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REVIEW

Binge-Eating Disorder Interventions: Review, Current Status, and Implications

Carlos M. Grilo[1,2] · **Adrienne Juarascio**[3,4]

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Abstract

Purpose of Review Binge-eating disorder (BED) is a serious psychiatric problem associated with substantial morbidity that, unfortunately, frequently goes unrecognized and untreated. This review summarizes the current status of behavioral, psychological, pharmacological, and combined treatments for BED in adults with a particular focus on recent findings and advances.

Recent Findings Certain *specific* psychological treatments, notably CBT and IPT, and to some extent DBT, have demonstrated efficacy and are associated with durable benefits after treatment. Certain *specific* lower-cost scalable interventions, notably CBTgsh, have demonstrated efficacy and have potential for broader uptake. An important advance is the emerging RCT data indicating that BWL, a generalist and available behavioral lifestyle intervention, has effectiveness that approximates that of CBT for reducing binge eating and eating-disorder psychopathology but with the advantage of also producing modest weight loss. There exists only one pharmacological agent (LDX) with approval by the FDA for "moderate-to-severe" BED. Research with other "off label" medications has yielded modest and mixed outcomes with a few medications statistically superior to placebo over the short-term and almost no longer-term data. Nearly all research combining medications and psychological treatments has failed to enhance outcomes (combined appears superior to pharmacotherapy-only but not to psychotherapy-only).

Summary Many people with BED suffer in silence and shame, go untreated, and rarely receive evidence-based treatments. Patients and practitioners need to recognize that research has identified several effective interventions for BED, and these can work quickly for many patients. Future research should identify treatments for those who do not derive benefit from initial interventions, identify additional pharmacological options, test agents with relevant mechanisms of action, and utilize innovative adaptative "SMART" designs to identify treatments to enhance outcomes among initial responders and to test alternative treatments to assist initial non-responders.

Keywords Eating disorders · Obesity · Binge eating · Treatment · Behavior therapy · Cognitive-behavioral therapy · Pharmacotherapy · Weight loss

Introduction

Binge-eating disorder (BED) is defined by recurrent binge-eating (eating unusually large quantities of food while experiencing a subjective sense of loss of control during the overeating episode), marked distress about binge eating, and the absence of inappropriate weight-compensatory behaviors that characterize bulimia nervosa and anorexia nervosa [1]. BED is recognized as a serious public health problem [2, 3] with high social and economic costs [4, 5]. BED is the most prevalent eating disorder among adults, occurs in both men and women, and comparably across ethnic/racial groups [2, 3]. BED is associated strongly with obesity [2, 3] and is associated with increased risk for psychiatric and

✉ Carlos M. Grilo
carlos.grilo@yale.edu

1 Department of Psychiatry, Yale School of Medicine, New Haven, CT, USA

2 Yale Program for Obesity Weight and Eating Research (POWER), New Haven, CT, USA

3 Department of Psychological and Brain Sciences, Drexel University, Philadelphia, PA, USA

4 Drexel University Center for Weight, Eating and Lifestyle Science (WELL), Philadelphia, PA, USA

medical comorbidities and serious psychosocial impairments [3, 6, 7]. Although BED is associated strongly with obesity, persons with BED have distinct behavioral and eating behavior [8], psychopathological and body image [9, 10], and neurobiological [11–13] profiles from persons with obesity without BED.

Despite high levels of morbidity and associated psychosocial burdens faced by people with BED, this disorder remains underrecognized by healthcare professionals [14–16]. The majority of people with BED suffer in silence and shame [17, 18] and go untreated [19–21], let alone receive evidence-based treatments, and this is especially the case for men and for people of color [19–21]. This is particularly unfortunate because treatment research has identified several effective interventions for BED, and practitioners and patients need to recognize that these treatments exist.

This review summarizes the current status of psychological/behavioral, pharmacological, and combined treatments for BED. This narrative review will cover the emerging treatment literature for BED since 2020, with a highly selective focus on rigorous studies that have attempted to address previous questions and uncertainties about treatments to move the field forward.

Background

Psychological Treatments

Despite the growth in treatment research for BED over the past 20 years, the literature regarding treatments with demonstrated efficacy for BED has changed relatively little. Reviews by Grilo and colleagues in 2007 (22) and again in 2017 (23) both noted that few specific focal psychological treatments—most notably cognitive-behavioral therapy (CBT) and interpersonal psychotherapy (IPT) adapted from versions developed initially for bulimia nervosa—have demonstrated efficacy for BED. CBT and IPT are "specialist" psychological treatments which a "focus on the here and now" for which manualized protocols have been developed and tested (see references cited below in the RCTs reviewed here).

