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Examining the Associations Between Overeating, Disinhibition, and Hunger in a Nonclinical Sample of College Women

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Abstract
Background Binge eating (BE) has long been identified as a correlate of overweight and obesity. However, less empirical attention has been given to overeating with and without loss of control (LOC) in nonclinical samples.
Purpose The goal of the present study was to examine the association of (1) established correlates of BE, namely, weight and shape concerns, dietary restraint, and negative affect, and (2) three additional correlates, disinhibition, hunger, and interoceptive awareness (IA), to overeating in a nonclinical sample of college women.
Method Female students (n=1,447) aged 18 to 21 years recruited from colleges in three Canadian metropolitan areas completed self-report questionnaires in class to assess sociodemographic and anthropomorphic characteristics, overeating, LOC, dietary restraint, negative affect, weight and shape concerns, IA, disinhibition, and hunger.
Results The established correlates of BE were significant correlates of all types of overeating and explained 33 % of the variance. Disinhibition was the most strongly associated correlate of overeating.
Conclusions Findings suggest that established correlates of BE are associated with other types of overeating such as objective overeating (OOE), as are disinhibition and hunger.

Keywords Overeating · Loss of control · Disinhibition · Hunger · Dietary restraint · Weight and shape concerns

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Introduction

Given its increasing prevalence [1, 2] and associated negative sequelae [3–5], there is an urgent need to further our understanding of overweight in order to improve its prevention and treatment. One robust predictor of overweight is overeating [6, 7]. The association between overeating, loss of control (LOC), and excess weight is well established [8]. However, most of the studies pertaining to overeating have focused on clinical syndromes or populations, and as such, on individuals seeking treatment for their weight problem or for binge eating (BE). This study aimed to expand our knowledge regarding different presentations of overeating by examining the association of established and putative risk factors of BE with objective overeating (OOE) in a population of female college students.

Overeating

Overeating is a risk factor of overweight [9, 10] and it has been linked to negative affect, dietary restraint, and body dissatisfaction [9, 11–13]. BE, a form of overeating, is characterized by two main features: eating in a discrete period of time an unusually large amount of food, accompanied by a subjective sense of LOC overeating during the episode [14, 15]. It is the most studied form of overeating. The dual pathway model [16] is a long-standing model that

seeks to explain bulimic psychopathology, including purging as well as weight and shape concerns. It provides a comprehensive and empirically sound model of BE symptomatology. Specifically, a number of studies have demonstrated that body dissatisfaction contributes to BE, with negative affect and dietary restraint mediating the relationship [9, 12, 13, 17, 18]. In addition, having an elevated body mass has been linked to an increase in body dissatisfaction [19, 20], which can take the form of weight and shape concerns.

Given the focus on BE, our knowledge about other subgroups of overeaters is incomplete. Further studies on different profiles of overeaters, including individuals reporting subclinical levels of overeating (e.g., subjective overeating and OOE) and/or from nonclinical samples, would be informative. In addition, specific and clinically significant features of BE versus OOE are not well understood although the latter has been shown to contribute to overweight and obesity [6, 7, 9]. Important issues to be examined include whether known predictors of BE are also associated with other types of overeating, such as OOE; whether those predictors are also associated with overeating within community samples; and whether other factors could be contributing to OOE.

Towards a Better Understanding of Overeating

Disinhibition, a predisposition for opportunistic eating, has been shown to play a major role in eating by creating an increased tendency to eat, especially when confronted with a threat to energy balance [21]. Such a threat can take the form of perceived deprivation [22, 23]. As disinhibition is associated with an increased tendency to eat, it fosters an environment where LOC is more likely to occur, especially in the presence of certain cues, such as ambiguous or negative emotional activation, food cues, and feelings of hunger [21].

Recent findings suggest that overweight individuals may, in fact, overeat in an attempt to compensate for a reward deficit because they generate weaker satiety signals [23, 24]. They may experience a chronic sense of perceived deprivation by eating less than wanted as opposed to eating less than needed [22, 23]. This dichotomy is reflected in the distinction between homeostatic or need-based hunger and hedonic or want-based hunger, the latter being driven by food availability or psychological motivations such as soothing from or avoidance of ambiguous or negative emotional activation [23].

In fact, individuals who have difficulty recognizing and identifying their emotional states, also known as interoceptivity, may use eating as a way to cope with a negative and ambiguous emotional activation [25, 26]. Deficits in interoceptivity have been identified as an important risk factor for problematic eating behaviors in adolescents [25, 27] and they partially explained the relationship between negative affect and BE in one study [12].

The present study aimed to examine the association between overeating and established and proposed correlates of BE. Specifically, the first objective of the study was to investigate the association between three established correlates of BE—weight and shape concerns, dietary restraint and negative affect, and overeating—in young college women. Furthermore, in light of the findings regarding the putative effect of disinhibition, hunger, and interoceptive awareness (IA) on eating behavior, the second objective was to examine associations between these factors and OOE/BE in the same population.

Methods

Participants

Out of the 1,747 female students who were solicited to take part in the study, 1,488 agreed to participate, yielding a participation rate of 85.17 %. Participants under 18 or over 21 years old (n=41; 2.76 %) were excluded from the final analyses to ensure homogeneity of the sample regarding age. Excluded participants were not significantly different from the other participants on sociodemographic and anthropomorphic characteristics. Our final sample consisted of 1,447 women aged 18 to 21 years, recruited from 14 public colleges and seven universities in three large metropolitan Canadian cities.

