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J Consult Clin Psychol. Author manuscript; available in PMC 2014 September 25.

Published in final edited form as:
J Consult Clin Psychol. 2013 August ; 81(4): 710–721. doi:10.1037/a0032946.

Race/Ethnicity, Education, and Treatment Parameters as Moderators and Predictors of Outcome in Binge Eating Disorder

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Results from this study were presented at the 17th Annual Meeting of the Eating Disorders Research Society.

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Abstract

Objective—Binge eating disorder (BED) is prevalent among individuals from minority racial/ethnic groups and among individuals with lower levels of education, yet the efficacy of psychosocial treatments for these groups has not been examined in adequately powered analyses. This study investigated the relative variance in treatment retention and post-treatment symptom levels accounted for by demographic, clinical, and treatment variables as moderators and predictors of outcome.

Method—Data were aggregated from eleven randomized, controlled trials of psychosocial treatments for BED conducted at treatment sites across the United States. Participants were N = 1,073 individuals meeting criteria for BED including n = 946 Caucasian, n = 79 African American, and n = 48 Hispanic/Latino participants. Approximately 86% had some higher education; 85% were female. Multi-level regression analyses examined moderators and predictors of treatment retention, Eating Disorder Examination (EDE) global score, frequency of objective bulimic episodes (OBEs), and OBE remission.

Results—Moderator analyses of race/ethnicity and education were non-significant. Predictor analyses revealed African Americans were more likely to drop out of treatment than Caucasians, and lower level of education predicted greater post-treatment OBEs. African Americans showed a small but significantly greater reduction in EDE global score relative to Caucasians. Self-help treatment administered in a group showed negative outcomes relative to other treatment types, and longer treatment was associated with better outcome.

Conclusions—Observed lower treatment retention among African Americans and lesser treatment effects for individuals with lower levels of educational attainment are serious issues requiring attention. Reduced benefit was observed for shorter treatment length and self-help administered in groups.

Keywords

binge eating disorder; race; ethnicity; socioeconomic status; treatment outcome

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Binge eating disorder (BED) is characterized by recurrent binge eating (i.e., eating a large amount of food with a sense of loss of control) and distressing concerns about body shape or weight (Grilo, 2010; Wonderlich, Gordon, Mitchell, Crosby, & Engel, 2009). BED is more prevalent than other eating disorders (EDs), and is associated with significant psychiatric comorbidity, psychosocial impairment, and obesity (Hudson, Hiripi, Pope, & Kessler, 2007).

Multiple psychosocial interventions for BED have demonstrated treatment efficacy in controlled treatment trials (Hay, Bacaltchuk, Stefano, & Kashyap, 2009; Wilson, Grilo, & Vitousek, 2007), and several moderators and predictors of treatment response have been identified in several recent studies (e.g., Grilo et al., 2012; Hilbert et al., 2007; Robinson & Safer, in press; Sysko et al., 2010; Wilson et al., 2010). Moderators are variables that identify for whom and under what circumstances a treatment has differential effects, whereas predictors describe associations between constant or baseline variables and outcome (Kraemer, Wilson, Fairburn, & Agras, 2002). The available research on moderators and predictors has focused primarily on clinical characteristics rather than demographic or treatment variables [interpersonal problems, shape and weight concerns (Hilbert et al., 2007); overvaluation of shape and weight, low self-esteem (Grilo et al., 2012); binge eating severity and negative affect (Sysko 2010)], and is limited by sample sizes of the individual studies (Wilson et al., 2007). Thus, two under-examined areas of importance are: (1) demographic factors such as race, ethnicity, and education, and (2) treatment parameters such as length and format (e.g., group vs. individual treatment). These variables are difficult to analyze in individual treatment trials, which are severely underpowered to study racial/ethnic minority and lower SES/educational attainment groups (Franko et al., 2011), and in which treatment conditions are typically matched for modality and length. Analyses of data aggregated from multiple studies may facilitate examination of the moderating effects of race/ethnicity and education on treatment approaches, as well as the relative direct effects of race/ethnicity, education, and treatment parameters on treatment outcome. Identifying reliable moderators and predictors of treatment outcome may assist in treatment delivery and development, as well as the identification of populations requiring new or modified treatments (Wilson et al., 2007).

Demographic Predictors of Treatment Outcome

Binge eating is observed to be prevalent among individuals from racial/ethnic minority groups in the U.S (Alegria, Woo, Cao, Torres, Meng, & Striegel-Moore, 2007; Marques, Alegria, Becker, Chen, Fang, Chosak, & Diniz, 2011). Several known, inter-related risk factors for BED include lower SES and obesity, both of which are associated with racial/ethnic minority status (Flegal, Carroll, Ogden, & Curtin, 2010; Marcus, Bromberger, Wei, Brown, & Kravitz, 2007). Despite this confluence of risk factors, racial and ethnic minorities are less likely to seek treatment for eating problems (Marques et al., 2011). Some explanatory factors, such as health care access, may be confounded with SES or educational attainment (Becker, Franko, Speck, & Herzog, 2003), whereas others, such as stigma, may be culturally specific (Becker, Hadley, Arrindell, Perloe, Fay, & Striegel-Moore, 2010).

