Published in final edited form as:
Gen Hosp Psychiatry. 2013 ; 35(6): . doi:10.1016/j.genhosppsych.2013.07.010.

Sex Differences in Biopsychosocial Correlates of Binge Eating Disorder: A Study of Treatment-Seeking Obese Adults in Primary Care Setting

Tomoko Udo, Ph.D.[1], **Sherry A. McKee, Ph.D.**[1], **Marney A. White, Ph.D., M.S.**[1], **Robin M. Masheb, Ph.D.**[1], **Rachel D. Barnes, Ph.D.**[1], and **Carlos M. Grilo**[1]
[1]Department of Psychiatry, Yale University School of Medicine, New Haven, Connecticut, USA

Abstract

Objective—Although community-based studies suggest equivalent levels of physical and psychological impairment by BED in men and women, men with binge eating disorder (BED) are still underrepresented in clinical studies. This study aimed to provide a comprehensive analysis of sex differences in biopsychosocial correlates of treatment-seeking obese patients with BED in primary care.

Method—One-hundred-ninety obese adults (26% men) were recruited in primary care settings for a treatment study for obesity and BED.

Results—Very few significant sex differences were found in the developmental history and in current levels of eating-disorder features, as well as psychosocial factors. Women reported significantly earlier age at onset of overweight and dieting, and greater frequency of dieting. Men reported more frequent strenuous exercise. Men were more likely than women to meet criteria for metabolic syndrome (MetS); men were more likely to show clinically elevated levels of triglycerides, blood pressure, and fasting glucose levels.

Conclusion—Despite few sex differences in behavioral and psychosocial factors, metabolic problems associated with obesity were more common among treatment-seeking obese men with BED than women. The findings highlight the importance of including men in clinical studies of BED, and active screening of BED in obese men at primary care settings.

Keywords

binge eating; obesity; metabolic syndrome; gender; sex differences

1. Introduction

Binge eating disorder (BED) is defined by recurrent binge eating without inappropriate compensatory weight-control behaviors [1]. The life time prevalence of BED is estimated at

Correspondence: Tomoko Udo, Yale University School of Medicine, 2 Church Street South, Suite 109, New Haven, CT. 06519. tomoko.udo@yale.edu.

The authors report no conflicts of interest or any competing interests. Dr. Grilo reports that he receives royalties from Guilford Press and Taylor and Francis Books (for academic books).

2.8% in the United States [2]. BED is associated strongly with the severity of obesity and with increased risk for broad psychosocial impairment [2]. BED, a research category in the *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.; DSM-IV) [1], will be a formal diagnosis in the *DSM-5* (www.dsm5.org). Unlike other forms of eating disorders, BED is commonly reported in men (2.5% in men vs. 3.0% in women) [2]. In contrast to the prevalence data for BED [2], men are underrepresented in clinical studies of treatment-seeking individuals with BED [3]. Two recent large-scale community-based studies reported only a few sex differences in physical and psychosocial impairment in relation to objective binge eating [4, 5]. This suggests that BED may affect health of men and women equivalently, and underrepresentation of men in clinical studies may not indicate less impact of BED in men than women. It is thus important to address whether sex differences exist in correlates of BED among treatment-seeking individuals.

Previous clinical studies with treatment-seeking individuals that have examined sex differences in correlates of BED have also reported few sex differences in developmental variables (e.g., age of first diet, first regular binge eating episodes), features of eating disorders (e.g., frequency of binge eating, eating concern, and weight or shape concern) [6, 7], rates of psychiatric comorbidity [8–10], and depressive symptoms [6]. Even less research has examined biological correlates of BED in clinical samples, and these few studies have reported mixed findings about the frequency of biological and metabolic problems and whether they differ by sex [6, 8, 11, 12]. This study aimed to provide a comprehensive evaluation of sex differences in biopsychosocial characteristics in treatment-seeking obese individuals with BED. Our study focused on obese individuals with BED for several reasons. BED is associated strongly with obesity in epidemiological studies, obesity is nearly universal in treatment-seeking persons with BED, and the subgroup of obese persons with BED are at particularly high risk for suffering from medical and psychiatric conditions [13–15]. Further, the present study was performed in primary care setting for several reasons. Many individuals with BED, particularly ethnic minority groups [16] who are also underrepresented in treatment studies for BED mostly performed at specialty clinics [3], appear to seek health care at generalist primary care settings [17]. Multiple distinctive differences have been reported between samples recruited in specialist clinic settings and community samples, including proportion of ethnic minority groups, severity of BED, and treatment-seeking behaviors [18–20]. This raises questions regarding the generalizability of findings from the existing clinical literature. In addition, despite the high rates of BED and associated increased rates of health service utilization in primary care [21], primary care providers continue to be unfamiliar with BED [17, 22, 23]. Thus, further information about the clinical presentation of men and women with BED in primary care settings may be important to improve screening and intervention of BED in general.

