SUBJECTIVE BINGE EATING: PHENOMENOLOGY, MOMENTARY EMOTIONS, AND ASSOCIATED FEATURES

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ABSTRACT

Lisa M. Brownstone: Subjective Binge Eating: Phenomenology,
Momentary Emotions, And Associated Features
(Under the direction of Anna Bardone-Cone)

The current study explored the phenomenology of subjective binge eating (SBE), which is defined as loss of control eating when one does not eat an objectively large quantity of food, but subjectively perceives the amount as large in quantity. Most research up to this point has focused on objective binge eating (OBE), which involves objectively large quantities of food combined with loss of control. Preliminary research, however, suggests that SBEs are associated with similar, if not higher, levels of bulimic behavior severity, trait-level negative affect, and interpersonal difficulties as OBEs. This was the first study to recruit individuals who had regular SBEs to explore the following: (1) facets of SBEs that could expand our current definition and understanding of the behavior, (2) how SBEs are related to momentary affect, and (3) how SBEs are related to broader psychological difficulties (e.g., disordered eating symptoms, negative affect, interpersonal difficulties). We completed a three-study design. The first study involved a quantitative and qualitative online survey, and recruited individuals with SBEs and/or OBEs, and individuals without loss of control eating. The second study focused on quantitative questions and used online survey methodology to recruit individuals with SBEs and/or OBEs. The third study followed up with individuals who reported having engaged in SBEs in the second study with a qualitative phone interview aimed at better explaining and building upon findings from the first and second studies. Most notably, SBEs appeared to be indicative of higher disordered

symptomatology (i.e., dietary restraint, compensatory behaviors, body shame) and anxiety/depressive symptoms than OBEs on their own. SBEs were also found to coincide with increases in negative emotion from before to after their occurrence. Additionally, SBEs were less likely to be described as intended or planned than OBEs. We conclude that SBEs likely have a phenomenology that is in many ways distinct from OBEs, and, further, that they are worthy of clinical concern.

This work is dedicated to those struggling with all varieties of loss of control eating and associated distress.

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CHAPTER 1: INTRODUCTION

Since the first recognition of bulimia nervosa (BN) as defined in the *Diagnostic and Statistical Manual of Mental Disorders,* 3rd edition (DSM-III; APA, 1980), the binge eating component of BN has been defined by two criteria: 1) size of the eating episode is "objectively large," and 2) loss of control is present during the eating episode. These same criteria have been consistently used to define binge eating in BN in each updated version of the DSM (APA, 1987, 1994, 2013), as well as to define the binge eating that occurs as part of Binge Eating Disorder, a diagnosis that was under study in DSM-IV that has been adopted into DSM-5 (APA; 2013). Even though the diagnostic criteria emphasize the use of these two criteria (size and loss of control), the Eating Disorder Examination (EDE), a widely used and well-validated semi-structured interview on eating disorder symptoms, assesses two variants of loss of control eating episodes: objective binge eating (OBEs) and subjective binge eating (SBEs) (Fairburn, 1997). OBEs involve a combination of a large amount of food being consumed with a sense of loss of control (Fairburn & Cooper, 1993). SBEs, on the other hand, involve loss of control during eating episodes in which the individual is not eating an objectively large quantity of food (or what others would consider a large quantity of food), even though the individual subjectively perceives the amount of food as large.

Very little work has specifically investigated the prevalence of SBEs both on their own and in comparison to OBEs. However, existing information suggests that SBEs occur at fairly high rates. Luce, Crowther, and Pole (2008), for example, explicitly assessed both SBE and OBE rates among a sample of undergraduate females, and found that SBEs were more common than

OBEs: 16.7% of the sample reported engaging in SBEs regularly and 6.4% reported engaging in OBEs regularly, with "regularly" defined as occurring at least once per week over the past month. Goossens, Soenens, and Braet (2009) also found a high occurrence of SBEs, as reported over the past 28 days, in their community sample of male and female adolescents with 9.3% having engaged in SBEs only, 4.8% having engaged in OBEs only, and 2.6% having engaged in both behaviors. Additionally, in a clinical sample of treatment-seeking individuals with BN, anorexia nervosa (AN) binge/purge subtype, or eating disorder not otherwise specified involving bingeing and purging behaviors, Kerzhnerman and Lowe (2002) reported that 5% of their sample engaged in only SBEs, while 10% of their sample engaged in only OBEs, indicating that most engaged in both types of binge eating.

A growing literature has begun to examine similarities and differences between SBEs and OBEs, generally finding that there are few differences in terms of associated eating disorder symptomatology, psychiatric comorbidity, and quality of life (e.g., Brownstone et al., 2013; Goossens et al., 2009; Mond et al., 2010; Palavras, Hay, Lujic, & Claudino, 2015; Palavras, Morgan, Borges, Claudino, & Hay, 2013). All of these studies, however, have explored SBEs among either nonclinical samples or samples recruited based upon occurrence of OBEs or other bulimic symptoms, which happened to also include individuals who reported SBEs as well. The current studies expanded upon prior work by specifically recruiting individuals who reported SBEs (who may or may not also report OBEs). We aimed to deepen our current understanding of SBEs to more fully capture the subjective experiences of individuals who engage in the behavior, as well as to investigate how SBEs may or may not be related to momentary affect. Additionally, we aimed to examine which psychological features and difficulties are associated with SBEs.

Phenomenology of SBEs

As mentioned above, the definition of SBEs was developed from the way in which SBEs were assessed in the EDE (Fairburn & Cooper, 1993), which was based upon anecdotal clinical observation rather than systematic qualitative data collection regarding individuals' nuanced descriptions and understandings of their own SBE experiences (Fairburn, 1997). It is therefore unclear whether there might be other variables that are important to our understanding of the phenomenology of SBEs. Of note, when we use the term phenomenology in the current paper, we are not referring to phenomenology as an approach to qualitative methodology nor as the branch of philosophy. Rather, we are referring to phenomenology as the psychological study of subjective experience. For example, does the experience of loss of control in the context of SBEs have qualities that differ from traditional ideas of loss of control in the OBE literature? And, what interpersonal and environmental factors may influence the occurrence and experience of SBEs? Qualitative data in particular may be important to expand our knowledge about the nuances of SBEs.

