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Exploring Relationships Among Appetitive Traits, Negative Affect, and Binge Eating in Adults with Overweight or Obesity

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Abstract

Binge eating (BE) is a significant public health concern due to its prevalence and impact on mental and physical health. While research has suggested both negative affect and appetitive traits are associated with BE, few studies have investigated these constructs concurrently. Structural equation modeling (SEM) evaluated relationships between negative affect, reward-related appetitive traits, and BE among 293 adults with overweight or obesity (OW/OB) seeking treatment for BE, overeating, and weight management (m age=46.6; m body mass index[BMI]=34.5; 81.2% female; 20.1% Latinx, 60.8% White non-Latinx). BE was related to negative affect (β=0.53; p<0.01) and appetitive traits (β=1.53; p<0.001). Negative affect and appetitive traits were related to one another (r=0.42; p<0.001), and the full model accounted for 77% of the variance in BE. In an exploratory follow-up analysis, multigroup SEM evaluated the above relationships in models stratified by sex. Exploratory findings demonstrated both negative affect and appetitive traits were related to BE across sex, particularly when examining BE cognitions and behaviors. However, relationships in men depended upon BE assessment tool. These findings highlight that both negative affect and appetitive traits are related to BE, and jointly

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Contributors

E.P., D.S., and K.B. conceptualized the manuscript. K.B. obtained funding for the trial and K.B., D.E., and D.S. directed and contributed to data collection. D.S. and M.M. aided in conducting analyses and interpreting results. E.P. wrote the first draft of the manuscript and prepared all tables and figures. D.E. and C.P contributed to writing and editing. All authors provided critical feedback and helped shape the research and final draft of the manuscript.

Conflict of Interest

All authors declare that they have no conflicts of interest.

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may represent significant risk and maintenance factors, particularly in adults with OW/OB. Our findings also highlight the importance of future investigation of sex differences in BE and the potential impact of assessment method.

Keywords

binge eating; structural equation modeling; appetitive traits; negative affect

1. Introduction

Binge eating (BE) is a serious public health concern due to its associations with several medical[1,2] and psychiatric comorbidities,[3] resulting in weight gain[4] and reduced quality of life.[5] BE is characterized by eating an objectively large amount of food while experiencing a loss of control (LOC) over one's eating. While BE is a feature of many eating disorders, it also occurs frequently in individuals without threshold eating disorders, particularly in adults with overweight or obesity (OW/OB).[6] Research has suggested that both BE and LOC eating are associated with significant distress and psychological comorbidities, regardless of whether size and frequency of episodes meets full criteria for an eating disorder.[7,8] Prevalence estimates have suggested that 28-37% of adults with OW/OB meet criteria for BED,[9,10] and subthreshold endorsement of BE features have been estimated significantly higher (57-100%).[11,12]

A large body of research has suggested that negative affect is a transdiagnostic antecedent of BE.[13] The affect regulation theory of BE purports that BE is used to reduce negative affect and distress.[14] Cross-sectionally, epidemiological studies and systematic reviews have demonstrated that higher levels of negative affect,[13] depression,[15] and anxiety[3] are associated with increased BE. Further, a systematic review supported the role of negative affect as a temporal antecedent to BE in bulimia nervosa and BED patients,[16] and this finding has also been supported among adults with OW/OB who engage in BE.[17] It is unclear in the literature if certain aspects of BE (i.e., frequency, cognitions, behaviors) have demonstrated greater associations with negative affect. However, it appears that a combination of both diagnostic requirements of a binge episode (i.e., LOC and objectively large amount of food) have been associated with greater levels of negative affect,[18,19] and worsened emotion dysregulation has been associated with increased BE severity.[20] Importantly, most of these studies have been conducted in women-only or majority-women samples, highlighting the need to evaluate these relationships in other gender identities, including cis-gender men.

