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Binge Abstinence is Associated with Reduced Energy Intake After Treatment in Patients with Binge Eating Disorder and Obesity

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Abstract

Objective—Binge eating disorder (BED) is strongly associated with obesity and related medical and psychiatric morbidities. Cognitive behavioral therapy (CBT) has consistently been shown to reduce binge eating frequency and improve psychological functioning, as well as to produce abstinence rates of roughly 50%. This study examined the relationship between binge abstinence and dietary and psychological outcomes after CBT for BED.

Methods—Fifty adult patients with BED received 6-month treatments using a combination of CBT and dietary counseling. Trained interviewers conducted two 24-hour dietary recall interviews on randomly selected days at baseline and at 6 months.

Results—Participants had significant reductions in energy, macronutrient, and sugar intake and an increase in fruit intake. They reported significant reductions in BMI and binge eating frequency (from mean = 14.24 to mean = 1.90 binge eating episodes during the previous 28 days), as well as improvements in psychological functioning. Those who became binge abstinent reported eating roughly 400 fewer calories per day and experienced greater improvements in psychological functioning than those who did not.

Conclusions—Findings from this study suggest that individuals who achieve complete cessation from binge eating have significantly improved dietary and psychological outcomes that could potentially improve weight status, compared with those who continue to binge eat post-treatment.

Introduction

Binge eating disorder (BED) is characterized by recurrent episodes of binge eating (eating unusually large amounts of food during a discrete period of time accompanied by a feeling of loss of control) without extreme weight compensatory behaviors characteristic of bulimia

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nervosa. BED is the most prevalent formal eating disorder diagnosis and is strongly associated with severe obesity and increased risk for psychiatric and medical morbidities (1,2). Cognitive behavioral therapy (CBT), the best-established treatment for BED (3,4), has been shown to reliably produce roughly 50% abstinence rates from binge eating and robust improvements in associated eating disorder pathology and psychological functioning (5–7). CBT outcomes have been durable for 2 (7) to 4 (8) years after treatment and significantly superior relative to medications when discontinued (9). Despite the positive robust effects of CBT on binge eating and psychosocial functioning, studies consistently have found overall minimal impact on weight (3,7,10).

It has been suggested that the limited weight loss observed after treatment for binge eating may be related to the treatment impacting the distress about episodes of overeating rather than impacting actual intake (11). In other words, participants may simply no longer view episodes of eating unusually large amounts of food as binge episodes. Alternatively, it may be that after treatment participants are redistributing energy intake throughout the day rather than consuming calories during discrete binge episodes. However, several investigators have identified binge abstinence as a predictor of post-treatment weight loss (7,12–14). This suggests that changes in energy intake, in addition to or instead of changes in distress, are taking place as a result of treatment for BED.

Research examining changes in dietary intake among individuals who binge eat, however, is limited and has mostly been conducted in laboratory settings. These studies have generally found that subjects with obesity who binge eat consume more energy overall compared with lean subjects who binge eat (15), as well as compared with subjects with obesity who do not binge eat (15–19). More specifically, intake of high-fat sweet foods, and overall fat, is greater for those who binge eat compared with those who do not (15–19). Findings regarding differences in protein intake are mixed (17,18,20). Outside of the laboratory setting, individuals with binge eating and obesity have greater energy intake on binge days compared with non-binge days, but their non-binge day energy intake is comparable to the energy intake of non-binge eating matched controls (21).

In our previously published controlled trial, we found that subjects with BED successfully reduced their dietary intake (overall energy intake, energy density, and fat), not just their distress, following CBT treatment with concurrent dietary counseling (6). This study extends those findings and will be the first to explore the relationship between binge abstinence and dietary intake, using random dietary recall interviews, among participants receiving treatment for BED. It was hypothesized that participants who become binge abstinent following treatment for BED would have superior nutritional outcomes compared with those who do not become abstinent. We additionally investigated whether there would be differences between abstinence groups on psychological variables given the psychological sequelae associated with BED (22) and that previous comparisons between abstinence groups have been limited to investigations of weight loss outcomes (7,10,12–14).

