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Overeating with and without loss of control: associations with weight status, weight-related characteristics, and psychosocial health

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Abstract

Objective—The relative importance of loss of control and overeating in the relationship between binge eating and eating-related and general psychopathology has been debated in the literature. This study assessed the prevalence and correlates of overeating with and without loss of control within a diverse, population-based sample of adolescents.

Method—A highly diverse (81.1% non-White) sample of adolescents (*n*=2,793) from EAT-2010 (Eating and Activity in Teens) completed self-report questionnaires assessing eating-related psychopathology, substance use, non-suicidal self-injury, depressive symptoms, and self-esteem.

Results—Overeating without loss of control was reported by 6.9% of girls and 5.0% of boys, while 9.6% of girls and 6.3% of boys reported overeating with loss of control (binge eating). Overall, overeating (with or without loss of control) was positively associated with unhealthy or extreme weight control behaviors, dieting, non-suicidal self-injury, lower body satisfaction and self-esteem, and higher depressive symptoms relative to no overeating. Among girls, binge eating was associated with unhealthy or extreme weight control behaviors, lower self-esteem, and higher depressive symptoms relative to overeating without loss of control, while in boys, binge eating was associated with greater cigarette usage, lower body satisfaction, and greater depressive

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Disclosure of Conflicts

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symptoms than overeating without loss of control (although cigarette usage was comparable in boys reporting binge eating and no overeating).

Discussion—Any overeating, with or without loss of control, was associated with multiple adverse correlates among adolescents. Loss of control was uniquely associated with multiple health indicators, further highlighting its importance as a marker of severity of overeating.

Keywords

Overeating; loss of control; EAT-2010; adolescent; correlates; psychopathology

Problematic eating patterns such as overeating (consuming an unusually large amount of food) and binge eating (overeating while feeling a sense of loss of control)[1] are common in adolescence[2] and are associated with unhealthy weight gain[3,4] and poorer psychosocial functioning.[5] The validity of the current definition of binge eating, and its core features, has long been debated in the literature.[6] Some studies suggest that loss of control while eating is the key construct that uniquely confers distress and impairment beyond the effects of overeating,[7,8] while others indicate that the combination of loss of control and overeating is a stronger marker for excess weight status and psychosocial dysfunction.[9–11] Few studies have assessed the prevalence and correlates of overeating with and without loss of control among community-based adolescents,[2,5] thereby impeding efforts to improve the classification system for eating disorders.

While approximately 10–15% of adolescents in population-based samples report binge eating,[12,13] fewer than 3% meet criteria for full syndrome bulimia nervosa or binge eating disorder.[14] This discrepancy may, in part, reflect that the current criteria for these disorders fail to capture a significant subset of the population due to the overly stringent binge eating size threshold.[6] Indeed, the experience of loss of control appears to be associated with significant distress,[7] impairment,[8,15,16] and problematic eating patterns,[17–19] independent of overeating, and is the most salient factor involved in patients' own descriptions of their binge eating behaviors.[20,21] Moreover, youth who endorse binge eating with loss of control evidence poorer weight-related and psychosocial outcomes than those who engage in overeating without loss of control in both cross-sectional and prospective studies,[2,5] suggesting that loss of control confers additional impairment beyond the effects of overeating alone.

Most studies comparing the relative strength of associations between loss of control versus overeating and psychosocial functioning in adolescence have been conducted in clinical samples,[8,10,22] thus impeding the generalizability of the findings and hindering their applicability to population-level prevention efforts. One cross-sectional study of problematic eating patterns among non-treatment seeking children and adolescents[15] found that eating episodes characterized by loss of control (with or without overeating) were associated with higher BMI z-scores and greater eating-related and general psychopathology than overeating in the absence of loss of control; however, the sample was relatively homogeneous in terms of race/ethnicity, which is limiting in light of the relative sociodemographic diversity associated with overeating and binge eating in adolescence.[13] More recently, binge eating was found to predict worse weight-related and psychosocial outcomes than overeating

without loss of control within a large, epidemiological sample of adolescents studied over nearly 10 years of follow-up;[5] however, that sample was also relatively non-diverse in terms of race/ethnicity and socioeconomic status. While prospective data are essential for establishing the prognostic significance of different constructs involved in binge eating and demonstrating the need for early identification and prevention, it remains important to assess the cross-sectional correlates of overeating with versus without loss of control in order to elucidate relevant targets for such early intervention efforts, as well as identify factors that may complicate treatment.

