

ORIGINAL ARTICLE

Comparing physical activity in individuals with overweight/obesity with and without binge eating disorder

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Summary

Objective

Differential participation in physical activity (PA) may partially explain the health discrepancies between individuals with or without binge-eating disorder (BED). Yet, little is known about the PA habits of individuals with overweight/obesity and how those patterns may differ based on BED status. PA patterns and exercise self-efficacy were examined in individuals with overweight/obesity, with and without BED.

Design

Ninety-seven participants with overweight/obesity self-reported their PA via the Godin Leisure-Time Questionnaire and the Paffenbarger PA Questionnaire. Exercise self-efficacy was assessed with the Marcus 5-item Exercise Self-Efficacy scale. Based on the Eating Disorder Examination, 27.8% ($n = 27$) of the participants met BED criteria. Participants were primarily female ($n = 75$, 77.3%), on average 47.5 years old (standard deviation = 10.4), and predominantly White/Not Hispanic ($n = 67$, 69.1%) or African-American/Not Hispanic ($n = 18$, 18.6%).

Results

Hierarchical regressions, accounting for significant differences in body mass index between those with and without BED, showed that the Marcus 5-item Exercise Self-Efficacy Scale (but not BED status) was significantly related to PA. BED status also was unrelated to likelihood of reaching Centres for Disease Control PA guidelines, and 44.3% of all participants reported no participation in weekly sports/recreation activities.

Conclusions

Both groups participated in relatively little purposeful and moderate/strenuous PA. Exercise self-efficacy may be important to assess and address among treatment seeking individuals with and without BED who struggle with excess weight.

Keywords: Binge-eating disorder, Obesity, Physical activity, Self-efficacy.

Introduction

Binge-eating disorder (BED) is defined as consuming unusually large quantities of food in a relatively brief period of time, coupled with a subjective sense of loss of control over eating, but without frequent compensatory behaviours (1). BED is associated with excess weight (2–4), possible greater difficulty losing weight (5,6) and worse health outcomes (7–10), even after controlling for body mass index (BMI) (10). One important potential

mechanism for the weight-related and health-related discrepancies may be physical activity. The role of physical activity, which is known to be protective against health risks regardless of weight status (11,12), has been understudied in individuals with excess weight and BED, particularly as they compare with their counterparts without BED.

Hypotheses for the possible differences in physical activity between those with and without BED include differing exercise tolerance and exercise self-efficacy.

Individuals with BED reported more fatigue and pain during the same controlled walk test as compared with those without BED, even when matched on demographic variables (13). Further, those with obesity and BED also reported lower exercise self-efficacy than individuals with overweight/obesity who did not binge eat (13–15).

Self-efficacy, the extent to which individuals believe that they will be successful at a task (16), has been applied to exercise. Exercise self-efficacy is positively related to physical activity engagement in general samples (17–19) and is associated with greater weight loss in individuals with obesity and BED (20). Lower self-efficacy among those with BED may stem from lower perceived sports competence and lower perceived physical strength than those without BED (15). These lower self-appraisals of exercise efficacy also may be related to the elevated levels of depression found among those with BED (21,22). Therefore, exercise self-efficacy may be an important factor influencing the adoption of physical activity by individuals with comorbid overweight/obesity and BED.

The scant existing data examining the impact of BED on physical activity levels are mixed. Thirteen percent of individuals with comorbid obesity and BED are estimated to reach the Centres for Disease Control (23) weekly physical activity recommendations (24), which is lower than rates observed for individuals of similar weight without BED (22% and 36% of individuals with obesity and overweight, respectively, screened for a weight loss maintenance trial) (25). Individuals with overweight/obesity comorbid with BED obtained less physical activity (13,26,27) and retrospectively reported decreasing physical activity levels over time (26) as compared with their counterparts without BED. These differences were reported based on self-report measure total scores (i.e. Bone Loading Health Questionnaire and Baecke Physical Activity Questionnaire). No significant differences emerged when Hrabosky et al. (24) compared treatment-seeking patients with obesity and BED to previous studies (obese with and without BED) based on The Paffenbarger Physical Activity Questionnaire (PPAQ) total score. Their sample's self-reported overall physical activity score was significantly lower than a general non-treatment-seeking community sample but similar to treatment-seeking individuals with obesity both with and without BED (24).