Methods

Study design

This is a secondary data analysis comparing dietary intake before and after treatment for BED in patients with obesity. The primary study was a treatment study for comorbid obesity and BED (6). The trial was designed to evaluate the efficacy of a combined weight loss and CBT approach to obesity and binge eating. Participants were randomized to one of two treatment arms for 21 hourly individual sessions over a 6-month treatment period: CBT plus a low-energy-density diet (CBT + ED; $n = 25$) and CBT plus general nutrition counseling not related to lowering energy density or weight loss (CBT + GN; $n = 25$).

Both treatment arms received CBT to address binge eating and psychological outcomes. CBT is considered the treatment of choice for the psychiatric symptoms of BED despite its negligible effects on weight loss (4). Low-energy-density dietary counseling served as the experimental condition because studies have shown the effectiveness of lowering energy density for reducing energy intake in short-term laboratory studies (23–25) and, more recently, for producing weight loss in longer-term efficacy (26,27) and effectiveness (28) trials. General nutrition, dietary counseling for health as opposed to reducing energy density or weight loss served as an active comparator condition. The two combined treatments (CBT + ED and CBT + GN) were matched for therapist contact and nutritional information such that each hour-long session included 40 min devoted to CBT and 20 min devoted to dietary counseling (ED or GN). Fuller descriptions of the CBT and the two dietary counseling interventions have been detailed in the main trial (6). The study received full human subjects and ethics review and approval by the Human Investigation Committee at Yale School of Medicine.

Participants and procedures

Participants were adult patients who met DSM-IV-TR (29) criteria for BED, were recruited via print advertisements for treatment studies for binge eating and weight loss at a medical school, and were required to be aged 21 to 60 years, to have obesity (body mass index [BMI] of 30 or greater), and to be available for the length of the treatment and follow-up at 12 months. Potential participants were excluded if they (1) had co-existing psychiatric or medical conditions requiring alternative treatments or hospitalization (i.e., substance use or serious cardiac disease); (2) met criteria for current substance dependence; (3) were currently receiving treatment known to affect eating or weight; (4) had low literacy or cognitive impairments that would interfere with consent or completion of assessments and treatments; or (5) were pregnant or lactating. The 50 consecutively randomized participants were aged 29 to 60 years ($M = 45.8$, $SD = 7.6$), 76% ($n = 38$) were female, and 84% ($n = 42$) attended or finished college. The participant group was 80% ($n = 40$) Caucasian, 18% ($n = 9$) African American, and 2% ($n = 1$) Hispanic American. Mean BMI was 39.1 ($SD = 6.6$). The two treatment groups did not differ in completion rates; 86% ($n = 43$) of the sample finished treatment and either the 6-month or 12-month assessments, or both.

Measures

Weight outcome—Weight and height were measured in person using a medical balance beam scale to calculate BMI (weight [kg] divided by height squared [m²]). Participants were weighed without shoes or coats at each assessment point and treatment session.

Psychological outcomes—Eating Disorder Examination Questionnaire (EDEQ) (30) is a 28-item self-report version of the widely used Eating Disorder Examination (31) that taps into the key dimensions of eating disorder psychopathology. The EDEQ has shown good concordance with the EDE interview (32) and good test-retest reliability (33) in clinical samples of BED. The EDEQ was assessed at baseline, monthly during treatment, and at post-treatment (6 months). The EDEQ global score was used. Cronbach's $\alpha = 0.869$.

Beck Depression Inventory (BDI) (34), 21-item version, is a psycho-metrically sound, widely used measure for symptoms of depression and negative affect. The BDI was used at baseline, monthly during treatment, and at post-treatment (6 months). Cronbach's $\alpha = 0.874$.

