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Associations of Adolescent Emotional and Loss of Control Eating with 1-year Changes in Disordered Eating, Weight and Adiposity

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Abstract

Objective—Adolescent emotional-eating, referring to eating in response to negative affective states, is frequently reported by those with loss of control (LOC) eating. Although LOC eating has been shown to predict exacerbated disordered eating and excess weight/adiposity gain, the extent to which emotional-eating, either alone or in combination with LOC, predicts adverse outcomes has not been determined. Thus, we examined associations of baseline emotional-eating with changes in disordered eating, BMI, and adiposity over 1-year, and to what degree the presence or absence of baseline LOC moderated these associations.

Methods—189 non-treatment-seeking youth (15.4±1.4y; 66% female; 67% non-Hispanic White, 38% overweight [BMI ≥85th %ile]) completed the emotional-eating Scale for Children/Adolescents and the Eating Disorder Examination interview at baseline and again at 1-year. Air displacement plethysmography assessed adiposity at both time points.

Results—Baseline emotional-eating alone was not significantly associated with the development of objective binge eating or changes in disordered eating attitudes, BMI or adiposity 1-year later.

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However, baseline emotional-eating interacted with the presence of baseline LOC in the prediction of 1-year outcomes. Among adolescents with LOC eating, greater baseline emotional-eating was related to increased disordered eating attitudes ($p=.03$), BMI ($p=.04$), and adiposity ($p=.04$) at 1-year, after correcting for false discovery rate.

Discussion—Emotional-eating among youth also reporting LOC was associated with adverse outcomes over 1-year. Adolescents who report both behaviors may represent a subset of individuals at especially high risk for exacerbated disordered eating and excess weight gain.

Keywords

Emotional-eating; loss of control eating; disordered eating attitudes; weight; adiposity

Introduction

Emotional-eating is broadly defined as eating in response to a range of negative emotions.¹ Estimates of emotional-eating in youth range from 10%-60%, with the highest rates reported by adolescents.^{2,3} Emotional-eating is more frequent among youth who endorse loss of control (LOC)-eating, the experience of being unable to control one's intake of any amount of food.^{4,5} Emotional-eating appears often to co-occur with LOC-eating in youth with overweight.^{6,7} Approximately 20% of youth report LOC,⁸ with higher estimates (>30%) among those with overweight and obesity.⁹ One model that may account for the relationship between emotional and LOC-eating is Affect Regulation Theory, which posits that individuals use LOC-eating as a coping strategy for negative mood states.^{10,11} Specifically, some individuals are hypothesized to engage in LOC-eating in an attempt to replace one aversive emotion (e.g., anxiety or anger) with another, less aversive one (e.g., guilt).^{10,11} LOC-eating is a distinct behavioral, pediatric phenotype associated with the exacerbation of disordered eating, in particular, the development of partial or full-syndrome binge eating disorder (BED).^{8,12} LOC-eating is also a salient risk factor for excess body mass index (BMI; kg/m²) and adiposity gain.^{13,14}

Notably, when examined cross-sectionally, youth's LOC-eating, but not emotional-eating, was associated with overweight.⁴ Youth who endorsed LOC reported more frequent emotional-eating than those without LOC; yet, many youth endorsed eating in response to emotional situations without reporting the experience of LOC over eating.⁴ Research has suggested that emotional-eating may be strongly influenced by traits such as difficulties in emotion regulation and sensitivity to reward.¹⁵ However, emotional-eating appears to be a distinct, domain-specific construct that captures eating in response to various negative emotions above and beyond the influence of the emotions alone, according to available construct validation studies in pediatric samples.^{4,16} These data suggest that despite some conceptual overlap between these constructs, they are distinct and separate phenomena. Indeed, the incentive salience theory of disinhibited eating emphasizes the rewarding properties of high-calorie food in LOC-eating.^{17,18} Specifically, it is hypothesized that for some individuals, LOC-eating is motivated by reward-seeking in response to the craving elicited by the presence of conditioned cues for high-calorie foods in the environment,^{17,18} suggesting that coping with negative affect may not be the sole precipitant of LOC-eating. Several observational studies have found that nearly half of youth who report LOC-eating

remit over time.^{8,12,19} Thus, we hypothesize that the overlap between emotional-eating and the LOC phenotype may represent a subtype of disinhibited eating that may be more detrimental to youth and be associated with the persistence of LOC-eating. Longitudinal studies examining the combination of these two problems are needed to investigate this question.