While associations between negative affect and BE have been established, a growing body of evidence has suggested that reward-related appetitive traits may also impact BE. The Behavioral Susceptibility Theory (BST) suggests that appetitive traits are genetically determined and interact with the obesogenic environment to promote overeating and weight gain.[21,22] Two widely investigated appetitive traits are food responsiveness (FR) and satiety responsiveness (SR). FR includes urges to eat based on the sight, smell, or taste of palatable food while SR refers to stopping eating in relation to physical fullness sensations. Two

reviews which incorporated neuroimaging, neurocognitive, and behavioral tasks supported the relationship between FR and BE both cross-sectionally and prospectively.[23,24] Relatedly, reward-based eating is characterized by lack of control over eating, lack of satiation, and preoccupation with food.[25] Reward-based eating is not inherently pathological but reflects a strong eating drive in response to the reward of highly palatable food.[25] Reward-based eating includes aspects of FR, which may serve to maintain the high reward value of food and can override satiety signals.[25] Evidence from neuroimaging studies has suggested that increased reward-based eating is associated with BE.[26] While the role of SR in BE has been less frequently studied, results from standardized meal paradigms found that both children and adults with BE reported lower levels of SR as compared to individuals without BE.[27,28] Lastly, interventions that aimed to reduce FR through food cue exposure and improve SR through appetite awareness training have demonstrated reductions in BE and LOC eating episodes.[29,30]

While research has suggested that both negative affect and appetitive traits are associated with BE, few studies have investigated relationships among the 3 constructs concurrently. Evidence has suggested that negative affect and FR are related to one another both cross-sectionally[31] and prospectively,[32-34] and may impact one another as well as eating behavior. Recently, frameworks have been proposed integrating of aspects of negative affect, reward responsivity, and BE behavior among both youth and adults.[35,36] While these reviews have suggested that both negative affect and appetitive traits are related to one another, and may together exacerbate BE, more research is needed to investigate these relationships concurrently among adults with OW/OB.

There are very few studies that have examined whether relationships between negative affect, appetitive traits, and BE may differ by sex. Two studies reported a stronger relationship between negative affect and BE in women compared to men.[37,38] Although several studies have examined sex or gender differences in relationships between reward-related appetitive traits and BE, measured constructs have been inconsistent and results mixed.[39,40] Understanding factors that contribute to BE behavior in adults with OW/OB, examining these questions using validated measures and a rigorous statistical approach, and exploring these relationships by sex can inform BE prevention and treatment targets in OW/OB.

The present study was a secondary data analysis to elucidate the relationships among negative affect (depression and anxiety), appetitive traits (FR, SR and reward-based eating), and BE in a sample of treatment-seeking adults with OW/OB. We used 2 well-validated questionnaires to assess aspects of BE: BE frequency measured by the Eating Disorder Examination Questionnaire (EDE-Q) and BE cognitions and behaviors measured by the Binge Eating Scale (BES). We hypothesized that negative affect and appetitive traits would demonstrate significant independent positive relationships with BE and with one another. We also conducted an exploratory follow-up analysis that aimed to examine relationships among negative affect, appetitive traits, and BE in models stratified by sex.

2. Methods

Data for this secondary analysis were drawn from the Providing Adults Collaborative Interventions for Ideal Changes trial (NCT02516839), a randomized control trial targeting BE, overeating, and body weight for adults with OW/OB. Recruitment methods, measures, interventions, and outcomes have been detailed in full in previous publications.[41,42] Participant inclusion criteria included aged 18-65 years, BMI ≥ 25 and ≤ 45 kg/m^2, English language of at least the 5th grade reading level, and willingness to participate in study visits over 2 years. Exclusion criteria included serious current physical disease (e.g., diabetes), any medical condition that would make physical activity unsafe, current substance use disorder, current or planned pregnancy or lactation, and any medical or psychological problems that could make adherence to the study protocol difficult or dangerous (e.g., purging). Measures for the current study were collected during baseline assessments completed at the University of California San Diego (UC San Diego) prior to randomization. The study was approved by the Institutional Review Board at UC San Diego (151110) and written consent was obtained from all participants.

2.1 Measures

2.1.1. Demographics and Anthropometrics—Participants self-reported their age, sex assigned at birth (female or male), and race/ethnicity as part of baseline assessments. We use the term sex to refer to biological attributes associated with an individual's physical and physiological features. Height was measured in triplicate to the nearest 0.1 cm using a portable Schorr stadiometer (Schorr Inc., Olney, MD). Weight was measured in duplicate to the nearest 0.1 kg using a calibrated digital Tanita scale (model WB 110-A). The values obtained at the baseline assessment were averaged to calculate BMI (weight[kg]/height[m^2]).

2.1.2 The Patient Health Questionnaire—9 (PHQ-9)—The PHQ-9[43] is a 9-item questionnaire that assessed depression symptoms and severity. The PHQ-9 demonstrated acceptable internal consistency (α = 0.76, omega-hierarchical [ω_H] = 0.64).