To this end, the current study aimed to assess the prevalence of overeating categories (no overeating, overeating without loss of control, and binge eating) within a diverse, population-based sample of adolescents, and to explore cross-sectional associations between overeating (with and without loss of control) and unhealthy weight-related outcomes, risky health behaviors, and psychological functioning. We hypothesized that binge eating would be associated with poorer health and well-being than both overeating without loss of control and no overeating.

Methods

Study Design and Population

Data were drawn from EAT-2010 (Eating and Activity in Teens), a study of eating, weight and psychosocial factors among adolescents.[23] Surveys and anthropometric measures were completed by 2,793 adolescents during the 2009–2010 academic year. Trained research staff administered surveys and measured adolescents' height and weight during selected health, physical education, and science classes. Following survey completion, participants were given a $10 gift card. All study procedures were approved by the University of Minnesota's Institutional Review Board Human Subjects Committee and by the research boards of the participating school districts. Among adolescents who were at school on the days of survey administration, 96.3% had parental consent and chose to participate.

The sample includes adolescents from 20 public middle schools and high schools in the Minneapolis/St. Paul metropolitan area of Minnesota, which serve socioeconomically and racially/ethnically diverse communities. Sample characteristics are described in Table 1.

Measures

The EAT-2010 survey is a 235-item, self-report instrument assessing a range of factors with potential relevance to weight status and weight-related behaviors among adolescents. The survey underwent extensive pilot testing and test-retest reliability testing by adolescents. Additional details on survey development are described elsewhere.[23]

Anthropometric and demographic factors—Age, sex, and race/ethnicity were self-reported. Socioeconomic status (SES) was determined by the highest educational attainment of either parent. Height and weight were measured by trained research assistants, using standardized equipment and procedures to calculate body mass index (BMI; kg/m^2).

Eating-related behaviors and attitudes—Overeating and loss of control were assessed with two questions adapted from the adult version of the Questionnaire on Eating and Weight Patterns-Revised,[24] which has good psychometric properties in adolescents.[25] Overeating was assessed by asking, "In the past year, have you ever eaten so much food in a short period of time that you would be embarrassed if others saw you (binge-eating)?" (current study test-retest agreement=90%). Loss of control was assessed by additionally asking, "During the times when you ate this way, did you feel you couldn't stop eating or control what or how much you were eating?" (current study test-retest agreement=75%). All participants were then categorized on the basis of their responses to these questions: no overeating was defined as a negative response to the overeating item; overeating without loss of control was defined as an affirmative response to the overeating item and a negative response to the loss of control item; and binge eating was defined as a positive response to both the overeating and loss of control items.

To assess unhealthy and extreme weight control behaviors, participants were asked, ""Have you done any of the following things in order to lose weight or keep from gaining weight during the past year?" Responses categorized as unhealthy included: fasted, ate very little food, used a food substitute, skipped meals, smoked more cigarettes; and those categorized as extreme included: took diet pills, made myself vomit, used laxatives, used diuretics. Participants who reported any of these behaviors were coded as engaging in disordered eating behaviors (current study test-retest agreement=85% [unhealthy behaviors] and 96% [extreme behaviors]).

Dieting was assessed by asking "How often have you gone on a diet during the last year?" Participants who reported any dieting during the past year were coded as engaging in dieting (current study test-retest agreement [non-dieter versus dieter]=82%).

Body dissatisfaction was measured using a modified version of the Body Shape Satisfaction Scale,[26] in which respondents rate their satisfaction with 10 aspects of their body (e.g., height, weight, body shape, thighs). Scores range from 10–50 with lower scores reflecting greater dissatisfaction (current study α=.92; test-retest r=.65).