2. Method

2.1. Participants

Participants were 190 adults (141 women, 49 men) who were interested in participating in treatment studies for obese individuals with BED conducted in primary care settings. All participants were obese (BMI ≥ 30 kg/m^2), and met or exceeded BED criteria based on the DSM-5, except that a more stringent longer duration criterion of 6 months from the DSM-IV-TR was used. Exclusion criteria for this treatment-seeking group were: current anti-depressant therapy, severe psychiatric problems (lifetime bipolar disorders and schizophrenia, and current substance use dependence), severe medical problems (e.g., cardiac and liver diseases), and uncontrolled hypertension, thyroid conditions, or diabetes. While the majority of male participants were Caucasian, a similar proportion of female participants were Caucasian and African-American. Written informed consent was obtained

from all participants and the research protocol was approved by the Yale Human Investigation Committee for the Protection of Human Subjects Involved in Research.

2.2. Assessment and measures

2.2.1. Developmental and eating-related characteristics—The Questionnaire for Eating and Weight Patterns-Revised (QEWP-R) [24] was used to assess the age of first becoming overweight, age of binge eating onset, and age of dieting onset. We also added questions regarding total number of times they tried dieting, and number of times they tried supervised diets.

The Eating Disorder Examination (EDE) [25] interview assesses eating disorders and their features. The EDE focuses on the frequency of different forms of overeating in the past 28 days, including objective bulimic episodes (i.e., binge eating defined as unusually large quantities of food coupled with a subjective sense of loss of control), objective overeating episodes (i.e., eating defined as unusually large quantities of food without a subjective sense of loss of control), and subjective bulimic episodes (i.e., subjective sense of loss of control while eating a quantity of food not regarded to be large given the context). The EDE also comprises four subscales: Restraint, Eating Concern, Shape Concern, and Weight Concern. The items assessing these four scales are rated on a 7-point scale (0–6), with higher scores reflecting greater severity or frequency. An EDE global score was calculated as the mean of the four scales. In addition, the EDE assesses overvaluation of shape and weight through two specific items: “Over the past 4 weeks, has your shape influenced how you feel about (judge, think, evaluate) yourself as a person?” and “Over the past 4 weeks, has your weight influenced how you feel about (judge, think, evaluate) yourself as a person?” Overvaluation of shape and weight is a diagnostic criterion for anorexia nervosa and bulimia nervosa, but not for BED. Recent evidence suggests that overvaluation of shape/weight could be an important diagnostic specifier for BED [26].

The Emotional Overeating Questionnaire (EOQ) [27] is a self-report questionnaire that assesses the frequency of eating an unusually large amount of food in response to nine different emotions in the past 28 days. Participants rated the frequency of overeating in response to each emotion on a 7-point scale (0 = no days, 1 = 1–5 days, 2 = 6–12 days, 3 = 13–15 days, 4 = 16–22 days, 5 = 23–27 days, and 6 = everyday). The mean of the nine components was also calculated as a global emotional eating score, with higher score indicating more frequent emotional eating.

2.2.2. Psychosocial characteristics—Perceived Stress Scale (PSS) assesses the perception of stress based on 10-item questions about the thoughts and feelings in the past month [28], with demonstrated validity associated with diverse health behaviors including disrupted eating [29]. The participants were asked to rate their feelings on a 4-point Likert scale (0 = never to 4 = very often; score range = 0–40) with higher score reflecting greater perceived stress.

The Beck Depression Inventory (BDI) [30] is a psychometrically sound, widely used measure of the features of depression [31] that consists of 21 questions regarding levels and symptoms of depression in the past week. For each question, participants were asked to select one of four statements that best describe their feeling (scored 0–3). A total score was calculated, and higher scores reflect higher levels of depression and negative affect (score range = 0–63).

Brief Self-Control Scale (SCS) is a 13-item scale that measures self-control and impulsivity with established reliability and validity [32]. Participants rated each statement on a 6-point

Likert scale (0 = not at all to 5 = very much; score range = 0–65). Higher score indicated greater self-control.

The 36-Item Short Form Survey (SF-36) consists of 36 questions regarding health-related quality of life [33], with well-established reliability and validity [34, 35]. For the current study, we calculated physical and mental component summaries (standardized score range = 0–100, with a mean of 50 with a standard deviation of 10 [i.e., t-score]). The scores less than 50 indicated poor functioning than the average.