The inconsistent results may stem from varying methods used to assess physical activity. Previous comparison research focused primarily on total physical activity indices (24,28); or general physical activity categories (e.g. 'sports') and did not compare physical activity intensity levels (13,24,26,27) or did not use similar recruitment methods for BED and non-BED comparisons (24).

Physical activity intensity may be an important variable to measure when attempting to understand physical health discrepancies between those with and without BED because moderate-intensity and strenuous-intensity physical activity has been most associated with improved health and disease prevention (29–32). Individuals with obesity and BED are most likely to engage in mild-intensity physical activity, but it is unknown how these results compare with individuals without BED (33). Understanding the patterns of physical activity (frequency and intensity), how the patterns compare between those with overweight/obesity with and without BED, and how self-efficacy impacts physical activity levels is important for better informing treatment.

In summary, BED confers distinct risks for obesity, poor health outcomes and possibly difficulty losing weight. Less physical activity, particularly in the moderate-exertion and strenuous-exertion ranges, among those with BED may help explain these added risks and could highlight an important area of needed intervention. The literature examining exercise among those with BED, however, is limited and mixed. The purpose of the current study was to address current limitations by (1) characterizing physical activity (frequency, intensity and likelihood of meeting minimum recommended thresholds) in a group of weight loss treatment-seeking individuals, (2) examining the impact of BED diagnosis on physical activity levels and (3) investigating levels and impact of exercise self-efficacy in both groups. Hypotheses included (1) participants with BED would report less frequent and lower intensity physical activity, be less likely to meet minimum recommendations and report lower exercise self-efficacy than individuals who do not binge eat; and (2) higher levels of exercise self-efficacy would be associated with higher self-reported physical activity frequency and intensity.

Methods

Participants

Participants were 97 adults (≥ 18 years old) with overweight/obesity recruited for weight loss treatment in primary care (BMI ≥ 25 and ≤ 55 kg/m²). The current paper presents secondary analyses from a previously published trial (34). Participants were recruited through referrals from primary care providers and via flyers placed in waiting/patient rooms. Exclusion criteria included over 65 years of age; severe psychiatric problems (e.g. schizophrenia); severe medical problems (e.g. cardiac disease); pregnancy/breastfeeding; or uncontrolled liver, thyroid disease, hypertension or diabetes. The Physical Activity Readiness Questionnaire (35) was used to exclude

individuals with cardiovascular problems, chest pains and unexplained/frequency dizziness (36). Participants were primarily female ($n = 75$, 77.3%), had an average age of 47.5 years (standard deviation = 10.4, range 22–65) and had an average BMI of 35.0 kg/m² (standard deviation = 6.8; 23.7% overweight [$n = 23$], 76.3% obese [$n = 74$]). Twenty-seven percent of participants met *Diagnostic and Statistical Manual of Mental Disorders-5* BED criteria (1), of those, 16 (59.3%) fell within the mild range (1–3 binge episodes weekly) and 11 (40.7%) fell within the moderate range (4–7 binge episodes weekly) of BED severity. Participants were of the following ethnicities: White, not Hispanic ($n = 67$, 69.1%); White, Hispanic ($n = 4$, 4.1%); African–American, not Hispanic ($n = 18$, 18.6%); African–American, Hispanic ($n = 1$, 1.0%); bi/multiracial, not Hispanic ($n = 3$, 3.1%); bi/multiracial, Hispanic ($n = 2$, 2.1%); and ‘other, Hispanic’ ($n = 2$, 2.1%).

Measures

Godin Leisure-Time Exercise Questionnaire (GLTEQ) is a self-report measure that assesses frequency of overall, mild, moderate and strenuous physical activity within a 7-day period (37). Participants report how many times on average in a week they participate in mild, moderate and strenuous activity for more than 15 min. The GLTEQ-total is calculated with the following formula: (9 × Strenuous) + (5 × Moderate) + (3 × Light). The GLTEQ has good test–retest reliability with diverse groups (37,38) and has good support from validation studies using various activity measurements such as activity monitors and maximum oxygen consumption (39).

The Paffenbarger Physical Activity Questionnaire (PPAQ) is a self-report measure of general physical activity (40). Activities assessed include number of flights of stairs climbed (i.e. 10 stairs per flight) and city blocks walked in a typical day and duration of weekly sports and recreational activities. Metabolic equivalents of the sports and recreation activities were calculated using the Ainsworth et al. (41) scoring system. The PPAQ-total was calculated using the formula developed by Paffenbarger et al. (40).

