The mediating role of emotion dysregulation and depression on the relationship between childhood trauma exposure and emotional eating[★]

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Abstract

Exposure to childhood adversity is implicated in the etiology of adverse health outcomes, including depression, posttraumatic stress disorder (PTSD), and obesity. The relationship between childhood trauma and obesity may be related to the association of childhood trauma and risk for emotional eating. One pathway between trauma exposure, psychopathology, and emotional eating may be through emotion dysregulation and depression. The current study was undertaken to characterize demographic, environmental, and psychological risk factors for emotional eating in a primarily African American, low socioeconomic status (SES), inner-city population ($N = 1110$). Emotional eating was measured using the Dutch Eating Behavioral Questionnaire and the Emotional Dysregulation Scale was used to assess emotion regulation. The Beck Depression Inventory and the modified PTSD Symptom Scale were used to assess depression and PTSD, respectively. Higher levels of emotional eating were associated with body mass index, income, childhood and adulthood trauma exposure, depressive and PTSD symptoms, negative affect and emotion dysregulation. Childhood emotional abuse was the most associated with emotional eating in adulthood. Hierarchical linear regression and mediation analyses indicated that the association between childhood trauma exposure (and emotional abuse specifically) and emotional eating was fully mediated by depression symptoms and emotion dysregulation, with emotional dysregulation contributing more to the mediation effect. Together these findings support a model in which obesity and related adverse health outcomes in stress- and trauma-exposed populations may be

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directly related to self-regulatory coping strategies accompanying emotion dysregulation. Our data suggest that emotion dysregulation is a viable therapeutic target for emotional eating in at-risk populations.

Keywords

Childhood adversity; PTSD; Depression; Emotion regulation; Emotional eating

Introduction

Exposure to childhood adversity has shown to be robustly related with an array of adverse developmental and psychological outcomes in a dose-dependent manner (Cicchetti, Rogosch, Gunnar, & Toth, 2010; Cicchetti & Toth, 2005; Manly, Kim, Rogosch, & Cicchetti, 2001), including increased risk for developing psychopathology (Heim & Nemeroff, 2001; Kessler, Davis, & Kendler, 1997) and eating disorders in adulthood (Burns, Fischer, Jackson, & Harding, 2012; Kong & Bernstein, 2009). Maltreated children go on to develop depression, posttraumatic stress disorder (PTSD), and substance use disorders at higher rates than non-maltreated children (Brown, Cohen, Johnson, & Smailes, 1999; Horwitz, Widom, McLaughlin, & White, 2001; Kaplow & Widom, 2007). Depression, PTSD, and childhood maltreatment are also highly comorbid with obesity (de Wit et al., 2010; Hemmingsson, Johansson, & Reynisdottir, 2014; Pagoto et al., 2012; Rosmond, 2004) that may result from increased emotional eating (Talbot, Maguen, Epel, Metzler, & Neylan, 2013). Therefore, understanding the factors that lead to emotional eating is critical to the development of interventional strategies that reduce the health burden imposed by obesity and its adverse consequences.

One risk factor for the development of adverse physical and mental health conditions among individuals exposed to childhood adversity is a deficit in adaptive coping strategies that can be deployed in response to environmental stressors (Pollak, 2008; Shields, Cicchetti, & Ryan, 1994). Instead, individuals with adverse childhood experiences are at increased risk for developing mal-adaptive coping strategies, including stress-induced emotional eating (Evers, Marijn Stok, & de Ridder, 2010). One reason this might occur is because of impairment in emotion regulation. Emotion regulation is the critical ability to modulate and maintain feelings, behaviors, and physiological responses that constitute an emotion (Gross, 2002). Extensive research now shows that poor emotion regulation contributes to an array of psychiatric conditions, including depression and PTSD (Aldao, Nolen-Hoeksema, & Schweizer, 2010; Bradley et al., 2011), in a manner distinct from negative affect alone (Bradley et al., 2011). Emotion regulation difficulties are often found in individuals exposed to trauma, particularly childhood abuse (Pollak, 2008; Shields et al., 1994), and are found to have long-term detrimental effects on expression, recognition, and communication of emotion, and the use of strategies for managing strong emotions (Southam-Gerow & Kendall, 2002).