In addition to its relationship with LOC-eating,^{4,5,20} emotional-eating is also associated with various disordered eating attitudes and behaviors, such as body dissatisfaction and unhealthy weight control strategies.²⁰ Longitudinal data suggest that emotional-eating may be a prospective predictor for the onset of objective binge eating among adolescent girls²⁰ and 9–13 year-old children.²¹ By contrast, data relating emotional-eating with BMI are mixed. Some cross-sectional studies demonstrate that emotional-eating is higher in youth who are overweight compared to youth who are non-overweight,^{22,23} while others did not find this association.^{4,24,25} Only one longitudinal study has reported on the prospective association between emotional-eating and BMI gain, and results were non-significant.²⁶ However, in that study, BMI was based on measured height and weight at some time points, and self-reported at others, thus potentially limiting findings. Further, there are no published data on the prospective association of emotional-eating with adiposity, which may be a better predictor of adverse cardiometabolic health outcomes in growing children and adolescents.²⁷ Given mixed findings and the paucity of prospective research on the impact of emotional-eating on disordered eating and weight outcomes, additional studies are warranted.

Although emotional-eating and LOC-eating often co-occur,^{4,5} it is unclear whether the tendency to eat in response to negative emotions in the absence of LOC-eating contributes to worsening of disordered eating and BMI/adiposity outcomes over time. Therefore, using a prospective design, we examined the impact of baseline emotional-eating on objective binge eating onset and frequency, disordered eating attitudes and behaviors, BMI, and adiposity gain 1-year later among non-treatment seeking adolescents. We hypothesized that reported emotional-eating would predict the onset of objective binge eating and worsening (increase in frequency) of binge eating, as well as a worsening of disordered eating attitudes. We also expected that emotional-eating would predict increased BMI and adiposity. Lastly, we hypothesized that LOC-eating would moderate all of these relationships, such that, among those with reported baseline LOC, baseline emotional-eating would be most strongly associated with increases in disordered eating attitudes and behaviors, BMI, and adiposity.

Methods

Participants

Participants were healthy adolescents ages 13-17 years who were enrolled in an observational study examining eating behaviors in adolescents (ClinicalTrials.gov Identifier [ID]): NCT00631644).²⁸ The study was advertised as an investigation of eating behaviors in adolescents and indicated that no treatment would be provided. Youth were recruited through flyers posted on public bulletin boards at the NIH, local libraries, supermarkets, and school parent email listservs in the Washington, DC greater metropolitan area between 2009 and 2014. Exclusion criteria included: chronic medical condition, use of medications affecting body weight or appetite, psychiatric condition that would impede adherence to

study procedures (e.g., major depression, panic disorder, psychotic disorder, substance use disorder), and active participation in a weight loss treatment program. One-hundred-eighty-nine adolescents participated at baseline and 162 participants completed a 1-year follow-up assessment (85.7% retention).

Procedure

The study protocol was approved by the *Eunice Kennedy Shriver* NICHD institutional review board. Each adolescent provided written assent and a parent/guardian gave written consent for participation. Participants were seen for a baseline and 1-year follow-up assessment in an outpatient pediatric clinic at the NIH Hatfield Clinical Research Center. At both visits, eligible participants underwent the following:

Anthropometrics—Participants' weight was measured in a fasted state to the nearest 0.1 kg with a calibrated digital scale. Height was the average of three measurements to the nearest millimeter by a calibrated electronic stadiometer. BMI and BMI_z were calculated according to the Centers for Disease Control and Prevention 2000 standards.²⁹ Fat mass was estimated by applying the Siri equation to body density measurements from air displacement plethysmography (Life Measurement Inc., Concord, CA) obtained while participants were wearing underclothes, as previously described.^{30,31}

Emotional-eating—The Emotional Eating Scale for Children and Adolescents (EES-C),⁴ adapted from the EES for adults,³² was completed to assess the tendency to eat in response to various negative affective states in youth (8–18y). In response to 25 items describing different negative emotions, participants rate their desire to eat on a 5-point scale from “*I have no desire to eat*” to “*I have a very strong desire to eat*.” A total emotional-eating score, generated from an average of all items and measured on a continuous scale (range of 0–4), has demonstrated good construct validity with observed eating behavior.¹⁶ A cut-off score of 2.6 has been suggested to categorize youth as exhibiting low (≤ 2.6) vs. high (> 2.6) emotional-eating.¹⁶ Since the latter study¹⁶ included generally healthy youth, but was enriched for those with reported LOC-eating, to capture greater variability in the current sample, total emotional-eating was treated as a continuous variable representing a tendency to eat in response to negative emotions.

