

Binge Eating Disorder Treatment: A Systematic Review of Randomized Controlled Trials

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ABSTRACT

Objective: The Research Triangle Institute-University of North Carolina Evidence Based Practice Center (RTI-EPC) systematically reviewed evidence on efficacy of treatment for binge eating disorder (BED), harms associated with treatments, factors associated with treatment efficacy, and differential outcome by sociodemographic characteristics.

Method: We searched six major databases for studies on the treatment of BED published from 1980 to September, 2005, in all languages against *a priori* inclusion/exclusion criteria and focused on eating, psychiatric or psychological, or biomarker outcomes.

Results: Twenty-six studies, including medication-only, medication plus behavioral intervention, and behavioral intervention only designs, met inclusion criteria. The strength of the evidence for medication and behavioral interventions was moderate, for self-help and other interventions was weak, for treatment-related harms was strong, for factors associated

with efficacy of treatment was weak, and for differential outcome by sociodemographic factors was nonexistent. Individual or group CBT reduces binge eating and improves abstinence rates for up to 4 months after treatment but does not lead to weight loss. Medications may play a role in treating BED patients.

Conclusion: The literature regarding treatment efficacy for BED is variable. Future directions include the identification of optimal interventions that are associated with both sustained abstinence from binge eating and permanent weight loss. © 2007 by Wiley Periodicals, Inc.

Keywords: binge eating disorder; eating disorders; second-generation antidepressants; behavioral intervention trials; cognitive behavioral therapy; dialectical behavior therapy; medication; outcomes; selfhelp trials; virtual reality

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Introduction

Binge eating disorder (BED) is marked by recurrent binge eating in the absence of compensatory

behaviors, a series of characteristics associated with binge eating such as rapid consumption and eating until uncomfortably full, and marked distress regarding the behavior. Population-based studies estimate the prevalence of BED to be between 0.7% and 3.0%. Overweight and obesity are common comorbidities. The presence of binge eating in overweight individuals may be associated with both medical and psychiatric conditions independent of the effect of obesity.¹ Effective treatments are critically needed that target the core behavior of binge eating and the weight loss goals in overweight individuals with BED.

The RTI International-University of North Carolina at Chapel Hill Evidence-based Practice Center (RTI-UNC EPC) conducted a systematic review of randomized controlled trials (RCTs) of BED treatments. Although we did not limit the literature reviewed to individuals with BED who were overweight, in the majority of the studies, this was the population investigated. Here, we present those

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TABLE 1. Criteria for searches on treatment of binge eating disorder

Category	Criteria
Study population	Humans; all races, ethnicities, and cultural groups; 10 years of age or older
Study settings and geography	All nations
Time period	Published from 1980 to September 2005
Publication criteria	Included: <ul style="list-style-type: none"> • All languages • Articles in print Excluded: <ul style="list-style-type: none"> • Articles in gray literature or nonpeer-reviewed journals or unobtainable during the review period.
Admissible evidence (study design and other criteria)	Original research studies that provide sufficient detail regarding methods and results to enable use and adjustment of the data and results. Eating disorders not otherwise specified (binge eating disorder) must be diagnosed according to DSM IV criteria. Eligible study designs include randomized controlled trials (RCTs): <ul style="list-style-type: none"> • Double-blinded, single-blinded, and cross-over designs (we report data for the portion of the trial completed before the first cross-over). • Initiated with 10 or more participants and followed for any length of time.

results, identify gaps and shortcomings in the literature, and provide recommendations for future research.

Method

Four key questions guided our review of the BED treatment literature:

1. What is the evidence for the efficacy of treatments or combinations of treatments for BED?
2. What is the evidence of harms associated with the treatment or combination of treatments for BED?
3. What factors are associated with efficacy of treatment among patients with BED?
4. Does the efficacy of treatment for BED differ by sex, gender, age, race, ethnicity, or cultural group?

The complete methodology for this review, supported by the Agency for Healthcare Research and Quality (AHRQ), is presented in Bulik et al. (this volume) and in the full evidence report on management of eating disorders (available at www.ahrq.gov/clinic/tp/eatdistp.htm), which also covered treatment of anorexia nervosa and of bulimia nervosa and epidemiology and outcomes of all three disorders. Specifically for the BED review, we first

generated a list of article inclusion and exclusion criteria, limiting our review to human studies that included participants ages 10 years and older and to those published from 1980 to the present (Table 1). We excluded data that combined eating disorders and that came from study populations without a primary diagnosis of BED. We examined three sets of outcome measures: eating, psychiatric and psychological, and biomarkers.

Results

We identified 26 studies addressing treatment efficacy for BED (nine medication-only trials, four medication plus behavioral intervention trials, eight behavioral intervention studies, three trials using various self-help methods, one exercise study, and one virtual reality therapy study). Primary outcome measures in BED clinical trials included reduction in and abstinence from binge eating and weight loss. Secondary outcomes included reductions in psychological features of BED (e.g. dietary restraint, disinhibition). Additional psychiatric outcomes include reduction of depression and anxiety.