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Race, ethnicity and SES/education have rarely been studied in relation to BED treatment (Reagan & Hersch, 2005) in part because individuals from racial/ethnic minority and lower SES groups are severely underrepresented in clinical trials for BED (Berkman, Bulik, Brownley, Lohr, Sedway, Rooks, & Gartlehner, 2006; Franko et al., 2011). The limited research conducted has found racial/ethnic differences in baseline clinical characteristics, with higher body mass index (BMI) and associated dietary restraint observed among African Americans, and greater shape and weight concerns among Hispanic/Latinos, compared to Caucasians (see Franko et al., 2011). Racial/ethnic differences in recruited clinic samples relative to community samples have also been observed (Grilo, Lozano, & Masheb, 2005; Pike, Dohm, Striegel-Moore, Wilfley, & Fairburn, 2001). One clinical trial of treatments for BED found that education level significantly predicted remission from binge eating (Wilson, Wilfley, Agras, & Bryson, 2010). Education and race/ethnicity, however, have not been examined together in adequately powered trials of BED to assess the relative influence of these interrelated factors and their potential as moderators of treatment response.

Research in other psychiatric disorders supports the importance of investigating treatment response by racial/ethnic group, and adjusting treatment approaches to address observed disparities. Variability in treatment retention and outcome for ethnic/racial minorities has been found in anxiety and mood disorders, even when SES or education level is controlled (Fortuna, Alegria, & Gao, 2010; Hankerson et al., 2011; Lesser et al., 2007; Lester, Resick, Young-Xu, & Artz, 2010; Miligan, Nich, & Carroll, 2004). Multiple studies indicate that thoughtful and data-driven treatment adaptations may help address observed disparities, such as a quality improvement study that demonstrated that interventions providing modest accommodations for depressed minority patients (e.g., translations, cultural training for clinicians) resulted in improved outcome (Miranda et al., 2003). However, no study of BED has fully examined whether treatment outcome differs by race and ethnicity. We explored the question of whether race or ethnicity had differential effects on outcome in BED without a priori hypotheses, as the risk factor research (Striegel-Moore & Bulik, 2007) and treatment outcome literature to date do not suggest any directional hypotheses for this patient group. However, given the prevalence of BED across minority groups, research on the efficacy of known BED treatment approaches with racial/ethnic minority individuals and those with lower levels of educational attainment has public health significance and will guide the development, cultural adaptation, and dissemination of treatment to underserved populations with BED.

Treatment Parameters as Predictors of Treatment Outcome

Apart from demographic variables, the format and context of treatment may impact treatment outcome, and the optimal treatment parameters may differ for diverse groups. Preliminary evidence regarding treatment length has shown inconsistent results. Two studies suggest longer treatments show better outcome, including one study that compared a longer form of BED treatment (16 sessions) to a shorter form (8 sessions) (Schlup, Meyer, & Munsch, 2010), and another that examined the response of initial non-responders in extended-length CBT (Eldredge et al., 1997). In contrast, a recent controlled study found that a 10-month sequence of CBT followed by Behavioral Weight Loss (BWL) was not significantly superior to 6-month courses of either CBT or BWL alone (Grilo, Masheb,

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Wilson, Gueorguieva, & White, 2011). Protocol treatments for BED range from 8 to 24 weeks in length; it is important to identify moderators of the effect of treatment length, i.e., certain types of individuals who obtain particular benefit from brief or extended treatment (Eldredge et al., 1997; Wilson et al., 2010). Given the public health importance of disseminating cost-effective treatments, and the observed pattern of early termination among ethnic/racial minorities with other disorders, it is important to examine whether treatment length in fact predicts outcome from BED, and whether race/ethnicity and education moderate this effect.

The relative benefit of group vs. individual therapy on retention and outcome in BED has received little attention compared to other disorders (Aderka, 2009; Saksa, Cohen, Srihari, & Woods, 2009; Weiss, Jaffee, de Menil, & Cogley, 2004). A single study comparing group and individual cognitive behavioral therapy (CBT) for BED found participants who received individual CBT were more likely to show binge eating remission after 20 weeks (Ricca et al. 2010). In contrast, one study of group vs. individual obesity treatment found that group format predicted greater weight loss, regardless of participants' preferences for treatment format (Renjilian, Perri, Nezu, McKelvey, Shermer, & Anton, 2001). Individual treatment is easier to implement in many treatment settings; however, group treatment is more cost-effective (Ricca et al., 2010). Generalizable research examining moderators of group vs. individual treatment, as well as their relative effects, would be useful to treatment providers and individuals with BED, particularly in relation to underserved and under-resourced populations.

Treatments with a self-help component have garnered significant attention but inconsistent results among BED researchers, in part due to different methods of self-help administration. In one study of individual therapist-guided self-help compared to unguided self-help (Loeb, Wilson, Gilbert, & Labouvie, 2000), binge eating showed significantly more improvement in the guided self-help condition than unguided self-help, but differences in binge eating remission rates were not found. One study comparing therapist-led, therapist-assisted, and unguided self-help CBT found no differences among the three groups, although sample sizes were small (Peterson, Mitchell, Engbloom, Nugent, Mussell, & Miller, 1998). A more recent, larger study with similar conditions found significantly greater improvement in binge eating frequency for therapist-led group CBT and therapist-assisted group CBT than unguided self-help, but again, found no significant differences in binge eating remission rates (Peterson, Mitchell, Crow, Crosby, & Wonderlich, 2009). To date, only CBT self-help approaches have been studied, and the relative benefit of different levels of therapist assistance is not clear. Though treatment approaches with a self-help component are cited as cost-effective, and therefore of possible utility for underserved populations, none of the studies cited above assessed whether SES/education or race/ethnicity predicted or moderated outcome.

The purpose of this study was to examine the relative influence of two demographic variables (race/ethnicity and education), and three treatment parameters (treatment length, group vs. individual, and self-help vs. therapist-led) on the outcome of psychosocial treatment trials for BED. We elected to examine these variables together in order to a) examine whether race/ethnicity and education moderated the effects of treatment length and

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treatment parameters on treatment outcome; and b) examine race/ethnicity and education as predictors of outcome while controlling for the potentially significant covariation of treatment parameters. This examination of moderator and predictor variables that have not been studied to date has potential implications for treatment development and modification. As the prevalence of racial/ethnic minorities with BED is substantial, determining whether there are elements of treatment that may be differentially beneficial will impact the fine-tuning of existing treatment options or the design of tailored interventions.