Yale Emotional Overeating Questionnaire (YEOQ) (35) is a self-report measure assessing the frequency with which individuals eat in response to various emotions (e.g., anxiety, sadness, boredom). The YEOQ has demonstrated adequate reliability and concurrent validity with measures of eating disorder symptomatology and disinhibited eating, and it was used at baseline, monthly during treatment, and at post-treatment (6 months). Cronbach's $\alpha = 0.939$.

Dietary outcomes—The Diet Assessment Center in the Department of Nutritional Sciences at The Pennsylvania State University collected, coded, and calculated nutrition information. Two 24-hour dietary recall interviews were conducted by telephone on unannounced, randomly selected days over a 2-week period at baseline and again at 6 months (post-treatment). One interview was conducted on a weekday and the other a weekend given that adults have been shown to eat differently during these time periods (36). Interviewers, who were blind to treatment assignment, used the Nutrition Data System for Research (NDSR Versions 2007, 2008, and 2009, Nutrition Coordinating Center, University of Minnesota, Minneapolis, MN) software with an interactive interface that guides the interviewer through a series of structured prompts and probes to collect detailed dietary information during the previous 24 h from midnight to midnight. This method for collecting dietary data has been shown to be a valid method for collecting detailed quantitative dietary data (37,38). Final nutrient and food group (e.g., fruit and vegetable servings) calculations were completed using NDSR 2009. The NDSR time-related database updates analytic data while maintaining nutrient profiles true to the earlier versions (2007 and 2008) used for data collection. NDSR output files containing food level data were coded to differentiate fluids added to foods (e.g., water added to soup concentrates or milk added to cereal) from those consumed as beverages. Dietary energy density was calculated as the ratio between total energy intake (kcal) and weight (g) of food only, given the variable impact of different beverages on calculations of energy density (39).

Analyses

Binge abstinence was determined based on the presence or absence of binge episodes in the previous 28 days, as assessed via the EDEQ post-treatment. Participants were categorized as 0 = no binge episodes in the past 28 days, 1 = one or more binge episodes in the past 28 days. Overall, demographic information was analyzed using basic frequencies and descriptive analyses. Those who were and were not binge abstinent after treatment were also compared on demographic information using one-way ANOVAs and χ^2 analyses. ANOVAs and χ^2 analyses were also conducted to examine potential differences in treatment arms at baseline; there were no differences at baseline, and therefore, for subsequent analyses, we collapsed across groups. Paired samples *t*-tests were used to compare changes for the total sample from baseline to post-treatment. ANCOVAs were conducted to assess differences in post-treatment variables, controlling for baseline BMI, baseline number of binge episodes, treatment arm, and baseline score of the target variable. Macronutrients (protein, carbohydrates, fat) were analyzed as percent of calories. Total fiber and added sugar were analyzed as grams per 1,000 kcal.

Results

Table 1 summarizes demographic information for the participants who achieved binge abstinence and those who did not. There were no significant differences in demographics between those who did and did not achieve binge abstinence after treatment.

Table 2 summarizes changes in BMI, dietary intake, and psychological variables from pre- to post-intervention for the overall sample. Mean BMI decreased significantly from pre- to post-intervention. Energy intake, as assessed by dietary recall interviews, decreased significantly by a mean of 1,017.05 calories per day. There were also significant decreases in energy density and fat intake and significant increases in intake of fiber, protein, and carbohydrates. Participants significantly increased their fruit intake from pre- to post-intervention. Participants reported significant decreases in binge eating frequency, depressive symptoms, eating disorder symptoms, and emotional overeating. The correlation between change in binge eating frequency and change in energy intake was in the expected direction, in that a greater decrease in binge eating frequency was associated with a greater decrease in energy intake, but did not reach significance ($r = 0.249$, $P = 0.144$).