Procedure

Data collection was carried out over three different phases spanning over 16 months and took place during regular class hours. The study was presented to students as focusing on eating behavior. After signing a written informed consent, participants completed self-report questionnaires. The entire procedure took up to a maximum of 60 min. Participants were offered an information package concerning eating disorders, in general, as well as references for useful health services. No further compensation was offered. The research was approved by our institutional review board.

Measures

To collect sociodemographic and anthropomorphic information, a 34-item self-report questionnaire was adapted from a questionnaire often used in clinical studies with adult women in our laboratory. This questionnaire was also used to assess weight status using two questions pertaining to height and weight. Self-report of weight and height has been deemed reliable and valid, with Pearson's r coefficients

ranging from 0.94 to 0.98, when compared with direct measures of weight and height taken by research staff [28–31].

The Eating Disorder Examination Questionnaire (EDE-Q) [32] was used to assess overeating, LOC, weight and shape concerns, and dietary restraint. The EDE-Q is a self-report version of the EDE [33], a validated semistructured interview considered by many as the golden standard in eating pathology assessment [34, 35]. Both are widely used [10, 36–38]. The EDE-Q internal consistency (α=0.84), test–retest reliability (mean r=0.80), and convergent validity (with the EDE; r=0.81) are well documented [32, 39, 40]. The EDE-Q generates two types of data. First, the frequency of key features of eating pathology is assessed using items enquiring about the number of episodes or number of days in which a given behavior has occurred. Second, 28 items divided among four subscales—dietary restraint, eating concern, shape concern, and weight concern—assess the severity of characteristics of eating pathology using Likert scales. Participants are asked to rate their behavior over the past 28 days. In our sample, the internal consistency for the four subscales was α=0.92.

Weight and shape concerns were assessed using the EDE-Q. A composite variable was created reflecting body dissatisfaction, discomfort with body exposure, and a desire to change body shape and weight. In accordance with Fairburn et al. [41] and Mond et al. [42], the scores on the Weight Concern and Shape Concern subscales were combined to obtain a score reflecting overall weight and shape concerns. A recent report on the factor structure of the EDE-Q suggested that most items of the Weight Concern and Shape Concern subscales did, in fact, combine into one factor [43]. The scores of the individual items of both subscales were added and then divided by the sum total of all items, hence creating a mean score. The scale yielded excellent internal consistency (α=0.94).

The EDE-Q was also used to measure dietary restraint, a subscale of the questionnaire. Our decision to use the dietary restraint subscale of the EDE-Q rather than the TFEQ's was based on good psychometric properties of the instrument and its subscales and its status as the "golden standard" in assessing eating disturbances and its widespread use in research, allowing for comparison. The score of the dietary restraint subscale was used as is and showed good internal consistency (α=0.79).

The negative emotionality scale of the Differential Emotional Scale IV (DES-IV) [44] was used to assess negative affect. The DES-IV is a 36-item self-report questionnaire designed to assess the frequency at which 12 distinct emotions are felt in daily life. Respondents rate how often they experience different emotional states on a Likert scale of 1 = rarely or never to 5 = very often. The reliability and validity of the DES-IV have been demonstrated—6-month test–retest reliability for the 12 subscales (mean r=0.69) and internal consistency (α=0.74) [45]. The reliability coefficient for the negative emotionality scale was α=0.94.

Interoceptivity was assessed using the IA subscale from the Eating Disorder Inventory 2 (EDI-2) [46]. The EDI-2 is a self-report questionnaire designed to examine the psychological characteristics of behaviors associated with different eating disorders. Respondents rate the frequency of several behaviors on a Likert scale of 1 = never to 6 = always. Responses for each item are then recoded in accordance with the procedure described in the instruction manual. The IA subscale is composed of ten items designed to identify difficulties in correctly recognizing and naming emotional states as well as feelings of hunger and satiety. The IA subscale has good internal consistency (α=0.76 to 0.86), and its test–retest reliability (r=0.65 to 0.97) as well as convergent validity (global score EDI/EAT: r=0.66; subscale EDI/global score EDI: mean r=0.62) are well documented [46–49]. The reliability coefficient for the interoceptivity scale was α=0.81.

The Eating Inventory, formerly known as the Three-Factor Eating Questionnaire (TFEQ) [50], is a 51-item self-report questionnaire designed to assess three separate concepts: restraint, hunger, and disinhibition. In the present study, the hunger and disinhibition subscales were used to assess, respectively, feelings of hunger and their behavioral consequences, and a susceptibility towards disinhibition (habitual, emotional, and situational) and its triggers. The TFEQ is divided in two parts; the first part of the questionnaire lists a series of 36 statements that respondents rate as true or false. The second part consists of 15 items describing various behaviors that respondents rate on a Likert scale of 1 to 4 according to their frequency, likeliness, or intensity. The internal consistency for both subscales is excellent (hunger: α=0.85 and disinhibition: α=0.91) [50] and they also show good 12-month test–retest reliability (disinhibition: r=0.86; hunger: r=0.75) [51]. In this study, reliability coefficients for the disinhibition and hunger scales were, respectively, α=0.79 and α=0.78.