Method

Participants

A thorough search for data appropriate for inclusion was conducted, including a literature search using online databases (e.g., CRISP; Clinicaltrials.gov; PubMed), in order to locate all the studies of BED that met the following criteria: (a) was a randomized, controlled trial; (b) included a psychosocial intervention arm; (c) included > 10 participants overall and presence of participants from African American or Hispanic/Latino racial/ethnic groups; (d) was either published in a peer reviewed journal or funded through a peer review process and; (e) was conducted in the United States (see also Franko et al., 2011, for original report on methods). Fourteen studies were identified through the search, some of which were multi-site studies. All investigators were approached for participation, and twelve were able to participate. One study was not included due to complications with the Institutional Review Board process; one study was not included because the original study data were no longer available. A database including de-identified outcome data for N=1138 individual participants in clinical trials for BED was created, termed the “Clinical Trials of Binge Eating Disorder” (CT-BED) database (Devlin et al., 2005; Gorin, Le Grange, & Stone, 2003; Grilo & Masheb, 2005; Grilo, Masheb, & Salant, 2005; Grilo, Masheb, & Wilson, 2005; Kristeller, 2007; Peterson et al., 2009; Safer, Robinson & Jo, 2010; Shapiro, Reba-Harrelson, Dymek-Valentine, Woolson, Hamer, & Bulik, 2007; Wilfley et al., 2002; Wilson, Wilfley, Agras, & Bryson, 2010). Data from eleven of the twelve trials were used for analyses described here, because one trial did not include the outcomes of interest (Shapiro et al., 2007). Written informed consent was obtained from all participants after description of the study. The current analyses included all participants who received an active form of psychotherapy, i.e., participants in waiting list, assessment-only, and supportive control groups were excluded from analyses. Psychosocial treatments included CBT, interpersonal therapy, dialectical behavior therapy, couples therapy, mindfulness therapy, and others. Although the treatments had varying emphases, they all included discussion of the antecedents of binge eating, interventions directed toward identifying psychological triggers for binge eating, and strategies to avoid binge eating. The Human Subjects Review committees of each of the original data sites, as well as the principal investigators’ institutions (Boston University and Northeastern University), approved the inclusion of data from the original trials in this study. (See also Franko et al., 2011, for additional details.)

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Measures[1]

Demographic Information—All studies collected sex, racial/ethnic information, and education status. Racial/ethnic information was self-reported in the original trials, and recoded into the current categories "Caucasian," "African American," and "Hispanic/Latino." Participants from other racial/ethnic groups were not recoded or included in analyses. These broad categories, encompassing diverse subpopulations, were chosen both to reflect previous research concerning BED and treatment outcome (Alegria et al., 2007; Fortuna et al., 2010) and to provide adequate power for statistical tests. Education was chosen as an important predictor of outcome and as a proxy for SES because data were collected at distinct geographic locations in the United States with different average household incomes and different price indices, and because education has been found to be a better predictor of health-related outcomes than income (Ross & Mirowsky, 1999). Education was coded in the original studies in multiple ways and could not be examined as a continuous variable. For this study, education was dummy-coded as 1 = high school/GED or less, and 2 = some college or more. We chose a break point after the high school level to capture important variance in education based on prior examination of epidemiological data concerning BED (Franko et al., 2011).

Body Mass Index—In each study, participants' height was measured using a stadiometer and weight was measured using a balance beam scale by study personnel, from which BMI (kg/m^2) was calculated.

Eating Disorder Symptoms—The treatment trials employed the Eating Disorder Examination (Fairburn & Cooper, 1993), a semi-structured investigator-based interview to assess BED and its features, including number of objective bulimic episodes (OBEs; i.e., eating unusually large quantities of food while experiencing loss of control, which corresponds to the DSM-IV definition of binge eating). The EDE yields four subscale scores —Restraint, Eating Concern, Weight Concern, and Shape Concern—as well as a Global Score that is an average of all four scales. The EDE has shown acceptable psychometric properties with BED (Grilo, Masheb, Lozano-Blanco, & Barry, 2004) and performs well with racial and ethnic minority groups (Grilo, Lozano, & Elder, 2005). Two of the trials (Gorin et al., 2003; Kristeller, 2007) utilized the questionnaire version of the EDE (EDE-Q) (Fairburn & Beglin, 1994) rather than the interview, and made BED diagnoses using the Structured Clinical Interview for Axis I DSM-IV Disorders (First, Spitzer, Gibbon, & Williams, 1996). Studies have documented acceptable levels of agreement between the EDE-Q and EDE on frequency of OBEs and scale scores among patients with BED (Grilo, Masheb, & Wilson, 2001a, 2001b), though they have also observed limitations to the agreement between versions of the instrument. Examination of the ethnic/minority representation, education levels, and treatment parameters at the two sites that utilized the EDE-Q indicated that inclusion of data from these sites would not introduce a systematic bias in the variables of interest. The frequency of OBEs, the remission of OBEs, and the Global EDE score (assessed for the 28 days prior to termination assessment) were used as outcome measures.

[1]Information regarding baseline measures is reprinted from Franko et al., 2011.

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Treatment Parameters and Treatment Completion—Data concerning the number of sessions, whether treatment was delivered in a group or individual format, and whether the treatment intervention was primarily self-help or primarily therapist-led were drawn from the original published studies and direct communication with investigators. Each participant's completion or dropout status was recorded in the original databases and aggregated in the CT-BED database.