Godin Leisure-Time Exercise Questionnaire is a well-validated questionnaire that includes four questions regarding frequencies of strenuous, moderate, and light physical activity per week that lasts more than 15 min [36, 37].

2.2.3. Biological and metabolic measures—Participants' height and weight were measured using a high-capacity digital scale. Waist circumference, heart rate, and blood pressure were measured by trained research staff. Fasting lipid profile (total cholesterol, HDL cholesterol, LDL cholesterol, and triglycerides), glucose levels, and glycated hemoglobin 1Ac (HbA1c) were obtained through serum sample, and were analyzed by Quest Diagnostics (Madison, New Jersey). Individuals were categorized as having metabolic syndrome (MetS) if they had three or more of the five criteria outlined by the National Cholesterol Education Program's Adult Treatment Panel III guidelines [38]: a) Central or abdominal obesity (> 40 inches for men, > 35 inches for women); b) Triglycerides ≥ 150 mg/dL; c) Reduced HDL cholesterol (< 40 mg/dL for men, < 50 mg/dL for women); d) Systolic blood pressure ≥ 130 mmHg or diastolic blood pressure ≥ 85 mmHg; and e) Fasting glucose ≥ 110 mg/dL.

2.3. Analysis

Men and women were compared on eating-related characteristics, psychosocial characteristics, and biological and metabolic measures. Chi-square tests were used for categorical variables. An analysis of covariance (ANCOVA) was used for continuous variables with race and BMI as covariates. In addition, logistic regression was used to compare the likelihood of meeting criteria for symptoms of the MetS by sex (women as a reference group) with adjusting for race and BMI. All analyses were conducted with the Statistical Analysis System (SAS) (release 9.3, 2002–2010, SAS Institute, Cary, NC).

3. Results

3.1. Developmental and eating-related characteristics

Men and women significantly differed in the proportion of ethnic/race composition (see Table 1 for participant characteristics), but did not differ in age, education, or BMI. Table 2 summarizes the results of sex comparisons of developmental and current eating-related characteristics. Compared with men, women reported earlier onset of dieting, a greater total number of dieting frequency, and a greater number of times they tried supervised diets, but did not differ in age of onset for either overweight or binge eating. No significant sex differences were found in the features of eating disorders or emotional eating scores (all $p > .05$).

3.2. Psychosocial characteristics

Men reported more frequent strenuous physical activity than women (Table 3). Men and women did not differ significantly in any other the psychosocial functioning measures, including perceived stress, depressive symptoms, self-control, and physical and mental

components of the SF-36, and frequencies of moderate and light physical activity (all $p > .05$).

3.3. Biological and metabolic measures

Table 4 summarizes the results of sex comparison of biological and metabolic measures. Men had a significantly greater waist circumference, compared with women. Men also had significantly higher systolic blood pressure, fasting glucose levels, HbA1c, and triglycerides, and significantly reduced HDL levels. Relative to women, a greater proportion of men met clinical diagnostic criteria for elevated level of triglycerides, elevated blood pressure, and elevated fasting glucose levels. A greater proportion of men also met diagnostic criteria for MetS. After adjusting for race and BMI, odds ratios (ORs) of meeting clinical criteria for these metabolic measures were significantly higher in men than women: elevated triglycerides (OR = 2.83 [95% CI = 1.29 – 6.17], $p < .01$); elevated blood pressure (OR = 2.54 [95% CI = 1.22 – 5.28], $p < .05$); elevated fasting glucose (OR = 2.27 [95% CI = 1.01 – 5.08], $p < .05$); MetS (OR = 2.98 [95% CI = 1.45 – 6.10], $p < .01$). No other significant sex differences were found (all $p > .05$).

4. Discussion

This study examined sex differences in biopsychosocial correlates of BED in obese individuals seeking treatment in primary care. Consistent with previous reports [3–9], obese women and men with BED in this study were strikingly similar in most developmental/historical variables pertaining to weight and dieting, current levels of eating disorder psychopathology, and across broad measures of psychosocial functioning. A few significant differences included significantly earlier onsets of overweight and dieting, and a significantly greater number of dieting attempts in women, whereas men reported more frequent strenuous physical activity than women. These findings may reflect sex differences in attempt to control their weight. With an earlier onset of overweight, women with BED may make more active attempts to intervene with their obesity problems at earlier age than men, while men use exercising as a method of weight control. We also emphasize that across sex groups, the number of attempts at supervised diets is low relative to the number of attempts at any dieting, which is consistent with reports that many individuals with BED do not appear to seek help at specialty settings [21]. These significant sex differences, however, may diminish in the future as increasing research has highlighted the prevalence of disordered eating and dieting behaviors among men, particularly in younger population [39, 40].