Binge eating presence/frequency and LOC-eating—The Eating Disorder Examination (EDE) version 12.0/C.2³³ was administered to determine the frequency of objective binge eating (consumption of an unambiguously large amount of food with a sense of LOC) and subjective binge eating episodes (experience of LOC while consuming an ambiguously large amount of food) in the past month. Consistent with prior studies in non-treatment seeking pediatric samples,^{34–38} objective binge eating was coded as present if youth reported at least one instance of eating an unambiguously large amount of food in the past month and the frequency of binge eating was determined based on the number of such episodes in the 28 days preceding the assessment. LOC-eating was coded as present if youth reported either subjective or objective binge episodes in the past month. The frequency of LOC-eating was the total number of subjective and objective episodes in the past

month.³⁴⁻³⁶ The EDE has demonstrated good interrater reliability for eating episodes in adolescent samples.^{34,39}

Disordered eating attitudes and behaviors—The EDE³³ also generates a global scale that encompasses a range of disordered eating attitudes and behaviors including cognitive and behavioral dietary restraint, eating concerns, shape concerns, and weight concerns. The global subscale of the EDE has good interrater reliability, convergent and discriminant validity in youth.^{34,40}

Statistical Analysis

Analyses were conducted using IBM SPSS Statistics 22. Outliers were examined and adjusted to fall 1.5 times the interquartile range below and above the 25th and 75th percentile.⁴¹ This strategy minimizes the influence of outliers on the characteristics of the distribution, minimally changes the distribution, and avoids potential bias of removing outliers altogether. The frequency of objective binge episodes, global disordered eating attitudes and behaviors, and emotional-eating were log transformed due to positively skewed distributions. Once transformed, there were no outliers (values falling 1.5 times the interquartile range below or above the 25th or 75th percentile) requiring recoding. Independent samples *t*-tests and χ^2 analyses were used to compare youth who did and did not complete a 1-year follow-up. To examine whether emotional-eating total score predicted the onset of objective binge eating (presence versus absence in the past 1 month) at 1-year, a logistic regression was conducted only in participants who did not endorse objective binge eating at baseline. Covariates included baseline adiposity (kg), baseline height (cm), age (y), sex (male vs. female), and race (Non-Hispanic White vs. non-White and Hispanic). Hierarchical linear regressions were used to test the hypothesis that baseline emotional-eating total score would be associated with change () in the frequency of objective binge eating episodes. Covariates were baseline frequency of objective binge episodes, in age from baseline to follow-up, in adiposity, in height, sex, and race. Hierarchical linear regressions were used to test the hypothesis that baseline emotional-eating total score, and the interaction of emotional-eating total score and LOC status at baseline, was associated with changes in global disordered eating attitudes and behaviors at 1-year. LOC-eating is known to be related to adiposity.^{13,14} Therefore, we wanted to determine the effect of LOC on disordered eating symptoms, adjusting for the known relationship of LOC to adiposity. Covariates entered in the first step of the model were baseline global disordered eating attitudes and behaviors, in age, in adiposity, in height, sex, and race. Baseline emotional-eating total score was entered in the second step and baseline LOC presence vs. absence was entered in the third step of the model. The interaction of emotional-eating total score and LOC presence at baseline was evaluated in the last step of the model. To ascertain that the models were not over-adjusting by including change in adiposity, identical models excluding in adiposity as a covariate were conducted. Hierarchical linear regressions were also used to examine whether baseline emotional-eating total score and the interaction of emotional-eating total score and LOC presence at baseline were associated with in BMI and adiposity at one year. Covariates for the BMI model included in age, race, sex, and baseline BMI. Covariates for the adiposity model included in age, in height, race, sex, and baseline adiposity. Baseline emotional-eating total score was entered in the second step,

and LOC presence at baseline was entered in the third step of the models. The interaction of emotional-eating total score and LOC presence at baseline was evaluated in the last step of the models. To calculate the interaction terms, emotional-eating total score was mean-centered.⁴² All tests were two-tailed. To adjust for multiple comparisons, a Benjamini-Hochberg correction was applied to each family of analyses⁴³ and all the results are reported after the correction. A 5% false discovery rate was used for the correction.