2.1.3 The Generalized Anxiety Questionnaire—7 (GAD-7)—The GAD-7[44] is a 7-item questionnaire that assessed anxiety symptoms and severity. The GAD-7 demonstrated good internal consistency (α = 0.83, coefficient H [H] = 0.51).

2.1.4 The Reward-Based Eating Drive Scale (RED)—The RED[25] is a 9-item questionnaire that assessed lack of control over eating, lack of satiation, and preoccupation with food. The RED demonstrated strong internal consistency (α = 0.89, ω_H = 0.73).

2.1.5 Adult Eating Behavior Questionnaire (AEBQ)—The AEBQ is an adaptation of the Children's Eating Behavior Questionnaire (CEBQ)[45] that assessed appetitive traits. Language from the CEBQ was modified to create the adult version of the CEBQ's FR and SR subscales by the research team, maintaining the likeness of each item. The FR subscale demonstrated strong internal consistency (α = 0.85, H = 0.61), and the SR subscale demonstrated acceptable internal consistency (α = 0.70, H = 0.36).

2.1.6 Binge Eating Scale (BES)—

The BES[46] is a 16-item questionnaire that assessed BE symptoms and severity on a continuous scale with scores ranging from 0-46. In addition to BE behavior, the BES assessed upstream cognitions and attitudes related to BE. The BES demonstrated strong internal consistency (α = 0.87, ω_H = 0.74).

2.1.7 Eating Disorder Examination Questionnaire (EDE-Q)—

The EDE-Q[47] is a 28-item questionnaire adaptation of the Eating Disorder Examination interview that assessed eating disorder attitudes and behaviors. Item 15 from the EDE-Q assessed number of days the respondent has eaten an unusually large amount of food with a sense of LOC (i.e., the 2 diagnostic requirements of a binge episode) in the past month. Responses on this item range from 0-28 days.

2.2 Statistical Analysis

The proposed measurement model was comprised of 3 latent variables: negative affect, appetitive traits, and BE. Negative affect (indicated by PHQ-9 and GAD-7 total scores) and appetitive traits (indicated by AEBQ-FR and -SR subscale scores and RED total scores) were modeled as exogenous (independent) latent variables, and BE (indicated by BES total scores and EDE-Q BE frequency item) was modeled as an endogenous (dependent) latent variable. First, the measurement model was evaluated to ensure acceptable fit between observed and latent variables. Subsequently, SEM assessed relationships among negative affect, appetitive traits, and BE, adjusting for sex, age, ethnicity, race, and BMI. These covariates were chosen because demographic factors have been associated with differential BE,[48,49] and increased BE has been associated with weight gain.[4] As an exploratory follow-up analysis, multigroup SEM assessed the above relationships in separate models stratified by sex. In this multigroup model, SEM was performed concurrently in 2 separate models in which the latent BE construct was indicated by 1) BES total scores, which we define as BE cognitions and behaviors, and 2) EDE-Q BE frequency item which we define as BE frequency, singularly. BE measures were separated in the multi-group model by necessity to maintain positive variance of all outcome variables and establish plausible models.

All study variables were analyzed using R version 4.1.0[50] using the “psych”[51] and “lavaan”[52] packages. Total or mean scores (if applicable) for observed variables were calculated and included in the present analysis if at least 50% of items were completed using mean item-imputation for missing data within a scale or subscale. Observations were excluded from analyses if any study variable required for SEM was missing. BES and RED scores were scaled by dividing by 10 to match scale of other included variables. Categorical race and ethnicity variables were dichotomized into White/non-White and Latinx/non-Latinx respectively, for incorporation into SEM.

Internal consistency was assessed using Cronbach’s alpha (α) and McDonald’s coefficient omega (ω). Omega-hierarchical (ω_H) was reported with $\omega_H \geq 0.65$ indicative of strong dimensionality.[53] For scales with less than 9 items, coefficient H from Mokken scale analysis (H) was reported as the second metric of dimensionality,[54] with $0.3 \leq H$ indicative of a weak scale and $H \geq 0.5$ indicative of a strong scale.[55] Overall model fit for both measurement and structural models was determined using 3 indices: the Comparative Fit

Index (CFI),[56] the root mean square error of approximation (RMSEA),[57] and standardized root mean residual (SRMR).[58] CFI values greater than .95 indicated good fit. RMSEA and SRMR values less than .08 indicated acceptable fit and values less than .05 indicated good fit. The likelihood ratio χ^2 was also reported.