Additionally, it is not known whether SBEs are experienced as intentional or planned in advance. Intentionality can be understood as separate from momentary loss of control. Taking OBEs as an example, some individuals report planning OBEs in advance of the behavior. For instance, a person might plan an OBE for the evening and purchase food supplies in order to make that particular episode possible, but the eating episode itself might still feel out of control. As mentioned by Stein, Kenardy, Wiseman, Dounchis, Arnow, and Wilfley (2007), it is unknown to what extent individuals may plan SBE experiences; however, based upon the idea that SBEs, by definition, are smaller in size, and therefore may require less preparation (e.g.,

purchasing a large quantity of food for an OBE), SBEs may be more likely to occur in a non-deliberate, unplanned fashion, as well as in a wider variety of contexts than OBEs.

It could be that if an episode is planned in advance, the deliberate quality of seeking loss of control might be more emotionally relieving than if the episode occurs in a non-planned way. In other words, expectation of loss of control, as opposed to a more spontaneous loss of control that sweeps over someone without a deliberate quality, may be more likely to serve an affect regulation function. In contrast to this hypothesis, however, in an unpublished dissertation study, Witt (2014) found using Ecological Momentary Assessment (EMA) that "anticipating" a binge at the start of a day did not have an effect on the subsequent affective experience of that binge episode. Of note, Witt did not factor in episode size when controlling for the effect of anticipation on affect surrounding the binge eating episode. It could be that anticipation has a differential effect on SBEs versus OBEs. Also, it could be that anticipating an episode at the start of the day may be less relevant than anticipating an episode closer in time to its occurrence. Thus, more research is needed in order to elucidate how loss of control, planning of binge episodes, and size may be related to escape and reinforcement processes in binge eating.

In addition, no prior research has examined how individuals with SBEs may experience other eating episodes. It is not known whether individuals with SBEs may feel a sense of loss of control or judgment of the eating episode as "too much" regardless of the food type or quantity consumed. Therefore, one exploratory component of the current study involved gaining a preliminary understanding of how such individuals experience day-to-day eating experiences or common food items that individuals may consume.

Binge Eating and its Relation to Momentary Affect

To the author's knowledge, no published studies have examined SBEs in relation to momentary affect. That said, Witt (2014) examined the effect of episode size on shifts in positive and negative affect surrounding binge episodes, and found that whether the episode was classified as an SBE or OBE did not differentiate the trajectories of affect across time. More specifically, positive affect and negative affect were found to decrease and increase, respectively, in the hours preceding the episode regardless of size. Additionally, positive affect and negative affect were found to be significantly lower and higher, respectively, during versus after the episode regardless of size. Given the lack of replication and published literature in this area, however, further research is needed to examine how SBEs might operate for individuals on a momentary basis (i.e., what affective function might SBEs serve for individuals engaging in the behavior?).

On the other hand, there is a building literature that supports the notion that OBEs likely operate as emotion regulation strategies. This conceptualization has been put forth in theoretical and narrative accounts of BN and tested empirically using multiple research methods, including experiments, EMA, and retrospective report (Engelberg, Steiger, Gauvin, & Wonderlich, 2007; Fox & Froom, 2009; Jeppson, Richards, Hardman, & Mac Granley, 2003; Moon & Berenbaum, 2009). In particular, using an EMA approach among a sample of women with bulimic symptoms, Engelberg et al. (2007) found that momentary negative affect, as well as dissociation, prospectively predicted the occurrence of OBEs across the day.

These empirical findings are in line with Heatherton and Baumeister (1991), which asserted that OBEs might be sought out as means of "blanking out" and escaping from aversive self-awareness. This idea that OBEs could be related to in-the-moment dissociation and negative

affect was corroborated by a statement made by one individual with binge eating disorder (BED) in the context of a qualitative study examining binge eating: "I'm constantly feeling afraid and panicky and I just want to plug that feeling up…I really just want the anxiety and self-hate to stop…" (McIver, McGartland, & O'Halloran, 2009, p. 1239). The OBE in this way may provide a temporary block of emotion, which in turn may reinforce the behavior over time. Engelberg et al.'s (2007) finding that dissociation often immediately precedes OBEs (as assessed by asking to what extent participants had "spaced" or "blanked out" prior to the most recent OBE) is in line with this idea that engagement in OBEs may serve an escape function. This escape may begin with an experience of dissociation.

Not all evidence, however, supports the argument that OBEs are behaviors used to regulate in-the-moment affect. Wegner et al. (2002), for example, used an EMA approach and found that when participants filled out a survey directly following a binge episode, they reported increases in depression, anger, guilt, and shame, as well as decreases in positive mood, as compared to their retrospective recall of emotion prior to the binge. In other words, Wegner et al. (2002) found that binge eating was immediately followed by feeling worse. A limitation of this work, however, was that participants reported on their emotion pre- and post-binge concurrently and closer in time to the post-binge rating (i.e., after the episode) raising the possibility that their report of pre-binge emotion may have been more inaccurate than the more recently reported moments. Additionally, Haedt-Matt and Keel (2011) completed a meta-analysis of EMA studies of OBEs and found that overall, negative affect ratings following binge episodes were significantly higher than ratings made prior to binge episodes.

The unidimensional construct of negative affect, however, may not include enough detail for conclusions to be accurately drawn regarding the relation between binge eating and affect.

More research must explore specific facets of negative affect (in addition to positive affect), in line with Wegner et al.'s (2002) approach, in order to fully investigate whether binge eating operates as an affect regulation strategy. In line with this idea, Berg et al. (2013) found using an EMA approach that guilt was particularly involved in the maintenance of OBEs: guilt steadily increased up until the moment of the episode, followed by a steady decline in level of guilt following the binge episode. It could be that an OBE provides a specific domain to direct distress toward (i.e., eating) that makes the distress more tolerable, because it is more contained and directed than its initial diffuse state. For example, it might feel more tolerable to experience guilt related to a binge episode than guilt related to the way in which one lives her life. As such, it might be important to examine the target and context of the emotion that a person is feeling in addition to the intensity and valence of that emotion in order to gain an understanding of how behaviors like OBEs are reinforced.