Results

Among the 162 participants who attended baseline and follow-up visits, <3% of data were missing at each time point, so pairwise deletion was employed. The final analysis was restricted to 156 participants (82.5% retention) who completed both the baseline and the 1-year follow-up assessments. Table 1 shows baseline and 1-year follow-up characteristics. There were no significant differences between youth who did and did not complete a follow-up visit with regard to any baseline demographic characteristic, body composition, or disordered eating attitudes and behaviors; however, youth with baseline LOC-eating were less likely to complete a follow-up compared to those who did not report baseline LOC ($\chi^2=5.79$, $p=.02$). No participant met criteria for a full-syndrome eating disorder at baseline or 1-year follow-up. One participant met a suggested cut-off¹⁶ for high emotional-eating at baseline and none met the cut-off at 1-year follow-up.

Binge eating at 1-year

Of the 156 participants included in the analyses, 10 participants reported objective binge eating episodes at baseline. Six of those participants remitted by the 1-year follow-up. Six youth who did not report objective binge eating at baseline reported this behavior at 1-year follow-up (4.8% of the 1-year follow-up sample without baseline LOC). Baseline emotional-eating did not distinguish between those who developed objective binge eating from those who did not ($\chi^2=1.08$, $p=.30$). Likewise, adjusting for covariates (in adiposity, in height, in age, sex, race) and baseline frequency of binge eating episodes, emotional-eating was not significantly associated with 1-year objective binge episodes frequency ($\beta=.05$, $p=.31$) (see Table 2). These results did not change when in adiposity was not included as a covariate ($\beta=.06$, $p=.27$).

Global disordered eating attitudes and behaviors at 1-year

Adjusting for covariates (in adiposity, in height, in age, and sex, race), baseline emotional-eating was not significantly associated with 1-year in global disordered eating attitudes and behaviors ($\beta=.08$, $p=.27$; see Table 3). Baseline LOC presence moderated the relationship between baseline emotional-eating and 1-year in global disordered eating attitudes and behaviors ($\beta=.22$, $p=.02$). To probe this interaction, the main effects of emotional-eating were examined using stratified hierarchical linear regressions in youth who endorsed LOC presence at baseline vs. those who did not (see Figure 1a). Among youth who did not endorse LOC at baseline ($n=126$), no significant relationship was observed between baseline emotional-eating and 1-year in disordered eating attitudes and behaviors ($\beta=.03$, $p=.68$). By contrast, among youth who reported LOC ($n=30$), emotional-eating was

positively associated with in global disordered eating attitudes/behaviors at 1-year follow-up ($\beta=.39, p=.034$).

When in adiposity was not included as a covariate, moderation results remained statistically significant ($\beta=.21, p=.02$). Among youth who did not endorse LOC at baseline, no significant relationship was observed ($\beta=-.006, p=.94$). Among youth who endorsed LOC at baseline, emotional-eating was marginally positively associated with 1-year in disordered eating attitudes and behaviors ($\beta=.35, p=.06$).

BMI and adiposity at 1-year

Accounting for covariates (in age, sex, and baseline BMI), baseline emotional-eating was not significantly associated with in BMI at 1-year follow-up ($\beta=-.01, p=.89$; see Table 4). However, baseline LOC presence moderated the relationship between baseline emotional-eating and 1-year in BMI ($\beta=.33, p=.001$). Among youth who did not endorse LOC at baseline ($n = 127$), a non-significant inverse relationship was observed between baseline emotional-eating and 1-year in BMI ($\beta=-.15, p=0.09$). By contrast, among youth with LOC at baseline ($n = 30$), baseline emotional-eating was positively associated with in BMI at 1-year follow-up ($\beta=0.43, p=0.02$; Figure 1b).

Adjusting for covariates (in height, in age, sex, race, and baseline adiposity), baseline emotional-eating was not significantly related to in adiposity ($\beta=-.08, p=.35$) at 1-year follow-up (see Table 4). However, baseline LOC presence moderated the relationship between baseline emotional-eating and 1-year in adiposity ($\beta=.29, p=.003$; see Figure 1c). Among youth who did not report baseline LOC ($n = 123$), an inverse association was observed between baseline emotional-eating and 1-year adiposity ($\beta=-.19, p=.04$). For adolescents who reported LOC at baseline ($n = 28$), baseline emotional-eating was positively associated with in adiposity at 1-year follow up ($\beta=.39, p=.03$).