Risky health behaviors—Use of alcohol, cigarettes, and marijuana was assessed with separate questions: "How often have you used [cigarettes, alcohol, and marijuana] during the past year (12 months)?" Response choices for each included "never," "a few times," "monthly," "weekly," and "daily." Responses were dichotomized into ever versus never. Non-suicidal self-injury was assessed with the question: "Have you ever deliberately hurt yourself, such as by cutting, scratching, or burning, but not with the goal of ending your life?" Response options included "yes, during the past year," "yes, more than a year ago," and "no." Responses were dichotomized into "yes, during the past year" versus "more than a year ago" and "no."

Psychological functioning—Self-esteem was assessed using six items from the Rosenberg Self-Esteem Scale.[27] Scores for the composite scale ranged from 6 to 24, with higher scores indicating higher self-esteem (current study α=.79).

Depressive symptoms were assessed using six items from Kandel and Davies scale for adolescents,[28] which inquires about the frequency of dysphoric mood, tension/nervousness, fatigue, worry, sleep disturbance, and hopelessness during the past year. Scores range from 6–18, with higher scores indicating greater depressive symptoms (current study α=.82).

Statistical Analysis

A total of 32 adolescents were missing responses on one or both of the overeating items, leaving 2,761 adolescents with complete data for the statistical analyses. Participants missing data on any of the dependent variables were removed from analyses that involved that dependent variable. Fisher's exact tests were used to examine if the proportion of adolescents in each overeating category varied across sociodemographic subgroups. Logistic regression was used to estimate associations between overeating categories (included as dummy variables with "no overeating" as the reference) and each *dichotomous* outcome variable of interest (i.e., unhealthy/extreme weight control behaviors, dieting, use of cigarettes, alcohol, or marijuana, non-suicidal self-injury). Linear regression was used to estimate associations between overeating category and each *continuously-measured* variable of interest (i.e., body satisfaction, depressive symptoms, self-esteem). For each model, pairwise contrasts were estimated. Adjusted predicted probabilities (for categorical outcomes) and predicted means (for continuous outcomes) were estimated from the corresponding regression models. All models were stratified by gender and included adjustment for age, race/ethnicity, SES and continuous BMI. Of note, there were 48 underweight participants in our sample (n=35 boys and 14 girls). When analyses were re-run excluding these individuals, results were unchanged; thus, results reported henceforth included the full sample, regardless of (under)weight status. All analyses were performed in Stata v13.

Results

Descriptive characteristics

As reported in Table 1, the majority of boys (88.8%) and girls (83.6%) did not report any overeating or binge eating. The prevalence of overeating without loss of control was 6.9% in girls and 5.0% in boys, and the prevalence of binge eating was 9.6% in girls and 6.3% in boys (p<.01). In terms of sociodemographic factors, overeating in boys, either with or without loss of control, was associated with race/ethnicity (with post-hoc tests indicating that Hispanic boys were significantly more likely to endorse overeating, both with and without loss of control, than other racial/ethnic groups; all p<.05) and SES (with post-hoc tests indicating that binge eating was disproportionately high among low and low-middle socioeconomic groups; all p<.05). In both boys and girls, overeating with and without loss of control were associated with excess weight status.

Associations between overeating categories, and eating- and health-related behaviors

Adolescent girls—After adjusting for sociodemographic factors, adolescent girls who reported engaging in any overeating (with or without loss of control) were more likely to report unhealthy or extreme weight control behaviors and dieting, as well as poorer functioning across the domains of body satisfaction, depressive symptoms, and self-esteem,

as compared to those with no overeating (see Table 2). Furthermore, girls who reported binge eating were more likely to report unhealthy or extreme weight control behaviors as compared to girls who reported overeating without loss of control. Similarly, girls who reported binge eating reported greater depressive symptoms and lower self-esteem as compared to girls who reported overeating without loss of control ($p<.05$).