CBT for BED is typically delivered in weekly 1-h individual (or group) sessions with a structured focus over a 12- to 24-week period of time. CBT is delivered in a highly collaborative and interactive learning process with patients. The first phase involves educating patients about BED and the CBT model, including jointly developing a shared and individualized case conceptualization of factors thought to maintain the disorder. The first phase focuses heavily on self-monitoring methods to identify problematic eating patterns while establishing normal eating patterns. The second stage is more cognitively oriented and involves teaching patients how to identify and modify maladaptive thoughts (i.e., "cognitive restructuring") regarding their body image and eating, as well as teaching problem-solving skills to better address stressful situations, interpersonal interactions, and triggers for binge eating. The third stage focuses on maintaining normalized eating, consolidating the new cognitive and problem-solving skills, and learning relapse prevention approaches.

IPT for BED is generally delivered over a 24-week period of time in either individual or group sessions. IPT for BED is also manualized with protocols generally involving 18-h-long sessions. In sharp contrast to CBT, IPT does not focus directly on binge eating behaviors (nor does it use CBT techniques). Similar to CBT, however, IPT is delivered in a highly collaborative and interactive learning process with the patients and is focused on the present. IPT focuses on four primary domains: interpersonal deficits, role conflicts, role transitions, and grief/loss. IPT helps patients identify and address difficulties in these domains. IPT helps patients to manage and to express their feelings more comfortably and effectively, which in turn, improves interpersonal skills and relationships, and this leads to enhanced psychosocial functioning.

Both 2007 and 2017 reviews [22, 23] noted that empirical evidence supports CBT as the leading treatment for BED, and good support exists for IPT and, to a lesser extent, for dialectical behavioral therapy (DBT). For example, in rigorous randomized controlled trials (RCTs), CBT and IPT reliably produced roughly 50% remission rates that were well-maintained for up to 24 to 48 months after treatment [24, 25] and CBT demonstrated significant superiority for reducing binge eating compared to specific credible and active treatments (i.e., "specificity of effects," not just nonspecific effects attributable to "common factors" or passage of time) such as behavioral weight-loss BWL [26] and pharmacotherapy with fluoxetine [27, 28]. Given the relative lack of availability in many communities of clinicians "specialized" in CBT and IPT, both 2007 and 2017 reviews [22, 23] highlighted the importance of developing scalable methods and the growing evidence supporting the effectiveness of a guided self-help version of CBT (CBTgsh) for BED [29].

Emerging evidence suggested the potential utility of behavioral weight loss (BWL) treatment for BED. BWL—adapted from intensive lifestyle versions developed initially for obesity—received support as a potential alternative treatment for BED [24, 26]. BWL for BED is a structured behavioral approach to helping patients achieve greater lifestyle balance including sustainable structured healthy eating patterns (moderate caloric decreases with improved nutritional composition) alongside sustainable modest increases in lifestyle physical activity. This line of research was logical to pursue because of (1) the strong association between BED and obesity, which is especially evident among treatment-seekers; and (2) the increased risk for a number of

obesity-related metabolic comorbidities [2, 3, 6]. Furthermore, treatment-seeking patients with BED often report substantial weight gain during the year prior [30] and none of the "specialist" psychological treatments (CBT, IPT, DBT) result in any weight loss [24]. Moreover, BWL, a "generalist" treatment is thought to be much more broadly available than the "specialist" CBT and IPT interventions [24]. In a rigorous RCT, BWL resulted in roughly 50% remission rates, which approximated the rates for CBT and IPT [24]. In contrast to CBT, however, BWL was associated with weight loss that was reasonably sustained through 12 months [26] and 24 months [24] after treatment.

Several systematic reviews and meta-analyses (e.g., [31–34]) arrived at generally similar conclusions as those provided above. These informed treatment recommendations and guidelines such as the National Institute for Health and Clinical Excellence (NICE) in the UK [31]. Evidence-based national guidelines such as the NICE [31] highlighted CBT as the treatment of choice for BED and noted the relative strengths of the evidence supporting certain other specific interventions, such as CBTgsh, IPT, DBT, and BWL. Noteworthy is that the NICE guidelines [31], which considered pragmatic cost and availability issues alongside effectiveness data, recommended that persons with BED begin with CBTgsh first, and if they do not benefit sufficiently after 1 month, to switch to traditional therapist-led CBT. Some of the more recent meta-analyses of treatments for BED attempted to take into account more variables as potential confounds and as moderators [34]. Overall, the general conclusions offered above have been supported though critical inspection of the data indicates that the nature of comparison groups plays an important role. Overall, the strength of the effects for the treatments supported below is greatest when the controls are weak (wait lists, inactive) and lessen when comparisons include stronger methodological controls for attention and credible and/or other active groups [34].