Statistical Analysis

Mixed-model analyses were used to examine factors associated with variance in treatment outcomes. The treatment outcomes, measured at post-treatment, were trial dropout (coded as 1 = stopped participating prior to post-treatment measurement vs. 0 = continued to participate), OBE (count of OBEs in the past 28 days), OBE remission (coded as 1 = no OBEs in the past 28 days vs. 0 = greater than zero OBEs in the past 28 days), and EDE global scale score. The analytic covariates (i.e., potential predictors of treatment outcomes) were race/ethnicity (Caucasian, African American or Hispanic/Latino), education (coded as 1 = high school/GED or less, and 0 = some college or more), age, baseline BMI, length of treatment (weeks) and type of treatment represented using four categories (self-help and therapist-led x individual and group). Thus the four treatment categories were labeled "self-help/group," "self-help/individual," "therapist-led/group," and "therapist-led/individual." To assess moderators, interactions were tested between the three racial/ethnic categories (African American, Latino/Hispanic, Caucasian), education level and the three treatment variables (self-help vs. therapist-led, group vs. individual, and treatment length), as well as between the treatment variables and education and age. A separate model was created for each outcome variable at post-treatment. The outcome variable measured at baseline was included as an adjustment variable in the models, so that differences in post-treatment outcomes could be interpreted as holding constant the outcome measured at baseline (baseline OBE was included as a measure of baseline severity in the model of dropout).

The observations (participants) were not independent, as subgroups of participants were treated at the same study site, and potentially had similarities due to geography, recruitment methods, etc. To account for this lack of independence, confidence intervals were adjusted (Wolter, 1985) and statistical tests were conducted using mixed models, in which the dataset was treated as if it were a multi-site clinical trial (Brown & Prescott, 1999) with a random intercept for site. Multiple imputation was used to handle missing data (Allison, 2001). Statistical tests were conducted with measures on their original scale, except that OBE frequency was log transformed prior to analysis due to a non-normal residual distribution. Although other meta-analytic approaches could have been used, mixed models were chosen because this method accounts for the non-independence of observations within sites, allows for co-variation of important associated variables, and enables multiple imputation to handle missing data.

All reported results were significant at $p < 0.05$. OBE and EDE global were modeled as continuous (using PROC MIXED in SAS 9.1, SAS Institute, Cary, NC) and OBE remission and dropout were modeled as binary using logistic regression (PROC NLMIXED in SAS).

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Cohen's *d*, interpreted as the standardized group difference in post-treatment outcomes (holding constant the other covariates), was used to estimate effect sizes in the models of the continuous outcomes, such as frequency of OBEs and EDE global score (*d* values around 0.2 are considered "small," 0.5 are "medium," and 0.8 are "large"; Bedard, Krzyzanowska, Pintilie, & Tannock, 2007). In the models of OBE remission and dropout, the odds ratio, interpreted as the group difference in odds of being in one post-treatment outcome category vs. the other (holding constant the other covariates), was used to estimate effect sizes (odds ratios around 1.3 have been considered "small," 1.5 are "medium" and 2.0 are "large"; Bedard et al., 2007). For BMI, age, and length of treatment, which were modeled as continuous, groups for effect size purposes were defined by first identifying participants who were above vs. below the covariate median, then using the covariate mean within each category to define the distance between groups.

Results

A total of 1,073 CT-BED participants met the analysis inclusion criteria including $n = 946$ Caucasian, $n = 79$ African American, and $n = 48$ Hispanic/Latino participants. Table 1 summarizes descriptive statistics for each outcome variable and analytic covariate, by time of measurement (baseline vs. post-treatment).

Baseline Severity Covariates

Although the relationship between baseline BED severity and treatment outcome was not the focus of the study, several significant results emerged worthy of notice. The frequency of OBEs at baseline was a significant predictor of the frequency of OBEs at post-treatment ($p < .0001$) and global EDE score at baseline was a significant predictor of global EDE score at post-treatment ($p < .0001$); however, baseline OBEs were not a significant predictor of treatment retention or OBE remission. Participants with higher BMI at baseline had significantly higher EDE global scores at post-treatment ($d = 0.13$, $p < 0.01$).

Moderator Analyses

As noted, multivariate, mixed model analyses were used to examine the relative associations of multiple covariates to each outcome. The moderator analyses, tested through interaction terms between race/ethnicity, education, age, and the treatment variables, yielded no significant results. There was no evidence that participants differing by race/ethnicity, education level, or age showed systematically different response to treatment approaches.

Demographic Predictors

Because the tested interaction terms were not significant, the final models included main effects only (no interactions). Table 2 shows parameter estimates, hypothesis tests, and effect size estimates for the analytic covariates in the model of each outcome. African American and Hispanic/Latino participants are compared to Caucasians as the reference group. Additional analyses testing for differences between African American and Hispanic/Latino participants yielded no significant results (p values > 0.10) but are not discussed due to the small sample size in these groups.

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Regarding race/ethnicity, African Americans were more likely to drop out than Caucasians (OR = 2.28, $p < 0.01$), with this analysis showing a large effect. African Americans showed significantly lower EDE global scores at post-treatment compared to Caucasians ($d = 0.21$, $p < 0.05$), indicating better treatment outcome on cognitive measures, although the effect size was small. Hispanic/Latino race/ethnicity did not predict differences in treatment outcome or treatment retention relative to Caucasians.

Regarding education level, having more than a high school education was significantly associated with fewer post-treatment OBEs ($d = 0.23$, $p < 0.05$) and higher likelihood of OBE remission at post-treatment (OR = 1.79, $p < 0.01$), compared to having a high school education or less.

