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The Role of Eating and Emotion in Binge Eating Disorder and Loss of Control Eating

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Abstract

Objective—Binge eating, defined as the consumption of large amounts of food during which a sense of loss of control is experienced, is associated with negative affect. However, there are no data on the experience of loss of control after accounting for the effects of negative affect and caloric intake.

Method—Nine adult patients with binge eating disorder (BED) and 13 obese non-BED (NBED) participants carried a palmtop computer for seven days, rating momentary mood and sense of loss of control multiple times each day. Electronic food logs were collected once daily.

Results—After removing the effects of caloric intake and negative affect, a significant group difference was observed for ratings of loss of control between BED and NBED participants.

Discussion—These findings suggest the experience of loss of control in adults with BED is a salient feature of binge episodes, beyond that explained by caloric intake and momentary affect.

Introduction

Binge Eating Disorder (BED) is included in the Diagnostic and Statistical Manual of Mental Disorders, 4th edition, text revision¹ (DSM-IV-TR) as an eating disorder diagnosis in need of further study and is currently being considered as an eating disorder diagnosis in DSM-5. BED is characterized by recurrent episodes of eating an objectively large amount of food accompanied by a sense of loss of control. In BED, binge eating episodes are “associated with subjective and behavioral indicators of impaired control over, and significant distress about, the binge eating without the presence of inappropriate compensatory behaviors”.¹

Approximately 8.5 million people in the United States are estimated to have BED, making this disorder and its comorbidities a significant health issue.² Empirical studies have indicated that BED is distributed relatively equally across genders,³ age groups of adults,² and racial and ethnic groups.⁴ This pattern differs from other eating disorder diagnoses. Recent findings have also demonstrated that BED is associated with decreased quality of

life, high rates of comorbid psychopathology, significant body image distress and concern for weight and shape.⁵ Finally, BED is associated with increased health care utilization.⁶

Central to the diagnosis of BED is the behavior of binge eating. There are two key components of a binge eating episode: a behavioral abnormality (i.e., consumption of an objectively large amount of food) and a cognitive/perceptual component (i.e., a sense of loss of control). A number of feeding laboratory studies have been conducted which focus on the behavioral component of a binge eating episode. These feeding laboratory studies consistently show that BED participants eat markedly more than non-BED (NBED) participants, regardless of whether they are provided with a multi-item array of food,⁷ or a one-item test meal,⁸ and whether they are instructed to binge or eat a normal meal.⁷

In addition to the feeding laboratory studies, several studies have examined eating in the natural environment.⁹⁻¹² Similar to the feeding laboratory studies, these naturalistic studies have focused on the behavioral component of a binge eating episode, but unlike the feeding laboratory findings, initial naturalistic studies generally found a lack of difference in eating behavior between BED and NBED participants.¹⁰⁻¹² However, more recently Engel and colleagues⁹ did find caloric intake differences between BED and Control participants using a more objective definition of a binge eating episode and a computerized dietary recall system that may have been less reliant on participant memory, and therefore more accurate, than past studies.

Other research has focused on the cognitive/perceptual component of a binge eating episode, the sense of loss of control (LOC). BED participants have consistently reported greater levels of LOC in interviews than NBED participants.¹³ Compared to the behavioral component of a binge eating episode, however, less is known about the construct of LOC in BED participants. Importantly, past feeding laboratory studies are limited regarding the salience of the LOC construct because the reporting of a sense of LOC is fully confounded with caloric intake. By necessity, these studies have allowed participants to consume any amount of food in order to show a discrete difference in binge size between groups. Given that BED participants eat more in these laboratory studies, it is impossible to know if their perceptions of LOC are a product of having eaten a large quantity of food or a more pervasive tendency to perceive eating as out of control regardless of the size of the eating episode. Similarly, the assessment paradigm employed in naturalistic studies does not adequately allow an assessment of LOC that is free of the influence of the quantity eaten.

To date, there have been no studies conducted that assess LOC between BED and NBED participants who have consumed the same amount of food. Two feeding laboratory studies in particular have approximated the appropriate methodologies for assessing LOC in this manner. The first, by Samuels et al,¹⁴ reported ratings of fullness in BED and NBED groups after giving each group the exact same meal. The second study, conducted by Anderson et al,¹⁵ showed that there is a higher rate of LOC in BED participants following a binge eating episode, but the study did not fix the caloric content of the lab meal.