While research has shown a relationship between emotion dysregulation and risk for psychological disorders including eating-related psychopathology (Moulton, Newman,

Power, Swanson, & Day, 2015), it remains unclear whether emotion dysregulation is associated with emotional eating. It is also unclear whether that relationship would exist above and beyond other demographic, environmental, and psychological risk factors for emotional eating. Furthermore, research comprehensively examining the relationship between the various factors that contribute to emotional eating (e.g., demographics and psychological characteristics) is limited. Thus, the goal of the current study was to examine the relationship between childhood maltreatment, other types of trauma, symptoms of PTSD and depression, and emotion dysregulation on emotional eating using linear regression and mediation analyses. We hypothesized that childhood maltreatment, depression, and emotion dysregulation would all be associated with increased emotional eating, and that the relationship between childhood maltreatment and emotional eating would be mediated by depressive symptoms, PTSD symptoms, and emotion dysregulation. Furthermore, we assessed the role of different types of childhood adversity (sexual, physical, and emotional abuse and neglect) on risk for emotional eating, as previous reports indicate that childhood emotional abuse is strongly associated with eating disorder pathology in adulthood (Burns et al., 2012; Kong & Bernstein, 2009). Overall, our analyses intended to identify demographic, environmental, and psychological factors for emotional eating in a low socioeconomic status (SES), primarily African American population that is exposed to greater rates of stress and trauma than the general population and has exacerbated risk for depression, PTSD, and obesity (Gillespie et al., 2009; Harrell & Gore, 1998).

Methods

Participants

Participants were recruited from waiting rooms in the gynecology and primary care medical (non-psychiatric) clinics at Grady Memorial Hospital, a publicly funded hospital in Atlanta, Georgia. We did not narrow our recruitment to specific selection criteria, but approached any individual in the waiting room. To be eligible for participation, subjects had to be English-speaking men and women between the ages of 18 and 65, not actively psychotic, and able to give informed consent. All study procedures were reviewed and approved by the Emory Institutional Review Board and the Grady Hospital Research Oversight Committee. All participants ($N = 1110$) of the current study underwent a screening interview and completed each of the measures used in the current study.

Measures

Demographic information was collected with a locally developed Demographics Form to assess for subject sex, age, self-identified race, education, and income (Gillespie et al., 2009). Body mass index (BMI; kg/m^2) was calculated using self-reported height (m) and weight (kg).

The Traumatic Events Inventory (TEI), 14-item version, is used to assess lifetime adult trauma history. The TEI assesses for experiencing and witnessing traumatic events separately and has been used to describe our sample population previously (Gillespie et al., 2009). Trained research interviewers administered the TEI to detail frequency and type of trauma(s) experienced. Total level of trauma exposure was measured by a sum score

reflecting the total number of different types of trauma (e.g., car accident, sexual assault, and natural disaster) to which a participant had been exposed over the course of their life. For this study, the TEI was used to measure overall trauma exposure in adulthood.

The Childhood Trauma Questionnaire (CTQ) assesses for childhood exposure to emotional, physical, and sexual abuse and neglect (Bernstein et al., 2003) and has been validated in a general population sample (Paivio & Cramer, 2004). Researchers created a continuous variable to account for reported rates of moderate-to-severe emotional, physical, and sexual abuse, as well as emotional and physical neglect. Higher scores on the measure indicate higher levels of reported childhood abuse.

The Beck Depression Inventory (BDI) – II is a 21-item self-report measure of depressive symptoms used to determine current (in the last two weeks) depressive symptom severity (total score) and a current depression diagnosis (total score > 18) (Beck, Steer, Ball, & Ranieri, 1996). We summed the severity items (4-point Likert scale ranging in intensity from 0 to 3) to calculate current depression symptom severity. In this sample, the BDI had a standardized α coefficient of 0.92.

The modified PTSD Symptom Scale (PSS) is a psychometrically valid, 17-item self-report measure assessing PTSD symptoms in the last two weeks. For the present study, we summed the PSS frequency items (4-point Likert scale ranging from "0: not at all" to "3: >5 times a week") to obtain a continuous measure of PTSD symptom severity ranging from 0 to 51 (α = 0.91). A PTSD diagnosis (scored as 0 or 1) was also determined based on prior DSM-IV criteria, if participants met for at least one re-experiencing symptom, three avoidance and/or numbing symptoms, two hyperarousal symptoms, and if the duration of symptoms was greater than one month (Falsetti, Resnick, Resick, & Kilpatrick, 1993).

The Emotional Dysregulation Scale (EDS), 12-item version, was used to determine overall individual emotional dysregulation (Powers, Stevens, Fani, & Bradley, 2015). Items are scored on a 7-point Likert scale ranging from 1 ("Not true") to 7 ("Very true"). Items assess domains of emotional experiencing (e.g., "Emotions overwhelm me"), cognition (e.g., "When I'm upset, everything feels like a disaster or crisis"), and behavior (e.g., "When my emotions are strong, I often make bad decisions"). In this sample, the EDS had a standardized α coefficient of 0.90.