We observed a significant sex difference in the frequency of men (57%) versus women (31%) meeting criteria for MetS. Even after adjusting for race and BMI, men were almost three times more likely than women to meet the MetS criteria, suggesting that the observed sex difference is above and beyond the influence of race and BMI on the MetS. These findings extend our previous initial report for MetS in a smaller series of patients in primary care [11] and a different series of BED patients in a specialty clinic [12] where 91% of men versus 51% of women were classified with MetS. These findings contrast with an earlier small study reporting no sex differences in MetS among BED patients [7]; that study, however, reported an unusually low rate (32%) of MetS that is considerably lower than most reports for obese persons [41]. Our findings of a higher rate of MetS among obese men than obese women with BED contrast with the general literature where most studies report a higher prevalence of MetS among women compared to men [42]. Among men, however, non-Hispanic whites have been found to have higher prevalence of MetS than non-Hispanic blacks, whereas the reverse relationship has been reported in women [43]. It is possible that the differences in ethnic composition might have contributed to the observed higher

prevalence of MetS in men than in women. A larger study to examine sex-race interaction in MetS may be warranted.

Our detailed comparison of MetS symptoms revealed that men were more likely to meet clinical criteria for elevated levels of triglycerides, blood pressure, and fasting glucose. Again, men were significantly more likely than women to meet clinical criteria for these metabolic measures even with controlling for race and BMI. Such sex differences have important clinical implications for developing screening and health care strategies for obese men with symptoms of BED in primary care settings. We note that Hudson and colleagues [43] reported that BED appeared to increase the risk for subsequent development of metabolic syndrome and its components over and above the risk attributable to obesity. Alternatively, higher prevalence of MetS in men than women may also be a result of more active attempts to cope with obesity in women at earlier age than men (i.e., earlier onset of dieting and greater number of dieting attempts). It is also possible that men may be exhibiting more severe obesity-related metabolic problems as they may be less likely than women to seek treatment [44–46] and thus wait until the symptoms of BED become severe. Collectively, our findings suggest that despite equivalent BMI, obesity with presence of BED may affect metabolic function more severely in men than in women, and that their cholesterol, glucose, and blood sugar should be carefully monitored.

The current results need to be interpreted in the context of strengths and limitations of the study. Unlike many previous studies in specialty clinic setting, subject recruitment in primary care setting allowed increased variability in ethnic composition of the sample. This is important for study generalizability since African-American and Hispanic groups have been underrepresented in research studies on BED in specialty clinic settings [3], despite their similar rates of binge eating to that of Caucasians [16, 47]. The present study, however, only included individuals who were interested in treatment for binge eating and obesity and interested in participating in treatment studies. These treatment-seeking factors might have introduced sampling bias and therefore may preclude generalizing the study findings to obese patients in primary care setting who chose to not seek treatment for BED or non-treatment seeking community sample. While we excluded individuals with cardiovascular disease and uncontrolled diabetes, we did not exclude participants who may have been treated for MetS symptoms. This might have resulted in an under-estimate of the natural prevalence of MetS in obese patients with BED. The study would have also benefitted from inclusion of obese individuals without BED as a control group.

In summary, we observed few sex differences in behavioral and psychosocial correlates of BED in obese patients in primary care. Metabolic problems associated with obesity, however, appear to be more common among treatment-seeking men than women with BED. Since, MetS is strongly associated with severe chronic conditions such as cardiovascular diseases and type-II diabetes [48], untreated obesity and BED may potentially have serious negative consequences [43] and this may be especially true for men. Primary care settings provide a potential valuable opportunity to implement interventions or to provide appropriate specialist referrals for obese patients with BED.

Acknowledgments

This research was supported, in part, by grants from the National Institutes of Health (K23 DK092279, R01 DK073542, K24 DK070052, K12 DA031050, P50 DA033945). The funding agency (NIH) had no role in the preparation or the content of this paper.