Another factor which could influence ratings of LOC is the individual's affective state. To the extent that BED participants may experience more negative affect than controls, this could influence ratings of LOC. BED participants have consistently reported higher rates of mood disorders,¹⁶ anxiety disorders,¹⁷ and higher scores on indices of neuroticism.¹⁸ Additionally, individuals with BED may experience greater levels of negative affect associated with eating episodes.¹¹ Thus, individuals with BED may be more apt to become upset with themselves for eating a large meal than a NBED participant. When distraught due to overeating, BED patients may be more inclined to describe an experience of LOC over the eating behavior. However, this perception may be significantly determined by the

individual's affective state rather than their BED status. While there have been no past studies evaluating the relationship between momentary negative affect and LOC, one recent study by Grilo and White¹⁹ has controlled for the effects of trait negative mood while assessing the BED diagnostic criteria of experiencing “marked distress about binge eating.” This study showed that levels of negative mood did not significantly affect the distress experienced during eating episodes.

Past studies have not examined the extent to which quantity of caloric intake or affect may explain differences in reports of LOC in BED versus NBED participants. The aim of the current paper is to examine differences in LOC between BED and NBED participants and to determine whether these differences can be accounted for by differences between the groups in affect or caloric intake. We hypothesize that the sense of LOC between BED and NBED participants will not be fully accounted for by the confounding variables of momentary affect or caloric intake.

Methods

Participants

Participants for this study were recruited via flyers placed in community and university settings as well as flyers placed at an eating disorder treatment facility. All flyers stated that participants should be “Normal weight or overweight and over the age of 18.” Clinicians at the eating disorder treatment facility were asked to help recruit any patients with binge eating who were not engaging in compensatory behaviors and would be interested in participating in research.

The total number of participants in this study was 40, two of whom upon review of the collected information were excluded due to missing data. This left a total of 38 participants in the study. However, only 22 of these participants were used in the data analysis for this paper. All participants were 18 years of age or greater. These participants were categorized into three groups: 16 Control participants (i.e., BMI 20-25, no eating disorders on the SCID-IV), 13 NBED Controls (i.e., BMI >30, no eating disorders on the SCID-IV), and 9 BED (i.e., BMI >30, an eating disorder diagnosis of BED only on the SCID-IV). In the current analysis, no data from the Control group was utilized.

Exclusion criteria for all participants were as follows: pregnancy, breastfeeding, current psychological disorder, suicidal ideation, illiteracy, purging or other compensatory behavior, any medication that could influence weight or produce eating changes, any illness requiring dietary modification, and any prior gastrointestinal surgery which would influence eating behavior. Compensation for participating in this study was a payment of \$100 with a \$50 bonus for attending all scheduled appointments. The protocol for this study was approved by an Institutional Review Board and participants provided informed consent before beginning the protocol.

Measures

Phone screen—Each phone screen was conducted by a trained Master's level research assessor who administered the Eating Disorder module of the Structured Clinical Interview for DSM-IV²⁰ (SCID-IV) with additional probes from the Eating Disorder Examination²¹ (EDE). Analysis of the collected phone screen information was the primary method of determining group membership in the study.

Ecological Momentary Assessment—Ecological Momentary Assessment (EMA) is a method of examining participants in their natural environment. EMA procedures typically

involve the use of a palmtop computer that provides precise information on the time and date of assessment, allowing for the temporal ordering of variables as they occur in the natural environment. Each participant carried a palmtop computer for seven days, during which each participant periodically rated feelings of loss of control and momentary affect. Three types of recordings were collected in this study: signal contingent recordings were collected at six semi-random timepoints per day, behavior contingent recordings were collected before and after each eating episode, and time contingent recordings were collected at the end of each day. The feeling of LOC was rated after each eating episode dichotomously (i.e., “Did you experience a loss of control? Yes/No”).

Momentary negative affect was assessed using an abbreviated version of the Positive and Negative Affect Scale²² (PANAS). Five items were included with the highest loading on the negative affect scale in an effort to keep the momentary mood assessments as brief as reasonably possible, yet still obtain a valid measure of the construct.