Age was a significant predictor of OBEs at post-treatment ($d = 0.15$, $p < 0.05$), OBE cessation (OR = 1.26, $p < 0.05$) and dropout (OR = 1.35, $p < 0.01$), although the size of the age effects were small. Older age predicted greater reduction in OBEs at post-treatment, greater rates of OBE cessation at post-treatment and lower dropout rates.

Treatment Parameter Predictors

As Table 2 shows, longer treatment was associated with significantly fewer OBEs ($d = 0.41$, $p < .05$) and lower EDE global scores at post-treatment ($d = 0.51$, $p < .05$), as well as greater likelihood of OBE remission (OR = 2.60, $p < .01$). Race/ethnicity was not associated with length of treatment (Kruskal-Wallis test, p=0.79).

Compared with the modal treatment category, which was therapist-led/group, self-help/group was associated with poor outcomes: higher global EDE at post treatment ($d = 0.38$, $p < 0.05$), lower rates of OBE remission (OR = 3.58, $p < 0.005$) and greater dropout rates (OR = 3.05, $p < 0.01$). Post-hoc tests also indicated self-help/group was associated with lower rates of OBE remission compared to self-help/individual (OR = 2.82, $p < 0.05$) and higher dropout rates compared with therapist-led/individual (OR = 2.50, $p < 0.05$). Only Caucasians were in self-help/group treatment; for the other treatments, all racial/ethnic categories were represented in proportions similar to the racial/ethnic distribution in the total sample.

Discussion

This study investigated the independent variance accounted for by race/ethnicity, education level, age, and treatment parameters (length and format) in outcomes using aggregated data from eleven clinical trials of psychosocial treatments for BED. In multivariate analyses accounting for baseline severity, demographic variables did not moderate the effect of group vs. individual treatment or treatment length. However, demographic variables and treatment parameters showed direct independent associations to treatment retention and treatment outcome as measured by frequency of OBEs, global EDE score, and OBE remission at post-treatment.

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Race/Ethnicity

Race/ethnicity significantly predicted dropout from treatment. Multivariate analysis indicated that African American participants were more than twice as likely to drop out than Caucasians. Descriptive statistics indicated that more than 1/3 of African American participants in clinical trials dropped out, whereas less than 1/4 of Caucasians dropped out. Hispanic/Latino participants did not show significant differences from Caucasians, and dropout rates for Hispanic/Latinos fell between those of Caucasians and African Americans.

Racial/ethnic group membership did not show large effects on post-treatment BED symptom levels. Across three outcome variables, only one significant relationship emerged, indicating African Americans showed significantly lower post-treatment global EDE scores (relative to Caucasians), reflecting a better outcome for cognitive concerns with weight, shape and eating characteristic of BED. However, the size of this effect was small. Hispanic/Latino race/ethnicity did not predict any post-treatment BED symptom variable in multivariate analyses, although the small number of Hispanic/Latino participants limited the power to detect effects.

These findings concerning race/ethnicity and treatment outcome are of importance to the field. Because African Americans and Hispanic/Latinos with BED are observed to seek treatment less often than Caucasians with similar symptoms (Marques et al., 2011), and few studies have examined treatment outcome among ethnic minorities with BED, the finding that many observed treatment effects appear similar is of crucial importance to the development of public health and outreach programs. These results are consistent with preliminary data suggesting an established treatment (behavioral weight loss) can be effective with Spanish-speaking obese Hispanics with BED (Grilo, 2011). However, our data indicating African Americans are less likely to complete treatment suggests that obstacles to treatment completion must be identified and addressed to promote successful outcomes among this group in particular. Detailed studies of treatment under-utilization and higher dropout among African Americans with other disorders have suggested that culturally-specific attitudes toward psychological treatments or psychological disorders may play a role (Bender et al., 2007; Fortuna et al., 2010; Milligan et al., 2004). Moreover, Bender and colleagues (2007) found that a positive support alliance factor was associated with the amount of individual psychotherapy utilized by African-American and Hispanic/Latino patients. However, it is also possible that logistic or other issues (e.g., transportation) may have affected retention.

Despite the significance of these findings, it is important to note that even when the majority of data from clinical trials of BED in the United States are aggregated, the representation of individuals from racial/ethnic minority groups and with lower levels of educational attainment is barely adequate to establish stable estimates of effect or to test interactions between race/ethnicity or education and treatment parameters. Additional clinical research with these groups—who are actually overrepresented in the general population with BED—are very much needed to guide treatment decisions for these populations. It was not possible to accurately estimate the power to detect effects prior to data aggregation, and post-hoc power analysis is of questionable utility (see Hoenig & Heisey, 2001). However, to illustrate the limitations to the power to detect ethnic/racial differences, the calculated power to detect

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the largest ethnic effect found in this study (i.e., the association between African American ethnicity and dropout) was 0.798. Though this is a conventionally acceptable level of power, the power to detect other racial/ethnic effects would be smaller, especially in tests of differences involving the Hispanic/Latino group. Therefore due to the limitations of the available data, our analyses may have failed to detect some effects of medium or small sizes, or specifically differences in response between Hispanic/Latino and Caucasian participants.

The two main findings concerning African American participants—higher drop out rates and larger reductions in EDE scores—merit additional consideration, given the apparent contradiction between these findings. One possible explanation is that African American participants who were not experiencing substantial reductions in symptoms were more likely to drop out of treatment and be lost to follow-up; another possible explanation is that African Americans who experienced substantial reductions in symptoms early in treatment felt less need to complete treatment given their positive response (Fortuna et al., 2010; Lester et al., 2010). Both principles may also have been operating simultaneously. Additionally, although African Americans in this treatment-seeking sample were not observed to have lower shape and weight concerns at baseline (Franko et al., 2011), multiple studies suggest that the severity and nature of body image concerns show cultural differences associated with racial/ethnic group membership (e.g., Baskin, Ahluwalia, & Resnicow, 2001; Padgett & Biro, 2003; Wildes, Emery, & Simons, 2001). It is possible that cultural differences in body satisfaction or ideal body shape render shape and weight concerns more malleable among African Americans in treatment for BED as well. Additional research concerning reasons for drop out among African Americans is needed in order to promote treatment retention.