Additionally, less research has specifically examined changes in positive affect related to loss of control eating. Witt (2014), using an EMA approach, found that positive affect tended to decrease in the hours preceding the binge, and increase in the hours following the binge. Of note, this pattern was not affected by whether or not the episode was large in size. On the other hand, Corstorphine, Waller, Ohanian, and Baker (2006) found in a sample of women with BN using a diary method that happiness ratings did not change from pre- to post- OBE.

In spite of discrepant findings in the EMA literature, the evidence taken together suggests that OBEs influence affect, whether or not they operate by reducing negative affect in the moment (e.g., Berg et al., 2013; Engelberg et al., 2007; Wegner et al., 2002) or increasing positive affect after their occurrence (e.g., Witt, 2014). If we are to understand these episodes as means by which people attempt to manipulate affective experience, we can begin to

conceptualize binge episodes as means by which individuals seek control of one domain (affect) at the expense of control in another domain (eating). This allows us to consider the possibility that loss of control may paradoxically operate as a means by which individuals seek control in domains besides eating. None of the existing studies regarding in-the-moment relations between binge episodes and affect have examined SBEs; therefore, it is unknown whether SBEs can be understood as similar means by which individuals seek control over affect.

Therefore, the current study examined the extent to which SBE occurrence influences emotional experience in the moment in an effort to better understand whether SBEs can be understood as affect regulation strategies. Given the lack of prior momentary research on SBEs, it is difficult to hypothesize whether or not SBEs will operate on affect in a similar way as OBEs, and what sets of emotions might be particularly salient to the SBE experience. It is important to examine specific emotions and feeling states, such as guilt, sadness, "blanking out," and anxiety in order to establish a more nuanced understanding of how SBEs are related to momentary emotion. In addition, examining the ways in which self-reported emotions surrounding SBEs relate to reported intentionality of the episode may provide preliminary information on whether participants are motivated to engage in SBEs for the purpose of modulating emotion.

SBEs and Associated Features

Research examining psychological correlates of SBEs has typically focused on related eating pathology, as well as broader psychological distress, and has used one of two analytic approaches. In one approach, group comparisons are performed comparing SBE presentations to OBE presentations (i.e., comparisons between those who only engage in SBEs versus those who only engage in OBEs). Another approach involves continuous data analytic methods in which

frequencies of SBEs and OBEs are considered jointly as independent variables to see if they account for unique variance in associated psychological features and symptoms.

These studies, taken together, have provided support for the idea that SBEs are worthy of clinical concern even if they involve smaller amounts of food than OBEs, because there are few overarching differences in psychological symptom severity based upon whether an individual tends toward SBEs versus OBEs. SBEs and OBEs have been compared in terms of their associations with other eating disorder symptoms (e.g., broad disordered eating, purging, body dissatisfaction), general psychological distress and quality of life, trait level negative affect, and interpersonal difficulties, as well as cognitive and affective processing difficulties (e.g., Brownstone et al., 2013; Fitzsimmons-Craft et al., 2014; Latner, Hildebrandt, Rosewall, Chisholm, & Hayashi, 2007; Latner, Vallance, & Buckett, 2008). Below is a summary of the findings in the literature regarding these domains.

Other disordered eating symptoms. Some research has examined SBEs and OBEs as they relate to broad disordered eating symptomatology. For example, Goossens et al. (2009) found that when comparing adolescents from a community sample who had engaged in only SBEs with those who had engaged in only OBEs over the past month, no significant differences were found in terms of eating disorder psychopathology. Similarly, Mond et al. (2010), in a sample with bulimic-type eating disorders, and Jenkins, Conley, Hoste, Meyer, and Blissett (2012), in a nonclinical sample of undergraduate women, did not find group differences in eating pathology between individuals regularly experiencing only SBEs (i.e., at least weekly) and individuals regularly experiencing only OBEs. Furthermore, in a sample of youth between the ages of 6 to 17 years of age, Shomaker et al. (2010) did not find differences in disordered eating attitudes between children who regularly engaged in only SBEs versus OBEs with or without

SBEs. Similarly, Fitzsimmons-Craft et al. (2014), in a sample of treatment seeking adolescents with BN, also found no significant differences in eating disorder symptomatology between those with only SBEs versus only OBEs. As such, these findings indicate that individuals with SBE-only presentations have similar levels of disordered eating symptomatology and attitudes as those with OBEs.

Some work has also examined specific eating disorder behaviors (e.g., purging behaviors) and body dissatisfaction as they relate to SBEs and OBEs. Brownstone et al. (2013), for example, found that SBEs, and not OBEs, accounted for unique variance in diuretic misuse, as well as weight and shape concerns, while Fitzsimmons-Craft et al. (2014) found that that SBEs, and not OBEs, accounted for unique variance in dietary restraint. Additionally, Brownstone et al. (2013) and Fitzsimmons-Craft et al. (2014) found that both SBEs and OBEs accounted for variance in eating concern. On the other hand, while Fitzsimmons-Craft et al. (2014) found that OBEs (and not SBEs) accounted for unique variance in vomiting frequency and global eating pathology, Brownstone et al. (2013) found that both SBEs and OBEs accounted for unique variance in vomiting frequency. As such, there is preliminary evidence to suggest that SBEs are more related to body image difficulties than OBEs (i.e., weight and shape concern), as well as diuretic misuse frequencies and dietary restraint, and more mixed evidence regarding the strength of the relationship between vomiting frequency and OBEs compared to SBEs. More research is needed to expand upon such findings and discern specific ways in which SBEs are related to other disordered eating behaviors and body image difficulties.