Eating behavior—In order to gather food intake data, the Nutritional Data System for Research (NDS-R) was used.²³ The NDS-R is considered by some to be the premier self-report method of measuring caloric intake.²⁴ The validity of the NDS-R has been confirmed in a study by Raymond et al²⁵ which reported a significant correlation between reports of caloric intake and doubly labeled water data. The NDS-R is an interviewer administered assessment of eating behavior over a 24-hour period. In this study, the NDS-R was administered the morning following each day of EMA data collection and data were collected for each recorded eating episode. The NDS-R has been used in prior research with overweight and obese samples.²⁶

Procedures

After completing the phone screen, all qualified individuals were invited to the research facility for an informational meeting and to provide informed consent. Demographic and descriptive information was collected. Participants were then trained to use a palmtop computer and the construct of LOC was explained by utilizing probes from the EDE, describing the experience as “feeling ‘driven’ or ‘compelled’ to eat”, feeling “unable to stop eating once eating had started,” or feeling “unable to prevent the episode from occurring.” Participants then began a 24 hour practice data collection process. Practice data were not utilized in the data analysis for this study.

After completing the 24 hour practice data collection, participants began the process of EMA data collection and returned to the research facility every day for the following week in order to complete data uploads. Participants were monitored for compliance to study guidelines and were also provided feedback regarding the quality of their collected data. Eating episodes were also reviewed in each upload visit: all relevant caloric intake information from the prior day was entered into the NDS-R system. All caloric intake data was merged with the EMA data, so that momentary measures of affect, eating and LOC were placed in correct temporal proximity to each other. At the final visit, the palmtop computer was returned, a payment form was filled out and the participant was debriefed.

Statistical Analysis

Independent samples t-tests were used to test for differences between BED and NBED groups on age and BMI. Fisher's exact tests were used to test group differences on race and marital status.

Diagnostic groups (BED and NBED) were compared on NDS-R kilocalories per eating episode and momentary negative affect using mixed-effects models based on a general

linear model with a random intercept. A general estimating equations (GEE) model with bivariate logistic response link was used to examine differences in LOC after meal between BED and NBED groups controlling for negative affect and kilocalories. Analyses were performed using SPSS version 18.0.

Results

Demographic Characteristics

Participants were divided into two groups based on the DSM-IV diagnostic criteria – 9 meeting BED criteria and 13 meeting NBED criteria. Participants in this study were primarily Caucasian, with two NBED participants being of other races or mixed race. The mean BMI of the BED group was slightly higher than in the NBED group (42.3 and 36.5, respectively), but this difference did not reach statistical significance. Similarly, there were no significant differences between groups on the variables of mean age (BED=37.3, NBED=34.6), marital status (BED=4 unmarried, NBED=5 unmarried), mean kilocalorie intake (BED=657.3, NBED=638.3), or mean ratings of negative affect (BED=6.4, NBED=6.9).

EMA

Twenty-two participants completed 2,009 separate EMA recordings representing 168 separate participant-days. These recordings included 837 responses to random beeps, 566 reports of starting eating episodes, 477 reports of finishing eating episodes and 128 end-of-day recordings. In terms of EMA compliance, 94% (range=17 to 100%) of all random beeps were answered within 45 minutes.

Loss of Control

Two GEE models were conducted to examine the relationship between post meal LOC and diagnostic groups (i.e., BED vs. NBED). The first model compared group differences in LOC, and the second compared group differences in LOC after controlling for kilocalories and negative affect. The results of these analyses are presented in Table 1. A significant main effect for group was identified in both models. In Model 1, the odds of experiencing a sense of LOC were 3.0 times higher for participants in the BED group compared to those in the NBED ($p<.001$); in Model 2, the adjusted odds of experiencing LOC were 3.6 times higher in the BED group ($p<.001$) after controlling for the effects of affective state and caloric intake. Kilocalorie intake and negative affect effects were also found to be significantly associated with LOC (p 's<.001).

Discussion

Past research has demonstrated that obese BED and NBED participants have differed in their perceptions of LOC associated with eating episodes. However, research in this area has also shown that BED and NBED participants also consume different amounts of food during eating episodes, and that individuals with BED have greater levels of negative affect than NBED participants. The purpose of the current study was to investigate whether differences in perception of LOC between BED and NBED participants were due to the differences in caloric intake or negative affect or if these differences were due to some inherent component of having the BED diagnosis.