The Positive Affect, Negative Affect Schedule (PANAS) is a validated measure of general mood and was used to determine negative affect traits of participants (Watson, Clark, & Tellegen, 1988). Participants were asked to rate on a 5-point Likert scale their general experiences with 20 emotion adjectives, 10 describing positive emotional states (e.g., excited, proud, and inspired) and 10 describing negative emotional states (e.g., distressed, jittery, and irritable). Analyses for the current study focused only on the negative affect portion of the PANAS scale (α = 0.92).

The Dutch Eating Behavior Questionnaire (DEBQ) was administered to assess emotional eating severity (Van Strien, Frijters, Vanstaveren, Defares, & Deurenberg, 1986). Items are scored on a 5-point Likert scale ranging from 0 ("No desire") to 4 ("A strong desire"). Items assess desire to eat under different emotional states (e.g., irritated, depressed, lonely,

frightened and disappointed). For the present study, summed scores were calculated for total emotional eating severity (α = 0.94).

Statistical analyses

Descriptive analyses on demographic, environmental, and psychological factors are depicted in terms of total number of subjects and percentage of sample. Bivariate correlations were used to determine the presence of significant associations between continuous demographic, environmental, psychopathological, and underlying psychological factors and emotional eating severity (primacy outcome measure). Univariate analyses of variance (ANOVA) were performed to assess the effects of categorical demographic, environmental, psychopathological and psychological factors on emotional eating (DEBQ total score). Hierarchical linear regression modeling was used to determine which demographic, environmental, and psychological factors predict emotional eating. Multiple mediation analyses were performed using the INDIRECT methods of SPSS (Preacher & Hayes, 2008) that allows for the examination of mediating effects of multiple variables while controlling for the effects of other factors in the model. Bootstrapping with 95% confidence intervals was used to determine the significance of mediating effects, as this method is preferred for interpreting mediation analyses (Preacher & Hayes, 2008). The data were analyzed using SPSS (v.21) and an alpha level of P 0.05 was considered statistically significant.

Results

Demographic characteristics and relationship to emotional eating

The demographic information for the overall sample is summarized in Table 1. Most subjects in the current study self-identified their race as African American (Table 1). The majority of the sample was female (80.4%), unemployed (68.4%), and approximately a third had achieved only a high school level education (Table 1). The socioeconomic status of the majority of the subjects was very low, with 79.2% of the sample having a mean monthly household income of less than $2000 and 16.6% of the sample having a mean monthly household income of less than $250 (Table 1). Mean ± SEM age (in years) and BMI in participants are also described in Table 1.

Bivariate correlation analyses indicated that BMI (r = 0.13; $P < 0.001$) and age (r = 0.06; $P = 0.05$) were significantly associated with emotional eating. ANOVA results showed that of the demographic variables examined, only employment ($F_{1,1109} = 7.26$; $P = 0.007$) and monthly income ($F_{4,1087} = 3.76$; $P = 0.005$) were significantly associated with emotional eating. Unemployed individuals reported greater emotional eating than employed individuals (16.6 ± 0.52 vs. 14.1 ± 0.77, respectively). Individuals with a monthly income less than $250 reported greater emotional eating compared to individuals making more than $250 a month (19.5 ± 0.1.07 vs. 14.4 ± 1.55, respectively).

Environmental exposures and association with emotional eating

A summary of environmental factors and how they influence emotional eating are summarized in Table 2. Bivariate correlation analyses (Table 2) indicated that emotional eating was significantly associated with childhood sexual abuse (r = 0.13; $P < 0.001$),

physical abuse (r = 0.09; *P* = 0.002), physical neglect (r = 0.15; *P* < 0.001), emotional abuse (r = 0.18; *P* < 0.001), emotional neglect (r = 0.15; *P* < 0.001), and overall childhood trauma exposure (r = 0.17; *P* < 0.001). Additionally, adult trauma exposure (experienced or witnessed), as determined by the TEI, was significantly associated with emotional eating (r = 0.14; *P* < 0.001). Table 3 describes the inter-correlations between these environmental factors and psychological factors described below.

Psychological characteristics and relationship to emotional eating

The psychopathological information for the overall sample is summarized in Table 4. Approximately a third of the sample (28.2%) met for a current PTSD diagnosis (Table 4) using the mPSS. Similarly, almost a third of the sample (31.5%) met for a current depression diagnosis as determined by the BDI (Table 4). Although quite high, these prevalence rates are consistent with prior reports from our group and others studying highly traumatized, low SES populations (Gillespie et al., 2009). ANOVA results indicated that independent diagnoses of current PTSD ($F_{1,1062}$ = 40.17; *P* < 0.001) and depression ($F_{1,1107}$ = 67.16; *P* < 0.001) were significantly associated with increased emotional eating (Table 4). Individuals with PTSD reported greater emotional eating than individuals without PTSD (20.3 ± 0.82 vs. 14.2 ± 0.51, respectively). Individuals who met for a depression diagnosis engaged in more severe emotional eating compared to individuals without a depression diagnosis (20.9 ± 0.75 vs. 13.54 ± 0.51, respectively).