Table 3 summarizes comparisons between participants who did and did not become abstinent from binge eating after treatment. Participants who were abstinent post-treatment reported consuming significantly fewer calories post-treatment, as well as significantly fewer depressive symptoms and less emotional overeating. There were no differences between groups in percent weight change, energy density, or macronutrient intake. Of note, participants who did not become abstinent from binge eating significantly reduced binge eating frequency, with a mean of 3.71 binge episodes in the previous 28 days (compared with 14.24 for the overall group at baseline).

Discussion

This study examined differences in dietary outcomes, using a rigorous validated random dietary recall interview method (37), as well as weight and psychological outcomes among those who were completely abstinent from binge eating after treatment for BED compared with those who continued to binge eat. Eighty-two percent ($n = 41$) of randomized participants completed treatment and reported information on binge eating post-treatment, and of these, 48.8% achieved abstinence from binge eating. In analyses combining those who did and did not achieve binge abstinence, we observed reductions in energy intake, energy density, and fat intake and increases in fiber, protein, and carbohydrates. As expected, we observed significant increases in fruit intake, but not vegetable intake. Overall, CBT plus dietary counseling resulted in significant reductions in binge eating, psychological distress, and BMI, as well as significant improvements in diet quality.

We note that even those who did not become fully abstinent reduced their binge eating frequency significantly. Specifically, among those who did not achieve binge abstinence after treatment, the median number of binges reported in the prior 28 days was three, with most participants reporting only one or two binges during that time. Despite this, comparisons of those who did, and did not, achieve binge abstinence after treatment revealed some specific differences. Those who were abstinent consumed significantly fewer calories (almost 400 fewer calories per day) than those who were not, and they also had significantly fewer symptoms of depression and were less likely to overeat in response to emotions. These findings highlight the importance of striving for complete binge abstinence rather than just a significant reduction in binge eating.

While we did not observe significant differences in weight loss between these groups, there was a trend in the expected direction consistent with the literature showing that subjects who become abstinent from binge eating tend to lose more weight than those who do not (7,10,12–14). Importantly, findings that those who are abstinent report eating significantly fewer calories, suggest that there may be a long-term benefit for weight loss or weight maintenance for those who do become abstinent. A reported reduction of 400 calories per day suggests that enough calories are reduced for almost a one pound weight loss per week; however, given that the comprehensive dietary assessments were only conducted pretreatment and 6 months later, we do not know if the reported 400 calorie reduction per day occurred rapidly after onset of treatment or gradually. There appears to be a psychological benefit to becoming abstinent from binge eating in that symptoms of depression are in the minimal range at the end of treatment, compared with the mild range at baseline, and that those who became abstinent reported improvements in psychological variables compared with those who continued to binge eat. In addition, those who were binge abstinent reported less emotional eating than those who were not abstinent. The nutritional and psychological benefits of complete binge abstinence in the current study extend the weight loss benefits observed in prior studies (7,10,12–14). Participants decreased BMI by about one point over the 6-month study period, which is a surprisingly small change given the significant improvements in other areas. It has been noted that the small weight loss observed after treatment for binge eating may be related to the treatment impacting the distress about episodes of overeating rather than affecting actual intake (11).

In other words, at the end of treatment participants may simply no longer view episodes of eating unusually large amounts of food as binge episodes, or they may be redistributing energy intake throughout the day rather than consuming calories during discrete binge episodes. However, in this study participants reported not only reducing binge eating frequency from roughly every other day to once every 2 weeks, but also reported reducing daily intake by about 1,000 calories. Therefore, an alternative hypothesis is that changes in intake did not occur until later in treatment, and that longer-term follow-up could detect greater weight loss over time as a result of changes in intake and binge eating frequency.