Statistical Analysis

The four mutually exclusive outcome groups were based on the answer provided by participants to questions regarding the frequency at which they had engaged in bouts of overeating and/or LOC in the past 28 days. Since the data for the overeating and LOC items were heavily skewed, a four-level categorical variable was created based on the presence/absence of overeating and LOC: participants who reported no overeating and no LOC were scored 0 (nonovereating (NOE), n=807),

those who reported no overeating but at least one episode of LOC were scored 1 (subjective BE [SBE], n=55), those who reported at least one episode of overeating without LOC were scored 2 (OOE, n=301), and those who reported at least one episode of overeating and at least one episode of LOC were scored 3 (objective BE [OBE], n=284). This procedure is commonly used in studies of overeating in community samples as this variable tends to be heavily skewed [10, 52].

A one-way analysis of variance (ANOVA) was first performed to examine between-group differences in body mass index (BMI), overeating, LOC, and purging across the four groups. Second, a multinomial logistic regression analysis was used to examine the association between the correlates and the outcome. Weight and shape concerns, negative affect, dietary restraint, IA, hunger, and disinhibition were regressed against overeating, yielding six contrasts: (1) NOE versus SBE, (2) NOE versus OOE, (3) NOE versus OBE, (4) SBE versus OOE, (5) SBE versus OBE, and (6) OOE versus OBE. The variables were entered into the regression analysis model following a forced or hierarchical procedure. The independent variables in the regression analysis (all continuous variables) were standardized (z scores), thus allowing comparisons among adjusted odds ratios (ORs) representing a 1 standard deviation (SD) change in the variable.

To detect possible confounding variables, ANOVAs and crosstabs were used. Only weak correlations were found between sociodemographic/anthropomorphic variables and the outcome variables (i.e., overeating and LOC) (all êta and tau C coefficients ranging from 0.001 to 0.14). The strength of the association between BMI and overeating (êta=0.13) was weak but significant (p<0.001). Hence, we controlled for BMI in all of the following regression analyses.

Results

Pearson's correlation coefficients between continuous variables used as predictors in the multinomial logistic regression were between 0.139 and 0.649 (p<0.05).

Final Sample Description

The mean age of the participants was 19.16 years (SD=1.07). The majority reported being born in Canada (n=1,346; 93.00 %) and lived in suburban communities (n=784; 54.18 %). The median annual household income for our sample was between $50,000 and $74,999 ($n$=423; 29.20 %). Descriptive statistics regarding weight status, overeating, LOC, and purging are presented in Table 1.

BMI, Overeating, LOC, and Purging Across Overeating Subgroups

A series of one-way ANOVAs showed a significant difference in BMI, overeating, LOC, and purging across our subgroups, with small-effect sizes for BMI (r=0.17) and purging (r=0.14), and large-effect sizes for overeating (r=0.56) and LOC (r=0.63). Means, SDs, 95 % confidence intervals (CI), p values, and Games-Howell post hoc comparisons are presented in Table 1.

Correlates of Overeating

Means and SDs for all independent variables according to overeating/LOC subgroups are presented in Table 2.

Multinomial Logistic Regression Analysis

The variables used as regressors were dietary restraint, weight and shape concerns, negative affect, lack of interoceptivity, disinhibition, and hunger. They were regressed against overeating. Main effects for individual variables were obtained. Taken together, these variables explained 33 % of the variance in overeating.

Table 3 presents the ORs, 95 % CIs, and p values for all the correlates. There were significant main effects for dietary restraint in two contrasts (NOE versus OOE and OBE versus OOE). Weight and shape concerns showed significant main effects in the contrasts comparing SBE and OBE to NOE and in the contrasts comparing SBE and OBE to OOE. Interpretation of the ORs indicates that for this sample, an increase in weight and shape concerns was associated with a 1.351 to 1.687 increase in LOC, regardless of overeating. Similarly, negative affect only showed main effects when comparing SBE and OBE to NOE. There was no significant main effect for lack of interoceptivity, whereas disinhibition showed significant main effects in all contrasts except the one comparing OOE to SBE. Interpretation of the ORs for disinhibition indicated that an increase in disinhibition was associated with marked increases in OBE when compared to NOE, OOE, and SBE as well as an increase in OOE and SBE when compared to NOE. Finally, hunger showed significant main effects in all three contrasts comparing OOE, SBE, and OBE to NOE, and in the contrast comparing OBE to OOE, with ORs ranging from 1.246 to 1.613.

Discussion

The first aim of this study was to test three known predictors of BE, namely weight and shape concerns, dietary restraint, and negative affect, in order to examine their association

Table 1 Descriptive statistics and analysis of variance for weight status, overeating, LOC, and purging across overeating subgroups