Bivariate correlation analyses also showed that current PTSD (r = 0.23; *P* < 0.001) and depression (r = 0.29; *P* < 0.001) symptoms were significantly associated with self-reported emotional eating (Table 4). Additionally, emotional eating was significantly associated with negative affect as determined by the PANAS (Table 5; *P* < 0.001) and emotion dysregulation as assessed by the EDS (Table 5; *P* < 0.001).

Prediction of emotional eating via hierarchical linear regression

All demographic, environmental, and psychological factors that were significantly associated with increased emotional eating (Tables 1–5) were included in a hierarchical linear regression model to predict emotional eating. A linear regression model was performed, with demographic factors (BMI, age, employment and income) in step one, environmental factors (total childhood trauma and total adult trauma experienced and witnessed) in step two, psychopathological factors (current PTSD and depression symptoms) in step three, and underlying psychological factors (emotional dysregulation and negative affect score) in step four.

As shown in Table 6, BMI (β = 0.11, *P* < 0.001) and monthly household income (β = −0.07, *P* = 0.04) were predictive of emotional eating. When environmental risk factors were entered into the model in step two, both childhood trauma (β = 0.12, *P* < 0.001) and adult trauma (β = 0.08, *P* = 0.02) were significantly predictive of emotional eating. Upon entering psychopathological risk factors into step three of the model, childhood and adult trauma were no longer significant and depressive symptoms significantly predicted emotional eating (β = 0.22, *P* < 0.001), suggesting that depressive symptoms may mediate the relationship between overall trauma exposure and emotional eating. In the final step, which included

underlying psychological components of psychopathology, both emotional dysregulation (β = 0.15, $P < 0.001$) and negative affect (β = 0.12, $P = 0.003$) were significantly predictive of emotional eating while depressive symptoms were no longer significant ($P > 0.05$), suggesting that negative affect and/or emotion dysregulation may mediate the association between depressive symptoms and emotional eating.

We reran the same analyses, but this time including subscales of childhood maltreatment as determined by the CTQ (sexual abuse, physical abuse, emotional abuse, emotional neglect, and physical neglect), to assess the effects of particular kinds of childhood trauma on emotional eating (Table 7). Results were overall similar to those described in Table 6. However, childhood emotional abuse (β = 0.16, $P = 0.003$) was the only type of childhood maltreatment that was significantly predictive of emotional eating in Step 2. The addition of emotional dysregulation (β = 0.14, $P = 0.001$) and negative affect (β = 0.11, $P = 0.005$) to the model indicated that both of these factors mediated the effect of childhood emotional abuse on emotional eating, as depressive symptoms were no longer significant ($P > 0.05$).

Multiple mediation analyses

Because of the results found in the linear regression models, we formally tested the mediation effects of depression symptoms and emotional dysregulation on the association between overall childhood maltreatment exposure and emotional eating using a multiple mediation analysis. As expected, there was a significant full mediation effect of depression ($P = 0.007$; bias-corrected 95% confidence interval: 0.003, 0.03) and emotional dysregulation ($P < 0.0001$; bias-corrected 95% confidence interval: 0.01, 0.05) on the relationship between childhood trauma exposure and emotional eating (F = 15.3, $P < 0.0001$; Fig. 1A), when controlling for BMI, age, income, employment, adult trauma exposure and PTSD symptoms.

We also formally tested the mediation effects of depression symptoms and emotional dysregulation on the association between childhood emotional abuse and emotional eating using a multiple mediation analysis, as emotional abuse was most associated with emotional eating in the secondary linear regression analysis. There was a significant full mediation effect of depression ($P = 0.008$; bias-corrected 95% confidence interval: 0.01, 0.12) and emotional dysregulation ($P < 0.0001$; bias-corrected 95% confidence interval: 0.06, 0.17) on the relationship between childhood emotional abuse and emotional eating (F = 15.6, $P < 0.0001$; Fig. 1B), when controlling for BMI, age, income, employment, adult trauma exposure and PTSD symptoms. Once again, the contribution of emotional dysregulation was more significant than that of depression on mediating the relationship between childhood emotional abuse and emotional eating.

