45**	1				
DERS Impulse	11.53 (4.40)	.34**	.56**	−.56**	.54**	.60**	1			
DERS Aware	16.43 (5.45)	.12	.44**	−.47**	.25**	.17**	.32**	1		
DERS Strategy	15.60 (6.43)	.43**	.71**	−.74**	.67**	.70**	.77**	.38**	1	
DERS Clarity	10.03 (3.44)	.36**	.60**	−.57**	.53**	.48**	.53**	.61**	.65**	1

YFAS, Yale Food Addiction Scale; BDI, Beck Depression Inventory; RSES, Rosenberg Self Esteem Scale; DERS, Difficulties in Emotion Regulation.
  [a] The diagnostic version of the YFAS exhibited the same pattern of significant results with general pathology.
  ** Correlation is significant at the 0.01 level (1-tailed).

Table 4
Correlations between the YFAS and other measures of eating psychopathology.[a]

	Mean (SD)	YFAS Symptoms	EDE Restraint	EDE Eating	EDE Shape	EDE Weight	EDE Global	OBE Episodes
YFAS Symptom	4.33 (1.81)	1						
EDE Restraint	1.70 (1.37)	.10	1					
EDE Eating	1.81 (1.25)	.55**	.28**	1				
EDE Shape	3.44 (1.27)	.40**	.19*	.53**	1			
EDE Weight	3.15 (1.08)	.32**	.30*	.51**	.73**	1		
EDE Global Average	2.53 (.92)	.45**	.61**	.76**	.80**	.83**	1	
OBE Episodes	35.29 (30.37)	.35**	.09	.30*	.34**	.20*	.29*	1

YFAS, Yale Food Addiction Scale; EDE, Eating Disorder Examination; OBE, Objective Bulimic Episodes.

[a] The diagnostic version of the YFAS exhibited the same pattern of significant results with eating pathology.

* Correlation is significant at the 0.05 level (1-tailed).

** Correlation is significant at the 0.01 level (1-tailed).

may differ between specialty (research clinic in psychiatry) and generalist (primary care in general hospital) settings. Although YFAS and psychiatric categories were not significantly associated, YFAS (dimensional) scores were associated significantly with higher levels of negative affect (BDI) and emotion dysregulation (DERS), as well as lower self-esteem scores. Food addiction scores were also associated with other cognitive–affective measures of eating psychopathology (e.g., elevated shape/weight concern), but not with dietary restraint scores. We note that previous research has suggested that BED patients with elevated negative affect and low self-esteem might reflect a more disturbed subgroup [27,28]. Davis and colleagues [29] also recently found that food addiction was associated with a more severe presentation of symptoms in obese participants, including elevated impulsivity, greater emotional reactivity, and more intense food cravings. Thus, the presence of addiction-related symptoms (e.g., withdrawal, tolerance, and continued use despite negative consequences) may signal the presence of more severe pathology among obese patients with BED.

Food addiction "symptoms" and "diagnosis" were both related to a reported earlier onset of becoming overweight and food addiction "symptoms" were associated with earlier dieting behavior. Younger ages of becoming overweight are associated with increased binge eating during childhood [30] and elevated BMI during adulthood [31] and younger ages of dieting are associated with increased risk for eating psychopathology [32]. Finally, as in the previous clinical study on food addiction [11], YFAS scores accounted for a significant amount of variability in the frequency of binge eating (OBE) episodes above and beyond other measures of eating disorder psychopathology and negative affect. This finding may be important for future research on the impact of food addiction on treatment outcomes [33].

There are limitations to consider when evaluating the implications of this study. First, the study is cross sectional in nature, which prevents any interpretations regarding causality or whether food addiction predicts a more enduring or problematic course of BED. Prospective studies on the relationship between food addiction and eating disorder pathology will be needed to answer these questions. Additionally, participants' self-report about the age of first becoming overweight or dieting was retrospective in nature, which increases the likelihood of error. An important future direction will be to examine the role of food addiction earlier in the developmental trajectory (e.g., adolescence). Although the recruitment of participants from primary care may have increased the representative nature of the sample, it is unknown to what degree the current findings would generalize to other populations. For example, it is unclear whether the same pattern of results would be present in a sample of obese participants without BED.

Despite these limitations, the current study suggests that the assessment of food addiction in clinical samples may be helpful in understanding eating disorder pathology. Furthermore, the current study may inform the debate about the role of food addiction in obesity. For example, Ziauddeen and colleagues [34] suggest that although evidence exists for similarities between obesity and addiction, the inconsistent nature of the findings implies that the food addiction hypothesis has limited applicability or that BED should be used to more closely represent food addiction. The current study found that only 41.5% of obese patients with BED met the food addiction threshold, which suggests that neither obesity nor BED is synonymous with food addiction. To more appropriately evaluate the contribution of an addictive process to obesity and disordered eating, it will be important to specifically assess indicators of food addiction. Finally, the current study suggests that the presence of "food addiction" may indicate a more severe presentation of BED, associated with factors such as greater negative affect, more frequent binge eating episodes, and earlier onset of problematic eating behavior.

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