References

1. American Psychiatric Association. Diagnostic and statistical manual of mental disorders. 4. Washington, DC: 1994. DSM-IV ed
2. Hudson JI, Hiripi E, Pope HG Jr, Kessler RC. The prevalence and correlates of eating disorders in the National Comorbidity Survey Replication. Biol Psychiatry. 2007; 61:348–58. [PubMed: 16815322]
3. Franko DL, Thompson-Brenner H, Thompson DR, Boisseau CL, Davis A, Forbush KT, et al. Racial/ethnic differences in adults in randomized clinical trials of binge eating disorder. J Consult Clin Psychol. 2012; 80:186–95. [PubMed: 22201327]
4. Striegel RH, Bedrosian R, Wang C, Schwartz S. Why men should be included in research on binge eating: Results from a comparison of psychosocial impairment in men and women. Int J Eat Disord. 2012; 45:233–40. [PubMed: 22031213]
5. Mitchison D, Mond J, Slewa-Younan S, Hay P. Sex differences in health-related quality of life impairment associated with eating disorder features: A general population study. Int J Eat Disord. 2013 Jan 28. Epub ahead of print. 10.1002/eat.22097
6. Barry DT, Grilo CM, Masheb RM. Gender differences in patients with binge eating disorder. Int J Eat Disord. 2002; 31:63–70. [PubMed: 11835299]
7. Guerdjikova AI, McElroy SL, Kotwal R, Keck PE Jr. Comparison of obese men and women with binge eating disorder seeking weight management. Eat Weight Disord. 2007; 12:e19–23. [PubMed: 17384521]
8. Grilo CM, White MA, Barnes RD, Masheb RM. Psychiatric disorder co-morbidity and correlates in an ethnically diverse sample of obese patients with binge eating disorder in primary care settings. Compr Psychiatry. 2012 Aug 31. Epub ahead of print.
9. Reichborn-Kjennerud T, Bulik CM, Sullivan PF, Tambs K, Harris JR. Psychiatric and medical symptoms in binge eating in the absence of compensatory behaviors. Obes Res. 2004; 12:1445–54. [PubMed: 15483209]
10. Tanofsky MB, Wilfley DE, Spurrell EB, Welch R, Brownell KD. Comparison of men and women with binge eating disorder. Int J Eat Disord. 1997; 21:49–54. [PubMed: 8986517]
11. Barnes RD, Boeka AG, McKenzie KC, Genao I, Garcia RL, Ellman MS, et al. Metabolic syndrome in obese patients with binge-eating disorder in primary care clinics: A cross-sectional study. Prim Care Companion CNS Disord. 2011; 13:e1–e7. [PubMed: 21977362]
12. Roehrig M, Masheb RM, White MA, Grilo CM. The metabolic syndrome and behavioral correlates in obese patients with binge eating disorder. Obesity. 2009; 17:481–6. [PubMed: 19219063]
13. Bulik CM, Sullivan PF, Kendler KS. Medical and psychiatric morbidity in obese women with and without binge eating. Int J Eat Disord. 2002; 32:72–78. [PubMed: 12183948]
14. Yanovski SZ, Nelson JE, Dubbert BK, Spitzer RL. Association of binge eating disorder and psychiatric comorbidity in obese subjects. Am J Psychiatry. 1993; 150:1472–1479. [PubMed: 8379549]
15. Specker S, de Zwaan M, Raymond N, Mitchell J. Psychopathology in subgroups of obese women with and without binge eating disorder. Compr Psychiatry. 1994; 35:185–190. [PubMed: 8045108]
16. Marques L, Alegria M, Becker AE, Chen CN, Fang A, Chosak A, Diniz JB. Comparative prevalence, correlates of impairment, and service utilization for eating disorders across US ethnic groups: Implications for reducing ethnic disparities in health care access for eating disorders. Int J Eat Disord. 2011; 44:412–20. [PubMed: 20665700]
17. Crow SJ, Peterson CB, Levine AS, Thuras P, Mitchell JE. A survey of binge eating and obesity treatment practices among primary care providers. Int J Eat Disord. 2004; 35:348–53. [PubMed: 15048950]
18. Grilo CM, Lozano C, Masheb RM. Ethnicity and sampling bias in binge eating disorder: Black women who seek treatment have different characteristics than those who do not. Int J Eat Disord. 2005; 38:257–62. [PubMed: 16211631]
19. Wilfley DE, Pike KM, Dohm FA, Striegel-Moore RH, Fairburn CG. Bias in binge eating disorder: How representative are recruited clinic samples? J Consult Clin Psychol. 2001; 69:383–8. [PubMed: 11495168]