To ascertain that baseline LOC-eating was not significantly associated with 1-year global disordered eating attitudes and behaviors, BMI, and adiposity, supplemental hierarchical regressions were conducted. These models were identical to the three hierarchical linear regressions as described in the *Data Analysis* section with the exception of entering LOC-eating in the second step of the model, and emotional-eating in the third step; the corresponding covariates were entered in the first step and the interaction term was entered in the fourth step, as in the original models. Baseline LOC-eating was not significantly associated with 1-year disordered eating attitudes and behaviors ($\beta=.13, p=.11$), BMI ($\beta=-.09, p=.26$), or adiposity ($\beta=-.06, p=.47$).

Given data suggesting that emotional-eating rates may vary depending on sex,²⁵ exploratory moderation analyses were conducted to examine whether the effects differed systematically by sex. The interaction term of emotional-eating and sex was calculated and entered in the penultimate step of the hierarchical linear regression models. The interaction term between baseline emotional-eating and sex was not significant for any disordered eating ($ps=.11-.90$) or body composition outcome ($ps=.65-.86$). Therefore, the relationship was not further probed.⁴² Given the small sample of those with LOC-eating, a three-way interaction of sex $\times$ emotional-eating $\times$ LOC was not evaluated.

Discussion

In this longitudinal study, we found adolescent baseline emotional-eating levels not to be directly related to changes in disordered eating, BMI, or adiposity one year later. However, emotional-eating levels interacted with LOC-eating, such that among those who endorsed LOC initially, greater emotional-eating tendencies were associated with significant increases in disordered eating attitudes, BMI and adiposity at 1-year. In contrast to other prospective studies^{20,21} and our hypotheses, we did not find emotional-eating alone predicted the development of, or increases in, objective binge eating, or a worsening of disordered eating attitudes. Our findings did not appear to be driven by the inclusion of boys in the sample, as moderation analyses did not indicate differential effects based on sex nor was sex a significant covariate in any of our models.

The observed interaction between baseline emotional-eating levels and LOC-eating may potentially account for the previous mixed results assessing the relationship between emotional-eating and disordered eating outcomes.^{4,22,23,25} Prior pediatric data have shown LOC-eating to be prospectively associated with sub-threshold and full syndrome BED and exacerbated disordered eating attitudes.^{8,12} Research has consistently shown that LOC-eating predicts excess weight and fat gain over time.^{13,44} However, several of these studies also found that approximately half of youth with reported LOC-eating remitted during follow-up.^{8,12,19} Notably, as emotional-eating was not considered in the analyses of these prior studies, it is plausible the children who experienced adverse eating and weight outcomes engaged in both LOC as well as increased emotional-eating at baseline. Interestingly, although not a primary hypothesis, in the current study, LOC presence alone was also not associated with worsening of disordered eating attitudes and behaviors, BMI, and adiposity. Most,^{12,13} but not all,^{44,45} of previous studies were in younger samples, and had a longer follow-up interval, which may explain why LOC did not predict worsening of outcomes in the current sample. In the shorter term, and in a non-treatment seeking sample of adolescents, our data point to the possibility that among youth with LOC-eating, higher, but not clinically elevated emotional-eating may place youth at risk for the worsening of disordered eating attitudes and excess weight gain. Moreover, it is possible that significantly elevated emotional-eating is what distinguishes those who persist in LOC-eating behavior from those who remit over time. However, these hypotheses require further testing.

The current study further underscores the importance of characterizing behavioral subtypes to determine those at greatest risk for adverse disordered eating and weight outcomes.⁴⁶ Previous research has suggested that youth with LOC-eating may be more prone to engage in maladaptive behaviors, such as aggressive acts or withdrawal, when experiencing negative emotions.⁴⁷ Thus, youth with emotional-eating tendencies likely turn to food as a coping strategy more frequently than other maladaptive strategies. Laboratory studies have indicated that although, on average, youth with LOC do not consume more calories relative to their peers without LOC, they tend to consume more calories from carbohydrates and highly palatable foods, and fewer calories from protein.^{37,48} Consequently, those with the LOC phenotype and greater emotional-eating tendencies may be most prone to unhealthy weight gain through consumption of more energy-dense foods when experiencing undesirable negative affective mood states. Among youth without LOC, greater baseline emotional-