General psychological distress and quality of life. Some research has also examined SBEs and OBEs as they relate to general psychological distress and quality of life. For example, Goossens et al. (2009) found that when comparing adolescents from a community sample who

had engaged in only SBEs versus only OBEs over the past month, no significant differences were found regarding global sense of self-worth. Similarly, Mond et al. (2010), in a sample with bulimic-type eating disorders, and Jenkins et al. (2012), in a nonclinical sample of undergraduate women, also did not find group differences between individuals regularly experiencing only OBEs (i.e., at least weekly) and individuals regularly experiencing only SBEs when examining variables such as general psychological distress, quality of life, and functional impairment. In line with these other findings, Palavras et al. (2015) found in a nonclinical sample of individuals with high disordered eating symptomatology at baseline that individuals with SBEs only had similar self-reported quality of life as those with only OBEs, and that this similarity remained over a 5-year follow-up period. As such, these findings suggest that individuals with SBE-only presentations have similar levels of psychological distress and quality of life as those with OBEs.

Trait negative affect. Research has also examined how SBEs versus OBEs are related to trait negative affect (i.e., anxiety and depressive symptoms). For example, Goossens et al. (2009), when comparing adolescents from a community sample who had engaged in only SBEs versus only OBEs over the past month, and Shomaker et al. (2010), when comparing a sample of youth (ages 6-17) with only SBEs versus regular OBEs with or without SBEs, both found no significant differences regarding depression symptoms. Fitzsimmons-Craft et al. (2014), on the other hand, found that those with only SBEs among an adolescent treatment-seeking sample with BN had significantly higher levels of depressive symptoms than adolescents with only OBEs.

These findings regarding group comparisons (i.e., SBE-only versus presentations with OBEs) were elaborated upon with continuous approaches examining relations between frequencies of SBEs and OBEs and trait negative affect. Using a continuous approach, Latner et al. (2007) found that in a community sample of women, frequencies of OBEs, and not SBEs,

accounted for unique variance in a measure of general psychopathology focused on depressive and anxiety symptomatology. Applying a similar approach, Brownstone et al. (2013), on the other hand, found among a sample of women with subthreshold and threshold BN that SBEs, and not OBEs, were associated with negative affect (i.e., anxiety and depressive symptomatology). These findings, therefore, suggest that further research is needed to elucidate differences in how SBEs versus OBEs are related to trait negative affect.

Interpersonal difficulties. There is very preliminary evidence that SBEs, and not OBEs, account for unique variance in social avoidance and insecure attachment (Brownstone et al., 2013). These findings give some indication that SBEs may be uniquely related to interpersonal difficulties; however, future work must investigate whether this pattern replicates, and, if so, decipher which types of interpersonal difficulties are particularly salient for individuals who struggle with SBEs.

Cognitive and affective processing. In a sample of women with subthreshold and threshold BN, Brownstone et al. (2013) found, using a group comparison approach, that individuals with SBE-only presentations (as compared to those with OBE-only presentations) had significantly higher levels of cognitive distortion. This finding was corroborated with a continuous approach in which SBEs, and not OBEs, were found to account for unique variance in cognitive distortion. Cognitive distortion can be understood as the extent to which an individual has a sense of things seeming unreal or imagined, which has a similar quality to dissociative experience (Brownstone et al., 2013). There was also a trend toward those with SBE-only presentations having higher affect lability than those with OBE-only presentations. These preliminary findings regarding relations between SBEs and cognitive distortion (and, to a

lesser extent, affect lability) suggest that more research is needed to further examine how SBEs may relate to cognitive and affective processing, as well as dissociation.

Integration of associated characteristics. All of these studies taken together indicate that SBEs are equally if not more problematic than OBEs in terms of broad disordered eating symptomatology and psychological difficulties. Replication is needed in order to investigate whether this pattern remains in a sample specifically recruited for engagement in SBEs. Additionally, further exploration is needed in order to deepen our understanding of which psychological difficulties are most related to SBEs (e.g., which types of interpersonal difficulties are most related to SBEs).

The Current Study

The current project examined SBEs by recruiting individuals who reported at least some regular SBE occurrence. The research questions of interest included: 1) how do individuals describe the experience of SBEs and how might that inform the definition used by researchers and clinicians, 2) how are SBEs related to affect in the moments directly before, during, and after their occurrence, and 3) what comorbid symptoms and psychological difficulties are related to SBEs? We examined this set of questions using a three-study design.

For question 1, we hypothesized that a range of themes would emerge in participants' own descriptions of their SBE experiences, and we made no specific a priori hypotheses regarding what themes would emerge, because of the exploratory and inductive nature of the study. We also hypothesized that individuals would tend to report that SBEs are not intentional, and that, more specifically, SBEs would be rated as less intentional than OBEs.

For question 2, given the lack of prior research, it was difficult to make specific hypotheses regarding momentary emotion and SBE occurrence. We tentatively hypothesized,

however, that the self-reported momentary emotion before and after an SBE would more closely resemble a typical emotion regulation strategy (i.e., with a decrease in the intensity of reported negative emotion post- as compared to pre-SBE) if the episode was rated as higher on intentionality. In other words, we anticipated that if an individual planned an SBE in advance, it might indicate some motivation to engage in the behavior due to predicted emotional responses to that behavior. On the other hand, if the episode was reported to be unintentional, we hypothesized that the self-reported momentary emotion before and after the SBE would indicate that the behavior was distress-inducing (i.e., with an increase in the intensity of reported negative emotion post- as compared to pre-SBE).

We also hypothesized that, in contrast to OBEs, given the normative (or small) size of SBEs, such episodes likely occur in a wider range of contexts than OBEs, including times when other people might be eating an identical quantity of food at the same time. Therefore, individuals would be less likely to seek SBEs as a means of specifically regulating affect. As such, we hypothesized that individuals would be less likely to report "blanking out" during SBEs than OBEs, and rather would report negative emotions and distress during such episodes.

For question 3, we hypothesized that those with SBEs (regardless of whether they also experienced OBEs) would report higher levels of other eating disorder behaviors, body dissatisfaction, and overall eating disorder symptomatology as compared to participants without loss of control eating. Furthermore, based upon the prior research described above, we expected that those with SBEs (regardless of whether they also experienced OBEs) would report similar if not higher levels of associated disordered eating symptoms as those with only OBEs (e.g., Brownstone et al., 2013; Fitzsimmons-Craft et al., 2014; Mond et al., 2010). We also hypothesized, based upon Brownstone et al. (2013) and Fitzsimmons-Craft et al. (2014), that

those with SBEs (regardless of whether they also struggled with OBEs) would report more difficulties with trait-level negative affect and interpersonal problems as compared to those without SBEs (i.e., those with only OBEs and those without loss of control eating).