20. Pike KM, Dohm FA, Striegel-Moore RH, Wilfley DE, Fairburn CG. A comparison of black and white women with binge eating disorder. Am J Psychiatry. 2001; 158:1455–60. [PubMed: 11532731]
21. Johnson JG, Spitzer RL, Williams JB. Health problems, impairment and illnesses associated with bulimia nervosa and binge eating disorder among primary care and obstetric gynaecology patients. Psychol Med. 2001; 31:1455–66. [PubMed: 11722160]
22. Cummins LH, Dunn EC, Rabin L, Russo JC, KA, McCann BS. Primary care provider familiarity with binge eating disorder questionnaire. J Clin Psychol Med Settings. 2003; 10:51–6.
23. Mond JM, Myers TC, Crosby RD, Hay PJ, Mitchell JE. Bulimic eating disorders in primary care: Hidden morbidity still? J Clin Psychol Med Settings. 2010; 17:56–63. [PubMed: 20039194]
24. Yanovski S. Binge eating disorder: current knowledge and future directions. Obes Res. 1993; 1:306–324. [PubMed: 16350580]
25. Fairburn, CG.; Cooper, Z., editors. The Eating Disorder Examination. 12. New York, NY: Guilford Press; 1993.
26. Grilo CM. Why no cognitive body image feature such as overvaluation of shape/weight in the binge eating disorder diagnosis? Int J Eat Disord. 2013 Epub ahead of print.
27. Masheb RM, Grilo CM. Emotional overeating and its associations with eating disorder psychopathology among overweight patients with binge eating disorder. Int J Eat Disord. 2006; 39:141–6. [PubMed: 16231349]
28. Cohen, S.; Williamson, GM. Perceived stress in a probability sample of the United States. In: Spacapan, S.; Oskamp, S., editors. The social psychology of health. Beverly Hills, CA: Sage Publications; 1998. p. 31-67.
29. Striegel-Moore RH, Dohm FA, Kraemer HC, Schreiber GB, Taylor CB, Daniels SR. Risk factors for binge-eating disorders: An exploratory study. Int J Eat Disord. 2007; 40:481–487. [PubMed: 17573685]
30. Beck, AT.; Steer, R. Manual for revised Beck Depression Inventory. New York: Psychological Corporation; 1987.
31. Beck AT, Steer R, Garbin M. Psychometric properties of the Beck Depression Inventory: 25 years of evaluation. Clin Psychol Rev. 1988; 8:77–100.
32. Tangney JP, Baumeister RF, Boone AL. High self-control predicts good adjustment, less pathology, better grades, and interpersonal success. J Pers. 2004; 72(2):271–324. [PubMed: 15016066]
33. Ware JE Jr, Sherbourne CD. The MOS 36-item short-form health survey (SF-36). I. Conceptual framework and item selection. Med Care. 1992; 30:473–83. [PubMed: 1593914]
34. McHorney CA, Ware JE Jr, Lu JF, Sherbourne CD. The MOS 36-item Short-Form Health Survey (SF-36): III. Tests of data quality, scaling assumptions, and reliability across diverse patient groups. Med Care. 1994; 32:40–66. [PubMed: 8277801]
35. McHorney CA, Ware JE Jr, Raczek AE. The MOS 36-Item Short-Form Health Survey (SF-36): II. Psychometric and clinical tests of validity in measuring physical and mental health constructs. Med Care. 1993; 31:247–63. [PubMed: 8450681]
36. Godin G, Shephard RJ. A simple method to assess exercise behavior in the community. Can J Appl Sport Sci. 1985; 10:141–6. [PubMed: 4053261]
37. Godin G, Shephard RJ. Godin leisure-time exercise questionnaire. ACSM. 1997; 19:S36–S38.
38. Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults. Executive Summary of The Third Report of The National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, And Treatment of High Blood Cholesterol In Adults (Adult Treatment Panel III). JAMA. 2001; 285:2486–97. [PubMed: 11368702]
39. Muise AM, Stein DG, Arbess G. Eating disorders in adolescent boys: a review of the adolescent and young adult literature. J Adolesc Health. 2003; 33:427–435. [PubMed: 14642705]
40. Robb AS, Dadson MJ. Eating disorders in males. Child Adolesc Psychiatr Clin N Am. 2002; 11:399–418. [PubMed: 12109328]
41. Park YW, Zhu S, Palaniappan L, Heshka S, Carnethon MR, Heymsfield SB. The metabolic syndrome: Prevalence and associated risk factor findings in the US population from the Third

National Health and Nutrition Examination Survey, 1988–1994. Arch Intern Med. 2003; 163:427–36. [PubMed: 12588201]