								ANOVA		Games-Howell post hoc comparison
			Number	Percent	Mean	SD	95 % CI	*F*	*p*	*p*
Weight status according to BMI										
	Underweight (BMI< 18.50)		101	7.00						
	Normal/healthy weight (BMI 18.50–24.99)		1,047	72.40						
	Overweight (BMI 25.00–29.99)		205	14.20						
	Obese (BMI>30.00)		94	6.50						
BMI								14.040	0.000	
	NOE		807	55.80	22.30	3.74	22.04–22.56			
		SBE								0.383
		OOE								0.266
		OBE								0.000
	SBE		55	3.80	23.17	3.90	22.12–24.23			
		OOE								0.904
		OBE								0.350
	OOE		301	20.80	22.78	3.97	22.33–23.23			
		OBE								0.004
	OBE		284	19.60	24.22	5.96	23.53–24.92			
Overeating								221.453	0.000	
	NOE		807		0.00	0.00	0.00–0.00			
		SBE								n/a
		OOE								0.000
		OBE								0.000
	SBE		55		0.00	0.00	0.00–0.00			
		OOE								0.000
		OBE								0.000
	OOE		301		3.62	5.05	3.05–4.19			
		OBE								0.004
	OBE		284		5.01	4.96	4.44–5.59			
LOC								314.020	0.000	
	NOE		807		0.00	0.00	0.00–0.00			
		SBE								0.000
		OOE								n/a
		OBE								0.000
	SBE		55		3.58	3.62	2.60–4.56			
		OOE								0.000
		OBE								0.713
	OOE		301		0.00	0.00	0.00–0.00			
		OBE								0.000
	OBE	284		4.18	4.58	3.64–4.71				
Purging								9.406	0.000	
	NOE		807		0.11	1.22	0.03–0.19			
		SBE								0.200
		OOE								0.968
		OBE								0.010
	SBE		55		0.02	0.13	−0.02–0.06			
		OOE								0.438

Table 1 (continued)

					ANOVA	Games-Howell post hoc comparison
	OBE					0.002
OOE		301	0.16	1.56	−0.02–0.33	
	OBE					0.029
OBE		284	0.85	3.89	0.39–1.30	

NOE nonovereaters, *SBE* subjective binge eaters, *OOE* objective overeaters, *OBE* objective binge eaters, *n/a* no result available

with different forms of overeating in a community sample. In addition, we wanted to examine the association between disinhibition, hunger and IA, and overeating as they have been shown to significantly increase the tendency to overeat.

The examination of correlates of overeating in a nonclinical sample of young women showed that overeating tendencies are not limited to clinical populations but are rather common. Over 40 % of our sample reported at least one episode of overeating in the last 28 days, with almost 21 % of participants reporting OOE and an additional 20 % reporting OBE. Findings confirmed that weight and shape concerns, negative affect, and dietary restraint were significantly associated with BE, which is congruent with findings showing that those variables are robust predictors of BE in children, adolescents, and adults [10, 19, 53–55]. Furthermore, our results showed that disinhibition and hunger were strong correlates of both BE and overeating, but not IA.

Body dissatisfaction has long been associated with eating pathology [12, 13, 19] and it has been shown that it can foster negative affect and BE [12, 18, 19]. In our nonclinical sample of young college women, weight and shape concerns were associated with LOC, regardless of overeating. Indeed, recent findings have suggested that LOC is a core feature of BE and appears to be strongly associated with psychological markers of distress, independent of overeating [18, 56, 57]. However, in most of the studies identified on the topic, the focus was either on the subjective/objective nature of an overeating or BE episode (i.e., the quantity of food eaten during an episode), or on the LOC feature of a binge and its correlates. If replicated with longitudinal data, our findings regarding weight and shape concerns could mean that it is a clinically meaningful risk factor for a more pathological form of overeating even in the general population and would be worth targeting early on via prevention programs in the community.

Negative affect was associated with SBE and OBE in our community sample. Studies have shown that negative affect can contribute to LOC [57, 58]. Furthermore, several studies have found that some individuals do eat more in the presence of negative emotions [9, 12, 59, 60]. Together, these data provide additional support for the pervasive influence of negative affect on eating behavior, which can translate into overeating and LOC that may lead to weight gain. The significant finding regarding negative affect also mirrors the hedonic or want-based model of hunger that postulates that certain individuals will eat in response to psychological motivations and not just to satisfy physiological needs [23].

Paradoxically, the fact that weight and shape concerns and negative affect are present in healthy as well as in clinical populations raises questions about elements of the constructs shared by both populations. It is not clear at present which elements are of true clinical significance with regards to eating pathologies versus those seemingly harmless elements potentially shared by a large portion of the general female population. These questions warrant further research in order to delineate what are noxious negative affect and weight and shape concerns as opposed to forms that would be more benign.

In our nonclinical sample, dietary restraint appeared to be associated with both NOE and OBE. Previous studies have also found similar results regarding dietary restraint [12, 13, 18]. Various hypotheses have been put forward to explain such findings. Current measures to assess dietary restraint

Table 2 Mean and standard deviation for all independent variables according to overeating subgroups

	NOE		SBE		OOE		OBE	
	M	SD	*M*	SD	*M*	SD	*M*	SD
Restraint	0.81	1.09	1.63	1.55	0.75	0.91	1.67	1.33
Weight and shape concerns	1.58	1.36	3.01	1.59	1.77	1.38	3.13	1.51
Negative affect	48.72	14.41	62.18	18.77	51.68	15.34	62.55	17.31
Lack of interoceptive awareness	1.77	2.91	4.09	4.15	2.16	3.08	4.75	4.93
Disinhibition	4.36	2.31	6.60	3.34	5.47	2.49	8.37	3.30
Hunger	4.37	2.91	6.45	3.50	5.58	3.05	7.70	3.45

NOE nonovereaters, *SBE* subjective binge eaters, *OOE* objective overeaters, *OBE* objective binge eaters