Adolescent boys—After adjusting for sociodemographic factors, adolescent boys who reported any overeating (with or without loss of control) were more likely to report unhealthy or extreme weight control behaviors, dieting, and non-suicidal self-injury, and to report poorer functioning across the domains of body satisfaction, depressive symptoms, and self-esteem as compared to those with no overeating (all $p<.05$). Endorsement of binge eating episodes was further associated with higher rates of cigarette usage, poorer body satisfaction, and greater depressive symptoms relative to overeating without loss of control ($p<.05$), although notably, cigarette usage was comparable in those reporting binge eating and no overeating.

Discussion

The current study assessed the prevalence and correlates of overeating with and without loss of control within a diverse sample of community-based adolescents. We found that overeating with or without loss of control was reported by approximately 10–15% of participants, and that the prevalence of both forms of overeating was higher among adolescent girls than boys, and among adolescents with excess weight status than non-overweight adolescents (although, of note, prevalence rates of binge eating were similar in overweight and non-overweight boys, but markedly higher in obese boys). In terms of eating-related and psychosocial correlates, overeating was generally associated with greater impairment in most domains regardless of the presence or absence of loss of control. Several psychosocial domains were found to be associated with binge eating relative to overeating, suggesting that loss of control overeating (rather than overeating alone) is specifically associated with poorer functioning in multiple health-related domains. Our findings replicate the existing literature with respect to the prevalence rates of overeating and binge eating, associations with gender, and health-related correlates,[2,5,12,13,15] but importantly extend the results to a sociodemographically diverse sample of population-based adolescents, thus enhancing their relevance to various subgroups of adolescents in the community.

Overall, results suggest that any form of overeating is associated with adverse health consequences among adolescents, but that experiencing loss of control during overeating episodes may confer added distress beyond the effects of overeating for some constructs. Alternatively, individuals experiencing psychosocial difficulties may be more likely to report feeling out of control with their eating. Irrespective of the nature of the relationship between these constructs, the co-occurrence of overeating/binge eating and poorer health-related functioning may indicate that clinicians should assess functioning in multiple health domains when encountering youth with problematic eating patterns.[6] Recently, Sonneville and colleagues[5] found that binge eating predicted poorer health-related outcomes across multiple weight-, mood-, and substance-related domains relative to overeating without loss of control, indicating that loss of control is uniquely prognostic of adverse health

consequences beyond the effects of overeating alone. Our cross-sectional findings suggest that many of the same health-related constructs assessed in that earlier study (e.g., depressive symptoms), as well as additional eating-related and general psychological constructs (e.g., body dissatisfaction, self-esteem), could serve as useful targets in interventions for adolescents exhibiting overeating behaviors.

The current study was marked by many important strengths, including the large and diverse population-based sample and the exploration of multiple indicators of health-related functioning. In addition, analyses were stratified by gender, allowing us to elaborate on previously identified gender effects with respect to the prevalence and correlates of overeating and loss of control.[2,5] Indeed, several interesting findings emerged in boys, including that overeating and binge eating were disproportionately high among Hispanic boys relative to other racial/ethnic groups, replicating earlier findings[29,30] and perhaps suggesting that these behaviors are more culturally sanctioned or reflect social pressures around eating in this racial/ethnic group.[31] However, exploring interactions with gender was beyond the scope of this study and should be a focus of future studies.

Limitations of this study include the cross-sectional design, which precluded being able to determine the direction of association between our dependent and independent variables. However, our findings augment similar associations between loss of control and negative health outcomes documented in prospective datasets.[5,16] Moreover, the co-existence of problematic eating patterns and poorer health-related functioning highlights the importance of comprehensive assessment and early intervention by healthcare providers serving adolescents. Measurement limitations included the use of brief self-report measures to assess eating- and health-related constructs, the characterization of overeating as eating “so much food in a short period of time that you would be embarrassed if someone saw you,” (which introduces an element of secrecy that is not typically included in other studies of overeating and thus may limit cross-study comparisons), and the dichotomization of the eating-related variables (which was necessitated by the small sample sizes in some overeating categories), all of which could have skewed our findings. In particular, associations between loss of control eating and poorer psychological functioning could reflect a tendency to pathologize one’s behaviors and attitudes across multiple domains.[32] On a related note, test-retest reliability was slightly lower for loss of control (75%) than overeating (90%), which may have artificially inflated differences between the two on health-related indicators. Finally, the nature of the overeating measure (in which a positive response to the overeating item on the survey was necessary in order to be asked loss of control item) precluded examining the prevalence and correlates of loss of control in the absence of overeating, which could help clarify whether loss of control as a unique construct confers distress and impairment *independent of* overeating.