Educational Attainment

A lower level of educational attainment—specifically, having educational attainment at the high school/GED level or less—was found to independently and significantly predict more frequent post-treatment OBEs and failure to attain OBE remission in multivariate analyses. For example, participants with a high school/GED level education or less were 1.79 times more likely to continue to experience OBE symptoms post-treatment than those with higher levels of education. It is important to note that prior analyses of the same data indicated that the Hispanic/Latino participants in this dataset were more likely to have lower levels of education (Franko et al., 2011), and therefore this effect may have disproportionately affected Hispanic/Latino participants. Low SES is a risk factor for BED, and the majority of individuals with BED in the general community are observed to have lower levels of educational attainment relative to the majority of individuals treated in clinical trials (Franko et al., 2011). The primary treatment settings for clinical trials (i.e., specialty clinics and academic research settings) may not be optimal for treating individuals with lower levels of educational attainment. Furthermore, the treatments studied in these trials may not be well suited for those with limited education or fluency levels. For example, treatments such as CBT and DBT require consistent written homework and the self-help treatment methods require fairly advanced reading comprehension (Fairburn, 1995). Alternatively, related variables associated with lower levels of education unexamined in this study (e.g., factors pertaining to limited financial or social resources, such as place of residence or specific

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stressors) may help explain this finding. It is important to consider modifications to typical BED treatments that might promote symptom remission in this group, as well as obstacles to OBE reduction and remission that are associated with educational level or income.

Treatment Length

Longer treatment was associated with better BED symptom outcome across all outcome metrics, including post-treatment OBE frequency, global EDE score, and OBE remission. Large effect sizes were observed for all these associations. Descriptive statistics indicated that 56% of those receiving 20 sessions or more attained OBE remission, whereas only 35% of those receiving less than 20 sessions attained OBE remission. Furthermore, treatment length was not significantly associated with dropout, suggesting that clinical trial participants were similarly likely to complete shorter and longer treatment protocols. Moderator analyses did not indicate that shorter or longer treatment was more or less beneficial to racial/ethnic minorities and individuals with less education in this sample. Our findings of increased benefit to treatment of longer duration are consistent with results from another RCT suggesting additional benefit for longer CBT (Schlup et al., 2010), but are contrary to those from an RCT suggesting a longer, sequential treatment did not improve outcomes for BED relative to CBT or BWL (Grilo et al., 2011). Our analyses relied on statistically controlling for some of the diverse ways in which the different psychosocial treatments were delivered across studies (e.g., group/individual, self-help/therapist-led, length), whereas the study by Grilo and colleagues (2011) experimentally held these and other factors (e.g., therapist-level and training) constant. Further research is needed to reliably identify those who show adequate benefit from shorter treatment.

Treatment Format

Our results suggested that the approach with the least amount of therapist contact produced relatively poorer outcomes. Participants receiving self-help in a group format were 3.05 times more likely to drop out and 3.58 times more likely to continue binge eating at termination than those in a therapist-led group. Self-help/group treatment was also associated with less likelihood of OBE remission than self-help/individual treatment, and greater likelihood of dropout than therapist-led/individual treatment. These findings extend prior studies indicating that unguided-self-help is less effective than guided-self-help and therapist-led treatments for reducing binge eating (Loeb et al., 2000; Peterson et al., 2009). Collectively, our findings are consistent with the view that guided-self-help CBT is comparable to therapist-led CBT.

On a methodological level, our findings demonstrate the importance of carefully considering covariates in the assessment of predictors of outcome. It is now well-accepted that basic patient factors comprising moderators of treatment effect—such as demographic factors and baseline severity—are important to assess and covary in treatment outcome analysis (Kraemer et al., 2002; Laurenceau, Hayes, & Feldman, 2007). Furthermore, race/ethnicity and SES should be considered in combination to elucidate the relative effects of each factor (Farmer & Ferraro, 2005; Navarro, 1991), given their potential confound in many regions, and the health disparities that may result from either racial/ethnic or socioeconomic status. Our analyses also indicate that treatment parameters—such as the number of treatment

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sessions and treatment format—may have significant relationships to outcome, and therefore should be considered in multivariate analyses in studies of treatment outcome.

Limitations

The most significant limitation to the current study is the relatively small size of the minority ethnic/racial subsamples, particularly the Hispanic/Latino subsample, which limited power to detect effects for these group. Prior to this study, not all of the clinical trials included in the database were published, some published manuscripts did not include detailed racial/ethnic data, and the amount of follow-up data collected on the ethnic minority participants was not known. Therefore, there was little information regarding the amount of treatment data collected to date on racial/ethnic minorities with BED. We consider this study to yield new, important information about the lack of treatment data concerning ethnic/racial minorities with BED, and the importance of collecting additional data for these groups. Furthermore, given the sample size, the reported significant findings are of note. However, the generalizability of the participants in clinical trials to other ethnic/racial minorities in treatment in other settings is not known, and (as noted) sample sizes limited the power to detect small or medium sized effects and to draw strong conclusions, particularly regarding negative findings. Limitations or variability in language proficiency may also have impacted our ability to detect findings for the Hispanic/Latino subsample.