Table 3 Multinomial Logistic Regression for correlates of overeating, controlling for Body Mass Index

	NOE versus OOE			NOE versus SBE			NOE versus OBE		
	OR	95 % CI	*p*	OR	95 % CI	*p*	OR	95 % CI	*p*
Dietary restraint	**0.801**	**0.649, 0.988**	**0.039**	1.115	0.816, 1.523	0.496	1.154	0.946, 1.408	0.157
Weight and shape concerns	0.996	0.791, 1.254	0.971	**1.680**	**1.115, 2.531**	**0.013**	**1.351**	**1.056, 1.729**	**0.017**
Negative affect	1.128	0.939, 1.355	0.198	**1.470**	**1.046, 2.066**	**0.027**	**1.265**	**1.027, 1.557**	**0.027**
Lack of interoceptivity	0.984	0.807, 1.199	0.869	1.009	0.739, 1.378	0.957	1.102	0.909, 1.337	0.322
Disinhibition	**1.526**	**1.252, 1.859**	**0.000**	**1.545**	**1.070, 2.232**	**0.020**	**2.652**	**2.133, 3.297**	**0.000**
Hunger	**1.294**	**1.096, 1.528**	**0.002**	**1.422**	**1.020, 1.982**	**0.038**	**1.613**	**1.334, 1.951**	**0.000**
	OOE versus SBE			OOE versus OBE			SBE versus OBE		
	OR	95 % CI	*p*	OR	95 % CI	*p*	OR	95 % CI	*p*
Dietary restraint	1.392	.989, 1.031	0.058	**1.441**	**1.138, 1.825**	**0.002**	1.036	0.756, 1.420	0.828
Weight and shape concerns	**1.687**	**1.098, 2.593**	**0.017**	**1.357**	**1.035, 1.778**	**0.027**	0.804	0.529, 1.224	0.309
Negative affect	1.303	0.912, 1.862	0.146	1.121	0.893, 1.409	0.325	0.860	0.606, 1.222	0.401
Lack of interoceptivity	1.026	.738, 1.426	0.881	1.121	0.904, 1.390	0.299	1.093	0.806, 1.483	0.568
Disinhibition	1.013	0.691, 1.483	0.948	**1.738**	**1.374, 2.198**	**0.000**	**1.716**	**1.183, 2.491**	**0.004**
Hunger	1.099	0.779, 1.550	0.593	**1.246**	**1.014, 1.532**	**0.036**	1.135	0.806, 1.597	0.469

The correlates (all continuous variables) were standardized (*z* scores), thus allowing comparisons among adjusted ORs representing a 1 standard deviation change in the correlate

Data in bold was used to highlight the significant results

NOE nonovereaters, *SBE* subjective binge eaters, *OOE* objective overeaters, *OBE* objective binge eaters

may not accurately reflect actual successful dietary restrictions [61], instead capturing the concept of perceived deprivation [22] whereby certain individuals experience a sense of not eating as much as they would like even if they are overeating or at least not in a state of actual caloric restriction [62]. These individuals could be the ones who show an association between dietary restraint and OBE. Furthermore, other key behavioral features of ED such as purging may influence whether an individual will restrain his or her eating. In fact, several studies have demonstrated that dietary restraint shows a strong association with purging [63], with dietary restraint fostering BE, which may lead to purging and so on [64]. In our sample, the participants who reported OBE did, in fact, report more purging than the participants who reported NOE, SBE, and OOE, possibly reflecting the dietary restraint/purging association. Hence, dietary restraint may reflect heterogeneous concepts whereby different outcomes are brought upon by contextual factors, such as the propensity toward weight gain and tendencies toward disinhibition or purging behaviors [63, 65–68]. Hence, dietary restraint could be beneficial, harmful, or ineffective [69] as indicated by our results.

Another interesting result was the fact that disinhibition was strongly associated with all types of overeating. In fact, higher disinhibition was associated with a one-and-a-half- to almost threefold increase in overeating and BE. As for hunger, it distinguished NOE from the groups reporting OOE, SBE, and OBE. In addition, hunger was associated with LOC in the overeating groups. The amplitude of the ORs indicates clinically meaningful effects, suggesting that disinhibition and hunger may play a significant role in overeating tendencies and in the associated LOC.

One interpretation for this result is provided by several authors who have suggested that there might be similarities between overeating tendencies and addictions [70–72]. Research has shown that chronic overeaters and individuals with addictions share common characteristics, namely impulsivity [72–75]. Further, impulsivity has been associated with disinhibition [76, 77] that increases the tendency to overeat, most notably in the presence of perceived/subjective hunger or highly palatable food.

Finally, contrary to our hypothesis, a deficit in IA was not associated with overeating and BE in our sample of young, healthy, college women. This result could mean that IA is a distinguishing feature of clinical versus subclinical levels of overeating as indicated by one study [12].

Limitations and Contributions

The cross-sectional design of this study does not allow for the establishment of causal and directional inferences concerning the inter-relationships among our variables. Furthermore, the use of self-reported weight, although shown to be highly correlated with measured weight [28–31], induces a possible systematic bias, given that heavier individuals tend to under-report their weight [78–80]. In addition, the use of the EDE-Q to designate group membership rather than an interview could have impacted our data as Berg et al. identified issues with regards to the assessment of BE/overeating frequency with the use of the questionnaire

version of the EDE [81–83]. Finally, although a strength in terms of internal validity, the homogeneous nature of the sample may limit the conclusions that we can draw from the results.