In general, findings suggest that overeating, regardless of loss of control, is associated with multiple adverse health correlates among adolescents and thus should be promptly identified and assessed by healthcare providers. However, loss of control appears to be uniquely associated with several markers of psychosocial health in this diverse, population-based sample. Clinicians working with adolescents who report loss of control eating should further inquire about substance use, depressive symptoms, and self-esteem, in addition to other

eating-related symptoms, and treatments addressing loss of control eating may benefit from focusing on these constructs as well. In light of the well-documented adverse health outcomes associated with overeating and loss of control in prospective studies,[4,5,16] early identification and intervention should be a priority to minimize future health-related concerns.

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Table 1

Distribution and associated sociodemographic features of overeating categories by gender

	Girls					Boys				
		No overeating % (*n*)	**Overeating without loss of control % (*n*)**	**Binge eating % (*n*)**	***p*-value**		**No overeating % (*n*)**	**Overeating without loss of control % (*n*)**	**Binge eating % (*n*)**	***p*-value**
		83.6 (1229)	6.9 (101)	9.6 (141)			88.8 (1145)	5.0 (64)	6.3 (81)	
Episode frequency distributions	*n*	%	%	%		*n*	%	%	%	
Nearly every day	34	---	12.9	14.9		21	---	11.1	17.3	
A few times a week	58	---	8.9	34.8		38	---	15.9	34.6	
A few times a month	63	---	22.8	28.4		38	---	20.6	30.9	
< once a month	87	---	55.5	22.0		47	---	52.4	17.3	
Sociodemographic variable	*n*	%	%	%		*n*	%	%	%	
Race										
White	246	80.9	10.2	8.9	0.08	275	93.5	2.2	4.4	0.01
Black	423	85.3	6.4	8.3		374	89.3	4.8	5.9	
Asian-American	251	87.3	4.8	8.0		212	89.6	3.8	6.6	
Hispanic	293	78.8	8.5	12.6		358	82.2	9.3	8.5	
Mixed/Other	252	84.5	4.8	10.7		168	88.7	4.8	6.6	
Age										
≤12	284	84.2	8.5	7.4	0.60	242	90.1	5.8	4.1	0.73
13–14	502	83.7	7.2	9.2		393	87.3	5.3	7.4	
15–16	449	83.3	5.8	10.9		388	89.2	4.4	6.4	
≥17	236	83.1	6.4	10.6		267	89.1	4.5	6.4	
SES										
Low	630	82.9	6.2	11.0	0.43	438	85.3	6.1	8.6	0.02
Low-middle	305	84.9	6.2	8.9		280	87.2	5.0	7.9	
Middle	238	85.7	6.7	7.6		229	91.7	3.9	4.4	
Upper-middle	166	80.1	11.5	8.4		178	94.9	1.7	3.4	
High	87	83.9	6.9	9.2		115	93.0	4.4	2.6	

	Girls					Boys				
		No overeating % (*n*)	**Overeating without loss of control % (*n*)**	**Binge eating % (*n*)**	***p*-value**		**No overeating % (*n*)**	**Overeating without loss of control % (*n*)**	**Binge eating % (*n*)**	***p*-value**
Weight status										
Non-overweight	888	86.4	5.7	7.9	<0.01	739	92.0	3.8	4.2	<0.01
Overweight	238	82.0	7.8	10.3		200	89.5	6.0	4.5	
Obese	279	76.3	9.7	14.0		326	81.0	7.1	12.0	

Note: SES=socioeconomic status; non-overweight=body mass index<85th percentile; overweight=85th percentile≤body mass index<95th percentile; obese=body mass index≥95 percentile (body mass index=kg/m^2). Numbers may vary slightly due to missing values for specific variables.