Marcus 5-item Exercise Self-Efficacy scale (MESE) (42) is a 5-item self-report measure of exercise self-efficacy with good validity and reliability (43,44). Higher scores reflect higher self-efficacy. Participants rated their confidence in their ability to participate in regular exercise when faced with barriers and obstacles such as fatigue, vacation or poor weather. Participants were given the option of choosing 0 for not applicable. Cronbach’s alpha for the current sample was 0.85.

Physical Measurements. Height was measured using a wall measure. Weight was measured using a large capacity digital scale.

Procedures

Measures were part of a larger set of surveys, but both physical activity surveys are presented here. Participants were screened by master-level or doctoral-level psychology clinicians trained in eating and weight disorders who used the Eating Disorder Examination (a semi-structured interview) to diagnose BED (edited to correspond with *Diagnostic and Statistical Manual of Mental Disorders-5* (45)). Please see Barnes et al. (34) for more details regarding procedure. The study had full IRB (Internal Review Board) review and approval, and all participants provided written informed consent.

Data analyses

T-tests and chi-square analyses were used to compare participants with and without BED on demographic variables and the MESE. Hierarchical linear regressions assessed the impact of BED status and exercise self-efficacy (MESE) on self-reported exercise (GLTEQ and PPAQ). Since the BED and non-BED groups differed significantly on BMI, BMI was added into the regressions before BED status and exercise self-efficacy. To examine the CDCs minimum recommendation of weekly physical activity (i.e. 150 minutes of moderate-intensity physical activity per week) (CDC, 2014), item 3 from the PPAQ was used (‘In what sports/recreational activities (e.g. tennis) do you participate each week? For how many hours?’). These data were categorized as yes (≥ 150 minutes per week) or no (< 150 minutes per week). Participants also were categorized as meeting or not meeting daily physical activity criteria related to health outcomes as outlined by Paffenbarger et al. (40); these criteria included reaching ($\geq 2,000$ kcal, (≥ 5 flights of stairs daily (i.e. approximately 50 stairs) and (≥ 5 city blocks walked daily. Participants with and without BED were compared on these categorical variables with chi-square analyses. To account for multiple comparisons, we utilized a p -value of ≤ 0.01 . One participant’s data were not included in the MESE-specific analyses because the participant reported all MESE questions as ‘0’ (i.e. not applicable).

Results

There were no significant differences between participants with and without BED based on age, sex distribution or marital status. Participants with BED had significantly higher BMIs, $t(95) = -3.11$, $p = 0.002$, than participants without BED. There were no significant differences, however, in distribution of participants with and without BED in the overweight versus obese BMI categories, $\chi^2(1) = 1.64$, $p = 0.201$. There were no significant

MESE differences between the groups, $t(94) = -1.10$, $p = 0.274$. See Table 1 for variable descriptive data.

Five of eight hierarchical regressions were significant at the $p \leq 0.01$ level (Table 2). BMI and MESE significantly contributed to GLTEQ-Total, $F(3, 92) = 11.83$, $p < 0.0005$, but BED status did not. MESE significantly contributed to GLTEQ-Moderate exercise, $F(3, 92) = 9.04$, $p < 0.0005$; GLTEQ-Strenuous exercise, $F(3, 92) = 5.21$, $p = 0.002$; PPAQ-total (kcal per week), $F(3, 92) = 4.75$, $p = 0.004$; and PPAQ-Daily city blocks walked, $F(3, 92) = 4.18$, $p = 0.008$, but BMI and BED status did not significantly contribute to these variables.

Using the CDC (2014) recommendation for minimum metabolic equivalents exerted (i.e. approximately 150 or more min per week), chi-square analyses were not significant, $\chi^2(1) = 0.152$, $p = 0.597$, for participants without BED ($n = 23$, 32.9%) as compared to participants with BED ($n = 10$, 37.0%) who met this criterion. Based on the Paffenbarger et al. (40) original publication, participants' likelihood to reach physical activity cut-offs were examined, and there were no significant group differences in likelihood to reach 2,000 kcal per week, $\chi^2(1) = 0.225$, $p = 0.635$; climb five flights of stairs daily, $\chi^2(1) = 0.011$, $p = 0.918$; or walk five city blocks daily, $\chi^2(1) = 1.051$, $p = 0.305$.