Pharmacological Treatments

The literature on pharmacological treatments for BED also evolved relatively little over the past 20 years [35, 36], although there is now one FDA-approved medication for BED lisdexamfetamine dimesylate (LDX) [37]. Although RCTs have tested various classes of medication for BED, most studies were small trials of short duration testing only "acute" effects [35–37] of various "re-purposed" medications with demonstrated efficacy for other indications, such as depression or seizure disorders, with minimal increments over the 20 years [35, 36]. Pragmatically, this relative lack of pharmacological research on BED might reflect severe funding limitations as eating disorders receive strikingly less research funding than other psychiatric conditions [38•]. Conceptually, this might reflect, in part, a strategy of "convenience" testing readily available medications rather than developing or testing medications a priori targeting specific neurobiological or eating/weight specific characteristics of BED [13].

Systematic reviews and meta-analyses over time arrived at the same conclusions as the above overview that the limited, albeit mixed, data suggested that certain medications were superior to placebo for producing acute reductions in binge eating with almost no data existing regarding longer-term outcomes [33]. Topiramate was essentially the sole pharmacologic agent found to reliably produce significant effects and notably also reduced weight in addition to binge eating [39, 40]. Topiramate, however, is associated with high rates of adverse events and discontinuation over time [41].

Lisdexamfetamine Dimesylate

An important development in 2015 was the FDA approval of LDX as the first, and to date, sole medication with a specific indication for "severe-to-moderate" BED. This followed a series of manufacturer supported multisite RCTs demonstrating that 50 mg and 70 mg LDX was superior to placebo for BED. A phase II, 11-week RCT found that 50 mg and 70 mg LDX were significantly superior to placebo on most primary and secondary measures [42]. Two identically designed phase III, 11-week RCTs [43] confirmed that LDX (50–70 mg dose optimization) was significantly superior to placebo for reducing binge-eating days; analyses revealed significantly higher binge-eating abstinence rates for LDX versus placebo (40% vs. 14% in study 1 and 36% vs. 13% in study 2). Effect sizes for LDX superiority over placebo for reducing binge-eating frequency (0.83 and 0.97) were robust in both RCTs [43]. Inspection of the time-course data reported by McElroy et al. [44] indicates an early and rapid response to LDX, often evident by the second week.

LDX was also associated with significant acute weight loss relative to placebo [42, 43]; importantly, weight loss was examined as a safety measure, not as a specified treatment outcome. The FDA-approval and manufacturer product labeling include a "Limitation of Use" highlighting that LDX is not indicated for weight loss and that the safety and efficacy of LDX for obesity are unknown. The FDA also required a "black box" warning that LDX is contraindicated for persons with substance misuse histories. Gasior and colleagues [45] reported safety/tolerability data from an open-label 12-month extension trial that were consistent with safety data from short-term BED and ADHD trials.

Hudson and colleagues [46] performed a double-blind placebo-controlled randomized withdrawal study of LDX with 275 "responders" to acute treatment with LDX. Analyses revealed that continuing LDX treatments was significantly superior to placebo for preventing relapse (3.7% vs. 32.1% relapsed). This study, the first test of any

pharmacological agent as a maintenance treatment for BED, provides practitioners with important guidance about continuing LDX medication with acute treatment responders.

Combination Treatments

Prior reviews of the literature on combining pharmacological with psychological/behavioral treatments for BED revealed relatively little evolution over the past 20 years. In fact, the studies and conclusions of reviews in 2007 [35] and 2021 [47] changed strikingly little. Despite the clinical importance of this question to practitioners (e.g., "will combining treatments potentially benefit my more complicated or refractory patients?"), very few RCTs have been performed. Indeed, in 2021, Reas and Grilo [47] identified only 12 published RCTs testing combination treatments for BED. Of the 12 RCTs, only two—which tested the antiseizure medications, topiramate [40] and zonisamide [48]—significantly enhanced both binge-eating and weight outcomes when combined with CBT. Collectively, the combination/additive RCTs found that combined approaches outperformed pharmacotherapy-only but not psychological/behavioral treatments, except in the case of adding anti-seizure medications. Reas and Grilo [47] concluded that future research testing combination treatments should focus on additive benefits of medications with relevant mechanisms of action to available effective psychological interventions.