The current study further underscores the importance of characterizing behavioral subtypes to determine those at greatest risk for adverse eating and weight outcomes.⁴⁶ Among adolescent boys and girls who report loss of control eating episodes, emotional-eating levels at baseline predict a worsening of disordered eating attitudes and excess weight and fat gain. Thus, assessing disinhibited eating phenotypes throughout childhood and adolescence may be important for the development of interventions for excess weight gain and eating disorders. Future longitudinal studies that use larger samples with a longer follow-up interval would be useful to further identify the mechanistic relationships among these constructs.

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Figure 1.

A. Baseline LOC status moderated the association between baseline emotional-eating levels and disordered eating attitudes and behaviors at 1-year follow-up, adjusting for baseline disordered eating symptoms and covariates. The association between baseline emotional-eating levels and disordered eating attitudes and behaviors at 1-year was significant and positive among those who reported LOC eating at baseline. Emotional-eating levels and, disordered eating attitudes and behaviors were not significantly associated in youth who did not report LOC eating at baseline.

B. Baseline LOC status moderated the association between baseline emotional-eating levels and BMI at 1-year follow-up, adjusting for baseline BMI and covariates. The association between baseline emotional-eating levels and BMI was significant and positive among youth who reported LOC eating at baseline, and significant and inverse among youth who did not report LOC eating at baseline

C. Baseline LOC status moderated the association between baseline emotional-eating levels and adiposity at 1-year follow-up, adjusting for baseline adiposity and covariates. The association between emotional-eating levels and adiposity was significant and positive among youth who reported LOC eating at baseline, and significant and inverse among youth who did not report LOC eating at baseline.

Note: LOC = loss of control over eating; BMI = body mass index.

For illustrative purposes, global disordered eating attitudes and behaviors score, and the emotional-eating score were anti-log-transformed from the base 10 log transformation.

Figure 1. Relationship between baseline emotional-eating and 1-year (A) disordered eating attitudes; (B) body mass index; and (C) adiposity, in a multiethnic sample of U.S. girls and boys with and without loss of control eating.

Table 1

Descriptive characteristics at baseline and 1-year follow-up in a multiethnic sample of U.S. girls and boys; *p*-values provided for the differences between follow-up completers and non-completers.

	Baseline		1-year Follow-up	<i>p</i>
	Non-Completers (<i>N</i> =33)	Completers (<i>N</i> =156)	(<i>N</i> =156)	
Age (y) [Mean (SD)]	15.26 (1.35)	15.34 (1.40)	16.44 (1.41)	.72
Sex (% Female)	60%	66%	66%	.56
Race (%)	46%	61%	61%	.56
White	46%	61%	61%	.56
Black	26%	27%	27%	.53
Asian	11%	4%	4%	.11
Multiracial and Other	17%	8%	8%	.06
Ethnicity (% Hispanic)	6%	6%	6%	1.00
Objective binge episodes in the past 28 days, log transformed [Geometric Mean (SD)/Max]	.03 (.13)/2	.03 (.11)/ 7	.02 (.08)/1	.34
Emotional-eating, log transformed [Geometric Mean (SD)]	.20 (.11)	.21 (.14)	.20 (.14)	.56
LOC [<i>N</i> (%)]	11 (33%)	30 (19.2%)	30 (19.2%)	.02
Objective binge eating in the past 28 days [<i>N</i> (%)]	2 (6.1%)	10 (6.4%)	11 (7%)	.70
BMI [Mean (SD)]	25.91 (8.87)	24.33 (6.65)	24.84 (6.61)	.88
BMIz [Mean (SD)]	.87 (1.15)	0.74 (1.02)	0.68 (0.99)	.44
BMI 85 th %ile [<i>N</i> (%)]	16 (46%)	77 (40%)	55 (35%)	.34
Adiposity [% Body fat (SD)]	20.32 (14.81)	18.36 (12.10)	19.14 (13.49)	.41

Note: LOC = loss of control over eating; LOC+ = endorsement of 1 loss of control over eating in the past month; BMI = body mass index.