3. Results

3.1 Demographics and Descriptive Statistics

In total, 293 participants had measurements for all included variables.[1] Participants had a mean age of 46.6 years, 81.2% (n = 238) of the sample was female, and 60.8% (n = 178) identified as non-Latinx White. Detailed demographic information for the sample by sex is presented in Table 1. Means and standard deviations by sex of scores on measures used to indicate latent variables are presented in Supplementary Table 1. The range of scores measuring BE cognitions and behaviors was somewhat wider for women (0 - 44) compared to men (0 - 31). Ranges of BE frequency were similar between women (0 - 28 days) and men (0 - 26 days). Approximately one quarter (26%, n = 76) of the sample met criteria for BED, which was somewhat higher in women (27.3%, n = 65) than men (20.0%, n = 11). Nonzero endorsement of BE frequency was similar between women (50.8%, n = 121) and men (47.3%, n = 26).

3.2 Measurement Model and Structural Equation Model

First, the measurement model containing the 3 hypothesized latent variables was evaluated, which demonstrated good fit to the data (CFI = 0.99; RMSEA = 0.06; SRMR = 0.04; $\chi^2(11) = 25.66$, $p = 0.007$).

Subsequently, the structural model was evaluated with pathways from negative affect and appetitive traits to BE (Figure 1). The model demonstrated acceptable fit to the data per all indices evaluated (CFI = 0.97; RMSEA = 0.05; SRMR = 0.05; $\chi^2(11) = 65.96$, $p = 0.008$). The direct effects from negative affect and appetitive traits to BE were both strong and statistically significant. The covariance between negative affect and appetitive traits was moderate ($r = 0.42$; $p < 0.001$). The overall R^2 for this model was 0.77.

3.3 Exploratory Multigroup Structural Equation Models by Sex

The exploratory multigroup structural model for women and men with pathways from negative affect and appetitive traits to BE cognitions and behaviors is presented in Figure 2 and for women and men with pathways from negative affect and appetitive traits to BE frequency is presented in Figure 3. Both exploratory multigroup models demonstrated good fit per all indices evaluated (CFI = 0.995; RMSEA = 0.02; SRMR = 0.05; equivalent for both models; BES $\chi^2(78) = 946.62$, $p < 0.001$; BE days $\chi^2(78) = 729.16$, $p < 0.001$). It was deemed inappropriate to test for sex differences between the pathways in models separated

[1] In total, 298 participants completed all questionnaires but 5 were excluded from analyses due to missing data. Of questionnaire data from 293 included participants, 0.3% of items (range for scales/subscales was 0.1 – 0.4%) were missing. 9.9% of cases required any imputation, and for most cases, this was only a single skipped item. The BES (16 items) was the only exception in which 3 items were imputed for 1 case.

by sex due to the small male sample size ($N = 55$).[59] Importantly, the results for men should be interpreted with caution, as there were only 55 men in the sample.

In the exploratory multigroup model for BE cognitions and behaviors, the relationship between BE cognitions and behaviors and negative affect was weak but statistically significant in both women and men. The relationship between BE cognitions and behaviors and appetitive traits was strong and statistically significant in both women and men. The relationships between BE cognitions and behaviors and planned covariates were nonsignificant across sex. Additionally, the covariance between negative affect and appetitive traits was moderate and statistically significant for both women and men. The overall R^2 for this model was 0.64 for women and 0.82 for men.

In the exploratory multigroup model for BE frequency, the relationship between BE frequency and negative affect was strong and statistically significant in women but was not significant in men. The relationship between BE frequency and appetitive traits was also strong and statistically significant in women but was not significant in men. The relationships between BE frequency and planned covariates were nonsignificant across sex. Additionally, the covariance between negative affect and appetitive traits was moderate and statistically significant for both women and men. The overall R^2 for this model was 0.28 for women and 0.12 for men.

4. Discussion

This study evaluated relationships between negative affect, appetitive traits, and BE among a sample of treatment-seeking adults with OW/OB. We found strong relationships between negative affect and BE and appetitive traits and BE, a moderate covariance between negative affect and appetitive traits, and that together these variables accounted for a large percentage of BE variance. These findings are consistent with existing literature, and provide evidence for the affect regulation model of BE and the role of appetitive traits in BE both singularly and jointly among treatment-seeking adults with OW/OB. These findings highlight the importance of assessing negative affect and appetitive traits concurrently due to their ability to account for significant variance in BE.