We graded the quality of all studies against *a priori* criteria relating to RCTs. Studies with a quality rating of “poor” ($n = 6$) are not discussed further. A “poor” rating was most frequently given because of some combination of fatally flawed and/or inadequately described randomization procedures, absence or failure to report blinding, failure to use intent-to-treat analysis and/or to conduct a power analysis, failure to report adverse events, or lack of adequate controls for confounding.

Medication-Only Trials for BED

We rated four medication trials as good²⁻⁵ and four as fair.⁶⁻⁹ The medications studied included second-generation antidepressants,^{2-4,6,7} tricyclic antidepressants,⁸ an anticonvulsant,⁹ and sibutramine.⁵ One study of a medication no longer available in the United States (d-fenfluramine) is not discussed here.¹⁰

A total of 413 individuals ranging in age from 18–60 were enrolled in these eight medication-only trials (Table 2). Samples ranged in size from 20–85. Based on studies that reported sex and race, the population included 322 women and 25 men and 234 white and 29 nonwhite patients.

Fluoxetine. One trial compared fluoxetine (average dose 71.3 mg/day) with placebo in 60 individuals meeting the Diagnostic and Statistical Manual for Psychiatric Disorders-Version IV (DSM IV) criteria for

TABLE 2. Results from medication trials for binge eating disorder

Source, Treatment, Sample Size, Quality Score	Study Location and Setting, Percentage Female, Age	Significant Differences Between Groups
Arnold et al. ² ; Fluoxetine vs. Placebo; enrolled: 60; dropouts: 40%; good	US, outpatient; female: 93%; age mean (SD) – Fluoxetine: 41.9 (9.7), Placebo: 40.8 (9.0)	At endpoint: Fluoxetine associated with lower illness severity and depressed mood, and less weight gain. Change over time: Fluoxetine superior in reducing binge frequency, illness severity, and depressed mood, and in controlling weight and BMI gain over 6 weeks.
Hudson et al. ⁶ ; Fluvoxamine vs. Placebo; enrolled: 85; dropouts: 21%; fair	US, outpatient; female: Fluvoxamine (93%), Placebo (88%); age, mean (SD) – Fluvoxamine: 41.2 (9.9), Placebo: 43.0 (9.5)	At endpoint: Not reported. Change over time: Fluvoxamine superior in reducing binge frequency, clinical severity, and BMI over 9 weeks.
Pearlstein et al. ³ ; Fluvoxamine vs. Placebo; enrolled: 25; dropouts: 20%; good	US, outpatient; female: 85%; age mean: 41.0	At endpoint: Not reported. Change over time: None.
McElroy et al. ⁷ ; Sertraline vs. Placebo; enrolled: 34; dropouts: 24%; good	US, outpatient; female: 94%; age mean (SD) – Sertraline: 43.1 (9.9), Placebo: 41.0 (12.2)	At endpoint: Not reported. Change over time: Sertraline superior in reducing binge frequency, illness severity, and BMI, and in increasing global improvement over 6 weeks.
McElroy et al. ⁹ ; Citalopram vs. Placebo; enrolled: 38; dropouts: 18%; fair	US, outpatient; female: 95%; age mean (SD) – Citalopram: 42.0 (9.0), Placebo: 39.2 (12.0)	At endpoint: Citalopram associated with greater reduction in frequency of binge days, BMI, and weight. Change over time: Citalopram superior in the rate of reduction in frequency of binges, illness severity, binge eating related obsessions and compulsions, and weight over 6 weeks.
Laederach-Hoffman et al. ⁸ ; Imipramine vs. placebo (with dietary and psychological counseling); enrolled: 31; dropouts: 7%; fair	Switzerland, outpatient; female: 87%; age mean (SD) – Imipramine: 40.7 (10.9), Placebo: 35.7 (10.3)	At endpoint: Not reported. Change over time: Imipramine superior in decreasing binge frequency, depressed mood, and body weight over 8 weeks of active treatment, and 32 week follow-up.
McElroy et al. ⁷ ; Topiramate vs. Placebo; enrolled: 61; dropouts: 43%; fair	US, outpatient; females: not reported; age mean (SD) – Topiramate: 40.9 (8.2), Placebo: 40.7 (9.1)	At endpoint: Not reported. Change over time: Topiramate superior in reducing binge frequency, illness severity, eating-related obsessions, compulsions, BMI, and weight over 14 weeks.
Appolinario et al. ⁵ ; Sibutramine hydrochloride vs. Placebo; enrolled: 60; dropouts: 20%; good	Brazil, outpatient; female: 88%; age mean (SD) – Sibutramine: 35.2 (9.0), Placebo: 36.6 (10.2)	At endpoint: Sibutramine associated with less depressed mood. Change over time: Sibutramine superior in reducing binge frequency and severity. Difference in weight at end of treatment with weight decreasing over treatment period in the sibutramine group but increasing in the placebo group.

Notes: BMI, body mass index; SD, standard deviation; US, United States; vs., versus.