Predictors and Moderators of Treatment Outcomes

The identification of predictors/moderators of outcomes and developing an understanding of processes and mediators through which interventions might work are logical avenues to pursue data to improve treatment delivery and help to refine interventions [22]. Unfortunately, little progress has been made in these areas. Overall, although a fair number of sociodemographic and clinical variables have been tested, reliable predictors or moderators of treatments for BED have yet to be identified [49, 50]. Some empirical support has suggested that overvaluation of shape/weight has prognostic significance in that it predicted a number of clinical outcomes [51] and that it significantly moderated responses to CBT versus pharmacotherapy [52].

Two recent studies of predictors and moderators of outcomes are relevant as they addressed important clinical issues. Lydecker and colleagues [53], in their analysis of aggregated RCTs at a single clinical-research site, found that Black individuals had comparable (global eating-disorder psychopathology scores) or better treatment outcomes (higher binge-eating remission rates, lower binge-eating frequency, and lower depression scores) than White individuals, although they were less likely to attain 5% weight loss. These findings are especially noteworthy given well-established disparities in treatment-seeking among Black individuals found in epidemiological and treatment studies. Lydecker and Grilo [54•], in their analysis of psychiatric comorbidity as a predictor and moderator of treatment outcomes, found that greater comorbidity was associated with more severe BED psychopathology at baseline and throughout treatment. Overall, patients with mood disorder comorbidity—but not anxiety disorder comorbidity—were less likely to attain remission from binge eating (30% vs. 41%). Psychiatric comorbidity, however, did not moderate outcomes in this analysis of aggregated RCT data which included various psychological, pharmacological, and combined psychological plus pharmacological approaches. These findings challenge clinical perspectives that combining psychological and pharmacological interventions is needed for patients with complex comorbidities. Finally, given the difficulty in identifying predictors of BED outcomes, a recent study [55•] applied machine learning models in an attempt to see whether they could improve on the accuracy of traditional statistical approaches for predicting treatment outcomes. Machine learning models had little advantage in their predictive accuracy across several outcomes and while several predictors were statistically significant, the overall accuracy was modest.

Rapid Response to Treatment

Reliable empirical support has been found for "rapid response" (i.e., a "process" during treatment when rapid improvements occur early in treatment, generally by the first month) as a potent predictor of clinical outcomes [56]. Rapid response has significantly predicted outcomes across various treatments for BED and has predicted different specific outcomes for pharmacotherapy versus CBT [57] and BWL versus CBT [58]. Interestingly, research to date has consistently reported that rapid response is unrelated to patients' sociodemographic and clinical characteristics (i.e., rapid response does not merely reflect high SES and functioning or low psychopathology). A recent study [59] found that patients' early attitudes regarding treatment (higher ratings about the "logic" of the treatment and greater "confidence" that the treatment would help with the binge eating), rather than their sociodemographic and clinical characteristics, prospectively predicted rapid response, which in turn was associated with better clinical outcomes.

Recent Developments and Advances

The overarching conclusions provided above of the literature have been generally supported further in an increasing number of systematic reviews and meta-analyses of the BED treatment literature [34]. The remaining narrative review,

which focuses on the literature since 2020, will be highly selective with a particular focus on a relatively few rigorous studies that address important questions that build on the current status to move the field forward.

Why This Selective Rather than (Another) Systematic Review?

It appears that the number of "systematic reviews and meta-analyses" of treatments for BED (and eating disorders) has grown markedly in recent years to the point where such "meta-analyses" might actually out-number the trials identified and included in the analyses. A simple search on PubMed will show this. The proliferation of such "systematic reviews and meta-analyses" reports is striking as some seem to focus on smaller questions with fewer and fewer data points despite no new trials (e.g., [60]). Now emerging are systematic reviews of meta-analyses of treatments for eating disorders [61] and more specifically of CBT for eating disorders [62]. Kaidesoja and colleagues [62] identified 44 systematic reviews *specifically* on CBT, which included 21 meta-analyses of "varying quality." The aforementioned meta-analyses and reviews of the meta-analyses essentially yielded the same "big picture" conclusions as offered above while highlighting the gaps and limitations in the existing data that the meta-analyses themselves cannot correct.