Based on the total sample, 44.3% ($n = 43$) of participants reported 0 min of weekly sports/recreational activities on the PPAQ, and 14.4% ($n = 14$) of the participants endorsed engaging in no physical activity on the GLTEQ (not even mild, which is described as 'yoga, archery, fishing from a river bank, bowling, horseshoes, golf, snowmobiling, easy walking'). An additional 4.1% ($n = 4$) of participants reported that their only weekly physical activity was engaging in these mild activities once weekly on average.

Discussion

This study examined the impact of BED status and exercise self-efficacy on physical activity engagement in individuals with overweight/obesity recruited from primary care for weight loss treatment. Even after accounting for BMI, exercise self-efficacy was significantly associated with numerous physical activity variables, including overall assessments (GLTEQ-total and PPAQ-total), moderate-level and strenuous-level physical activity and daily city blocks walked. BED was not significantly related to any physical activity outcomes (after accounting for BMI). There also were no significant differences between individuals with and without BED on exercise self-efficacy levels or the likelihood of obtaining the CDC minimum physical activity recommendations. Approximately one-third of participants met the CDC's recommendation for minimum weekly physical activity, and almost half of the participants reported no participation in weekly sports/recreational activities.

Exercise self-efficacy emerged as a potent variable related to physical activity outcomes, particularly activities that might be considered 'purposeful' exercise at moderate or strenuous intensity. Even though 'daily city blocks walked' might be considered an 'unavoidable' activity, brisk walking may be a main source of exercise for this population (13,27) and likely also represents purposeful exercise. It is unknown from these data if participants who experienced maintaining a successful exercise routine then felt increased exercise self-efficacy or vice versa. These findings do highlight, however, that exercise self-efficacy may be a potential area of focus for clinicians working with individuals, both with and without BED, to increase physical activity (46).

Table 1 Variable descriptive data

	BED M (SD) ($n = 27$)	Non-BED M (SD) ($n = 70$)	Overall range
Body mass index (kg/m^2)	38.30 (7.73)	33.74 (5.92)	25–55
GLTEQ-total	16.04 (13.55)	27.02 (20.20)	0–92
Mild exercise	2.41 (2.29)	3.01 (2.68)	0–14
Moderate exercise	0.96 (1.26)	1.95 (1.94)	0–7
Strenuous exercise	0.44 (0.85)	0.91 (1.33)	0–5
PPAQ (kcal per week)	1,079.41 (1073.90)	1,117.12 (1,222.44)	0–5,620
Daily flights of stairs climbed	4.15 (4.66)	3.56 (3.64)	0–20
Daily city blocks walked	2.52 (4.45)	6.43(10.93)	0–50
Weekly minutes of sports/recreational activities	143.44 (173.00)	105.00 (137.67)	0–600
Marcus 5-item Exercise Self-Efficacy	15.59 (8.12)	18.14 (7.74)	4–35

Note. BED, binge-eating disorder; GLTEQ, Godin Leisure-Time Exercise Questionnaire; M, mean; PPAQ, Paffenbarger Physical Activity Questionnaire; SD, standard deviation.

Table 2 Linear regressions examining relationship between body mass index (BMI), BED status, exercise self-efficacy (MESE) and exercise