BED with three or more binges per week for 6 months and higher than 85% ideal body weight (IBW) in a 6-week flexible dose trial.² Compared with placebo, fluoxetine significantly decreased weekly binge frequency, illness severity, and clinician-rated depression and was associated with less weight gain. Dropout rates were high and unevenly distributed (fluoxetine, 57%; placebo 23%), and abstinence rates and long-term follow-up were not reported, thus, interpretability of these findings is limited.

Fluvoxamine. In a 9-week trial involving 85 BED patients, intent-to-treat analysis indicated a significantly greater rate of reduction in binge frequency and greater improvement in illness severity with fluvoxamine (50–300 mg/day) than with placebo.⁶ However, neither remission rate nor change in depression differed between groups. Body mass index (BMI) decreased at a faster rate with fluvoxamine than placebo; however, given that endpoint BMI was not reported the clinical significance of this effect was unclear.

In a 12-week trial in 20 patients with DSM-IV BED, binge frequency, shape and weight concerns, and self-reported depression decreased with treatment overall, but none of these effects differed between the group receiving fluvoxamine (average dose 239 mg/day) and the group receiving placebo.³ Neither group showed significant weight change with treatment.

In both studies, approximately 20% of participants dropped out, and no long-term follow-up was performed. Thus, inferences drawn from these findings should be viewed with caution.

Other Second-Generation Antidepressants. In two separate 6-week treatment trials, McElroy and colleagues studied the effects of sertraline (mean dose 187 mg/day) versus placebo⁴ and citalopram (40–60 mg/day) versus placebo⁷ on binge frequency, weight, and mood in individuals with BED. In both studies, participants met DSM-IV criteria. Compared with placebo, sertraline led to greater reduction in binges per week and body weight, although BMI at endpoint was not reported. No differences emerged on categorical ratings of remission. Sertraline also reduced illness severity, but not depressed mood, compared with placebo. Citalopram was associated with a significantly greater rate of decrease in binge eating, binge eating days, and BMI than placebo; patients lost on average 2.7 kg and those on placebo gained on average 5.2 kg during treatment. However, the percentage of individuals achieving marked (75–99% decrease in binge eating), moderate (50–74% decrease), or no (<50% decrease) remission did not differ significantly between groups. In addition, although the rate of change data suggested more rapid response in the citalopram group, differences between the groups over time were not significant for the core outcome variables of binges per week or severity of illness. The citalopram group showed greater reductions in clinician-rated obsession and compulsion scores and in severity of illness and depression scores.

Dropout was fairly high in both studies: 28% and 19% (sertraline versus placebo) and 16% and 21% (citalopram versus placebo). No long-term follow-up data were reported.

Tricyclic Antidepressants. Laederach-Hoffman et al. augmented standard bi-weekly diet counseling and psychological support with either imipramine (25 mg three times a day) or placebo in 31 individuals with DSM-IV BED and BMI greater than 27.5.⁸ At 8 and 32 weeks, binge eating episodes, depressed mood, and body weight decreased significantly in the imipramine-treated group; notably, the placebo group gained weight. Abstinence rates were not

reported, and dropout was between 6% and 7% in both groups.

Anticonvulsants. One 14-week trial compared topiramate (average dose 212 mg/day) with placebo in 61 individuals with BED, BMI >30, and a score greater than 15 on the Yale-Brown Obsessive Compulsive Scale for Binge Eating (YBOCS-BE).⁹ Patients receiving topiramate experienced a significantly greater rate of change and a significantly greater percentage reduction in binge episodes, binge days per week, and YBOCS-BE. Compared with placebo, topiramate was not associated with significantly greater weight loss (1.2 kg vs. 5.9 kg) or greater reduction in severity of illness; change in depressed mood did not differ between groups. Follow-up data, abstinence rates, and endpoint values were not reported, and dropout was very high (topiramate, 47%, placebo, 39%), making it difficult to estimate the magnitude of clinical significance of these observed differences.

Sibutramine. Appolinario et al. studied the effects of sibutramine (15 mg/day) versus placebo treatment for 12 weeks in 60 individuals with DSM-IV BED and a Binge Eating Scale (BES) score of greater than or equal to 17.⁵ Compared with placebo, sibutramine produced significant decreases in binge days per week, BES scores, and self-reported depression scores over the course of treatment. At week 12, the sibutramine group had lost on average 7.4 kg, whereas the placebo group gained weight (a significant difference). Data regarding abstinence rates and long-term follow-up were not reported. Dropout was 23% for sibutramine and 17% for placebo.

Medication plus Behavioral Intervention Trials

Three trials of medications plus psychotherapy included 267 individuals (237 women and 30 men) between 21 and 65 years of age; sample sizes ranged from 50 to 109.^{11–13} Based on two of the three trials that reported participant race or ethnicity, 140 individuals were white, 12 were African American, and six were Hispanic.^{11,13} All three trials (**Table 3**), used cognitive behavioral therapy (CBT).

Fluoxetine. In a 16-week, four-arm trial of comparing fluoxetine (60 mg/day) versus placebo either alone or with CBT.¹¹ Treatment groups receiving CBT reported greater reductions in frequency of binge episodes, eating and shape concerns, disinhibition, and depression and greater remission rates than did groups receiving medication only or placebo. Weight loss did not differ across groups, however. Dropout was comparable across groups (15–23%).