Table 2

Associations between overeating categories and eating-related behaviors and attitudes, risky health behaviors, and psychological functioning, % unless otherwise indicated

	Girls			Boys		
	No overeating	**Overeating without loss of control**	**Overeating with loss of control**	**No overeating**	**Overeating without loss of control**	**Overeating with loss of control**
Eating-related behaviors and attitudes						
Unhealthy and extreme weight control behaviors	45.8[a]	64.1[b]	77.8[c]	34.3[a]	57.2[b]	62.3[b]
Risk Difference (CI)	Referent	18.3 (8.6, 28.0)	32.1 (24.3, 39.8)	Referent	22.9 (9.8, 36.0)	28.0 (16.5, 40.0)
Dieting	42.7[a]	54.4 [b]	66.3[b]	28.1[a]	47.1[b]	40.9[b]
Risk Difference (CI)	Referent	11.6 (1.9, 2.1)	23.6 (15.3, 31.2)	Referent	19.0 (6.5, 31.4)	13.8 (2.4, 24.1)
Body satisfaction*	34.3[a]	28.0[b]	28.1[b]	35.4[a]	31.9[b]	28.5[c]
Risk Difference (CI)	Referent	−6.3 (−8.3, −4.4)	−6.2 (−7.9, −4.5)	Referent	−3.5 (−6.0, −1.1)	−6.9 (−9.1, −4.7)
Risky health behaviors						
Cigarette use	10.5[a]	12.8[a]	13.3[a]	12.8[a]	4.2[b]	19.3[a]
Risk Difference (CI)	Referent	2.3 (−4.6, 9.3)	2.9 (−2.9, 8.7)	Referent	−8.6 (−14.5, −2.7)	6.5 (−2.3, 15.3)
Alcohol use	23.4[a]	25.4[a]	26.7[a]	26.0[a]	31.2[a]	32.6[a]
Risk Difference (CI)	Referent	2.0 (−6.9, 11.0)	3.3 (−4.3, 10.8)	Referent	5.2 (−6.2, 16.6)	6.6 (−3.7, 17.0)
Marijuana use	12.6[a]	15.8[a]	11.0[a]	17.5[a]	13.0[a]	22.0[a]
Risk Difference (CI)	Referent	3.1 (−4.5, 10.8)	−1.7 (−7.2, 3.8)	Referent	−4.6 (−14.0, 4.8)	4.5 (−4.9, 13.8)
Non-suicidal self-injury	13.2[a]	16.4[ab]	23.3[b]	7.7[a]	18.8[b]	22.4[b]
Risk Difference (CI)	Referent	3.2 (−4.2, 10.6)	10.0 (2.7, 17.4)	Referent	11.1 (1.1, 21.0)	14.7 (5.2, 24.2)
Psychological functioning						
Depressive symptoms*	10.5[a]	11.8[b]	13.2[c]	9.2[a]	10.4[b]	11.5[c]
Risk Difference (CI)	Referent	1.26 (0.62, 1.91)	2.74 (2.18, 3.30)	Referent	1.16 (0.34, 1.99)	2.22 (1.50, 1.94)
Self-esteem*	17.9[a]	16.4[b]	15.2[c]	18.6[a]	16.8[b]	15.8[b]
Risk Difference (CI)	Referent	−1.46 (−2.21, −0.72)	−2.67 (−3.32, −2.02)	Referent	−1.77 (−2.66, −0.89)	−2.81 (−3.60, −2.03)

Note: All models include age, race/ethnicity, socioeconomic status, and body mass index as covariates. Body dissatisfaction range=10–50; depressive symptoms range=6–18; self-esteem range=6–24. Different superscripts indicate statistically significant differences at $p<0.05$. Numbers may vary slightly due to missing values for specific variables.

[*] Values reflect adjusted means (95% confidence intervals)