42. Razzouk L, Muntner P. Ethnic, gender, and age-related differences in patients with the metabolic syndrome. Curr Hypertens Rep. 2009; 11(2):127–32. [PubMed: 19278602]
43. Hudson JI, Lalonde JK, Coit CE, Tsuang MT, McElroy SL, Crow SJ, et al. Longitudinal study of the diagnosis of components of the metabolic syndrome in individuals with binge-eating disorder. Am J Clin Nutr. 2010; 91:1568–73. [PubMed: 20427731]
44. Striegel-Moore RH, Leslie D, Petrill SA, Garvin V, Rosenheck RA. One-year use and cost of inpatient and outpatient services among female and male patients with an eating disorder: evidence from a national database of health insurance claims. Int J Eat Disord. 2000; 27:381–389. [PubMed: 10744844]
45. Striegel-Moore RH, Wilson GT, DeBar L, Perrin N, Lynch F, Rossell F, Kraemer HC. Cognitive behavioral guided self-help for the treatment of recurrent binge eating. J Consult Clin Psychol. 2010; 78:312–321. [PubMed: 20515207]
46. Bedrosian RC, Striegel-Moore RH, Wang C. Demographic and clinical characteristics of individuals utilizing an internet-based digital coaching program for recovering from binge eating. Int J Eat Disord. 2011; 44:639–646. [PubMed: 21997428]
47. Alegria M, Woo M, Cao Z, Torres M, Meng XL, Striegel-Moore R. Prevalence and correlates of eating disorders in Latinos in the United States. Int J Eat Disord. 2007; 40 (Suppl):S15–21. [PubMed: 17584870]
48. Isomaa B, Almgren P, Tuomi T, Forsen B, Lahti K, Nissen M, et al. Cardiovascular morbidity and mortality associated with the metabolic syndrome. Diabetes Care. 2001; 24:683–9. [PubMed: 11315831]

Table 1

Participant Characteristics by Sex.

	Women (n = 141)	Men (n = 49)	t-test/χ^2 test
Age	43.6 (12.3)	46.5 (10.3)	$t(188) = 1.53$, *ns*
Race (%)			$\chi^2(3) = 12.51$, $p < 0.01$
Caucasian	37.6	65.3	
African American	39.7	16.3	
Hispanic	14.2	12.2	
Other	8.5	6.1	
Completed high school (%)	90.0	93.9	$\chi^2(1) = 0.65$, *ns*
BMI	38.1 (5.5)	38.6 (5.0)	$t(177) = -0.51$, *ns*

Notes: Numbers in parentheses indicate standard deviations. BMI = body mass index.

Table 2

Eating-Related Characteristics by Sex.

	Women Mean (SD)	Men Mean (SD)	*F*-test
Age of first time overweight	19.0 (1.1)	22.8 (1.8)	$F(1, 150) = 4.25$, $p = 0.04$
Age of binge eating onset	25.5 (1.3)	27.4 (2.0)	$F(1, 165) = 0.73$, *ns*
Age of dieting onset	22.0 (1.0)	30.5 (1.6)	$F(1, 152) = 22.70$, $p < 0.01$
Number of times on a diet [a]	29.2 (6.2)	19.0 (9.8)	$F(1, 155) = 4.58$, $p = 0.03$
Number of times tried supervised diets [a]	4.1 (1.0)	0.4 (1.6)	$F(1, 159) = 17.94$, $p < 0.01$
EDE interview			
Global	2.65 (0.09)	2.32 (0.15)	$F(1, 178) = 4.22$, *ns*
Restraint	1.88 (0.14)	1.52 (0.22)	$F(1, 178) = 2.47$, *ns*
Eating concern	1.97 (0.12)	1.54 (0.20)	$F(1, 178) = 3.97$, *ns*
Shape concern	3.55 (0.13)	3.29 (0.20)	$F(1, 176) = 1.39$, *ns*
Weight concern	3.20 (0.11)	2.94 (0.17)	$F(1, 176) = 1.85$, *ns*
Shape overvaluation	3.67 (0.20)	3.39 (0.33)	$F(1, 175) = 0.61$, *ns*
Weight overvaluation	3.60 (0.20)	3.20 (0.32)	$F(1, 175) = 1.27$, *ns*
Objective bulimic episodes [1,a]	16.76 (1.48)	23.43 (2.43)	$F(1, 178) = 0.72$, *ns*
Subjective bulimic episodes [1]	11.84 (1.42)	11.01 (2.26)	$F(1, 177) = 0.11$, *ns*
Objective overeating episodes [1,a]	3.19 (0.93)	4.86 (1.49)	$F(1, 177) = 3.88$, *ns*
EOQ Global	1.83 (1.42)	1.47 (0.98)	$F(1, 177) = 1.13$, *ns*

Notes. EDE = Eating Disorder Examination; EOQ = Emotional Overeating Questionnaire.