Study 1. Study 1 used an internet snowball sampling method (Goodman, 1961), as well as Amazon Mechanical Turk (Mturk; Buhrmester, Kwang, & Gosling, 2011) to recruit individuals who had engaged in loss of control eating over the prior three months and individuals who had not engaged in loss of control eating in the prior three months. A survey link was e-mailed to a range of listservs and posted to relevant social media pages that allowed public posting, and used skip logic to select from initial volunteers who reported loss of control over eating in some capacity to find individuals who specifically endorsed SBEs. Information was obtained about the amounts of food that individuals consumed, degree of intentionality, environmental context for the loss of control eating, emotions and physiological sensations/states experienced during the episode, as well as other psychological symptoms experienced in the prior three months. Exploratory information was also gathered regarding participants' perceptions of imagined eating experiences in order to begin to understand how individuals with loss of control eating may tend to experience eating in their day to day lives. In order to obtain a comparison sample of individuals without loss of control eating, the same survey was also sent to individuals not recruited based upon self-reported SBEs through Amazon MTurk (Buhrmester et al., 2011).

Study 2. Study 2 also used an internet snowball sampling method (Goodman, 1961) to recruit individuals who had engaged in loss of control eating over the prior three months. The survey used skip logic to select from initial volunteers who reported loss of control over eating in some capacity to find individuals who specifically endorsed SBEs or OBEs. The survey included

questions to clarify the type(s) of loss of control eating being reported (i.e., by asking participants to provide details regarding what was consumed during a recent SBE and/or OBE), as well as questions about emotions experienced before versus after a recent SBE, degree of intentionality of the SBE, and other psychological symptoms recently experienced.

Study 3. Study 3 involved a 30-minute qualitative phone interview of individuals who reported an average of at least one SBE per week over the prior three months. These participants were a subset of participants from Study 2 who expressed interest in a follow-up study and who met SBE frequency criteria. The phone interview incorporated an adapted Event Reconstruction Method (ERM) interview to collect detailed information regarding a recent SBE (Kahneman, Krueger, Schkade, Schwartz, & Stone, 2004). The interview also included questions regarding the bodily sensations and sensory experience of the recent SBE, as well questions about imagined eating experiences. If applicable, the interview also included a briefer set of questions about a recent OBE.

Thus, the current project aimed to systematically expand the existing limited understanding of SBEs in the literature and to establish a better sense of the phenomenology, functionality in relation to emotion, and associated features of SBEs.

CHAPTER 2: STUDY 1

Method

Participants. Participants included 686 individuals, 133 of whom reported no loss of control eating nor a history of AN, and 553 of whom reported having experienced at least one loss of control eating episode in the prior three months. Among those with loss of control eating in the prior three months, 341 individuals reported having engaged in an SBE (with or without OBEs), while 212 individuals reported having engaged in only OBEs.

In order to verify the size of self-reported SBEs and OBEs, participants provided an example of a recent SBE and/or OBE as part of the survey if they endorsed the given episode type. A subset of participants reported amounts for a given episode type that did not meet size criteria. For example, some participants reported an objectively large quantity of food as their recent example of a recent SBE (e.g., eating a large pizza and reporting that others would have disagreed that the episode was large in size). Other participants reported a subjectively large episode as their recent OBE (e.g., eating an apple and assuming that others would agree that the episode was large in size). These binge examples did not fit clearly into the episode type that the participant identified, and thus were categorized as "other." Additionally, some participants endorsed having had an SBE (or OBE) in the prior three months, but did not provide an example or did not provide enough detail to determine whether the episode met size criteria; these episodes were also categorized as "other" for the relevant binge.

Given that some participants responded to both SBE and OBE questions in these unexpected ways, the following groups emerged that were not easily classified: 1. Those with

"other" under SBE and no reported OBEs (SBE-other Only; *n* = 14), 2. Those with "other" under OBE and no reported SBEs (OBE-other Only; *n* = 77), 3. Those with "other" for both binge types (Other; *n* = 183), 4. Those with "other" for SBE and an example episode that met criteria for OBE (OBE and Other; *n* = 12), and 5. Those with "other" for OBE and an example episode that met criteria for SBE (SBE and Other; *n* = 61). There were also individuals who provided example episodes that met size criteria, such that the following more expected groups emerged: 1. Those with only SBEs (*n* = 42), 2. Those with both SBEs and OBEs (*n* = 29), and 3. Those with only OBEs (*n* = 135). See Table 1 for a summary of each of these groups that emerged in the recruitment process.

Given that some analyses in the current paper focused on the presence versus absence of SBEs (by comparing those with any SBEs to those with only OBEs and non-loss of control (LOC) eating; group difference analyses) and other analyses focused on comparing SBEs to OBEs (e.g., comparing emotion-ratings for a recent SBE versus OBE; episode level comparisons), we included different subgroups depending upon which analyses were being completed. These inclusions/exclusions will be specified along with the results from each unique analysis, and are also summarized in Table 1. See Figure 1, as well, for a depiction of the participant groups.

Of note, the sizes of participants' example loss of control episodes were coded based upon EDE size criteria (Fairburn, 1997) by two independent raters: L.M. Brownstone and a post-baccalaureate research assistant with one and a half years of eating disorder assessment experience. Percent agreement between the two coders for SBE and OBE example amounts were 80.92% and 79.10%, respectively. For discrepant codes, L.M. Brownstone carefully examined the discrepancy, and determined which codes were most representative. L.M. Brownstone sought

a third opinion from a fellow clinical psychology doctoral student specializing in eating disorder research for particularly questionable loss of control examples to allow for final consensus.

