RESEARCH ARTICLE

Food Addiction in Bulimia Nervosa: Clinical Correlates and Association with Response to a Brief Psychoeducational Intervention

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Abstract

Food addiction (FA) has been examined in different populations. Although high FA levels are associated with greater eating disorder severity, few studies have addressed how FA relates to treatment outcome.
Goals: The study aims (1) to determine whether a brief intervention for bulimia nervosa (BN) reduces FA diagnosis or severity compared with baseline and (2) to determine if FA is predictive of treatment outcome.
Method: Sixty-six female BN patients participated in the study. The Yale Food Addiction Scale was administered at two time points: prior to and following a 6-week intervention. The number of weekly binging/purging episodes, dropout and abstinence from bulimic behaviour were used as primary outcome measures.
Results: This brief intervention reduced FA severity and FA diagnosis in the 55 patients who completed treatment. FA severity was a short-term predictor of abstinence from binging/purging episodes after treatment ($p = .018$).
Conclusions: Food addiction appears to be prevalent in BN although FA severity can improve following a short-term intervention. Copyright © 2016 John Wiley & Sons, Ltd and Eating Disorders Association.

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Introduction

Since the development of the Yale Food Addiction Scale (YFAS) (Gearhardt, Corbin, & Brownell, 2009), the first validated tool for the measurement of food-related addictive behaviours, research in food addiction (FA) has steadily grown. The FA construct upholds that obesity and eating disorders (ED) can be driven by an addictive response to certain types of foods (e.g. high sugar and high fat) in a manner that is akin to substances of abuse. As such, the YFAS is based upon symptomatic criteria for substance dependence as defined by the DSM-IV-TR. Nevertheless, FA remains a controversial topic, and the question of whether FA is more similar to a substance use disorder or is better classified as a behavioural addiction is still unresolved (Hebebrand et al., 2014).

To date, the prevalence and correlates of FA diagnosis have been examined in a range of different populations. Cross-sectional studies have explored FA prevalence in non-clinical populations (Gearhardt et al., 2009), abnormal weight and eating populations, namely, in people with obesity (Meule, Hermann, & Kübler, 2015), and in individuals with eating disorders, namely, binge eating disorder (Gearhardt et al., 2012; Gearhardt, White, Masheb, & Grilo, 2013) and bulimia nervosa (BN), along with other ED subtypes (Granero et al., 2014; Meule & Gearhardt, 2014a; Pursey, Stanwell, Gearhardt, Collins, & Burrows, 2014).

Food addiction symptomatology is associated with high levels of negative affect and depression, high general psychopathology, eating pathology and a high body mass index (Gearhardt, Boswell, & White, 2014; Gearhardt et al., 2013; Granero et al., 2014). Moreover, high scores in FA are linked to dieting, an earlier age of excess-weight onset and binge eating frequency (Gearhardt et al., 2013). Personality traits also play a role in being vulnerable to develop FA; ED patients with FA have been found to report lower self-directedness, higher negative urgency and a greater lack of perseverance (Wolz et al., 2016).

A limited number of studies have addressed the question of how FA is related to treatment outcomes in weight loss-seeking populations and have provided contradictory results (Burmeister, Hinman, Koball, Hoffmann, & Carels, 2013; Clark & Saules, 2013; Lent, Eichen, Goldbacher, Wadden, & Foster, 2014; Pepino, Stein, Eagon, & Klein, 2014). Whereas FA symptoms were negatively correlated with weight loss in some studies (Burmeister et al., 2013; Clark & Saules, 2013), others found that neither FA diagnosis nor the number of FA symptoms were associated with successful weight loss (Lent et al., 2014). However, another study showed that bariatric surgery-induced weight loss led to FA remission and improved several eating behaviours associated with FA (Pepino et al., 2014). Another recent study explored the stability of FA diagnosis and FA symptomatology in a non-clinical population over 18 months. The study concluded that the number of FA symptoms and FA diagnosis remained relatively stable over time (Pursey, Collins, Stanwell, & Burrows, 2016). The authors also tested if engaging in weight loss behaviours could explain within-person changes, but did not find a significant correlation. This observed stability of FA symptoms suggests that the YFAS could be an appropriate tool for assessing addictive-like eating behaviours prior to and following clinical interventions.