TABLE 3. Results from medication plus behavioral intervention trials for binge eating disorder

Source, Treatment, Sample Size, Quality Score	Study Location and Setting, Percentage Female, Age	Significant Differences Between Groups
Grilo et al. ¹¹ ; Fluoxetine vs. Placebo vs. CBT + placebo vs. CBT + fluoxetine; enrolled: 108; dropouts: 20%	US, outpatient; female: 78%; age range: 21–59	At endpoint: Not reported. Change over time: CBT groups superior to placebo and fluoxetine alone in decreasing binge frequency, eating and shape concerns, global eating score, disinhibition, and rate of remission. CBT + fluoxetine superior to placebo alone and fluoxetine alone in decreasing weight concerns and hunger; superior to fluoxetine alone in reducing depressed mood and dietary restraint; superior to placebo in decreasing body dissatisfaction; CBT + placebo superior to placebo alone and fluoxetine alone in decreasing depressed mood; superior to fluoxetine alone in decreasing dietary restraint, weight concerns, and body dissatisfaction.
Agras et al. ¹² ; weight loss therapy vs. CBT + weight loss therapy vs. CBT + weight loss therapy + desipramine enrolled: 109; dropouts: 22%; fair	US, outpatient; female: 100%; age, mean (SD) (range) – 45.0 (10) (22–65)	At endpoint: Not reported. Change over time: CBT + weight loss (with or without desipramine) superior to weight loss alone in reducing binge frequency over 12 weeks. Significant difference between groups at 12 wks in change in weight over time with weight decreasing in weight loss group and increasing in CBT groups. By 3 month FU, CBT plus desipramine superior to CBT without desipramine in reducing weight.
Grilo et al. ¹³ ; CBT + orlistat vs. CBT + placebo; enrolled: 50; dropouts: 22%; good	US, outpatient; female: 88%; age range, mean (SD): 35–58; Orlistat: 45.2 (7.4), Placebo: 47.0 (7.0)	At endpoint: Greater percentage of CBT + orlistat group remitted and achieved at least 5 percent weight loss over 12 weeks. Group difference in weight loss maintained at 2-month follow-up. Change over time: CBT + orlistat superior in total weight loss and in percent weight loss to post-treatment over 12 weeks.

Notes: CBT, cognitive behavioral therapy; SD, standard deviation; US, United States; vs., versus.

Desipramine. Agras et al. randomly allocated 109 participants to 9 months of weight loss therapy, 3 months of CBT followed by 6 months of weight loss therapy, or 3 months of CBT followed by 6 months of weight loss therapy and desipramine (300 mg/day).¹² Groups receiving CBT showed significant reduction in binge eating at 12 weeks, but this effect and other changes in self-report measures of eating pathology did not persist at 36 weeks. Weight loss was initially greater in the weight loss therapy group, but over time (i.e., at 3-month follow-up) loss was greatest in the group receiving desipramine (average reduction of 4.8 kg from baseline). Neither changes in depression nor dropout from acute treatment (weight loss therapy, 27%; CBT+weight loss therapy, 17%) differed between groups.

Orlistat. A 12-week trial of 50 individuals with DSM-IV BED and BMI >30 compared CBT plus placebo with CBT plus orlistat (120 mg three times/

day).¹³ CBT plus orlistat was associated with greater remission rates at the end of treatment and initial weight loss (–1.6 kg vs. –3.5 kg). Neither effect was maintained at 2-month follow-up but, using a different metric to measure weight loss, the orlistat group was more likely to have achieved a weight loss of 5% of body weight or more. Other eating-related measures, depression, and dropout (24% for orlistat; 20% for placebo) did not differ between groups.

Behavioral Intervention Trials

We identified eight behavioral intervention-only trials,^{14–21} three trials of self-help,^{22–24} and one trial each of exercise and virtual reality^{25,26} (Table 4). In these trials, CBT tailored for BED was the most commonly tested therapeutic approach; one study used dialectical behavior therapy (DBT). A total of 481 individuals (449 women and 32 men), ranging in age from 18 to 65 years, enrolled in these eight

TABLE 4. Results from behavioral intervention, self-help, and other nonmedication intervention trials for binge eating disorder