Recruitment. We recruited individuals who reported SBEs primarily by means of the snowball sampling method, which involved sending an e-mail to a set of listservs and organizations, and posting an announcement to various social media sources (Goodman, 1961). The e-mail was aimed at recruiting individuals who had experienced loss of control eating, and included a link to an online survey. We also posted the study to a range of social media pages through Facebook. See Appendix A for examples of social media pages on which our research team posted information regarding Study 1 and 2. Additionally, we sent the study to colleagues who posted the study to their own Twitter pages in order to facilitate the distribution of study information through the snowball method.

Individuals without self-reported loss of control eating in the prior three months or a history of AN (n = 217) were recruited via the administration of the survey through Amazon Mturk. Mturk is a common recruitment method used in social science research that has been found to maintain similar reliability on measures of demographic and personality variables when compared to lab-based (mostly undergraduate) samples while providing greater diversity (Buhrmester et al., 2011). Additionally, Shapiro, Chandler, and Mueller (2013) found that the prevalence of depression, general anxiety, and trauma exposure among Mturk participants matched or exceeded the prevalence of these difficulties among the general population, which indicates that Mturk is a useful resource for examining subclinical (and clinical) difficulties.

Of note, 84 of the participants without loss of control eating nor a history of AN were randomly excluded to match the number of participants with loss of control eating in the group difference analyses (more information regarding these analyses is described in the data analytic

plan), such that our non-loss of control eating group for analyses included 133 participants. Random exclusions were made within each gender group in order to maintain a similar gender ratio as each of the loss of control eating groups. The excluded non-LOC individuals did not significantly differ from the included non-LOC individuals on core study variables or demographics.

In order to recruit individuals who were less likely to report loss of control eating, the Mturk recruitment announcement stated the current study was a "study about eating," and did not specify loss of control eating. In spite of the different recruitment announcement, Mturk participants completed an identical survey to participants recruited via Snowball method, and were asked to report on loss of control eating experiences if applicable. Therefore, a subset of participants recruited through Mturk reported loss of control eating. These individuals (n = 148) were included in the loss of control eating samples.

Procedure. Given that the snowball recruitment announcement called for those with loss of control eating, many participants reported having SBEs and/or OBEs. Those who reported both SBEs and OBEs first answered in-depth SBE questions, followed by a briefer set of questions regarding the OBE experience, as well as the questions regarding broader psychological functioning. Those who reported OBEs without SBEs were immediately skipped to the questions about their most recent OBE, followed by questions regarding broader psychological functioning. Individuals who reported only SBEs were skipped to questions regarding broader psychological functioning after responding to in-depth questions related to SBEs. Those who did not endorse any loss of control eating were skipped to questions about broad psychological functioning. Thus, regardless of recruitment strategy (i.e., snowball method, Mturk), all participants (i.e., those with loss of control eating and those without) completed the

same survey. A chart depicting the skip logic of the survey is included in Appendix B. The inclusive nature of this survey allowed for a focus on SBEs, while still collecting information on other loss of control eating experiences.

Regarding compensation, participants recruited through the snowball method were given an opportunity to include their name in a drawing, which offered four chances toward a $25 gift card to Amazon.com, while Mturk participants were compensated $.40 for completion of the survey. Mturk specifications were set such that repeat participants were not included in the sample.

Measures. The online survey began with demographic questions regarding gender, racial identity and ethnic identity, followed by questions about psychological treatment history (i.e., whether a person has sought mental health services, and, if applicable, services for which psychological difficulty). Participants were also asked questions to determine history of AN. The survey then proceeded through a series of questions regarding the experience of SBEs and OBEs, as applicable, followed by subsets of questions from established measures of the associated features of interest (i.e., other disordered eating symptoms, trait negative affect, and interpersonal difficulties).

Phenomenology. Quantitative questions regarding SBEs included several questions aimed to determine intentionality of the SBE. In particular, we asked how intentional the episode was, how surprised the participant was by the episode, and to what extent the episode could have been anticipated, with each item rated on a 0-6 Likert scale. We also attempted to assess intentionality with a question regarding to what extent the episode was planned in advance with the following three options: “Not planned at all; I was surprised that I felt a sense of loss of control while I was eating,” “Not so much planned as much as something I could anticipate in

advance; I was not surprised that it happened," and "I planned for this loss of control episode prior to it occurring; that is, prior to the eating episode, my intent was to experience some loss of control while eating." Other factors assessed included: extent of hunger prior to and fullness following the SBE (each on 0-4 Likert scales; e.g., from "not at all hungry" to "extremely hungry/famished"), time of day when the SBE occurred (i.e., morning, afternoon, evening, nighttime/dawn), length of the SBE (i.e., number of minutes), as well as when the loss of control began (i.e., before, during, or at the completion of the eating episode). Participants also reported how many SBEs they had experienced over the prior three months.

Qualitative items in Study 1 were focused on establishing a descriptive understanding of SBEs (i.e., what is consumed during such episodes, as well as where and when these episodes occur). Examples of qualitative questions included: "Provide a detailed description of what you ate (types of foods and amounts of each) during your most recent SBE," "Please describe where this episode occurred, including who you were with, if anyone, and location," and "What was happening immediately before this eating episode?" These questions were asked of those who reported at least one SBE in the past three months to capture a more nuanced picture of SBE experiences. We also included an open-ended question in which we asked the participant: "Please describe your most recent SBE experience." This broad question allowed participants to generate the information they judged most pertinent regarding their SBE experiences without guidance from the question regarding which information to include.

Those who did not endorse SBEs, but who did report experiences of OBEs were skipped to a briefer set of questions regarding OBEs, which were a subset of the quantitative and qualitative questions asked regarding SBEs pertaining to the most recent OBE experience. Quantitative questions regarding the OBE included: the extent to which the OBE was planned in

advance and when the loss of control began surrounding the episode (i.e., identical questions to the questions outlined above for SBEs). Participants also reported how many OBEs they had experienced over the prior three months. These participants were also asked two qualitative questions regarding OBEs: "Provide a detailed description of what you ate (types of foods and amounts of each) during your most recent OBE?" as well as "Please describe your most recent OBE experience." Those who reported both SBEs and OBEs were first asked questions regarding SBEs, followed up by the briefer set of questions about OBEs.