[1] frequency over the past 28 days.

[a] statistics are based on log-transformed values, but presented means and standard deviations are raw values.

Table 3

Psychosocial Functioning by Sex.

	Women Mean (SD)	Men Mean (SD)	*F*-test
PSS	19.8 (0.7)	19.6 (1.1)	$F(1, 175) = 0.02$, *ns*
BDI-II	16.6 (1.0)	15.4 (1.6)	$F(1, 175) = 0.49$, *ns*
SCS	41.1 (0.8)	39.7 (1.3)	$F(1, 171) = 0.99$, *ns*
SF-36			
Physical health component (t-score)	43.3 (1.0)	44.1 (1.7)	$F(1, 174) = 0.16$, *ns*
Mental health component (t-score)	42.0 (1.2)	42.0 (1.9)	$F(1, 174) = 0.00$, *ns*
Physical activity			
Strenuous [a]	0.28 (0.13)	1.11 (0.21)	$F(1, 175) = 12.34$, $p < 0.01$
Moderate [a]	1.29 (0.23)	1.01 (0.38)	$F(1, 175) = 0.25$, *ns*
Mild	1.80 (0.21)	1.42 (0.34)	$F(1, 172) = 1.07$, *ns*
Frequency of any activity	2.45 (0.06)	2.41 (0.10)	$F(1, 177) = 0.16$, *ns*

Notes. PSS = Perceived Stress Scale; BDI = Beck Depression Inventory; SCS = brief Self-Control Scale; SF-36 = 36-Item Short Form Survey.

[a] statistics are based on log-transformed values, but presented means and standard deviations are raw values.

Table 4

Biological and Metabolic Measures by Sex.

	Women Mean (SD)	Men Mean (SD)	*F*-test/χ^2 test
Waist	44.8 (0.4)	48.3 (0.6)	$F(1, 172) = 28.25$, $p < 0.01$
Heart rate	74.0 (1.20)	76.3 (1.9)	$F(1, 173) = 1.19$, $p < 0.01$
Systolic BP	125.9 (1.5)	132.2 (2.5)	$F(1, 173) = 5.60$, $p = 0.02$
Diastolic BP	79.2 (1.0)	82.5 (1.6)	$F(1, 173) = 3.43$, *ns*
Fasting glucose level [a]	100.5 (3.9)	122.1 (6.2)	$F(1, 154) = 12.50$, $p < 0.01$
HbA1c [a]	5.9 (0.1)	6.6 (0.2)	$F(1, 153) = 11.67$, $p < 0.01$
Total cholesterol	186.1 (4.0)	186.8 (6.4)	$F(1, 156) = 0.01$, *ns*
≥ 200 mg/dL (%)	28.4	32.7	$\chi^2(1) = 0.32$, *ns*
HDL	55.0 (1.4)	42.8 (2.3)	$F(1, 156) = 24.00$, $p < 0.01$
LDL	108.2 (3.5)	114.4 (5.7)	$F(1, 155) = 1.01$, *ns*
Triglycerides [a]	113.9 (8.5)	156.4 (13.6)	$F(1, 156) = 7.92$, $p < 0.01$
% meeting criteria for symptoms of metabolic syndrome (MetS) [1]			
Central or abdominal obesity (> 40 inches for men, > 35 inches for women)	88.7	91.8	$\chi^2(1) = 0.53$, *ns*
Triglycerides ≥ 150 mg/dL	14.9	38.8	$\chi^2(1) = 12.47$, $p < .0.01$
Reduced HDL cholesterol (< 40 mg/dL for men, < 50 mg/dL for women)	48.2	44.9	$\chi^2(1) = 0.16$, *ns*
Systolic BP ≥ 130 mmHg or Diastolic BP ≥ 85 mmHg	43.3	61.2	$\chi^2(1) = 4.70$, $p = 0.03$
Fasting glucose ≥ 110 mg/dL	15.6	30.6	$\chi^2(1) = 5.22$, $p = 0.02$
Meeting criteria for MetS (%)	30.5	57.1	$\chi^2(1) = 11.03$, $p < 0.01$

Notes. BP = blood pressure; HbA1c = glycated hemoglobin 1Ac.

[1] Criteria for MetS was based on the National Cholesterol Education Program's Adult Treatment Panel III guidelines (21). Participants were categorized as having metabolic syndrome if they report 3 or more of the 5 criteria.

[a] statistics are based on log-transformed values, but presented means and standard deviations are raw values.