Nonetheless, this study sheds new light on correlates of overeating, which could have a significant impact on the prevention and treatment of important and widespread health problems such as overweight and eating disturbances. Moreover, by investigating the correlates of overeating in a community sample, this study highlights the fact that overeating is a widespread issue not limited to clinical populations. In addition, our study showed that several correlates of BE are also associated with milder forms of overeating, even in a nonclinical sample of young college women. These are important findings because they indicate a need to develop targeted prevention interventions for these young women.

References

1. Ford ES, Mokdad AH. Epidemiology of obesity in the Western Hemisphere. J Clin Endocrinol Metab. 2008;93:S1–8.
2. Flegal KM, Carroll MD, Ogden CL, Curtin LR. Prevalence and trends in obesity among US adults, 1999–2008. JAMA. 2010;303:235–41.
3. Guh DP, Zhang W, Bansback N, Amarsi Z, Birmingham CL, Anis AH. The incidence of co-morbidities related to obesity and overweight: a systematic review and meta-analysis. BMC Publ Health. 2009;9:88.
4. Faith MS, Butryn M, Wadden TA, Fabricatore A, Nguyen AM, Heymsfield SB. Evidence for prospective associations among depression and obesity in population-based studies. Obes Rev. 2011;12:e438–53.
5. Brownell KD, Wadden TA, Phelan S. Obesity. In: Sadock BJ, Sadock VA, Kaplan HI, editors. Kaplan and Sadock's comprehensive textbook of psychiatry. 8th ed. Philadelphia: Lippincott Williams & Wilkins; 2005. p. 2 v. (xlviii, 4064, 115 p.).
6. Kaplan HI, Kaplan HS. The psychosomatic concept of obesity. J Nerv Ment Dis. 1957;125:181–201.
7. Noppa H, Hallstrom T. Weight gain in adulthood in relation to socioeconomic factors, mental illness and personality traits: a prospective study of middle-aged women. J Psychosom Res. 1981;25:83–9.
8. Tanofsky-Kraff M, Yanovski SZ, Schvey NA, Olsen CH, Gustafson J, Yanovski JA. A prospective study of loss of control eating for body weight gain in children at high risk for adult obesity. Int J Eat Disord. 2009;42:26–30.
9. Stice E, Presnell K, Spangler D. Risk factors for binge eating onset in adolescent girls: a 2-year prospective investigation. Health Psychol. 2002;21:131–8.
10. Stice E, Presnell K, Shaw H, Rohde P. Psychological and behavioral risk factors for obesity onset in adolescent girls: a prospective study. J Consult Clin Psychol. 2005;73:195–202.
11. Stice E, Akutagawa D, Gaggar A, Agras WS. Negative affect moderates the relation between dieting and binge eating. Int J Eat Disord. 2000;27:218–29.
12. van Strien T, Engels RC, Van Leeuwe J, Snoek HM. The Stice model of overeating: tests in clinical and non-clinical samples. Appetite. 2005;45:205–13.
13. Ouwens MA, van Strien T, van Leeuwe JF, van der Staak CP. The dual pathway model of overeating. Replication and extension with actual food consumption. Appetite. 2009;52:234–7.
14. Spitzer RL, Devlin M, Walsh BT, et al. Binge eating disorder: a multisite field trial of the diagnostic criteria. Int J Eat Disord. 1992;11:191–203.
15. American Psychiatric Association. Diagnostic and statistical manual of mental disorders (4th ed., text revision). Washington, DC: American Psychiatric Association; 2000.
16. Stice E, Agras WS. Predicting onset and cessation of bulimic behaviors during adolescence: a longitudinal grouping analysis. Behav Ther. 1998;29:257–76.
17. Stice E. A prospective test of the dual-pathway model of bulimic pathology: mediating effects of dieting and negative affect. J Abnorm Psychol. 2001;110:124–35.
18. Gagnon-Girouard MP, Begin C, Provencher V, Tremblay A, Boivin S, Lemieux S. Can we apply the dual-pathway model of overeating to a population of weight-preoccupied overweight women? Int J Eat Disord. 2009;42:244–52.
19. Stice E, Shaw HE. Role of body dissatisfaction in the onset and maintenance of eating pathology: a synthesis of research findings. J Psychosom Res. 2002;53:985–93.
20. Mond J, van den Berg P, Boutelle K, Hannan P, Neumark-Sztainer D. Obesity, body dissatisfaction, and emotional well-being in early and late adolescence: findings from the project EAT study. J Adolesc Health. 2011;48:373–8.
21. Bryant EJ, King NA, Blundell JE. Disinhibition: its effects on appetite and weight regulation. Obes Rev. 2008;9:409–19.
22. Timmerman GM, Gregg EK. Dieting, perceived deprivation, and preoccupation with food. West J Nurs Res. 2003;25:405–18.
23. Lowe MR, Levine AS. Eating motives and the controversy over dieting: eating less than needed versus less than wanted. Obes Res. 2005;13:797–806.
24. Stice E, Spoor S, Bohon C, Small DM. Relation between obesity and blunted striatal response to food is moderated by TaqIA A1 allele. Science. 2008;322:449–52.
25. Leon GR, Fulkerson JA, Perry CL, Early-Zald MB. Prospective analysis of personality and behavioral vulnerabilities and gender influences in the later development of disordered eating. J Abnorm Psychol. 1995;104:140–9.
26. Sim L, Zeman J. Emotion regulation factors as mediators between body dissatisfaction and bulimic symptoms in early adolescent girls. J Early Adolesc. 2005;25:478–96.
27. Leon GR, Fulkerson JA, Perry CL, Cudeck R. Personality and behavioral vulnerabilities associated with risk status for eating disorders in adolescent girls. J Abnorm Psychol. 1993;102:438–44.
28. Stunkard AJ, Albaum JM. The accuracy of self-reported weights. Am J Clin Nutr. 1981;34:1593–9.
29. Stewart AL. The reliability and validity of self-reported weight and height. J Chronic Dis. 1982;35:295–309.
30. Galambos NL, Almeida DM, Petersen AC. Masculinity, femininity, and sex role attitudes in early adolescence: exploring gender intensification. Child Dev. 1990;61:1905–14.
31. Wing RR, Epstein LH, Ossip DJ, LaPorte RE. Reliability and validity of self-report and observers' estimates of relative weight. Addict Behav. 1979;4:133–40.
32. Fairburn CG, Beglin SJ. Assessment of eating disorders: interview or self-report questionnaire? Int J Eat Disord. 1994;16:363–70.
33. Cooper Z, Fairburn C. The eating disorder examination: a semi-structured interview for the assessment of the specific psychopathology of eating disorders. Int J Eat Disord. 1987;6:1–8.