In all examined models, appetitive traits, compared to negative affect, demonstrated numerically stronger relationships with BE, suggesting that appetitive traits may be a more salient contributor to BE than negative affect. Further, negative affect and appetitive traits were significantly related to one another across sex, demonstrating a consistent, moderate covariance in all models. While examining the temporal relationship between constructs was beyond the scope of this study, our findings suggest that negative affect and appetitive traits were related to each other and to BE in both sexes. It is possible that together, negative affect and appetitive traits may present larger risk and/or more potent maintenance factors for BE than alone. Further, the hypothesis that the interaction of negative affectivity and elevated reward responsivity for food increases risk for the development of BED and adult obesity has been discussed in a previous review paper.[35] Thus, future research is needed to investigate if appetitive traits may potentially moderate the relationship between negative affect and BE.

Upon exploring these relationships by sex and separate BE constructs, we found that both negative affect and appetitive traits were related to BE across sex, particularly when examining BE cognitions and behaviors. However, this relationship was only observed in women when examining BE frequency. Numeric differences in R^2 values were observed across sex and BE models. Negative affect and appetitive traits accounted for a larger proportion of the variance in BE cognitions and behaviors in men while negative affect and appetitive traits accounted for a larger proportion of the variance in BE frequency in women. However, negative affect and appetitive traits did not account for as much variance in BE frequency in both sexes. This observed discrepancy may reflect the ability of the BE cognitions and behaviors construct to capture subthreshold BE, as compared to BE frequency, which measures the occurrence of a discrete behavior, and specifies both LOC and objectively large criteria. Due to our small sample of men we are not able to make statistical inferences about sex differences in BE relationships.

We were unable to form a plausible multigroup model separated by sex that maintained the latent BE construct, for which we offer a number of potential explanations. While there were more men in this study than in many other investigations of eating disorder symptoms in men, it was not large (18.8%, $n = 55$). It is possible that differential item functioning may have influenced the relationship between the BE frequency item and BES total scores in men, therefore rendering the model with the combined BE latent construct implausible. Multiple previous studies have found poorer psychometric functioning (i.e., lower criterion and predictive validity) of eating disorder measures among male compared to female respondents.[60,61] This hypothesis is also consistent with results of a previous study which found a dimensional measure of BE (the Eating Disorder Diagnostic Scale[62]) to yield greater specificity when examining gender differences in the severity of BE symptoms.[37] This phenomenon may have contributed to our exploratory findings which showed consistent relationships across sex between negative affect and appetitive traits with BE cognitions and behaviors when measured dimensionally, but a lack of relationship between negative affect and appetitive traits with BE frequency in men when measured categorically and for which endorsement of LOC was required. Literature suggests that men are just as likely as women to engage in overeating,[63] but women are more likely to endorse LOC eating.[64] Results from a qualitative study in men suggested that while overeating is consistent with the stereotypical, Western male gender role, LOC is not.[65] Thus, men may experience the same phenomenon as women but are more reluctant to endorse or label LOC. While we are unable to form conclusions due to the exploratory nature of this sex-based analysis, our findings highlight the need for more research on potential sex and gender bias in the measurement of eating disorder symptoms in men.[66]

The present study has several strengths. The study sample had some racial and ethnic diversity and the evaluation of appetitive traits, negative affect, and BE, was conducted concurrently, included multiple measures for each latent construct, and used advanced multivariable statistical modelling techniques with *a priori* model fit threshold cutoffs. However, several limitations are important in interpreting the study findings. This study was cross-sectional and included only treatment-seeking individuals who were predominantly women; thus, no causal inference can be made, results cannot be generalized to the population, and conclusions about BE in men should be interpreted with caution. Further, results cannot

be generalized to nonbinary, gender fluid, and transgender populations. Due to the small male sample, we were unable to evaluate for sex differences in SEM pathways, and the estimates we report may lack precision. While the BE frequency item from the EDE-Q assessed BE directly, it did not capture LOC eating which did not meet the size criteria for BE but may have been clinically significant, and it also required endorsement of the phenomenon of LOC, which some individuals may have been reluctant to endorse. Lastly, thorough psychometric testing has yet to be completed for the AEBQ FR and SR subscales adapted by the research team. Evaluating how BE symptoms and behavior may differ by sex and among gender identities, and examining potential sex and gender bias in existing eating disorder measurement tools and reporting of LOC will be useful to explore. Future research in this domain will benefit from choosing measurement tools that consider the dimensional nature of BE.