To our knowledge, no study has yet to explore whether ED treatment reduces FA symptomatology. This study presents the first longitudinal examination of FA and ED treatment response. It is worth noting, however, that Meule and colleagues explored the differences in FA prevalence between current BN patients and recovered BN patients in a cross-sectional study (Meule, von Rezori, & Blechert, 2014). This study found that FA diagnosis and symptomatology were significantly lower in recovered BN patients than in currently ill patients.

The objectives of the present study were twofold: (1) to determine if brief psychoeducational treatment for BN has an impact on FA diagnosis and on reducing FA symptomatology compared with baseline levels; and (2) to determine if FA has a predictive capacity in terms of short-term treatment outcome in BN. For this purpose, FA and other clinical variables (namely, the number of binge and purging episodes, eating symptomatology and general psychopathology) were assessed prior to and following a brief psychoeducational intervention for BN.

In line with previous BN studies (Granero et al., 2014; Meule & Gearhardt, 2014a; Pursey et al., 2014), we expected BN patients to present a high prevalence of FA diagnosis. We also expected FA severity to positively correlate with eating symptomatology and general psychopathology. Moreover, given that brief psychoeducational treatment has proved to be effective as a first-stage approach to reduce binging and purging behaviours (Davis, Olmsted, & Rockert, 1990; Fernández-Aranda et al., 2009), and that recovered BN patients present less FA symptoms (Meule et al., 2014), we expected FA severity levels to significantly reduce following treatment. Lastly, we also hypothesised that higher FA severity at baseline would be associated with worse treatment outcomes.

Methods

Participants and procedure

All participants in this sample were women with BN who were consecutively referred to the Eating Disorders Unit at Bellvitge University Hospital between September 2013 and December 2015 ($n = 66$). Patients were diagnosed according to DSM-5 criteria (APA, 2013) by means of a semi-structured, face-to-face interview conducted by PhD-level psychologists. Final diagnoses were made by the unit psychologists following the completion of the study questionnaires. Inclusion criteria to the study were (1) being female; (2) fulfilling DSM-5 criteria for BN; and (3) being between 18 to 65 years old.

Questionnaires were administered at two time points: before and upon completion of psychoeducational treatment. Additional information concerning clinical variables was also taken during the completion of the questionnaires by means of an interview conducted by a member of the unit staff.

During the weeks prior to admission to treatment and throughout the entirety of the programme, patients recorded their eating behaviour and the frequency of binge eating and purging episodes by means of a food diary (Fernandez-Aranda & Turon, 1998) that was shared with their therapist on a weekly basis.

The present study was carried out in accordance with the latest version of the Declaration of Helsinki. The Bellvitge University

Table 1 Comparison of patients with good response to treatment to patients with poor response to treatment (at baseline and following the intervention)

	Good responders ($n = 42$; 76.4%)		Bad responders ($n = 13$; 23.6%)		Group comparison						
	Mean	SD	Mean	SD	MD	SE	$t_{df = 49}$	p	95% CI MD		$|d|$
Number of FA criteria at baseline	6.02	1.27	6.58	0.51	0.56	0.379	1.48	.146	−0.20	1.32	0.48
Number of FA criteria at post-treatment	4.78	2.04	6.09	1.04	1.31	0.460	2.84	.008[†]	0.37	2.24	0.81[‡]

Note: SD, standard deviation; FA, food addiction; 95% CI, 95% confidence interval; MD, mean difference; SE, standard error. Good responders: change to a lower severity group after treatment.
[†]Significant pre–post change.
[‡]Moderate ($|d| > 0.50$) to high effect size ($|d| > 0.80$).