Discussion

The current data describe demographic, environmental, and psychological risk factors for emotional eating in a primarily African American, low SES population. BMI, monthly income, child and adult trauma exposure, depression and PTSD symptoms, and negative affect and emotional dysregulation were all associated with emotional eating. Importantly, childhood emotional abuse was the most predictive of emotional eating compared to other

forms of childhood maltreatment assessed. Regression and mediation analyses indicated that the positive association between childhood trauma exposure and emotional eating was fully mediated by current depression symptoms and emotion dysregulation. Overall, our comprehensive results extend previous findings describing risk factors for emotional eating by concurrently examining the relationship between demographic, environmental, and psychological factors that contribute to emotional eating.

Low monthly income levels were associated with increased emotional eating, corroborating previous reports indicating that low income level is a vulnerability factor for an array of diet-dependent diseases that are common in low SES populations (Leung, Epel, Ritchie, Crawford, & Laraia, 2014), including obesity, type II diabetes and cardiovascular disease (Larson & Story, 2011; Seligman, Laraia, & Kushel, 2010). Increased intake of highly palatable foods in individuals of low income may be linked to low diet quality (Wolongevicz et al., 2010) due to increased cost of healthy foods (Horning & Fulkerson, 2015). However, low income is also associated with food insecurity, a form of psychosocial stress that is related to increased intake of palatable foods (Leung et al., 2014). While we did not measure food insecurity as a form of psychosocial stress directly in the current study, the role of psychosocial stressor exposure in susceptibility to emotional eating was further supported by our findings indicating that childhood and adult trauma exposure were significantly associated with emotional eating in adulthood.

Studies in humans, monkeys and rodents indicate that both acute and chronic exposure to psychosocial stressors can precipitate stress-induced emotional eating (Adam & Epel, 2007; Michopoulos, Toufexis, & Wilson, 2012) and lead to increases in weight (Arce, Michopoulos, Shepard, Ha, & Wilson, 2010; Bjorntorp, 2001; Dallman, Pecoraro, & la Fleur, 2005; Rosmond, 2004). Additionally, perceived stress levels are associated with emotional eating of palatable foods in humans (R. Sims et al., 2008). While exposure to adult trauma was associated with emotional eating in the current sample, exposure to childhood trauma was more significantly associated with emotional eating, providing a potential mechanism by which exposure to stressors during childhood leads to obesity in adulthood (Hemmingsson et al., 2014). Childhood emotional abuse was the most associated with emotional eating, a finding that is consistent with previous reports indicating that this form of childhood abuse and neglect contributes most to psychological etiology of emotional eating (Burns et al., 2012; Kong & Bernstein, 2009).

Importantly, our analyses indicated that depressive symptoms and emotional dysregulation fully mediated the relationship between childhood trauma exposure and emotional eating. The contribution of emotional dysregulation was more significant than that of depression on mediating the relationship between overall childhood maltreatment and emotional eating. This result was expected, as the inability to regulate negative and intense emotions has been characterized as a consequence of psychosocial stress exposure, including childhood abuse (Pollak, 2008; Shields et al., 1994), as well as a characteristic trait of depression and other psychopathology (Aldao et al., 2010; Bradley et al., 2011). Childhood adversity also increases individual risk for both emotion dysregulation and for developing psychopathology in adulthood (Heim & Nemeroff, 2001; Kessler et al., 1997), and depression is highly comorbid with obesity (de Wit et al., 2010; Pagoto et al., 2012;

Rosmond, 2004). Thus, our data suggest that emotional eating in individuals who have been exposed to childhood adversity, and more specifically childhood emotional abuse, is due primarily to difficulties in emotion regulation, as well as depressive symptoms. This notion is supported by recent evidence indicating that deficits in executive function, such as reduced behavioral inhibition, are associated with negative eating behaviors, including intake of palatable foods, and obesity (R. C. Sims et al., 2014). Future studies are necessary to delineate which aspects of emotional regulation are critical for engaging in emotional eating, as they might serve as important targets for therapeutic strategies aimed at attenuating emotional eating severity in at-risk and vulnerable populations, such as those exposed to childhood emotional abuse.

Limitations and conclusions

In summary, our results underscore the importance of emotion regulation in the ability to control caloric intake in the face of psychopathology and exposure to psychosocial stressors. The current findings are limited due to a number of factors, including the cross-sectional design of the study. All of the factors we assessed were not only related to emotional feeding, but also to each other. This is not surprising as exposure to psychosocial stressors, including childhood adversity, increases individual risk for depression and PTSD in adulthood (Heim & Nemeroff, 2001; Kessler et al., 1997), as well as with obesity, which itself is also related to psychopathology (de Wit et al., 2010; Pagoto et al., 2012; Rosmond, 2004). Thus, we cannot discern causality as a result of our cross-sectional approach, and can only report associations between demographic, environmental, and psychological factors and emotional eating while controlling for such inter-related factors.