5. Conclusions

In sum, the present study demonstrated significant relationships between negative affect, appetitive traits, and BE, supporting the affect regulation model of BE and extension of the Behavioral Susceptibility Theory to BE, as well as their joint utility. Treatment approaches that address appetitive traits in addition to emotion regulation skills may demonstrate increased effectiveness in individuals with OW/OB who engage in BE. Research is needed to investigate the potential moderating role of appetitive traits on the relationship between negative affect and BE, to explore both sex and gender differences in BE experiences, and evaluate potential sex and gender bias in the current measurement of BE in men.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Abbreviations:

BE	binge eating
OW/OB	overweight or obesity
BMI	body mass index
BES	Binge Eating Scale

EDE-Q	Eating Disorder Examination Questionnaire
CFI	comparative fit index
RMSEA	root mean square error of approximation
SRMR	standardized root mean residual
BED	binge eating disorder
FR	food responsiveness
SR	satiety responsiveness
UC San Diego	University of California San Diego
PHQ-9	Patient Health Questionnaire—9
GAD-7	Generalized Anxiety Disorder Questionnaire—7
RED	Reward-based Eating Drive Scale
AEBQ	Adult Eating Behavior Questionnaire
ω_H	omega-hierarchical
SEM	structural equation modeling
H	coefficient H from Mokken scale analysis

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Highlights

- Negative affect and appetitive traits both strongly related to binge eating (BE)
- Negative affect and appetitive traits accounted for significant variance in BE
- Negative affect and appetitive traits related moderately to one another

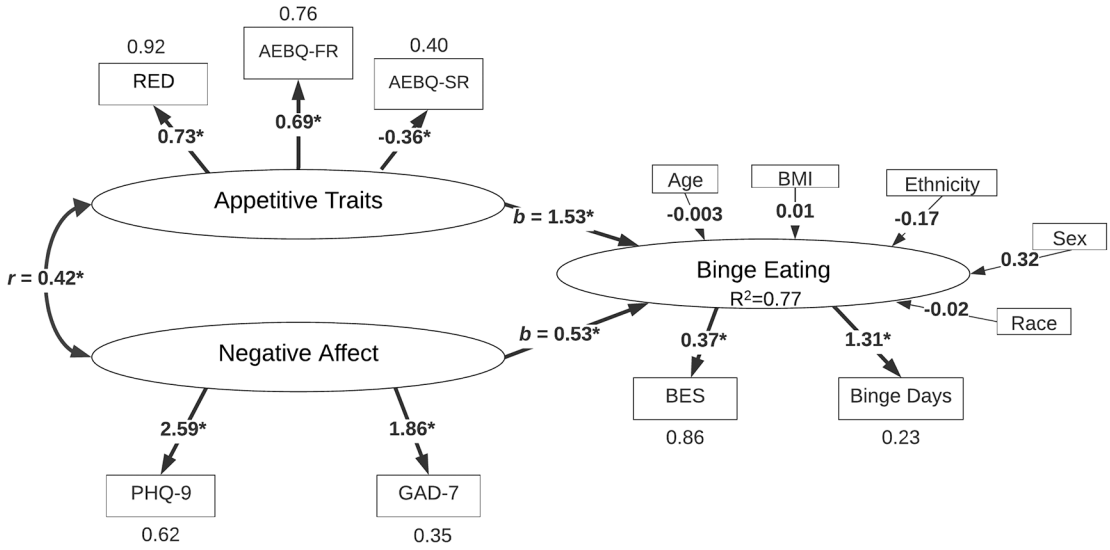

Figure 1. Path Diagram for the Combined Structural Model

Abbreviations: RED = Reward-Based Eating Drive Scale; AEBQ-FR = Adult Eating Behavior Questionnaire Food Responsiveness Scale; AEBQ-SR = Adult Eating Behavior Questionnaire Satiety Responsiveness Scale; PHQ-9 = Patient Health Questionnaire-9; GAD-7 = Generalized Anxiety Questionnaire-7; BE = binge eating; BMI = body mass index

* Denotes statistically significant loading or correlation ($p \leq 0.01$)