34. Decaluwe V, Braet C. Assessment of eating disorder psychopathology in obese children and adolescents: interview versus self-report questionnaire. Behav Res Ther. 2004;42:799–811.
35. Guest T. Using the eating disorder examination in the assessment of bulimia and anorexia: issues of reliability and validity. Soc Work Health Care. 2000;31:71–83.
36. Jackson TD, Grilo CM, Masheb RM. Teasing history, onset of obesity, current eating disorder psychopathology, body dissatisfaction, and psychological functioning in binge eating disorder. Obes Res. 2000;8:451–8.
37. Masheb RM, Grilo CM. Emotional overeating and its associations with eating disorder psychopathology among overweight patients with binge eating disorder. Int J Eat Disord. 2006;39:141–6.
38. Decaluwe V, Braet C, Fairburn CG. Binge eating in obese children and adolescents. Int J Eat Disord. 2003;33:78–84.
39. Black CM, Wilson GT. Assessment of eating disorders: interview versus questionnaire. Int J Eat Disord. 1996;20:43–50.
40. Luce KH, Crowther JH. The reliability of the Eating Disorder Examination-self-report questionnaire version (EDE-Q). Int J Eat Disord. 1999;25:349–51.
41. Fairburn CG, Stice E, Cooper Z, Doll HA, Norman PA, O'Connor ME. Understanding persistence in bulimia nervosa: a 5-year naturalistic study. J Consult Clin Psychol. 2003;71:103–9.
42. Mond JM, Rodgers B, Hay PJ, et al. Obesity and impairment in psychosocial functioning in women: the mediating role of eating disorder features. Obesity (Silver Spring). 2007;15:2769–79.
43. Peterson CB, Crosby RD, Wonderlich SA, et al. Psychometric properties of the eating disorder examination-questionnaire: factor structure and internal consistency. Int J Eat Disord. 2007;40:386–9.
44. Blumberg SH, Izard CE. Discriminating patterns of emotions in 10- and 11-year-old children's anxiety and depression. J Pers Soc Psychol. 1986;51:852–7.
45. Izard CE, Libero DZ, Putnam P, Haynes OM. Stability of emotion experiences and their relations to traits of personality. J Pers Soc Psychol. 1993;64:847–60.
46. Garner DM. Eating disorder inventory-2. Odessa,: Psychological Assessment Resources; 1991.
47. Tasca GA, Illing V, Lybanon-Daigle V, Bissada H, Balfour L. Psychometric properties of the eating disorders inventory-2 among women seeking treatment for binge eating disorder. Assessment. 2003;10:228–36.
48. Phelps L, Wilczenski F. Eating disorders inventory-2: cognitive–behavioral dimensions with nonclinical adolescents. J Clin Psychol. 1993;49:508–15.
49. Eberenz KP, Gleaves DH. An examination of the internal consistency and factor structure of the eating disorder inventory-2 in a clinical sample. Int J Eat Disord. 1994;16:371–9.
50. Stunkard AJ, Messick S. The three-factor eating questionnaire to measure dietary restraint, disinhibition and hunger. J Psychosom Res. 1985;29:71–83.
51. Bond MJ, McDowell AJ, Wilkinson JY. The measurement of dietary restraint, disinhibition and hunger: an examination of the factor structure of the Three Factor Eating Questionnaire (TFEQ). Int J Obes Relat Metab Disord. 2001;25:900–6.
52. Allen KL, Byrne SM, McLean NJ. The dual-pathway and cognitive–behavioural models of binge eating: prospective evaluation and comparison. Eur Child Adolesc Psychiatry. 2012;21:51–62.
53. Goodman E, Whitaker RC. A prospective study of the role of depression in the development and persistence of adolescent obesity. Pediatrics. 2002;110:497–504.
54. Pine DS, Goldstein RB, Wolk S, Weissman MM. The association between childhood depression and adulthood body mass index. Pediatrics. 2001;107:1049–56.
55. McGuire MT, Wing RR, Klem ML, Lang W, Hill JO. What predicts weight regain in a group of successful weight losers? J Consult Clin Psychol. 1999;67:177–85.
56. Elder KA, Paris Jr M, Anez LM, Grilo CM. Loss of control over eating is associated with eating disorder psychopathology in a community sample of Latinas. Eat Behav. 2008;9:501–3.
57. Colles SL, Dixon JB, O'Brien PE. Loss of control is central to psychological disturbance associated with binge eating disorder. Obesity (Silver Spring). 2008;16:608–14.