Hospital Ethics Committee approved this study, and written informed consent was obtained from all participants.

Assessment

The Yale Food Addiction Scale (Gearhardt et al., 2009)

The YFAS is a 25-item self-report instrument, based upon the seven symptomatic criteria for substance dependence set out in the DSM-IV-TR (Gearhardt et al., 2009; Table 1). It includes two additional items that assess significant clinical impairment or distress because of overeating. When at least three criteria and significant clinical impairment are reported, a diagnosis of FA is given. Moreover, a symptom count, indicating FA severity, can be measured to provide a score between 1 and 7.

The YFAS requests that respondents answer questions according to their eating behaviour in the past 12 months. For the assessment upon completing psychoeducational treatment, patients were instructed to complete this questionnaire keeping in mind their present eating behaviour. The Spanish version of the YFAS has been validated and has shown good psychometrical properties (Granero et al., 2014).

The Symptom Checklist Revised (Derogatis, 1990)

The Symptom Checklist Revised (SCL-90-R) is a 90-item questionnaire that is widely used for the measurement of self-reported overall psychological distress and psychopathology (Derogatis, 1990). It is scored using the following dimensions: somatization, obsessive-compulsive, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation and psychoticism. The Spanish validation of this instrument has shown a mean internal consistency of $\alpha = 0.75$ (Ignacio & Sánchez, 2002; Martínez-Azumendi, Fernández-Gómez, & Beitia-Fernández, 2001).

Eating Disorders Inventory-2 (Garner, 1991)

Eating Disorders Inventory-2 (EDI-2) is a 91-item self-report questionnaire that assesses the following features of eating disorders: drive for thinness, bulimia, body dissatisfaction, ineffectiveness, perfectionism, interpersonal distrust, interoceptive awareness, maturity fears, asceticism, impulse regulation and social insecurity (Garner, 1991). A Spanish version of this questionnaire has been validated (Garner, 1998).

Treatment protocol

This outpatient treatment programme consisted of a brief group psychoeducational intervention based on the model of Davis et al. (1990). This model is designed to promote symptom management, and each meeting is structured around specific themes such as 'the multidetermined and self-perpetuating nature of BN' and 'the nondieting approach to eating'. The intervention included six weekly outpatient sessions lasting 90 minutes each. The treatment protocol was explained to the group members, and therapeutic materials were provided during the initial sessions. The main aims of this intervention are to offer educational information about BN, to show patients the importance of assuming an active role in the resolution of their disorder and to encourage them to establish a pattern of regular and healthy eating, as well as to reduce dieting. Additionally, information from food diaries was used as a therapeutic tool during the sessions. For example, information from these diaries might be discussed with the therapist and the rest of group members in order to increase awareness about bulimic symptoms. Nonetheless, given the main aims of this intervention, delving into individual patient problems was avoided during sessions.

This treatment has been shown to be effective in significantly reducing eating psychopathology, and approximately 30% of treated patients do not present either binging or purging behaviour at the end of the treatment (Fernández-Aranda et al., 2009; Wilson, Fairburn, & Agras, 1997). A total of 11 consecutive psychoeducational groups, with a range of six to eight patients per group, made up the study sample.

Outcome measures

The number of binging/purging episodes per week, based on entries from a food diary, was used as the primary outcome measure to assess response to treatment. Participants were categorised (at baseline and after treatment) into five groups based on DSM-5 severity criterion for BN: null (0 binging/purging episodes per week), mild (1–3 episodes), moderate (4–7 episodes), severe (8–13 episodes) and extreme (14 or more episodes) (APA, 2013). Patients who completed treatment were re-classified into two categories depending on the presence, or absence, of a reduction in severity: 'good responders' (change to a lower severity group after treatment, that is, from severe to moderate, mild or null, or from moderate to mild or null) *versus* 'poor responders' (failing to reduce severity group after treatment). Dropout from treatment and achieving complete abstinence from binging/purging episodes during the final week of treatment were also used as primary treatment outcomes. As secondary outcome measures, we compared pre-treatment and post-treatment scores for ED symptomatology, by means of the EDI-2, and general psychopathology, by means of the SCL-90-R.