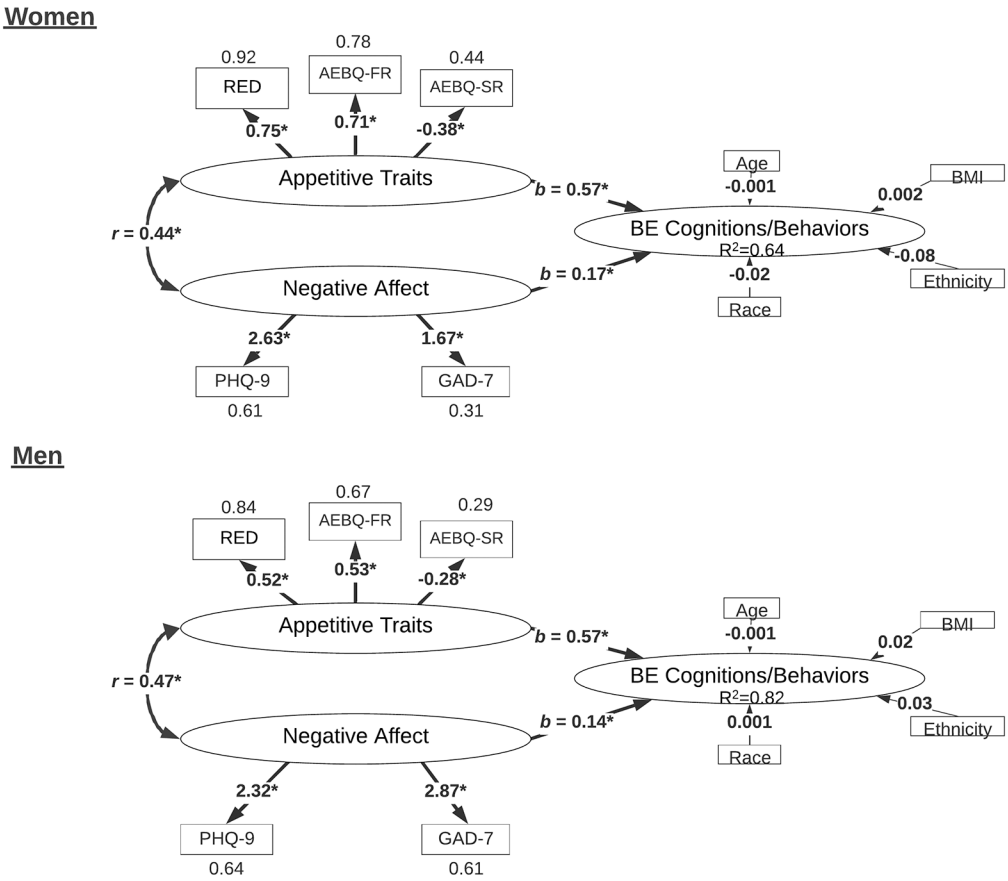

Figure 2. Binge Eating Cognitions and Behaviors Path Diagram for Women and Men

Abbreviations: RED = Reward-Based Eating Drive Scale; AEBQ-FR = Adult Eating Behavior Questionnaire Food Responsiveness Scale; AEBQ-SR = Adult Eating Behavior Questionnaire Satiety Responsiveness Scale; PHQ-9 = Patient Health Questionnaire-9; GAD-7 = Generalized Anxiety Questionnaire-7; BE = binge eating; BMI = body mass index

*Denotes statistically significant loading or correlation ($p \leq 0.01$)