Additionally, the current study was conducted in a primarily African American, low SES sample. While we feel that the high-risk burden and relative homogeneity of the sample are strengths of the current study, they could also serve as limitations, as the results may not be generalizable to other demographic samples. However, African American individuals of low SES are exposed to greater rates of stress and trauma than the general population (Gillespie et al., 2009) and have exacerbated risk for depression, PTSD, and obesity (Harrell & Gore, 1998), indicating that our findings are highly relevant to a group of at-risk, underserved individuals.

Because emotional dysregulation is associated with stressor exposure, psychopathology, and emotional eating, it is important to determine whether emotional dysregulation is a viable therapeutic target for controlling caloric intake and thus alleviating the downstream consequences of obesity (de Wit et al., 2010; Pagoto et al., 2012; Rosmond, 2004). Overall, our results indicate that therapeutic strategies targeting emotion regulation may provide benefits for individuals exposed to childhood adversity who are at greater risk for psychopathology, obesity, and other adverse health consequences that arise from depression and obesity (Hill, 2006).
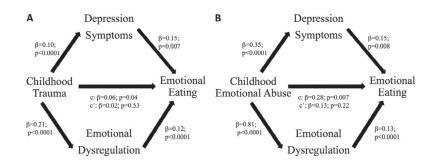
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Fig. 1.
Multiple Mediation Analysis of Predictors of Emotional Eating. (A) The full mediating effects of adult depression symptoms (BDI) and emotional dysregulation (EDS) on the relation between *total childhood trauma exposure* (CTQ) and emotional eating while controlling for BMI, age, income, adult trauma exposure (TEI), PTSD symptoms (PSS), and negative affect (PANAS negative). (B) The full mediating effects of adult depression symptoms (BDI) and emotional dysregulation (EDS) on the relation between *childhood emotional abuse* (CTQ) and emotional eating while controlling for BMI, age, income, adult trauma exposure (TEI), PTSD symptoms (PSS), and negative affect (PANAS negative).

Table 1

Demographic characteristics of sample in frequency (*n*), percent (%) and mean ± SEM. Association with emotional eating severity (DEBQ total score) is indicated in *P*-value column. Asterisks (*) denote demographic characteristics that influence emotional eating (all *P* 0.05).

Demographics	Overall *N* = 1110		F	*P*-value
	N	**%**		
Sex			0.10	0.76
Male	218	19.6		
Female	892	80.4		
Race			1.20	0.31
African America/Black	1040	93.7		
Hispanic	5	0.5		
Caucasian or White	30	2.7		
Other	35	3.2		
Employment			7.26	0.007*
Unemployed	759	68.4		
Education			0.65	0.69
<12th Grade	211	19.0		
12th or High school grad	368	33.2		
GED	49	4.4		
Some college/Tech school	298	26.8		
Tech school grad	61	5.5		
College grad	95	8.6		
Grad school	28	2.5		
Income			3.76	0.005*
$0–249	180	16.6		
$250–499	86	7.9		
$500–999	279	25.7		
$1000–1999	316	29.1		
$2000 or more	226	20.8		
On disability			1.23	0.27
Yes	203	18.4		

Mean ± SEM	Mean	SEM	R	*P*-value
Age	39.6	0.41	0.06	0.05*
BMI	31.7	0.23	0.13	<0.001*

Table 2

Mean ± SEM of environmental exposure characteristics of sample. Association with emotional eating (DEBQ total score) is indicated in *P*-value column. Asterisks (*) denote environmental characteristics that influence emotional eating (all *P*   0.05).

Childhood maltreatment	Overall *N*= 1110			
Mean ± SEM	Mean	SEM	r	*P*-value
Childhood trauma questionnaire (CTQ)				
Childhood trauma total	40.0	0.52	0.17	<0.001*
Sexual abuse	7.84	0.16	0.13	<0.001*
Physical abuse	7.92	0.12	0.10	0.002*
Physical neglect	6.70	0.09	0.15	<0.001*
Emotional abuse	8.63	0.14	0.18	<0.001*
Emotional neglect	9.00	0.15	0.15	<0.001*
Total adult traumas experienced/ witnessed (TEI)	3.94	0.08	0.14	<0.001*

Table 3

Inter-correlations between childhood maltreatment (overall and subscales as determined by the CTQ), PTSD and depression symptoms, emotional dysregulation and negative affect. Asterisks (*) denote significant correlation between factors.