The frequency of objective binge eating episodes and the emotional-eating score were log transformed, and the geometric means are reported for these variables.

p-values for the comparison of baseline characteristics in those who returned for follow-up and those who did not return are provided for *t*-tests (age, emotional-eating, BMI, BMIz, and adiposity) or χ^2 analysis (sex, race, ethnicity, LOC+, BMI 85th %ile).

Table 2

Hierarchical linear regression model: Test of whether baseline emotional-eating total score is associated with change () in the frequency of objective binge eating episodes in a multiethnic sample of U.S. girls and boys. Covariates (entered in the first step of the model) include in age from baseline to follow-up, race, sex, in adiposity, in height and baseline frequency of objective binge episodes. Baseline emotional-eating total score is entered in the second step of the model. Baseline binge eating frequency and baseline emotional-eating have been log transformed.

	Binge Frequency			
	<i>R</i>	<i>R</i> ²	<i>β</i>	<i>p</i>
Step 1	.81	.66		<.001
Age (y)			-.13	.01
Race (0=non-Hispanic White)			.11	.04
Sex (0=Male)			-.04	.43
Adiposity (kg)			-.03	.52
Height (cm)			-.10	.08
Baseline Binge Eating Frequency			-.80	<.001
Step 2	.81	.66		.29
Baseline emotional-eating			.06	.29

Table 3

Hierarchical linear regression model: Test of whether baseline emotional-eating total score, and the interaction of emotional-eating total score and LOC status at baseline, is associated with changes in global disordered eating attitudes and behaviors at 1-year in a multiethnic sample of U.S. girls and boys. Covariates (entered in the first step of the model) include age, race, sex, adiposity, height, and baseline global disordered eating attitudes and behaviors. Baseline emotional-eating total score is entered in the second step of the model. Baseline LOC presence vs. absence is entered in the third step of the model. The interaction term of emotional-eating total score and LOC presence at baseline is entered in the last step of the model. To calculate the interaction terms, emotional-eating total score was mean-centered. Global disordered eating attitudes and behaviors, and emotional-eating have been log-transformed.

	Global Disordered Eating			
	<i>R</i>	<i>R</i> ²	<i>β</i>	<i>p</i>
Step 1	.50	.25		<.001
Age (y)			-.20	.007
Race (0=non-Hispanic White)			.15	.049
Sex (0=Sex)			.01	.96
Adiposity (kg)			.07	.37
Height (cm)			-.01	.95
Baseline global disordered eating			-.45	<.001
Step 2	.51	.26		.27
Baseline emotional-eating			.08	.27
Step 3	.51	.26		.14
Baseline LOC presence			.12	.14
Step 4	.54	.30		.02
Baseline emotional-eating × Baseline LOC presence			.22	.02

Note: LOC = loss of control over eating.

Table 4

Two hierarchical linear regression models: To test whether baseline emotional-eating total score and the interaction of emotional-eating total score and LOC presence at baseline were associated with BMI (left panel of the table) and adiposity (right panel of the table) at one year follow-up in a multiethnic sample of U.S. girls and boys. Covariates (entered in the first step of the model) include age, race (for adiposity model only), sex, baseline BMI (for BMI model only), baseline adiposity (for adiposity model only), and height (for adiposity model only). Baseline emotional-eating total score is entered in the second step of the model. Baseline LOC presence vs. absence is entered in the third step of the model. The interaction term of emotional-eating total score and LOC presence at baseline is entered in the last step of the model. To calculate the interaction terms, emotional-eating total score was mean-centered. Emotional eating total score was log-transformed.

	BMI					Adiposity				
	R	R ²	β	p		R	R ²	β	p	
Step 1	.16	.03		.27	.25	.06			.08	
Age (y)			.05	.54				.06	.49	
Sex (0=Male)			.01	.98				.03	.77	
Baseline BMI			-.15	.07				-	-	
Race (0=White)			-	-				-.05	.51	
Baseline adiposity (kg)			-	-				-.22	.014	
Height (cm)			-	-				-.17	.064	
Step 2	.16	.03		.89	.27	.07			.35	
Baseline emotional-eating			-.01	.89				-.08	.35	
Step 3	.18	.03		.26	.27	.07			.57	
Baseline LOC presence			-.09	.26				-.05	.57	
Step 4	.32	.11		.003	.34	.12			.008	
Baseline emotional-eating $\times$ Baseline LOC presence			.33	.001				.29	.003	

Note: LOC = loss of control over eating.