Additional limitations pertain to the generalizability the data, as treatment was conducted at specialty clinics, in treatment studies, and may not be applicable to those who seek treatments at other settings or different types of treatment (e.g., pharmacological) where different patterns of predictors/moderators may exist (Grilo, Masheb, & Crosby, in press). Although the psychosocial treatments shared many characteristics, there may also be important differences that were obscured by data aggregation. Subsamples of participants from different study sites may have differed in important ways that were unknown to us. As much as possible, we attempted to control for possible differences that may have impacted outcome, such as baseline severity and BMI. Analyses were also limited to the variables collected at all sites and variables that may be related to treatment outcome among ethnic/racial minorities and individuals from low SES groups, such as therapist ethnicity and therapeutic alliance, were not collected at all sites and could not be analyzed.

Implications

These findings have important implications for the delivery of services to individuals with BED across treatment settings. This study suggests that although treatment outcome was similar among racial/ethnic groups, the issue of treatment completion among African Americans in particular may require additional attention when developing treatments for BED. Moreover, effective treatments for less educated groups and additional research including more individuals from lower SES groups are much needed.

Acknowledgments

This study was supported by two grants from the National Institutes of Health/National Institute of Mental Health. R03MH083987 provided support to all authors for study conduct, data management and analysis, and manuscript preparation and review. K23MH71641 provided support to the first author for design and conduct of the study; interpretation of the data; and preparation of the manuscript.

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Dr. Wilfley is an advisory board member and has received a consulting fee from Wellspring Healthy Living Academy and the Childhood Obesity Initiative of the United Health Group. Dr Crow has research grants from Alkermes and Shire Inc.

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Table 1

Mean (95% CI), sample size and percent change over time by outcome variable, time of measurement (baseline vs. post-treatment) and analytic covariate.

Analytic covariate	OBE			EDE global			OBE cessation[a]	Dropout
	Baseline	Post-treatment	% change	Baseline	Post-treatment	% change	post-treatment	Post-treatment
Ethnicity								
Caucasian	19.3 (17.4, 21.3), 939	4.4 (2.3, 6.5), 793	−77.2%	2.8 (2.7, 3.0), 941	2.1 (1.8, 2.4), 795	−25.0%	48.0% (34.4%, 61.6%), 795	22.3% (14.7%, 29.9%), 946
African American	19.6 (16.9, 22.2), 78	4.8 (2.6, 7.1), 69	−75.5%	3.0 (2.7, 3.3), 79	2.0 (1.7, 2.3), 61	−33.3%	46.8% (36.3%, 57.4%), 69	36.7% (29.6%, 43.8%), 79
Hispanic	17.5 (11.9, 23.1), 47	4.4 (2.5, 6.3), 43	−74.9%	3.3 (3.0, 3.6), 48	2.4 (1.9, 2.9), 41	−27.3%	43.8% (25.1%, 62.4%), 43	29.2% (16.5%, 41.8%), 48
Age								
< 46	19.3 (16.7, 21.9), 475	5.1 (2.7, 7.5), 397	−73.6%	3.0 (2.8, 3.2), 475	2.2 (1.9, 2.5), 381	−26.7%	45.0% (44.1%, 45.9%), 397	27.0% (26.6%, 27.4%), 478
≥ 46	19.2 (17.6, 20.9), 589	3.9 (2.2, 5.7), 508	−79.7%	2.8 (2.6, 2.9), 593	2.0 (1.8, 2.3), 516	−28.6%	49.9% (36.6%, 63.3%), 510	21.0% (20.8%, 21.2%), 595
Education								
High school/GED or less	19.6 (15.6, 23.6), 144	6.2 (3.3, 9.0), 115	−68.4%	2.9 (2.7, 3.1), 146	2.3 (2.0, 2.7), 118	−20.7%	34.2% (16.3%, 52.1%), 116	31.0% (18.7%, 43.4%), 147
Some college or more	19.2 (17.5, 21.0), 887	4.2 (2.3, 6.0), 772	−78.1%	2.9 (2.7, 3.0), 889	2.1 (1.8, 2.3), 760	−27.6%	49.9% (37.5%, 62.3%), 773	22.5% (16.0%, 29.0%), 893
Baseline BMI								
< 40	18.9 (17.0, 20.8), 700	4.2 (2.4, 6.1), 595	−77.8%	2.9 (2.7, 3.1), 699	2.1 (1.8, 2.3), 587	−27.6%	48.7% (36.4%, 61.0%), 596	24.6% (18.3%, 31.0%), 704
≥ 40	19.9 (17.6, 22.2), 363	4.8 (2.6, 7.0), 310	−75.9%	2.8 (2.7, 3.0), 368	2.2 (1.9, 2.5), 310	−21.4%	45.9% (30.5%, 61.3%), 311	21.8% (11.9%, 31.7%), 368
Treatment length								
<20 weeks	16.6 (13.4, 19.8), 416	5.9 (3.9, 7.8), 345	−64.5%	2.9 (2.6, 3.2), 420	2.5 (2.2, 2.8), 349	−13.8%	35.1% (22.9%, 47.2%), 345	29.2% (19.9%, 38.5%), 425
≥20 weeks	21.0 (19.9, 22.1), 648	3.5 (1.0, 6.0), 560	−83.3%	2.8 (2.7, 3.0), 648	1.9 (1.7, 2.1), 548	−32.1%	56.0% (40.5%, 71.6%), 562	20.1% (11.2%, 28.9%), 648
Self-help or guided self-help (GSH) treatment vs. other treatment, by group vs. individual								
Self-help/GSH, group	22.4 (19.2, 25.7), 67	8.7 (5.6, 11.7), 40	−61.2%	2.7 (2.7, 2.7), 67	2.3 (2.1, 2.5), 40	−14.8%	17.9% (17.4%, 18.4%), 40	40.3% (39.4%, 41.2%), 67
Self-help/GSH, individual	20.1 (16.4, 23.8), 161	4.6 (1.5, 7.7), 132	−77.1%	2.6 (2.6, 2.7), 161	1.9 (1.5, 2.4), 132	−26.9%	49.8% (36.1%, 63.5%), 132	26.1% (25.8%, 26.4%), 161