Source, Treatment, Sample Size, Quality Score	Study Location and Setting, Percentage Female, Age	Significant Differences Between Groups
Gorin et al. ¹⁶ ; group-based CBT vs. CBT with spouse involvement vs. waiting list; enrolled: 94; dropouts: 34%; fair	US, outpatient; female: 100%; age mean (SD): 45.2 (10.0)	At endpoint: Higher percent abstinent in CBT groups compared to waiting list. Change over time: CBT (with and without spouse involvement) superior to waiting list in decreasing number of binge days, disinhibition, hunger, depressed mood, and BMI over 12 weeks.
Hilbert and Tuschen-Caffier ¹⁵ ; CBT+exposure vs. CBT+cognitive interventions for image disturbance; enrolled: 28; dropouts: 14%; fair	Germany, outpatient; female: 100%; age, mean (SD) – CBT+exposure: 42.1 (12.1), CBT+cognitive interventions: 38.6 (8.5)	At endpoint: No differences in percent recovered. Change over time: No differences on any measures.
Wilfley et al. ¹⁴ ; CBT vs. IPT; enrolled: 162; dropouts: 18%; good	US, outpatient; female: 83%; age mean (SD) – CBT: 45.6 (9.6), IPT: 44.9 (9.6)	At endpoint: Less restraint in CBT at post-treatment and 4-month follow-up. Change over time: CBT superior in decreasing eating restraint at post-treatment and 4, 8, and 12 month follow-up.
Telch et al. ¹⁷ ; DBT vs. waiting list; enrolled: 44; dropouts: 23%; fair	US, outpatient; females: 100%; age mean (SD): 50 (9.1)	At endpoint: Not reported. Change over time: DBT superior to waiting list control in decreasing number of binge episodes and binge days, binge severity, and weight, shape, and eating concerns.
Carter and Fairburn ²² ; Guided self-help vs. non-guided self-help vs. waiting list; enrolled: 72; dropouts: 12%; good	UK, outpatient; female: 100%; age mean (SD) range: 39.7 (10.0) 21–59	At endpoint: Both self-help groups associated with higher abstinence rates, less binge eating, and lower GSI, EDE global and restraint scores, compared to waiting list at post-treatment. Guided self-help associated with less restraint and binge eating at 3 month follow-up and with less binge eating at 6 month follow-up compared to nonguided self-help. Change over time: Guided self-help superior to nonguided self-help and waiting list in reducing eating restraint over 12 weeks.
Peterson et al. ²⁴ ; Therapist-led group CBT vs. partial self-help group CBT vs. structured self-help group CBT vs. waiting list; enrolled: 50; dropouts: 16%; fair	US, outpatient; female: 100%; age mean (SD): 42.4 (10.2)	At endpoint: Abstinence rates for binge eating higher in each of the CBT groups compared to waiting list. Change over time: CBT groups superior to waiting list in decreasing objective and total binge episodes/week, hours spent binge eating/week, binge severity, disinhibition, and hunger over 8 weeks.
Peterson et al. ²³ ; Therapist-led group CBT vs. partial self-help group CBT vs. structured self-help group CBT; enrolled: 51; dropouts: 14%; fair	US, outpatient; female: 100%; age mean (SD): 42.9 (10.1)	At endpoint: Abstinence from total binge episodes higher in structured self-help group versus therapist-led self-help and partial self-help groups. Change over time: No differences on any measures.
Riva et al. ²⁶ ; Virtual reality-based tx for body image vs. CBT-based psycho-nutritional group therapy; enrolled: 20; dropouts: 0%; fair	Italy, inpatient; female: 100%; age mean (SD) – Virtual reality: 30.5 (6.7), CBT-based psycho nutritional: 30.1 (7.0)	At endpoint: Not reported. Change over time: Virtual reality treatment superior to psycho-nutritional treatment in increasing WELSQ total score and in decreasing state anxiety and overeating.

Notes: BMI, body mass index; CBT, cognitive behavioral therapy; DBT, dialectical behavior therapy; EDE, eating disorders examination; GSI, general severity index; SD, standard deviation; UK, United Kingdom; US, United States; vs., versus; WELSQ, weight efficacy life-style questionnaire.

trials. Race or ethnicity was reported for 436 of the 481 participants (white, 401; nonwhite, 19; African American or Afro-Caribbean, 8; Hispanic American,

6; Native American and Asian, 1 each). In no instance were results analyzed specifically by race or ethnic group.

Cognitive Behavioral Therapy. Gorin et al. conducted a 12-week trial comparing standard CBT tailored for BED with CBT plus spousal involvement and with waiting list controls in 94 individuals with a BMI ≥ 25 .¹⁶ Compared with controls, both active CBT groups had significant reductions in days binged, BMI, disinhibition, hunger, depression, and self-esteem, and they were more likely to be abstinent from binge eating at the end of treatment. Adding spousal involvement did not significantly enhance the effect of standard CBT on these measures. The average BMI decrease from baseline to follow-up was 0.11 for CBT and 0.77 for CBT with spousal involvement, suggesting minimal impact of CBT (with or without a spouse participating) on weight change. Overall, dropout was 34%.

Hilbert et al. studied 28 women with broadly defined BED (i.e., at least one binge per week) who were assigned to either 5 months of group CBT with body exposure treatment or group CBT with cognitive restructuring of negative body cognitions.¹⁵ Binge eating, psychological aspects of binge eating, self-report binge eating scores, and self-report depression decreased significantly and to a similar extent in both groups. Neither group experienced significant weight loss. Dropout was 14% in each group.