Consistent with past research, the current findings show that BED patients report greater ratings of LOC and negative affect as well as consume more calories per eating episode than NBED participants. Importantly, after controlling for the effects of caloric intake and affect, BED status is significantly associated with perceptions of LOC during an eating episode.

This finding suggests that the perception of LOC is an inherent component of the BED diagnosis.

In a review of the validity and utility of the diagnosis of BED, Wonderlich and colleagues⁵ posed an important question that is particularly relevant to the current study. They asked, "...can BED be discriminated from obesity and does the presence of BED confer clinically useful information beyond that associated with simple obesity or obesity with nonspecific psychopathology?" (p. 701). The current study nicely addresses this question by including both obese BED and NBED participants and is specifically focused on in the extent to which the diagnosis of BED provides clinically useful information regarding the experience of LOC associated with an eating episode. Importantly, a BED diagnosis does appear to provide additional information about the experience of LOC, even after factoring out the effects of differences in amount eaten and negative affect between BED and NBED participants.

This difference, however, may be in part cognitive/perceptual in nature and signifies that the experience of LOC need not be associated with consumption of an objectively large amount of food. The present findings coupled with studies suggesting that BED is associated with the consumption of large quantities of food²⁷ support the idea that BED is associated with both an objective behavioral disturbance and a cognitive/perceptual dysfunction. Treatments targeting BED, therefore, may rationally include interventions that modify both eating behaviors and cognition.

In addition to the primary findings, we also found that pre-meal LOC ratings were positively correlated with energy consumed during the binge episode. In adults, there are data to indicate that LOC, as opposed to the amount of food consumed, is the more salient component of binge episodes.²⁸⁻³⁰ Although no study has examined energy intake specifically in relation to the experience of LOC in adult samples, data in pediatric studies support an association. For example, among overweight girls, those with reported LOC consume more energy than girls without LOC.³¹ There are also data demonstrating that boys and girls with reported LOC over eating consume less healthy meals by self-report³² and in the laboratory^{31, 33} compared to their peers without LOC.

One particular strength of the current manuscript involves the momentary nature of the data. Rather than using traditional self-report data, the current study employed momentary assessment of key constructs such as negative affect and the experience of LOC. Further, caloric intake was assessed using a dietary recall system that was reliant on a relatively minimal amount of retrospective recall. The key benefit to this approach is that it minimizes memory-related biases in general, but may also circumvent biases that are more pronounced in one of the two groups of interest. For example, recall in the BED group may be particularly biased regarding the amount of food they ate, how poor their mood was or how out of control they felt when eating. Such memory biases may impact the relationships between variables differentially between the BED and NBED groups.

A limitation of this study is a relatively small sample size. However, the current study was adequately powered to find the hypothesized relationships. Further, the proposed study demonstrated that BED status was associated with LOC ratings, even after covarying for caloric intake and affect, suggesting that the analyses were adequately powered. In addition, although we were able to statistically covary for the effects of caloric intake and negative affect, this is not the same as fixing these variables in the "real world". While this statistical approach is a reasonable method for factoring out the effects of these two variables, it is not as strong as comparing BED and NBED participants' perceptions of LOC during eating episodes in which they ate identical amounts of food or were in similar affective states.

Additionally, while the two groups in this study did not differ on state rating of affect, they may differ on baseline level of trait negative mood, but these data were not collected. One further limitation of this study may involve the background of participants, as the NBED group may be more apt to come from a community setting and the BED group from a clinical setting.

Findings from the current study suggest that differences between BED and NBED in reports of the perception of LOC cannot be adequately explained by group differences in momentary mood or caloric intake. Therefore, we conclude that the diagnosis of BED appears to be informative about LOC experiences in the natural environment.

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Table 1

Parameter estimates from general estimating equations (GEE) model

Model	parameters	β	Odds Ratio	S.E.	P	Estimated Marginal Means
1	Group: BED	1.109	3.031	.2679	<.001	.24
	NBED ^a	0	-	-		.09
2	Group: BED	1.282	3.604	.2902	<.001	.23
	NBED ^a	0	-	-		.08
	Negative Affect	.154	1.166	.0433	<.001	-
	Kilocalories	.001	1.001	.0002	<.001	-

^aReference group in GEE model