	CTQ-total	CTQ-sexual abuse	CTQ-physical abuse	CTQ-emotional abuse	CTQ-emotional neglect	CTQ-physical neglect	PSS-PTSD symptoms	BDI-depression symptoms	EDS-emotional dysregulation	PANAS-negative affect
CTQ-total	–	–	–	–	–	–	–	–	–	–
CTQ-sexual abuse	r = 0.74, $P < 0.001$*	–	–	–	–	–	–	–	–	–
CTQ-physical abuse	r = 0.80, $P < 0.001$*	r = 0.46, $P < 0.001$*	–	–	–	–	–	–	–	–
CTQ-emotional abuse	r = 0.90, $P < 0.001$*	r = 0.55, $P < 0.001$*	r = 0.70, $P < 0.001$*	–	–	–	–	–	–	–
CTQ-emotional neglect	r = 0.84, $P < 0.001$*	r = 0.42, $P < 0.001$*	r = 0.58, $P < 0.001$*	r = 0.74, $P < 0.001$*	–	–	–	–	–	–
CTQ-physical neglect	r = 0.75, $P < 0.001$*	r = 0.41, $P < 0.001$*	r = 0.52, $P < 0.001$*	r = 0.61, $P < 0.001$*	r = 0.65, $P < 0.001$*	–	–	–	–	–
PSS-PTSD symptoms	r = 0.45, $P < 0.001$*	r = 0.36, $P < 0.001$*	r = 0.33, $P < 0.001$*	r = 0.44, $P < 0.001$*	r = 0.38, $P < 0.001$*	r = 0.28, $P < 0.001$*	–	–	–	–
BDI-depression symptoms	r = 0.44, $P < 0.001$*	r = 0.30, $P < 0.001$*	r = 0.29, $P < 0.001$*	r = 0.43, $P < 0.001$*	r = 0.41, $P < 0.001$*	r = 0.35, $P < 0.001$*	r = 0.68, $P < 0.001$*	–	–	–
EDS-emotional dysregulation	r = 0.38, $P < 0.001$*	r = 0.27, $P < 0.001$*	r = 0.23, $P < 0.001$*	r = 0.38, $P < 0.001$*	r = 0.35, $P < 0.001$*	r = 0.27, $P < 0.001$*	r = 0.51, $P < 0.001$*	r = 0.63, $P < 0.001$*	–	–
PANAS-negative affect	r = 0.31, $P < 0.001$*	r = 0.22, $P < 0.001$*	r = 0.18, $P < 0.001$*	r = 0.32, $P < 0.001$*	r = 0.27, $P < 0.001$*	r = 0.23, $P < 0.001$*	r = 0.50, $P < 0.001$*	r = 0.62, $P < 0.001$*	r = 0.61, $P < 0.001$*	–

Table 4

Description of depression and PTSD symptoms within the study sample in frequency (*n*), percent (%) and mean ± SEM. Association with emotional eating (DEBQ total score) is indicated in *P*-value column. Asterisks (*) denote psychopathological characteristics that influence emotional eating (all *P*   0.05).

Psychopathological characteristics	Overall *N* = 1110		F	*P*-value
	N	%		
PTSD diagnosis			40.17	<0.001*
Yes	299	28.2		
No	763	71.8		
Depression diagnosis			67.16	<0.001*
Yes	349	31.5		
No	758	68.5		

Mean ± SEM	Mean	SEM	R	*P*-value
PTSD symptoms (mPSS Total)	12.4	0.37	0.23	<0.001*
Depression symptoms (BDI Total)	14.4	0.35	0.29	<0.001*

Table 5

Mean ± SEM of underlying psychological characteristics of sample. Association with emotional eating (DEBQ total score) is indicated in *P*-value column. Asterisks (*) denote psychological characteristics that influence emotional eating (all *P*   0.05).

Psychological characteristics	Overall *N* = 1110			
	Mean	SEM	r	*P*-value
Negative affect (PANAS negative)	21.3	0.64	0.28	<0.001*
Emotional dysregulation (EDS total)	37.6	0.64	0.30	<0.001*

Table 6

Emotional eating as predicted by demographic (Step 1), environmental (Step 2), psychopathological (Step 3), and psychological (Step 4) factors. Childhood trauma exposure in Step 2 was captured by total score on the CTQ.