Wilfley et al. compared group CBT with group interpersonal therapy (IPT) in 20 sessions with 3 additional individual sessions in 162 overweight or obese (BMI 27–48) individuals with BED.¹⁴ Both therapies led to significant decreases in the number of days binged at the end of treatment and at 4-month follow-up, but neither significantly reduced BMI. CBT led to greater improvements in Eating Disorders Examination (EDE) Restraint scores at all time points. At 12 months, illness severity and depression levels were significantly reduced in both groups; abstinence (CBT, 72%; IPT, 70%) did not differ by therapeutic group. Dropout (CBT, 20%; IPT, 16%) rates did not differ significantly between groups.

Dialectical Behavioral Therapy. Telch et al. studied 20 weeks of DBT versus waiting list control in 44 women with DSM-IV BED.¹⁷ Compared with controls, DBT led to greater reduction in binge days and binge episodes and in weight, shape, and eating concerns. No differences in weight loss, depression, or anxiety emerged between groups during treatment. Dropout differed appreciably by groups (DBT, 18%; waiting list, 55%).

Self-Help Trials. Carter and Fairburn compared self-help using a book²⁷ with waiting list control in 72 women with BED and weekly binges.²² The self-

help book was delivered in two formats: with and without the help of a facilitator. Compared with controls, both self-help approaches led to greater reductions in the mean number of binge days and in clinical severity while also improving abstinence and cessation rates and EDE scores. Adding a facilitator did not enhance self-help effects on eating, depression, or BMI at any follow-up point; no group exhibited significant weight loss during the study or at follow-up. Dropout differed considerably across groups (guided self-help, 24%; control, 4%; self-help-only, 0%).

In a four-group comparison, Peterson et al.²³ compared (1) therapist-led self-help, (2) partial self-help, (3) structured self-help, and (4) waiting list controls in 61 individuals with DSM IV BED. All self-help groups received psychoeducation followed by group discussions. In therapist-led self-help, a doctoral-level therapist led both the psychoeducational component and group discussion; in the partial self-help group, psychoeducation was delivered in videotape form and discussion was led by a therapist; and in the structured self-help group, participants watched the psychoeducational videotape and then led their own 30-min discussion. Results suggest that patients using self-help modalities in any of the three formats did better than controls in reducing objective binges, total binges, and hours spent bingeing and in improving self-reported eating attitudes. Abstinence rates were also better following self-help treatment (68–87% across the 3 groups) than control (12.5%). The groups did not differ in depression scores or BMI changes. Lack of differences between self-help groups are difficult to interpret, however, given differential dropout rates (structured self-help, 27%; therapist-led, 13%; and partial, 11%).

A subsequent report by this same group of authors compared therapist-led self-help, partial self-help, and structured self-help in 51 individuals with DSM-IV BED.²⁴ All three approaches led to significant decreases in objective binges, hours spent bingeing, body dissatisfaction, and depression, the magnitude of which did not differ significantly between groups. Structured self-help led to significantly greater abstinence than the other approaches at the end of treatment but not at follow-up. BMI changes appeared to be minimal within groups and did not differ across groups. Dropout was not reported.

Virtual Reality for BED. Riva et al. compared virtual reality therapy to psychonutritional control in 20 female inpatients with DSM IV BED.²⁶ Each group also received a low-calorie diet and physical activ-

TABLE 5. Strength of evidence concerning treatment key questions for binge eating disorder treatment

Treatment Outcomes	Harms of Treatment	Factors Associated with Efficacy	Differences by Sociodemographic Factors
	Medication and medication plus behavioral interventions		
Moderate	Strong	Weak	Nonexistent
	Behavioral interventions		
Moderate	Nonexistent	Weak	Nonexistent
	Self-help		
Weak	Nonexistent	Weak	Nonexistent
	Other		
Weak	Nonexistent	Weak	Nonexistent

ity training. Both groups achieved 100% abstinence (which may be secondary to the fact that all patients were also receiving intensive inpatient treatment), but weight efficacy and diet scores improved significantly only in the virtual reality group. Dropout was not reported.

Harms of Treatments for BED

The most commonly reported harms were those associated with the side effects of second-generation antidepressants.²⁸ Side effects in trials involving fluoxetine were sedation, dry mouth, headache, nausea, insomnia, diarrhea, fatigue, increased urinary frequency, and sexual dysfunction. Some patients taking fluvoxamine reported headache, asthenia, depression, dizziness, somnolence, dry mouth, nervousness, and decreased libido. Compared with placebo, fluvoxamine was associated with higher rates of insomnia, nausea, and abnormal dreams; sertraline was associated with more insomnia; citalopram was associated with more reports of sweating and fatigue; imipramine was associated with higher rates of constipation, dry mouth, blurred vision; sibutramine was associated with significantly more constipation; and orlistat was associated with higher rates of gastrointestinal upset. Medication-related side effects were the impetus for dropout in 24% of individuals treated with desipramine and in 20% of individuals treated with topiramate.

No direct adverse events were reported for any psychotherapy trials; however, three DBT-treated individuals required treatment for depression during the follow-up period.