Statistical analysis

Statistical analysis was carried out with SPSS 21. First, independent *t*-tests compared the mean number of YFAS symptoms between 'good' and 'poor' responders. The effect size for mean differences was estimated through the 95% confidence interval (95% CI) for mean differences and Cohen's *d* coefficient ($|d| > 0.50$ was considered moderate effect size and $|d| > 0.80$ was considered high effect size). Second, binary logistic regressions explored the predictive capacity of FA severity at baseline on our three primary outcomes: good response to treatment, extinction of binging/purging episodes and dropout. Global predictive capacity for the logistics was estimated by the Nagelkerke's pseudo-R^2 coefficient, and discriminative ability by the area under the receiver operating characteristic curve.

Additionally, paired *t*-tests compared pre–post changes for quantitative ED measures (number of binges and purges per week, EDI-2 scores, SCL-90-R scores and FA severity), and McNemar tests compared the pre–post changes for each FA symptom (presence *versus* absence) and for FA diagnosis (positive *versus* negative diagnosis).

In this study, increases in Type-I error due to multiple statistical comparisons were controlled *via* Finner's method (Finner, 1993), a procedure in family-wise error rate stepwise systems that offers more powerful tests than classical Bonferroni correction (Finner, 1993).

Results

Study sample

The mean age for the $N = 66$ participants who began treatment was 29.2 years (SD = 9.2), the mean age of onset for BN was 18.6 years (SD = 5.6) and the mean duration of the disorder was 10.6 years (SD = 9.1). About 42.5% of patients reported between 1 to 3 previous ED treatment attempts (the remaining 57.5% had not previously sought help for eating-related problems). At baseline, 90.6% of the study sample met criteria for FA, with a mean number of FA symptoms equal to 6.1 (SD = 1.2).

Treatment effectiveness and changes in food addiction diagnosis

The number of dropouts during treatment was low $n = 11$ (16.7%). No statistical differences were found between completers and dropouts in baseline measures of the number of binges ($p = .559$) and purges ($p = .276$), total number of FA symptoms ($p = .879$), EDI-2 scores and the level of psychological symptoms measured on the SCL-90-R ($p > .05$ for all scales).

Table 2 contains the distribution of the BN severity group at baseline and post-treatment for the patients who completed treatment ($n = 55$). At baseline, moderate severity level had the highest level of prevalence (32.7%), followed by extreme (25.5%), severe (23.6%) and mild (18.2%) levels. After treatment, 14 patients were placed into the null severity group (the risk of obtaining abstinence from binging/purging episodes was 25.5%; 95% CI: 15.8% to 38.3%), 38.2% were placed in the mild severity group, 25.5% in the moderate group, 9.1% in the severe group and only 1.8% in the extreme group. The number of patients in the good responder group (change to a lower severity group after treatment) was 42 (risk = 76.4%; 95% CI: 63.7% to 85.6%).

Table 1 contains a comparison of FA severity between the good responders and poor responders groups. FA severity was statistically lower for patients in the good responders group compared with patients in the poor responders group at the end of treatment. No statistically significant differences were found in patients' age of illness onset ($p = .377$) or in the number of

Table 2 Distribution of the bulimia nervosa severity groups at baseline and post-treatment

Post-treatment	Pre-treatment				Total	
	Mild (1–3 episodes)	Moderate (4–7 episodes)	Severe (8–13 episodes)	Extreme (≥14 episodes)		
Null (0 episodes)	**6**	**4**	**3**	**1**	14	25.5%
Mild (1–3 episodes)	4	**8**	**6**	**3**	21	38.2%
Moderate (4–7 episodes)	0	6	**2**	**6**	14	25.5%
Severe (8–13 episodes)	0	0	2	**3**	5	9.1%
Extreme (14 high)	0	0	0	1	1	1.8%
Total	10	18	13	14	55	
	18.2%	32.7%	23.6%	25.5%		

Note: Bold: good responder (change to a lower severity group at post-treatment).