58. Ansell EB, Grilo CM, White MA. Examining the interpersonal model of binge eating and loss of control over eating in women. Int J Eat Disord. 2012;45:43–50.
59. Henderson NJ, Huon GF. Negative affect and binge eating in overweight women. Br J Health Psychol. 2002;7:77–87.
60. Chua JL, Touyz S, Hill AJ. Negative mood-induced overeating in obese binge eaters: an experimental study. Int J Obes Relat Metab Disord. 2004;28:606–10.
61. Stice E, Fisher M, Lowe MR. Are dietary restraint scales valid measures of acute dietary restriction? Unobtrusive observational data suggest not. Psychol Assess. 2004;16:51–9.
62. van Strien T. Eating less than required versus eating less than desired. The criterion problem in the validity studies of Williamson et al. (2007). Appetite. 2008;50:548–9.
63. Roberto CA, Grilo CM, Masheb RM, White MA. Binge eating, purging, or both: eating disorder psychopathology findings from an internet community survey. Int J Eat Disord. 2010;43:724–31.
64. Polivy J, Herman CP. Dieting and binging. A causal analysis. Am Psychol. 1985;40:193–201.
65. van Strien T, Engels RC, van Staveren W, Herman CP. The validity of dietary restraint scales: comment on Stice et al. (2004). Psychol Assess. 2006;18:89–94. discussion 5–9.
66. Polivy J, Herman CP, Deo R. Getting a bigger slice of the pie. Effects on eating and emotion in restrained and unrestrained eaters. Appetite. 2010;55:426–30.
67. Lowe MR, Kral TV. Stress-induced eating in restrained eaters may not be caused by stress or restraint. Appetite. 2006;46:16–21.
68. Snoek HM, van Strien T, Janssens JMAM, Engels RCME. Restrained eating and BMI: a longitudinal study among adolescents. Health Psychol. 2008;27:753–9.
69. Lowe MR, Timko CA. Dieting: really harmful, merely ineffective or actually helpful? Br J Nutr. 2004;92 Suppl 1:S19–22.
70. Barry D, Clarke M, Petry NM. Obesity and its relationship to addictions: is overeating a form of addictive behavior? Am J Addict. 2009;18:439–51.
71. Davis C. Psychobiological traits in the risk profile for overeating and weight gain. Int J Obes (Lond). 2009;33 Suppl 2:S49–53.
72. Holden C. 'Behavioral' addictions: do they exist? Science. 2001;294:980–2.
73. Wang G-J, Volkow ND, Logan J, et al. Brain dopamine and obesity. Lancet. 2001;357:354–7.
74. Volkow ND, Wang G-J, Fowler JS, Telang F. Overlapping neuronal circuits in addiction and obesity: evidence of systems pathology. Philos Trans R Soc Lond B Biol Sci. 2008;363:3191–200.
75. Wang G-J, Volkow ND, Thanos PK, Fowler JS. Imaging of brain dopamine pathways: implications for understanding obesity. J Addict Med. 2009;3:8–18.
76. Yeomans MR, Leitch M, Mobini S. Impulsivity is associated with the disinhibition but not restraint factor from the Three Factor Eating Questionnaire. Appetite. 2008;50:469–76.
77. Lyke JA, Spinella M. Associations among aspects of impulsivity and eating factors in a nonclinical sample. Int J Eat Disord. 2004;36:229–33.
78. McCabe RE, McFarlane T, Polivy J, Olmsted MP. Eating disorders, dieting, and the accuracy of self-reported weight. Int J Eat Disord. 2001;29:59–64.
79. Gorber SC, Tremblay M, Moher D, Gorber B. A comparison of direct vs. self-report measures for assessing height, weight and body mass index: a systematic review. Obes Rev. 2007;8:307–26.

80. Larsen JK, Ouwens M, Engels RCME, Eisinga R, van Strien T. Validity of self-reported weight and height and predictors of weight bias in female college students. Appetite. 2008;50:386–9.
81. Berg KC, Stiles-Shields EC, Swanson SA, Peterson CB, Lebow J, Le Grange D. Diagnostic concordance of the interview and questionnaire versions of the eating disorder examination. Int J Eat Disord. 2012;45:850–5.
82. Berg KC, Peterson CB, Frazier P, Crow SJ. Psychometric evaluation of the eating disorder examination and eating disorder examination-questionnaire: a systematic review of the literature. Int J Eat Disord. 2012;45:428–38.
83. Berg KC, Peterson CB, Frazier P, Crow SJ. Convergence of scores on the interview and questionnaire versions of the Eating Disorder Examination: a meta-analytic review. Psychol Assess. 2011;23:714–24.