Limitations of this study include a small sample size that may have impacted the ability to detect weight loss differences between groups, and the fact that the sample consisted primarily of women. Findings for women, particularly on metabolic and psychological variables, may not generalize to men. There were also not great differences in binge eating frequency at the end of treatment between groups—even those who continued to binge eat did so infrequently. We acknowledge that while dichotomizing the data simplified analyses and interpretability, it may have obscured potentially important differences among non-abstinent individuals who engaged in varying frequencies of binge eating over the prior 28 days. Future research, with larger sample sizes, could examine associations between frequency of binge eating and food-related and psychological outcomes within the non-abstinent group. Regardless, our findings do suggest that there are meaningful differences between those who were and were not binge abstinent. Since we observed no significant differences between the groups receiving the two dietary interventions combined with CBT, we opted to collapse across those groups to increase power to detect differences associated with binge abstinence. Future studies could utilize a treatment arm consisting of CBT without dietary counseling to determine whether CBT alone contributes to similar changes in binge eating frequency, weight change, and dietary intake. In order to determine when changes to intake begin and whether changes to intake ultimately lead to changes in weight, future studies could also consider more frequent dietary assessments and longer-term follow-up.

The major strength of this study was the dietary recall interview that is considered the gold standard assessment method for nutritional intake, and is more accurate than food diaries (38). The interviews are conducted by trained interviewers who utilize prompts from computer-based software designed specifically for dietary intake. Telephone calls are unannounced on randomly selected days, thus avoiding the chance that participants might alter their diet in anticipation of an evaluation. Call days are also randomly selected to have a balance across all days of the week as intake might vary on different days (e.g., weekdays and weekends). Missing data are minimized as interviewers continue to contact participants until they were reached.

It is important to acknowledge that dietary recall data, like all other dietary assessment, is subject to underreporting of energy intake (40). It is possible that the reported reduction of 1,017.05 calories per day from pre- to post-treatment did not result in greater weight loss because the calorie reduction was inflated in the reporting of dietary intake. However, given that participants did lose weight over the course of the intervention, there appears to be some validity to the data gathered during dietary recall interviews even if participants did not

reduce energy intake to the extent reported during interviews. It also seems likely that those who became abstinent from binge eating did reduce their energy intake to a greater extent than those who did not achieve abstinence given concomitant, nonsignificant reductions in macronutrient and added sugar intake. An alternative explanation for the discrepancy between calorie decrease and weight loss could be attributed to a difference in reporting of nutrition information between the binge abstinent and non-abstinent conditions, as opposed to a difference in actual nutrition intake.

This is the first study to assess changes after treatment for BED using 24-hour dietary recall interviews to comprehensively assess dietary intake and its association with binge abstinence. The current study suggests that there are significant improvements in dietary and psychological outcomes, and potentially weight outcomes, for those achieving complete abstinence from binge eating. Findings further suggest that binge abstinence is a critical goal for BED treatment. Continuation of treatment until achievement of binge abstinence, rather than providing treatment based on a specific number of sessions or until significant improvement but without abstinence, may therefore contribute to superior nutritional outcomes and psychological well-being. Future research should examine longer-term impacts on dietary intake, well-being, and weight for those who achieve binge abstinence, as well as person- and treatment-related factors that might contribute to achievement of binge abstinence.

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TABLE 1

Participant characteristics

	Overall	Binge abstinent	Not binge abstinent	F or χ^2	P
BMI (kg/m²) (M, SD)	39.16 (6.46)	40.63 (6.27)	37.77 (6.47)	2.07	0.158
Age (M, SD)	45.83 (7.61)	46.85 (7.96)	44.86 (7.31)	0.7	0.409
Gender (n, %)				0.09	0.768
Male	9 (21.95)	4 (20.00)	5 (23.81)		
Female	32 (78.05)	16 (80.00)	16 (76.19)		
Ethnicity (n, %)				1.6	0.449
Caucasian	32 (78.05)	15 (75.00)	17 (80.95)		
African American	8 (19.51)	5 (25.00)	3 (14.29)		
Hispanic American	1 (2.44)	0 (0.00)	1 (4.76)		