New Rigorous RCTs for BED that Address Treatment Gaps

Pharmacological Treatments

Small recent pilot RCTs have reported preliminary outcome data for various medications—including two FDA-approved weight-loss medications for obesity [63, 64] and methylphenidate [65], which require larger more definitive RCTs to evaluate. Two new pharmacotherapy RCTs for BED are noteworthy given the relative lack of agents and the recent approval of LDX (previously approved for ADHD) for BED [43, 44]. Two RCTs tested dasotraline for BED, a dual dopamine and norepinephrine reuptake inhibitor [66, 67]; these two 12-week RCTs were designed based closely on the LDX RCTs [43, 44]. In the first RCT [66], a flexible-dose study with 315 patients with BED, dasotraline (4, 6, or 8 mg/day) was significantly superior to placebo for reducing binge-eating frequency (effect-size = 0.74) and three secondary outcome measures, including 4-week abstinence from binge-eating (46.5% vs. 20.6%, respectively). In the second RCT (67), a fixed-dose study with 385 patients with BED, dasotraline (6 mg/day, but not 4 mg/day) was significantly superior to placebo for reducing binge-eating frequency (days/week). Dasotraline was significantly superior to placebo on several secondary measures, but abstinence rates did not differ between dasotraline (either dose) and placebo (34% vs. 30%, respectively). Both RCTs reported that the different doses of dasotraline were generally safe and well-tolerated; discontinuation rates of dasotraline due to adverse events were roughly 11% (vs. 2.5% for placebo) [66]. The drug manufacturer submitted and then withdrew an application to the FDA for consideration of this medication for approval.

Psychological Treatments

A number of trials with varied designs and settings have provided further relevant guidance about treatments for BED. These studies include a RCT evaluating a new innovative psychological treatment that targets proximal triggers for binge eating [68], an "effectiveness" trial in a real-world clinical setting [69], a new treatment for binge eating (BED and bulimia nervosa) specifically for patients at higher weights [70, 71], and a RCT testing the effectiveness of CBT for patients with BED who do not respond to initial acute treatments [72].

Peterson and colleagues [68] compared integrative cognitive-affective therapy (ICAT), a new innovative psychological treatment that targets momentary behavioral and emotional triggers of binge eating, versus CBTgsh, an established active treatment, for BED. This 17-week RCT compared ICAT (21 sessions) and CBTgsh (10 sessions) in 112 patients with BED. Both ICAT and CBTgsh showed significant reductions in binge eating at posttreatment and at 6-month follow-up, with no significant differences between the two treatments. Remission rates, which also did not differ, were 57.1% for ICAT and 42.9% for CBTgsh at posttreatment and these were well-maintained at 6-month follow-up (46.4% and 42.9%, respectively). The two treatments showed similar improvements in secondary measures of psychopathology and putative maintenance mechanism variables.

A "quasi-randomized" study [69] compared the "real world" effectiveness of two evidence-supported psychological treatments—CBT and DBT—in a community eating disorder center in 175 patients with subthreshold/threshold BED. CBT ($n = 133$) and DBT ($n = 42$) had high completion rates (85% and 81%, respectively) and were both associated with significant decreases in binge eating that did not differ between treatments. CBT was associated with significantly greater reductions (reflecting medium effect sizes) in eating-disorder psychopathology at posttreatment and depression scores at 6-month follow-up. The authors concluded that these outcomes in a "real world" clinical setting provide further support for DBT as a viable and effective treatment for BED given that the DBT comprised roughly half of the therapy time required for CBT in that specific setting.

A recent RCT compared HAPIFED (Healthy Approach to Weight Management and Food in Eating Disorders) to CBT-E in 98 adults with BED, bulimia nervosa (BN), or other specified/unspecified feeding or eating disorders

[70, 71]. The investigators developed HAPIFED, a multidisciplinary treatment approach method integrating CBT-E and weight management methods, to address more comprehensively medical and functioning needs often associated in people with eating disorders who are at higher BMIs. Palavras and colleagues [70] reported that HAPIFED was not superior to CBT-E for promoting weight loss and that the two treatments did not differ significantly in their effects on eating-disorder psychopathology, which reduced significantly in both treatments. One analysis revealed that binge-eating remission rates favored HAPIFED over CBT-E (34.0% vs. 16.7%, $p = 0.049$). No worsening of ED symptoms was observed in the HAPIFED condition. More recently, Hay and colleagues [71] reported secondary outcomes for the HAPIFED versus CBT-E trial. Analyses revealed no significant differences between the two treatments in physical and metabolic parameters, psychopathology, or quality of life outcomes [71]. The findings for this integrated HAPIFED approach (CBT-E plus weight management) versus CBT are consistent with previous RCTs of BWL versus CBT for reducing eating-disorder psychopathology; the findings for HAPIFED and CBT-E, however, are at odds with previous RCTs comparing BWL and CBT [24, 26] which reported substantially higher remission rates as well as significant differences as expected between BWL and CBT (greater weight losses in BWL and higher remission rates in CBT).