Outcome variable	Linear regressions
GLTEQ-total	$F(3, 92) = 11.83, p < 0.0005$ BMI: $Beta = -0.249, p = 0.008$ BED: $Beta = -0.126, p = 0.179$ MESE: $Beta = 0.405, p < 0.0005$
Mild exercise	$F(3, 92) = 1.50, p = 0.220$ BMI: $Beta = -0.038, p = 0.720$ BED: $Beta = -0.056, p = 0.600$ MESE: $Beta = 0.194, p = 0.061$
Moderate exercise	$F(3, 92) = 9.04, p < 0.0005$ BMI: $Beta = -0.196, p = 0.044$ BED: $Beta = -0.134, p = 0.165$ MESE: $Beta = 0.374, p < 0.0005$
Strenuous exercise	$F(3, 92) = 5.21, p = 0.002$ BMI: $Beta = -0.242, p = 0.018$ BED: $Beta = -0.067, p = 0.511$ MESE: $Beta = 0.254, p = 0.010$
PPAQ-total (kcal per week)	$F(3, 92) = 4.75, p = 0.004$ BMI: $Beta = -0.144, p = 0.158$ BED: $Beta = 0.073, p = 0.477$ MESE: $Beta = 0.341, p = 0.001$
Daily flights of stairs climbed	$F(3, 92) = 2.52, p = 0.063$ BMI: $Beta = -0.247, p = 0.020$ BED: $Beta = 0.083, p = 0.432$ MESE: $Beta = 0.141, p = 0.165$
Daily city blocks walked	$F(3, 92) = 4.18, p = 0.008$ BMI: $Beta = -0.069, p = 0.502$ BED: $Beta = -0.122, p = 0.237$ MESE: $Beta = 0.293, p = 0.004$
Weekly minutes of sports/recreational activities	$F(3, 92) = 2.03, p = 0.054$ BMI: $Beta = -0.078, p = 0.455$ BED: $Beta = 0.181, p = 0.088$ MESE: $Beta = 0.239, p = 0.020$

Note. BED = binge-eating disorder status; GLTEQ = Godin Leisure-Time Exercise Questionnaire; MESE, Marcus 5-item Exercise Self-Efficacy; PPAQ, Paffenbarger Physical Activity Questionnaire.

Contrary to hypotheses, BED status was unrelated to physical activity levels and exercise self-efficacy (13,15). The current results are, however, similar to those of Hrabosky et al. (24) who reported no significant physical activity differences between individuals with and without BED. Similarly, the exercise self-efficacy differences reported by Rosenberger and Dorflinger (14) between individuals with and without binge eating (BED diagnosis based on self-report only) were only considered 'marginal' ($p = 0.056$) and based on an all-male sample. This is the

first study to compare individuals with and without BED (diagnosed by interview) who also were recruited similarly for weight loss treatment in primary care. It is feasible that existing significant differences could not be detected because of the small BED sample size, and future studies with larger samples should replicate these analyses.

Consistent with existing literature, current participants were relatively sedentary, with one-third of the sample reporting meeting the CDC's weekly minimum physical activity guideline. Mild-intensity physical activity was most commonly reported (24,26,33). Physical activity intensity remains an important area of study because there is a preponderance of data suggesting that moderate and strenuous physical activity is the most beneficial for both healthy weight maintenance (29–32) and preventing/reversing negative health-related outcomes (e.g. cardiovascular disease) (47–51). In addition to increasing overall physical activity within this population, it may be of particular importance to also focus specifically on increasing at least moderate-intensity activities as well (with medical clearance).

These results should be interpreted in the context of the study limitations. This is a cross-sectional study, so causality, or the directional relationship between exercise and exercise self-efficacy, cannot be assumed. As mentioned earlier, the total sample was small, and it was further limited by a small number of individuals with BED. It is possible, therefore, that these analyses were not adequately powered and differences between the groups do exist. This sample came from one geographic area and was primarily female, and therefore, these findings may not generalize across settings and locations, to individuals not seeking weight loss treatment, or to groups more balanced in sex. Because participants were recruited from primary care, findings may not generalize to specialty or psychiatric settings. Physical activity levels were based on participant self-report and were not directly measured via accelerometer, which is deemed the most accurate assessment method (52).

In addition to recruiting a larger sample size with a higher ratio of men, future studies may wish to include multiple methods of physical activity measurement as relying on one method, or overall indices may be limiting. For example, a large proportion (44%) of current participants reported no regular engagement in sports/recreational activities (based on the PPAQ), whereas a much smaller proportion reported no regular physical activity (14%) based on the GLTEQ.

In conclusion, after adjusting for BMI, BED status was unrelated to frequency or intensity of physical activity in this treatment seeking sample of individuals with overweight/obesity. Self-efficacy was broadly related to

physical activity, regardless of BED status or BMI. Expansion and replication of the current results with a larger sample, particularly men and those with BED, is warranted. Current results suggest determining methods for increasing exercise self-efficacy, and more strenuous physical activity, may be important for clinicians and future research.

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Conflicts of Interest Statement

The authors have no competing interests to report.

Contributors

All authors contributed equally to the literature review and manuscript preparation.

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