Table 3 Changes in food addiction severity and diagnosis pre-treatment and post-treatment

	Prevalence (%)			
	Pre-treatment (%)	Post-treatment (%)	*p*	|*d*|
Substance taken for longer period than intended	81.3	60.4	.021[†]	0.50[‡]
Persistent desire or repeated unsuccessful attempts to quit	100.0	95.8	.500	0.29
Much time/activity to obtain, use, recover	93.8	75.0	.006[†]	0.53[‡]
Important social-occupational-recreational activities reduced	92.2	77.1	.039[†]	0.43
Use continues despite knowledge of adverse consequences	73.4	50.0	.006[†]	0.50[‡]
Tolerance	84.4	81.3	.999	0.08
Characteristic withdrawal; substance taken to relieve withdrawal	89.1	68.8	.013[†]	0.51[‡]
Food addiction: positive diagnosis	90.6	72.9	.012[†]	0.50[‡]

Note: Exact McNemar test
[†]Significant pre–post change.
[‡]Moderate (\|*d*\| > 0.50) to high effect size (\|*d*\| > 0.80). ($n = 55$).

previous treatments for ED ($p = .100$) when comparing these groups. However, good responders were older in age (means 30.7 *versus* 24.7 years old; $p = .040$) and had a longer illness duration (means 12.7 *versus* 5.5 years; $p = .015$).

Table 3 compares changes in the presence of each FA symptom and in FA diagnosis between baseline and post-treatment for patients that completed treatment ($n = 55$). Only two FA symptoms did not obtain lower prevalence following the intervention (persistent desire or repeated unsuccessful attempts to quit and tolerance). The change in the prevalence of FA diagnosis was statistically significant ($p = .012$), and decreased from 90.6% at baseline to 72.9% at post-treatment.

Table S1 (Supporting Information) contains pre–post mean comparisons for ED-related measures, psychopathological symptom levels and the number of FA symptoms. Almost all these variables were significantly different when comparing baseline to post-treatment scores, with the exception of some EDI-2 scales (ineffectiveness, maturity fears, perfectionism, impulse regulation and social insecurity) and the SCL-90-R paranoid ideation score.

Predictive capacity of baseline food addiction levels on treatment outcomes

Table 4 contains three logistic regressions measuring the predictive capacity of the total number of FA symptoms registered at baseline on three treatment outcomes: being a 'good responder' to treatment, total abstinence from binging/purging episodes and dropout. High FA severity predicted a lower likelihood of total abstinence from binging/purging episodes, although it did not predict risk of being a good responder to treatment nor dropout. Results were equivalent when including age and illness duration as covariates into the logistic models.

Discussion

The main aim of the present study, the first longitudinal study to assess FA in BN patients, was to ascertain whether FA severity at baseline predicted short-term treatment outcome. We also explored whether a brief psychoeducational intervention for BN was associated with reduced FA severity (measured by the number of reported FA symptoms) and FA diagnosis.

Our main finding is that, when comparing good responders to treatment to poor responders, FA severity served as a predictor of short-term treatment outcome; patients with higher FA severity at baseline were less likely to obtain abstinence from binging/purging episodes after treatment. One potential interpretation of these findings is that FA is solely a marker of BN severity and that FA does not independently measure addictive mechanisms.