Examining treatments for patients who do not derive benefit from initial treatments is a pressing research need given the paucity of relevant data in the literature. Grilo and colleagues [72] tested the efficacy of CBT for patients with BED who did not respond to initial treatments. In this RCT, 31 patients with BED with co-existing obesity who did not derive benefit from initial acute treatments in a RCT testing naltrexone/bupropion and/or BWL, were randomized to either therapist-led CBT or to no-CBT, in addition to continuing double-blind pharmacotherapy, for 16 weeks. Analyses revealed binge-eating remission rates were significantly greater for CBT than no-CBT (61.1% vs. 7.7%, respectively) and that binge-eating frequency decreased significantly with CBT but not in the no-CBT condition. Sensitivity-type analyses restricted to the 27 patients who received pharmacotherapy during the acute treatment revealed the same pattern of significant findings for CBT versus no-CBT. The authors concluded that CBT may be beneficial for adult patients with BED who fail to respond to initial pharmacological treatments for BED.

e-Health and Technology-Delivered/Assisted Methods

The previous decade has witnessed a remarkable growth in the initial development and dissemination of technology-delivered or assisted methods for many health and medical areas, including BED. Such e-Health methods have great potential to play roles in clinical gaps and overcoming barriers to treatment. At this point in time, however, a great deal of careful research is needed to learn about the utility of such e-health methods for BED (and most medical domains) in order to establish both potential benefits as well as risks [73, 74]. Although the INTERBED trial [75], a large and rigorous study designed as an inferiority trial, found that internet-based delivery of CBTgsh was statistically inferior to face-to-face CBT for BED, the observed clinical outcomes suggested clear viability and high potential for that specific internet-based CBTgsh intervention. A recent systematic review and meta-analysis of RCTs of eHealth interventions for BED [76] identified only three studies, which the authors concluded offer initial promising results supporting the need for future research to examine further the efficacy of such e-health interventions. Grilo [74] offered several cautionary notes for future research needed on e-health and technology-delivered methods that also have implications for readers to evaluate the proliferation of claims regarding the utility of e-health. While technology has potential to deliver and/or augment treatments for BED, it must be emphasized that the treatments being delivered/assisted by technologies themselves must work (i.e., an "impressive" technology with broad reach delivering an "inert" intervention does no good; for example, a smartphone app reminder to take an inert pill does no good).

Combination Pharmacological and Behavioral/Psychological Treatments

A recent RCT tested naltrexone-bupropion combination (FDA-approved weight-loss medication for obesity) and behavior therapy (a specific behavioral weight loss lifestyle intervention), alone and combined for BED [77•]. This 16-week RCT with 135 patients with BED, using a 2X2 balanced factorial design, reported the following binge-eating remission rates: 17.7% (for placebo), 31.3% (for naltrexone-bupropion), 37.1% (for behavioral therapy plus placebo), and 57.1% (for behavioral therapy plus naltrexone-bupropion). Analyses indicated that behavioral therapy was significantly superior to no behavioral therapy, naltrexone-bupropion was significantly superior to placebo, but there was no significant interaction between behavioral therapy and medication. Analyses of percent weight loss and of proportion attaining $\geq 5\%$ weight loss were both significantly superior for behavioral therapy than no behavioral therapy but did not differ significantly between naltrexone-bupropion and placebo. Analyses of secondary measures of eating disorder psychopathology, depression, a wide range of eating behaviors and concerns, and certain metabolic variables (cholesterol and glycemic control) revealed significant reductions and improvements for behavioral therapy but not

naltrexone-bupropion. Collectively, these findings suggested that behavioral therapy (a specific behavioral weight-loss lifestyle intervention) and naltrexone-bupropion were associated with improvements in BED, with a consistent pattern of behavioral therapy having an advantage over no behavioral therapy [77•].