Predicting emotional eating severity	Standardized β	T	P	R	R²	F change	P change
Step 1 – demographic				0.16	0.02	6.53	<0.001*
BMI	0.11	3.67	<0.001*				
Age	0.04	1.33	0.18				
Currently employed	−0.05	−1.53	0.13				
Monthly household income	−0.07	−2.10	0.04*				
Step 2 – environmental				0.23	0.05	15.6	<0.001*
BMI	0.11	3.63	<0.001*				
Age	0.03	1.04	0.30				
Currently employed	−0.04	−1.18	0.24				
Monthly household income	−0.07	−2.02	0.04*				
Childhood trauma total (CTQ)	0.12	3.62	<0.001*				
Adult trauma experienced and witnessed (TEI)	0.08	2.36	0.02*				
Step 3 – psychopathological				0.31	0.10	24.8	<0.001*
BMI	0.10	3.29	0.001*				
Age	0.04	1.30	0.20				
Currently employed	−0.01	−0.5	0.81				
Monthly household income	−0.04	−1.27	0.20				
Childhood trauma total (CTQ)	0.04	1.08	0.28				
Adult trauma experienced and witnessed (TEI)	0.02	0.60	0.55				
PTSD symptoms (PSS)	0.04	1.03	0.31				
Depression symptoms (BDI)	0.22	5.15	<0.001*				
Step 4 – psychological				0.35	0.13	16.2	<0.001*
BMI	0.10	3.44	0.001*				
Age	0.06	1.82	0.07				
Currently employed	0.002	0.06	0.95				
Monthly household income	−0.03	−1.05	0.30				
Childhood trauma total (CTQ)	0.02	0.52	0.61				

Predicting emotional eating severity	Standardized β	T	P	R	R²	F change	P change
Adult trauma experienced and witnessed (TEI)	0.03	0.96	0.34				
PTSD symptoms (mPSS)	0.01	0.14	0.89				
Depression symptoms (BDI)	0.08	1.70	0.09				
Negative affect (PANAS)	0.12	2.98	0.003*				
Emotion dysregulation (EDS)	0.14	3.52	<0.001*				

Table 7

Emotional eating as predicted by demographic (Step 1), environmental (Step 2), psychopathological (Step 3), and psychological (Step 4) factors. Childhood trauma exposure in Step 2 is now composed of individual sub-clusters of childhood abuse and neglect as determined by the CTQ.

Predicting emotional eating severity	Standardized β	T	P	R	R²	F change	P change
Step 1 – demographic				0.16	0.02	6.53	<0.001*
BMI	0.11	3.67	<0.001*				
Age	0.03	1.08	0.28				
Currently employed	−0.05	−1.46	0.14				
Monthly household income	−0.07	−2.10	0.04*				
Step 2 – environmental				0.25	0.06	7.07	<0.001*
BMI	0.11	3.75	<0.001*				
Age	0.04	1.11	0.27				
Currently employed	−0.04	−1.13	0.26				
Monthly household income	−0.06	−1.91	0.06				
Childhood sexual abuse (CTQ)	0.04	1.02	0.31				
Childhood physical abuse (CTQ)	−0.10	−2.35	0.02*				
Childhood emotional abuse (CTQ)	0.16	2.96	0.003*				
Childhood emotional neglect (CTQ)	−0.01	−0.23	0.82				
Childhood physical neglect (CTQ)	0.06	1.33	0.18				
Adult trauma experienced and witnessed (TEI)	0.08	2.26	0.02*				
Step 3 – psychopathological				0.32	0.10	22.8	<0.001*
BMI	0.10	3.39	0.001*				
Age	0.04	1.29	0.20				
Currently employed	−0.007	−0.21	0.83				
Monthly household income	−0.04	−1.24	0.22				
Childhood sexual abuse (CTQ)	0.02	0.45	0.66				
Childhood physical abuse (CTQ)	−0.08	−1.89	0.06				
Childhood emotional abuse (CTQ)	0.11	2.04	0.04*				
Childhood emotional neglect (CTQ)	−0.06	−1.15	0.25				
Childhood physical neglect (CTQ)	0.06	1.35	0.18				
Adult trauma experienced and witnessed (TEI)	0.02	0.53	0.60				

Predicting emotional eating severity	Standardized β	T	P	R	R²	F change	P change
PTSD symptoms (PSS)	0.05	1.04	0.30				
Depression symptoms (BDI)	0.21	4.91	<0.001*				
Step 4 – psychological				0.36	0.13	15.04	<0.001*
BMI	0.10	3.51	<0.001*				
Age	0.06	1.78	0.08				
Currently employed	0.003	0.09	0.93				
Monthly household income	−0.03	−1.03	0.31				
Childhood sexual abuse (CTQ)	0.01	0.31	0.76				
Childhood physical abuse (CTQ)	−0.07	−1.55	0.12				
Childhood emotional abuse (CTQ)	0.08	1.55	0.12				
Childhood emotional neglect (CTQ)	−0.06	−1.16	0.25				
Childhood physical neglect (CTQ)	0.05	1.26	0.21				
Adult trauma experienced and witnessed (TEI)	0.03	0.86	0.39				
PTSD symptoms (mPSS)	0.01	0.20	0.84				
Depression symptoms (BDI)	0.08	1.66	0.10				
Negative affect (PANAS)	0.11	2.84	0.005*				
Emotion dysregulation (EDS)	0.14	3.49	0.001*				