Momentary emotion. Momentary emotion during the most recent SBE (and OBE, if applicable) was assessed with the Modified-Differential Emotions Scale (mDES; Fredrickson, Tugade, Waugh, & Larkin, 2003), which assesses a broad range of emotions from low to high arousal and from positive to negative valence. The mDES is a modified version of Izard's Differential Emotions Scale (DES; Izard, 1977), and assesses the degree to which participants have experienced 20 discrete emotions over the time period of interest on a five-point scale (0 = *never*, 4 = *most of the time*). The mDES can be divided into two subscales: Positive Emotions subscale and Negative Emotions subscale, both with support for adequate internal reliability (coefficient alphas of 0.79 and 0.69, respectively; Fredrickson et al., 2003). Evidence of construct validity of the mDES comes from findings that individuals tend to report more negative emotions in response to situations that would likely elicit such emotions (e.g., the September 11th attacks) (Fredrickson et al., 2003). Of note, we added several descriptors of feeling states particularly relevant to eating experiences that are not included in the mDES. These states included: "gross," "sick," "uncomfortable," and "zoned out." We chose to focus on emotions felt only during the most recent episode rather than asking about before, during, and after in order to minimize participant burden.

Other disordered eating symptoms. The Eating Disorder Examination-Questionnaire (EDE-Q; Fairburn & Beglin, 1994) is a 36-item self-report survey adapted from the Eating Disorder Examination (EDE) interview, which assesses psychological symptoms of eating disorders (Fairburn & Cooper, 1993). Construct validity has been demonstrated by high correlations between the EDE-Q and the interview version of the EDE subscales ranging from 0.78 to 0.85 (Fairburn & Beglin, 1994). In order to assess eating disorder behaviors, we used items from the EDE-Q that assess the number of episodes over the prior month of the following behaviors: vomiting, laxative misuse, diuretic misuse, hard exercise. We also included an item from the EDE-Q asking participants to specify the number of days in the past 28 days that they had deliberately engaged in dietary restriction.

In order to assess body shame, we used two items based upon highest item-total correlations from the Body Shame subscale of the Objectified Body Consciousness Scale (OBCS-BS; McKinley & Hyde, 1996). The two items were: "I feel like I must be a bad person when I don't look as good as I could" and "When I can't control my weight, I feel like something must be wrong with me." The Body Shame subscale captures feelings of shame related to one's body not conforming to cultural expectations using eight items rated on a 7-point scale. The OBCS-BS has been found to have adequate internal consistency, as indicated by an alpha of 0.75 in prior work (McKinley & Hyde, 1996). Construct validity has also been demonstrated with an expected negative correlation between body shame and body esteem (McKinley & Hyde, 1996). In the current study, the correlation between the two items from the OBCS was 0.68 ($p < .001$).

Trait negative affect. In order to assess depression and anxiety symptoms, we selected six items based upon thematic content and item-total correlations from the depression and anxiety scales of the Depression Anxiety Stress Scales (DASS; Lovibond & Lovibond, 1995).

The DASS-21is a 21-item self-report measure, which includes three 7-item self-report scales: anxiety, depression, and stress. The DASS-21 was designed based upon an earlier and longer version of the DASS, which included twice as many items (Lovibond & Lovibond, 1995). Each of these scales has been found to have adequate internal consistency (Cronbach's alpha >0.88 for each scale), and these scales have also been found to have adequate validity when compared to other measures of depression and anxiety, such as The Hospital Anxiety and Depression Scale and the Beck Depression Inventory (Henry & Crawford, 2005; Lovibond & Lovibond, 1995). In the current study, coefficient alphas for the three items chosen from each of the anxiety and depression scales were 0.79 and 0.88, respectively.

Interpersonal difficulties. In order to assess interpersonal difficulties, we selected five items based upon thematic content and item-total correlations from the UCLA Loneliness Scale (UCLA-LS - three items; Russell, 1996), as well as the Multidimensional Scale of Perceived Social Support (MSPSS - two items; Zimet, Dahlem, Zimet, & Farley, 1988).

The UCLA-LS is a 20-item self-report survey that assesses feelings of loneliness and social isolation using a 4-point scale (1 = *never*, 4 = *always*) (Russell et al., 1978). The UCLA-LS has been found to have high internal consistency, as indicated by alphas of 0.89 to 0.94 in prior work, as well as high test-retest reliability over a one-year period of time (Russell, 1996). Construct validity has also been demonstrated by high concordance between UCLA-LS scores and self-perceived inadequacy of interpersonal relationships (Russell, 1996). In the current study, the coefficient alpha for the three items chosen from the UCLA-LS was 0.87.

The MSPSS is a 12-item measure of perceived adequacy of social support, which uses a 7-point scale (1 = *very strongly disagree* to 7 = *very strongly agree*) and focuses on three subscales (divided by source of social support): family, friends, and significant other (Zimet et

al., 1988). The MSPSS has been found to have good internal reliability as indicated by alphas between 0.84 to 0.93 for the overall scale (Canty-Mitchell & Zimet, 2000; Zimet, Powell, Farley, Werkman, & Berkoff, 1990). Validity from each subscale has also been demonstrated based upon concordance with other indicators of perceived support in the given domain (e.g., adolescent participants who report closer relationships with family also reporting higher perceived social support in the domain of family than those who do not report close relationships with family) (Zimet et al., 1990). In the current study, the correlation between the two items from the MSPSS (one from the Family subscale, and the other item from the Friends subscale) was 0.39 ($p < .001$).

Perceptions of hypothetical eating experiences. There was no precedent from which to base measurement of eating experience perception. As such, we used a novel, computer-based approach to ascertain how study participants would interpret a hypothetical eating situation. We showed participants images of five items of food: a banana, a bowl of salad, a slice of pizza, a bagel, and a muffin. Participants were asked the following: "Imagine that you have not eaten in two hours and that the last item of food you ate was a small snack (e.g., 1 cup of pretzels or carrots)…Now imagine that you just ate the item of food pictured above. Please answer the following set of questions regarding this imagined eating experience." Participants then indicated on a Likert scale from 0 to 6 the extent to which they would have (1) felt "out of control," (2) perceived the item they had eaten was "too much food," and (3) considered the item they had eaten was "bad" or "unhealthy." Items were grouped into a "carbohydrate" (i.e., pizza, bagel, and muffin) and a "fruit/vegetable" (i.e., banana and bowl of salad) category for analyses. Mean responses for each question within each food category were considered in analyses. See Appendix C, which provides the images that were shown to participants.