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Analytic covariate	OBE			EDE global			OBE cessation[a]	Dropout
	Baseline	Post-treatment	% change	Baseline	Post-treatment	% change	post-treatment	Post-treatment
Other treatment, group	18.5 (15.8, 21.2), 609	4.5 (1.9, 7.0), 534	−75.7%	3.0 (2.7, 3.2), 614	2.1 (1.7, 2.5), 527	−30.0%	48.5% (46.6%, 50.4%), 534	22.7% (22.1%, 23.2%), 618
Other treatment, individual	19.8 (17.4, 22.3), 227	3.0 (1.6, 4.4), 199	−84.8%	2.8 (2.7, 3.0), 226	2.1 (1.7, 2.6), 198	−25.0%	52.9% (52.1%, 53.6%), 201	19.8% (19.7%, 20.0%), 227

[a]Both OBE cessation and dropout were 0 at baseline, therefore percent change compared with baseline was not meaningful for these measures.

Note: The displayed means and confidence intervals were adjusted to account for missing data (via multiple imputation) and non-independence of observations within study site.

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Table 2

Model parameter estimates and estimated effect sizes in the models of each post-treatment outcome variable.

Outcome	Parameter	Estimate[f]	SE	P-value	Effect size[g]
Dropout[e]	Intercept	−1.07	0.47	0.0216	n/a
	OBE (baseline)	0.01	0.01	0.1915	n/a
	BMI (baseline)	−0.01	0.01	0.3309	n/a
	African American[a]	0.83	0.26	0.0018	2.28
	Hispanic[a]	0.45	0.36	0.2094	n/a
	HS/GED or less[b]	0.35	0.21	0.0973	n/a
	Treatment length	−0.09	0.05	0.0598	n/a
	Age (years)	−0.02	0.01	0.0061	1.35
	Self-help, group[c]	1.11	0.40	0.0057	3.05
	Self-help, individual	0.63	0.36	0.0823	n/a
	Therapist-led, individual	0.20	0.40	0.6250	n/a
EDE global at post-treatment	Intercept	0.51	0.20	0.0128	n/a
	EDE global (baseline)	0.49	0.03	<.0001	n/a
	BMI (baseline)	0.01	<0.01	0.0076	0.13
	African American[a]	−0.22	0.10	0.0377	0.21
	Hispanic[a]	0.04	0.15	0.7750	n/a
	HS/GED or less[b]	0.15	0.09	0.1171	n/a
	Treatment length	−0.07	0.01	<.0001	0.51
	Age (years)	<0.01	<0.01	0.4826	n/a
	Self-help, group[c]	0.39	0.18	0.0310	0.38
	Self-help, individual	0.09	0.12	0.4394	n/a
	Therapist-led, individual	0.29	0.13	0.0194	0.29
OBE at post-treatment	Intercept	3.70	1.62	0.0261	n/a
	OBE (baseline)	0.10	0.02	<.0001	n/a
	BMI (baseline)	−0.01	0.04	0.8580	n/a
	African American[a]	0.48	0.84	0.5655	n/a

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Outcome	Parameter	Estimate[f]	SE	P-value	Effect size[g]
	Hispanic[a]	0.66	1.15	0.5705	n/a
	HS/GED or less[b]	1.41	0.64	0.0292	0.23
	Treatment length	−0.39	0.18	0.0336	0.44
	Age (years)	−0.06	0.03	0.0229	0.15
	Self-help, group[c]	2.54	1.38	0.0716	n/a
	Self-help, individual	1.37	1.31	0.3029	n/a
	Therapist-led, individual	1.52	1.66	0.3721	n/a
OBE remission[d]	Intercept	−0.11	0.42	0.7984	n/a
	OBE (baseline)	−0.01	0.01	0.1864	n/a
	BMI (baseline)	<0.01	0.01	0.7643	n/a
	African American[a]	−0.07	0.26	0.8006	n/a
	Hispanic[a]	−0.32	0.32	0.3301	n/a
	HS/GED or less[b]	−0.58	0.21	0.0047	1.79
	Treatment length	0.14	0.05	0.0042	2.60
	Age (years)	0.02	0.01	0.0165	1.26
	Self-help, group[c]	−1.27	0.41	0.0019	3.58
	Self-help, individual	−0.24	0.31	0.4480	n/a
	Therapist-led, individual	−0.45	0.36	0.2091	n/a

[a] Reference level is Caucasian. Direct comparisons between African American and Hispanic/Latinos were conducted but nonsignificant.

[b] Reference level is some college or more.

[c] Reference level for treatment is therapist-led/group.

[d] Coded as 1 = no binge eating episodes in the last 30 days, at post-treatment, vs. 0 = one or more episodes of binge eating in the last 30 days, at post-treatment

[e] Coded as 1 = stopped participating the in trial at post-treatment vs. 0 = continued to participate at post-treatment.

[f] Estimates and SE are on the logit (log of odds) scale for OBE cessation and dropout and on the raw scale for all other variables.

[g] Effect sizes are expressed as Cohen's d for OBE and EDE global, or the odds ratio (OR) for OBE cessation and dropout (OR where the coefficient is ≥1, or 1/OR where the coefficient is <1).

Effect size estimates are presented for all significant effects except the intercept and outcome at baseline (OBE is a proxy outcome for dropout because there is no dropout measure at baseline).