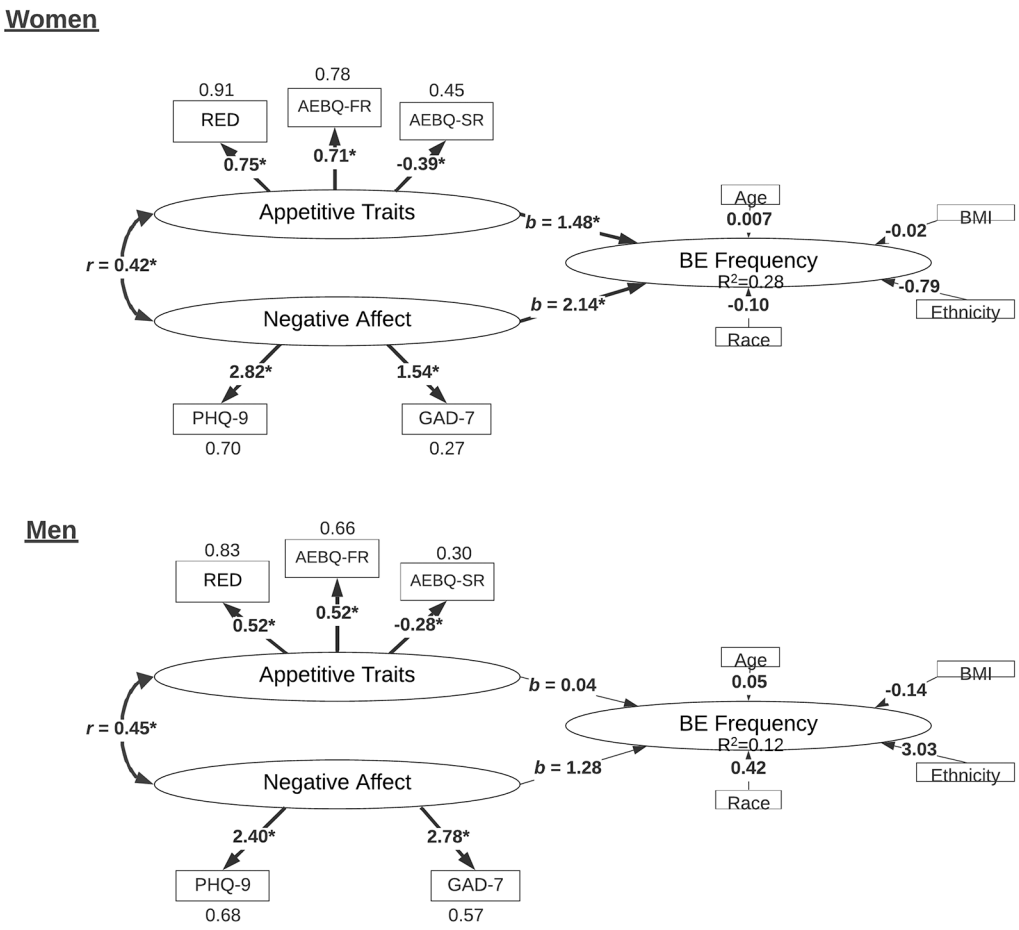

Figure 3. Binge Eating Frequency Path Diagram for Women and Men

Abbreviations: RED = Reward-Based Eating Drive Scale; AEBQ-FR = Adult Eating Behavior Questionnaire Food Responsiveness Scale; AEBQ-SR = Adult Eating Behavior Questionnaire Satiety Responsiveness Scale; PHQ-9 = Patient Health Questionnaire-9; GAD-7 = Generalized Anxiety Questionnaire-7; BE = binge eating; BMI = body mass index

*Denotes statistically significant loading or correlation ($p \leq 0.01$)

Table 1.

Sample Characteristics

Demographics, *N* (%) unless stated otherwise*	**Full Sample (*N*=293)**	**Women (*N*=238)**	**Men (*N*=55)**
Age (years), Mean (SD)	46.6 (11.9)	46.8 (11.9)	45.9 (12.3)
Race/Ethnicity			
Latinx	59 (20.1%)	48 (20.2%)	11 (20.0%)
Non-Latinx, White	178 (60.8%)	146 (61.3%)	32 (58.2%)
Black	18 (6.1%)	15 (6.3%)	3 (5.5%)
Asian/Pacific Islander	22 (7.5%)	15 (6.3%)	7 (12.7%)
American Indian	3 (1.0%)	3 (1.3%)	0 (0.0%)
Multiracial**	13 (4.4%)	12 (5.0%)	1 (1.8%)
Unreported	17 (5.8%)	12 (5.0%)	5 (9.1%)
BMI (kg/m^2), Mean (SD)	34.5 (5.2)	34.5 (5.3)	34.9 (4.9)
Household Income			
<$50 000/year	56 (19.1%)	47 (19.7%)	9 (16.4%)
$50 000-$99 999/year	94 (32.1%)	83 (34.9%)	11 (20.0%)
>$100 000/year	118 (40.3%)	87 (36.6%)	31 (56.4%)
Prefer not to answer answer/Unreported	25 (8.5%)	21 (8.8%)	4 (7.3%)

Abbreviations: BMI = body mass index

*No significant sex differences observed between demographic categories (all *p*'s > 0.05).

**Note: race/ethnicity percentages add up to > 100% due to selection of multiple categories by some respondents.