Factors Associated with Treatment Efficacy in BED

Evidence for specific factors contributing to treatment efficacy in BED is sparse. One study suggested that early abstinence from binge eating is

associated with significantly greater weight loss.¹² Another suggested that higher initial self-esteem predicts a poorer outcome, although the effect was small, accounting for 6% of the variance in outcome.²² No replicated factors associated with outcome were identified.

Treatment Efficacy by Subgroups in BED

Of the 680 individuals enrolled in the 12 drug or medication plus behavioral intervention trials, less than 10% ($n = 55$) were men. Authors often failed to report the age (4 of 12 studies) and race or ethnicity (5 of 12 studies) of participants, and no studies explicitly tested differential outcomes by sex, gender, age, or race or ethnicity. Based on the seven studies that did report race or ethnicity, participation by minorities was approximately 11% (47 of 421 participants). Thus, we could draw no conclusions about differential efficacy of pharmacotherapy interventions for BED by sex, age, gender, race, ethnicity, or cultural group.

Men (32 of 532) as well as children and adolescents were likewise undersampled in psychotherapy, self-help, and other behavioral trials; all participants were at least 18 years old. From the trials that reported race or ethnicity, minority participation was approximately 7% (35 of 485). In no instance did the investigators analyze results separately by race or ethnic group; therefore, no data exist regarding differential efficacy of psychotherapeutic treatment for BED by sex, age, gender, race, ethnicity, or cultural group.

Conclusion

Strength of the Evidence Base

The strength of evidence for the four treatment key questions was variable (Table 5). Regarding

treatment efficacy, we judged the evidence as moderate for medication, medication plus behavioral interventions, and behavioral interventions; we judged strength of evidence as fair for self-help and as weak for virtual reality. The evidence for harms was strong for trials involving medication but nonexistent for all other trials. Evidence regarding factors associated with treatment outcome was universally weak, and for differences in treatment outcome between age, sex, race, and cultural subgroups, evidence was nonexistent.

Summary of the Evidence

When viewed collectively, the series of short-term, placebo-controlled medication-only trials suggests that selective serotonin reuptake inhibitors (SSRIs) lead to greater rates of reduction in target eating, psychiatric, and weight symptoms in individuals with BED than placebo. Dropout (16–57%) and placebo response rates were substantial in medication trials for BED; thus, conclusions should be viewed tentatively. Both sibutramine and topiramate yielded promising results in terms of weight reduction. However, studies that provide clear data for endpoint outcomes, abstinence, remission, and follow-up are needed before definitive conclusions can be drawn about the clinical impact and persistence of these interventions. As rate of change data provide limited insight into the clinical status of participants at the end of treatment, we do not recommend use of rate of change as a primary outcome in future studies. In terms of tricyclic antidepressants, more studies are needed to confirm the therapeutic potential of low-dose imipramine as an augmentation strategy to standard dietary counseling and psychological support.

Combination therapies (i.e. CBT plus medication) may improve both binge eating and weight loss outcomes, but which medications optimally produce and maintain weight loss and under what circumstances remain unclear. Because most weight-loss effects of medication are generally known to cease when the medication is discontinued,²⁹ future studies will need to demonstrate the nature of the relationships among pharmacotherapy duration, behavioral and psychological change, and long-term weight outcome. In addition, future studies targeting novel interventions (e.g. targeting craving and appetite control) are warranted.

In terms of behavioral interventions, no trial comparing individually administered CBT with waiting list, treatment as usual, or a second therapy was rated as fair or good; as noted, we excluded them from this review. Furthermore, like the medi-

cation treatment trials for BED, those using behavioral interventions suffered from marked dropout (11–27% in active treatment groups), which makes interpretation difficult. Thus, our understanding of CBT for the treatment of BED, despite having received considerable research attention, is still limited.

Taken together, the three CBT trials we reviewed suggest that CBT (either group or individual) is effective in reducing either the number of binge days or the actual number of reported binge episodes; this apparently also leads to greater rates of abstinence that appear to persist for up to 4 months after treatment ends. CBT also improves the psychological features of BED such as ratings of restraint, hunger, and disinhibition. Findings regarding the effects of CBT on self-rated depression in this population are inconclusive. Weight did not decrease with CBT (or DBT), but this does not preclude the possibility that either treatment is associated with less weight gain (as opposed to actual weight loss) over time in individuals with BED.

Further studies are needed to address all these questions and to confirm the findings of decreased binge eating and eating-related psychopathology and negative mood with DBT. Specific unaddressed questions include whether calories previously consumed as binges become distributed over nonbinge meals after treatment, which would contribute to the absence of weight change in CBT, and whether treatment alters the way in which patients label binges and nonbinge meals.

Evidence is growing that self-help is efficacious in decreasing binge days, binge-eating episodes, and psychological features associated with BED and in promoting abstinence from binge eating. That these changes occur in the absence of measurable changes in negative mood and weight may have important implications in terms of patient education and treatment expectancies.