Grilo and colleagues recently reported acute [78•] and longer-term [79] outcomes from an adaptive "sequential multiple assignment randomized trial" (SMART) that evaluated an innovative adaptive treatment model for patients with BED with co-existing obesity. Although stepped-care approaches have been suggested in some treatment guidelines, such as NICE [31], very few RCTs have tested sequential approaches [26], and most stepped-care models and trials tend to start with available and least-costly approaches first and then proceed with more intensive treatments as needed [80]. In contrast, the Grilo et al.'s [78•] adaptive SMART design was built on reliable findings that rapid response to treatments for BED has robust prognostic significance and, specifically, that rapid response to BWL (a generalist and widely available treatment) is associated with reductions in *both* binge eating and weight [58].

In this single-site trial with 191 patients with BED with co-existing obesity [78•], participants were randomized to either BWL or to Stepped Care for 6 months. *Within* Stepped Care, after 1 month of BWL, patients were assessed and stratified by whether they had "rapid response" or not. Rapid responders were then randomized to weight-loss medication (sibutramine or orlistat) or placebo (in double blind fashion) in addition to continuing BWL for another 5 months. Participants without a rapid response to BWL were switched to guided-self-help CBT in addition to being randomized to also receive (in double blind fashion) either weight-loss medication or placebo. Overall, BWL and Stepped Care both produced robust improvements in binge eating (74.4% and 66.5% remission rates, respectively) and weight loss (5.1% and 5.8%) and within Stepped Care, weight-loss medications enhanced outcomes [78•]. Outcomes were reasonably well-maintained following treatments [79]. At 12-month follow-up, binge-eating remission rates were 41% (for BWL) and 45% (for Stepped Care). The amount of weight regained by 12-month follow-up did not differ significantly between BWL and Stepped Care (+1.3% and +1.7%, respectively, from posttreatment weight values) and the total percent weight loss from baseline 18 months earlier was still −3.4% (for BWL) and −5.0% (for Stepped Care). Paralleling these significant improvements in the primary outcomes (binge-eating and weight loss) were substantial improvements in secondary outcomes (eating-disorder psychopathology, depression, and waist circumference) observed at 12-month follow-ups which did not differ significantly from posttreatment values [79].

BED and Obesity: Clarification of Comorbidity Issues and Empirical Findings

The two new RCTs for BED with co-existing obesity [77•, 78•] reviewed above are especially noteworthy given the overview of the treatment literature above. Both RCTs provided further evidence for the utility of this "generalist" lifestyle behavioral intervention for addressing *both* BED and obesity. Both considered co-existing obesity as an additional outcome measure, and both considered "relevant" weight-loss medications using different designs. Importantly, in addition to the significant reductions in binge eating, both RCTs reported substantial improvements in eating-disorder psychopathology, improvements across broad eating behaviors and concerns, and reductions in depression scores. The later findings, which were maintained at 12-month follow-ups after completing and discontinuing treatments [79], indicate that appropriately delivered behavioral weight loss lifestyle treatments can result in improved psychological health (reduced depression and eating-disorder psychopathology comprising various aspects of body-image disturbances).

More broadly, these two new RCTs [77•, 78•], the previous rigorous RCTs testing BWL for BED with co-existing obesity [24, 26], and the recent HAPIFED [70, 71] trial testing an integrated approach to weight management for patients with binge eating with higher weights are especially timely given increasingly heated conflict pertaining to issues regarding patient-centered care for obesity and certain groups voicing their strong concerns regarding potential harms that might arise when treating obesity in persons with eating disorders. Cardel and colleagues [81] cogently addressed challenges faced by providers treating obesity while actively and effectively addressing weight-related stigma and eating-disorder related risks. The research-based commentary by Cardel and colleagues [81] synthesized the evidence base pertaining to the possible relationships between obesity treatment, stigma, and eating-disorder risk and challenged the "false dichotomy" between treating obesity versus reducing eating-disorder risk that exists and appears to be growing, perhaps fueled by groups espousing views that treating obesity merely serves to further weight-related stigma and foster eating disorders.

More recently, Cardel and colleagues [82] provided a further evidence-based response to several common misconceptions regarding effective behavioral treatment and eating-disorder risk in obesity. We emphasize here, as did Cardel and colleagues [82], that behavioral weight loss lifestyle interventions, such as those in the RCTs reviewed above for BED [24, 26, 77•, 78•] and for binge eating [70, 71], as well as similar contemporary intensive lifestyle interventions used in the landmark Look AHEAD trial—which resulted in significant weight losses over time [83] along with numerous important long-term health benefits [84]—do *not* involve (in fact, they proscribe) severe