The second main finding is that FA severity and the prevalence of FA diagnosis was significantly reduced following a brief group psychoeducational intervention. In the current study, 90.6% of BN patients fulfilled criteria for FA diagnosis before starting treatment, and 72.9% of patients continued to meet the criteria for FA diagnosis following treatment. According to literature, a high percentage of patients with BN meet diagnostic criteria for FA, ranging from 81.5% (Granero et al., 2014) to 100% (Meule et al., 2014). Meule and colleagues (Meule et al., 2014) found that the prevalence of FA was 70% higher in individuals with current BN relative to those with remitted BN, although the cause of remission was not assessed (e.g., specific ED treatment, naturally occurring remission).

Both, in clinical and general population samples, the most frequently endorsed FA symptom is 'persistent desire or unsuccessful attempts to cut down' (Flint et al., 2014; Gearhardt et al., 2009, 2013; Meule et al., 2014; Pursey et al., 2016; Wolz et al., 2016). In our sample, this criterion, which denotes the feeling of lack of control, did not significantly change and remained the most prevalent FA symptom following treatment (95.8%). This could be due to the fact that it is the only common symptom in BN and in FA. The criteria 'continual use despite knowledge of adverse consequences' and 'tolerance' have also shown high prevalence rates (Meule & Gearhardt, 2014b) in ED samples. In this study, 84.4% of patients met the tolerance criterion at baseline and prevalence was not significantly reduced following treatment. One possible explanation for this lack of change could be that this symptom, indicating physiological dependence, needs more than the 6 weeks our treatment provided in order to notably improve.

The dropout rates obtained after these brief interventions were in line with previous literature (Agüera et al., 2013; Shapiro et al., 2007; Nakai et al., 2014), and a total of 14 patients (27.3%) were abstinent of binging/purging episodes during the final week of treatment. Although this reduction in BN symptomatology is significant, the prevalence of FA symptoms still

Table 4 Predictive capacity of the number of food addiction symptoms at baseline on main treatment outcomes

Criteria	B	S.E.	Wald	p	OR	95% CI (OR)		R^2	AUC
Being into the good responder group	−0.619	0.440	1.98	.159	0.54	0.23	1.28	.077	.604
Abstinent binges/vomits	−0.622	0.28	4.85	**.018**	0.54	0.31	0.93	.146	.682
Dropout from treatment	−0.043	0.276	0.02	.877	0.96	0.56	1.65	.001	.500

Note. R^2: Nagelkerke's-R^2 coefficient. AUC, area under the receiver operating characteristic curve; 95% CI, 95% confidence interval; OR, odds ratio; B, estimated logistic regression coefficient; SE, standard error.
Bold: significant predictive capacity (.05 level).
Good responders: change to a lower severity group after treatment. ($n = 55$).

remained relatively high. Future studies using longer treatment interventions should be carried out to determine whether these improvements are enduring.

Some limitations must be taken into account when interpreting the results of this study. First, the YFAS was not designed to detect short-term changes being that it explores people's behaviour in the time frame of 1 year. However, we used this scale to measure changes after a brief intervention and requested our patients to complete the YFAS keeping in mind how they felt in relation to their eating behaviour at that moment. A recent longitudinal study (over 18 months) with a non-clinical sample has shown that YFAS scores and FA diagnosis are relatively stable, and therefore, the YFAS could be a suitable tool to assess addictive-like eating behaviours over time and detecting treatment changes (Pursey et al., 2016). Second, we cannot speak of BN remission in our study, because of the fact that the time frame was too short and that patients had just initiated treatment. However, these results are promising given that response to the initial stages of treatment predict treatment outcome (Agras et al., 2000; Brauhardt, De Zwaan, & Hilbert, 2014; Fairburn, Agras, Walsh, Wilson, & Stice, 2004).

Conclusions

Our results indicate that a brief psychological intervention is effective in reducing FA symptoms in BN patients. An important future direction would be to examine whether higher FA in BN patients is predictive of worse long-term treatment response and whether emphasising mechanisms associated with addiction could be a useful adjunct to treatment in order to ensure long-term recovery in these patients.

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