Shortcomings of the Literature

A common problem plaguing the BED treatment literature is insufficient sample size. Even when investigators based sample sizes on power calculations, they apparently often overlooked allowance for attrition. *A priori* hypotheses were rarely stated explicitly. As a result, designs that contrasted one approach with another frequently yielded no clear evidence of superiority of either intervention. This result was especially true in trials of behavioral interventions, particularly those with large number of comparison groups but small sample sizes. Future studies should elevate the level of scientific rigor by (1) assessing reasons for and strategies to

counteract dropout, (2) performing intent-to-treat analyses to offset bias from differential dropout across groups, (3) performing accurate power analyses and articulating those analyses in published documents, (4) including multiple study sites to expand patient enrollment, and (5) providing full disclosure of randomization procedures and allocation concealment.

A second common problem in the BED literature involves lack of attention to the within-subject repeated design inherent in intervention and treatment trials and a resulting incongruence between stated analytic strategies and data interpretation. An improved appreciation is needed of the subtle but important distinctions between repeated-measures analyses and an approach using paired *t*-tests of post-treatment outcome data with or without accounting for baseline differences. Delta scores (i.e. post-treatment minus baseline values) are inherently easy to understand but not as easy to interpret in the absence of baseline data. Attention to these details will facilitate the integration of information from disparate studies and enhance our ability to draw conclusions with higher yield with respect to the design and implementation of future interventions.

From a statistical as well as a pragmatic perspective, the BED treatment literature as a whole suffers from an unusually large and inconsistently used array of diagnostic and outcome assessment measures. This is a particularly egregious problem with respect to unstandardized measures of weight and weight change, especially when age and sex corrections for BMI should be made. Future efforts to refine and consolidate the number of measures would be a valuable contribution to the field.

Consensus is also needed on definitions of stage of illness, remission, recovery, and relapse and on metrics for outcome reporting. Specifically, studies should not rely solely on percentage reduction in binge days, percentage reduction in binges, or amount of time spent binge eating as outcome measures. These tell only half of the story concerning symptomatic relief; by contrast, a reduction in the absolute number or level of symptoms provides a more meaningful index of treatment efficacy. Future studies should report either abstinence from binge eating or absence of binge days for a specified duration of time (at least 1 month but preferably longer).

Finally, regarding analytical rigor, defining what constitutes clinically meaningful (as opposed to statistically significant) differences in weight loss in BED trials is imperative.

The glaring absence of data on sociocultural forces that influence BED treatment efficacy and outcome must be remedied. With greater attention to the psychometric properties of these contextual factors, we are likely to discover important and often overlooked factors that influence disease trajectory and in doing so may open new avenues for prevention and treatment.

Future Research Needs

Developing new methods that enhance motivation and retention in medication trials is a critically needed step. Additional studies are required to determine the long-term effectiveness of relatively brief medication trials, the optimal duration of medication treatment, and the optimal strategy for maintenance of treatment gains. Medication trials should focus on achieving abstinence from binge eating, not merely reducing the frequency with which these behaviors occur.

Future investigations should report specifically and separately on two outcomes—weight loss and abstinence from binge eating. Investigators should state explicitly the weight status of patients at baseline and clarify whether either weight loss or weight loss maintenance (or both) is a targeted outcome. Studies that target relapse prevention in BED also warrant a high research priority. Because previous studies indicate a high placebo response rate in BED trials, longer placebo run-in phases should be incorporated into future study designs. Finally, lessons learned from recent depression-treatment trials³⁰ regarding potential drug augmentation and sequential medication benefits may be useful in developing treatment strategies for early BED nonresponders. Similarly, the next generation of studies should target strategies for enhancing efficacy of CBT and how best to treat CBT nonresponders. On the basis of preliminary trials, DBT also deserves further study.

Research on innovative medications and behavioral treatments are required. This should include exploration of novel modalities that reduce the subjectively reinforcing properties of binge eating. We also recommend trials of novel medications and psychotherapeutic interventions that target and are tailored to the core biological and cognitive features of BED and that are also acceptable to patients. New behavioral interventions that target motivation to change and encourage retention in treatment will be instrumental in moving the field forward. A previously untapped resource may be found in new information technologies (such as

e-mail, the Internet, personal digital assistants, text messaging, and other technological advances) that can be used to enhance treatment, particularly for those patients experiencing shame, denial, and interpersonal deficits or facing limited availability of specialty care.

Other research priorities include determining BED prevalence in adolescents and exploring differential outcomes by age, sex, race, ethnicity, and cultural background. The current BED literature is devoid of any mention of specific issues of gay, lesbian, transsexual, or transgender individuals. Investigators should systematically record these factors in both treatment and outcome studies; where possible, they should report differences between groups as well. Prospective, multidisciplinary studies, which tap the collective expertise of treatment providers, researchers, patient advocates, patients and their families and which track transitions in severity of BED and related eating disorders, are much needed. Examining BED within in the broader context of our current obesity epidemic,^{31,32} particularly with respect to the impact of various weight loss treatments on binge eating and on the development of eating disorders and eating-disordered behaviors, will be an important area of study.

Ultimately, improved understanding of the etiology, pathology, and treatment of BED lies in the next generation of studies that plan for adequate durations of follow-up, include measures of disability and impairment associated with BED, and carefully attend to statistical and research design issues.

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