TABLE 2

Changes in BMI, dietary intake, and psychological variables from pre- to post-intervention

	Pretreatment, M (SD)	Post-treatment, M (SD)	t	P
Main outcomes				
Binge eating frequency	14.24 (8.86)	1.90 (3.04)	9.2	<0.001
Calories	2,668.30 (1080.64)	1,651.25 (518.14)	6.48	<0.001
BMI	39.16 (6.46)	38.00 (6.38)	3.19	0.003
Energy density-related				
Grams (food)	1,369.62 (410.31)	1,229.55 (287.62)	1.92	0.062
Energy density (food)	1.94 (0.42)	1.39 (0.47)	6.29	<0.001
Fiber^a	9.12 (3.97)	13.66 (5.88)	-4.46	<0.001
Water (oz)	1,920.56 (627.06)	1,767.78 (582.48)	1.36	0.181
Macronutrients				
Protein^b	0.16 (0.04)	0.19 (0.05)	-3.93	<0.001
Fat^b	0.39 (0.06)	0.30 (0.08)	6.49	<0.001
Carbohydrates^b	0.46 (0.08)	0.52 (0.08)	-3.82	0.001
Other dietary				
Added sugar^a	35.61 (21.47)	30.12 (14.45)	1.65	0.107
Fruits (servings)	1.03 (1.01)	2.07 (1.29)	-4.41	<0.001
Vegetables (servings)	3.58 (2.45)	3.97 (2.11)	-0.77	0.449
Psychological				
Depression (BDI)	16.38 (7.77)	8.40 (8.40)	6.18	<0.001
ED pathology (EDEQ global)	77.00 (17.64)	44.80 (21.00)	8.33	<0.001
Emotional overeating (YEOQ)	24.84 (5.68)	4.59 (6.66)	2.37	0.023

^aCalculated as grams per 1,000 kcal.^bCalculated as percent of calories.

TABLE 3

Comparisons post-treatment by binge status

	Binge eating post-treatment (n = 21), M (SD)	Abstinent from binge eating post- treatment (n = 20), M (SD)	F	P
Main outcomes				
Binge eating frequency	3.71 (3.38)	0.00 (0.00)	17.49	<0.001
Calories	1,836.28 (558.00)	1,455.94 (400.25)	4.37	0.004
Percent weight change	-1.97 (3.86)	-3.85 (6.97)	0.89	0.353
Energy density-related				
Grams (food)	1,275.31 (272.87)	1,181.25 (302.54)	0.24	0.626
Energy density (food)	1.46 (0.40)	1.31 (0.52)	2.6	0.117
Fiber ^a	12.83 (4.96)	14.53 (6.76)	1.82	0.188
Water (oz)	1,749.33 (477.42)	1,787.26 (690.19)	0.5	0.484
Macronutrients				
Protein ^b	0.19 (0.05)	0.20 (0.05)	0.66	0.424
Fat ^b	0.30 (0.07)	0.30 (0.08)	1.81	0.189
Carbohydrates ^b	0.52 (0.07)	0.52 (0.09)	0.59	0.447
Other dietary				
Added sugar ^a	32.68 (15.38)	27.42 (13.28)	0.57	0.455
Fruits (servings)	2.13 (1.14)	2.01 (1.45)	0.01	0.946
Vegetables (servings)	3.90 (1.43)	4.04 (2.80)	0.01	0.971
Psychological				
Depression (BDI)	10.50 (9.24)	6.72 (7.35)	7.1	0.012
ED pathology (EDEQ global)	49.56 (22.4)	40.60 (19.32)	1.87	0.182
Emotional overeating (YEOQ)	7.38 (8.28)	1.62 (2.16)	6.07	0.020

Covariates: baseline binge eating frequency, baseline BMI, treatment, baseline score of target variable.

^aCalculated as grams per 1,000 calories.^bCalculated as percent of calories.