caloric restriction and unbalanced nutritional intakes. Thus, these lifestyle BWL interventions are *not* "just diets" (which can trigger feelings of deprivation and craving) but *rather* are behavioral therapies designed to assist patients achieve healthier and balanced nutritional and physical activity behaviors and lifestyles with the goals of promoting improved health. Such BWL interventions teach appropriate attainable goal setting, self-monitoring to assist with moderate changes while avoiding extreme behaviors, and various problem-solving and coping skills to address barriers and life challenges. Consistent with the BWL specifically for BED trials reporting improved psychological functioning outcomes [77•, 78•], Jones and colleagues [85], in their systematic review and meta-analysis of 42 treatment studies (only one with binge eating), reported that BWL was associated with improved depression and psychological health outcomes relative to controls. The HAPIFED [70, 71] trial reported improvements in mental health and no evidence of harm (i.e., no worsening of ED symptoms).

In this context, we highlight the recent systemic review and meta-analysis by Jebeile and colleagues [86] of eating-disorder risk during behavioral treatment trials specifically for obesity. Data from 49 trials revealed *decreases* in general eating-disorder psychopathology and in binge eating at posttreatment as well as in the follow-up data. Of the 14 trials reporting binge eating in the samples of patients with obesity (not all were full-threshold BED samples), all 14 reported reductions in binge eating and associated eating psychopathology. Only 4 studies reported symptoms of eating disorders at posttreatment that had not been present at baseline, and these occurred in a small subset of patients (0–6.5%).

Collectively, rigorous RCTs evaluating BWL for treating BED in persons have produced important findings relevant for the treatment of BED in persons with co-existing obesity while also challenging the "false dichotomy" of reducing eating disorder psychopathology and addressing obesity (see [81]). All four RCTs reviewed here [24, 26, 77•, 78•] evaluating BWL for BED in persons with obesity reported significant reductions in binge eating and associated eating-disorder psychopathology psychology (rigorously assessed with leading semi-structured clinical interviews) in addition to weight loss and that the benefits were well maintained for 12 to 24 months after finishing treatments. These findings, based on rigorous methods, represent a strong data-driven counter argument against views BWL is not only ineffective for weight loss but might exacerbate binge eating or associated eating-disorder pathology in people with obesity.

Conclusions

Although treatment research for BED has grown over the past 20 years, the literature regarding effective treatments for BED has changed relatively little. Certain *specific* psychological treatments, notably CBT and IPT, and to some extent DBT, have demonstrated efficacy and are associated with durable benefits well past completion of treatments. Certain *specific* lower-cost scalable interventions, notably CBTgsh, have demonstrated efficacy and have potential for broader uptake. One important advance is the emerging RCT data indicating that BWL, a generalist and available behavioral lifestyle intervention, has effectiveness that approximates that of CBT for reducing binge eating and eating-disorder psychopathology but with the advantage of also producing modest weight loss in patients with co-existing obesity and associated medical risks. The longer-term effects of CBTgsh are not as well established and the "effect sizes" in the literature appear to diminish with the rigor of the controls. There exists only one pharmacological agent (LDX) with approval by the FDA for "moderate-to-severe" BED. To date, research with other "off label" medications has yielded modest and mixed outcomes with a few medications statistically superior to placebo over the short-term and almost no longer-term data. To date, nearly all research combining medications and psychological treatments has failed to enhance outcomes (combined appears superior to pharmacotherapy-only but not to psychotherapy-only).

Treatment research priorities include (1) identifying treatments for those who do not derive benefit from initial interventions; (2) identifying additional pharmacological options, with research efforts developing and testing agents with relevant mechanisms of action (rather than just "repurposed" agents); (3) research on combining treatments should focus on additive benefits of medications with relevant mechanisms of action to available effective psychological interventions; and (4) utilization of adaptative "SMART" designs to identify ways to enhance outcomes among initial responders and to test alternative methods to assist initial non-responders.

Further advances in treatment research for BED (and other eating disorders), a costly public health problem, would perhaps be facilitated by policy efforts in light of significant funding limitations faced by investigators as eating disorders receive much less research funding than other psychiatric conditions [38•].

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Declarations

Conflict of Interest Dr. Grilo declares no conflicts of interest. Dr. Grilo reports broader interests, which did not influence this research, including Honoraria for lectures and CME activities at universities and scientific conferences, and Royalties from Guilford Press and Taylor & Francis Publishers for academic books.

Human and Animal Rights and Informed Consent This article is a review of the published literature. This review article does not contain any studies performed with human or animal subjects by the authors.

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- • Of importance
- •• Of major importance

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