Data analytic plan. There were three broad categories of analyses in Study 1: (1) analyses within the sample of individuals with SBEs (regardless of whether or not they also reported other loss of control eating) (n = 132), (2) group comparisons between those with SBEs (n = 132), those with only OBEs (n = 135), and those without LOC eating (n = 133), and (3) episode-level comparisons of SBEs to OBEs (i.e., comparing 132 SBEs to 176 OBEs). OBE episodes (176 OBEs) were analyzed from the following groups: OBE-only (n = 135), SBE and OBE (n = 29), and OBE and other (n = 12) (i.e., from all individuals who reported an OBE that met size criteria). Of note, Table 1 provides information regarding which groups or episodes were used in which analyses.

Analyses within the subsample of those with SBEs focused on the descriptive, phenomenological features (quantitative and qualitative data) to establish a more nuanced understanding of the SBE experience. (See below for more details on the qualitative data analytic plan.)

Group difference analyses were applied to the associated features (i.e., other disordered eating symptoms, trait negative affect, and interpersonal difficulties) and the perceptions of hypothetical eating experiences. We compared these groups (SBE-included, OBE-only, non-LOC eating) using multivariate analyses of variance (MANOVA) for each of the following conceptual groupings of dependent variables: eating disorder behaviors (number of vomiting, laxative misuse, diuretic misuse, and hard exercise episodes), trait negative affect (items from the anxiety and depression subscales of the DASS), interpersonal difficulties (loneliness and perceived social support), perception of hypothetical eating experiences (carbohydrate eating experience, fruit/vegetable eating experience). Significant multivariate findings were followed up with univariate analyses of variance (ANOVA) for each specific dependent variable of

interest, as well as, where applicable, post-hoc Tukey tests. Dietary restriction and body shame were investigated using ANOVAs. All significant ANOVAs were followed with Tukey post-hoc tests. We also further characterized these groups by examining group differences on demographic variables (i.e., age, gender, ethnicity, race), treatment history, and history of AN. For categorical variables, we used a chi-square approach to determine if groups statistically differed. Omnibus chi-squares were followed up with cell comparisons using a z-score comparison approach with Bonferroni correction, as proposed by Goodman (1969) and, more recently, as suggested by Scharpe (2015). This cell comparison approach allowed us to probe significant omnibus chi-square tests to see which groups were significantly different from one another.

We also completed episode-level comparisons for which we used a multi-level model with episodes (i.e., SBEs and OBEs) nested within participants. We used a 2-level hierarchical model in which Level 1 was type of episode (i.e., SBE or OBE), and Level 2 was person-level data. These analyses were used to examine differences in emotion ratings and intentionality ratings among SBEs versus OBEs within individuals. For qualitative comparisons between SBEs and OBEs (as described further below), we analyzed all episodes descriptions corresponding to SBEs and/or OBEs that met size criteria; this meant that the same participants were included in qualitative comparison analyses as the quantitative episode-level comparisons (i.e., 132 SBEs and 176 OBEs were analyzed qualitatively).

Of note, given the possibility that those with different types of loss of control eating might differ on frequency of loss of control episodes (e.g., those with SBEs may tend to engage in more episodes of loss of control than those with OBEs), and that these differences may be related to overall severity levels of disordered eating or other psychological difficulties, we

entered the average number of SBEs and OBEs (i.e., average of SBEs and OBEs together) as a covariate for each group-level and episode-level analysis. Since adding this covariate did not affect our findings, for parsimony, we report results from the MANOVAs without the covariate throughout our results.

Qualitative analytic plan. Our coding and analytic process involved a combined content and map analytic approach focused on better understanding the phenomenology of SBEs. Content analysis has been described as an approach that allows for the "extraction of content" from data (e.g., qualitative narratives and open-ended responses) that can focus on when and if content appears in a response, and not as much on how the content appears, as is done in narrative analysis. As such, our coding methodology, as described in more depth below, was informed by content analysis, because we focused on the existence of a given code within an episode and not on the particularities of the narrative in which the code appeared (e.g., how many times a code appeared within a description, or the order in which content unfolded across a participant description) (Carley, 1993). We also employed a content analytic approach to determine which codes emerged in SBEs, and examined which codes emerged in OBEs in order to compare content of OBE descriptions to SBE descriptions. Map analysis, on the other hand, focuses on relationships among concepts in a given set of qualitative data. As described in more depth below, we analyzed relationships among codes within both SBE and OBE descriptions in order to inform a more in-depth understanding of SBE experiences (Carley, 1993).

Coding process. We coded participant responses using an inductive and iterative coding process (Saldaña, 2015). We began by identifying concrete descriptive codes (e.g., whether a person was at *home* or *not home* during a recent loss of control episode), and continued with more interpretive codes (e.g., whether or not the participant experienced the episode as meeting

an *emotional need*). Coding and subsequent analyses were completed with the use of MAXQDA Version 12 software (Kuckartz, 2007), and organized into a codebook.

After the codebook was compiled, an advanced undergraduate research assistant completed a coding agreement check on 10% of participant responses. This research assistant not only had prior experience with qualitative coding, but also transcribed five phone interviews for Study 3 prior to initiating coding for the current study. The process of transcribing the phone interviews was thought to provide the research assistant preliminary knowledge regarding the phenomenology of loss of control eating, which would help with her subsequent coding process. This coding check was completed with regard to descriptive codes, and not interpretive codes based upon the tendency for low agreement on interpretive codes in inductive qualitative work (Kvale, 1995; Neuendorf, 2004; Sandelowski, 2004); Appendix D specifies which codes were included in the inter-coder reliability calculation. Cohen's kappa was 0.77, which is considered to be at a level of substantial agreement according to Landis and Koch (1977), and adequate agreement according to Harkness et al. (2010). Our adequate kappa value was somewhat higher than expected, particularly given that we did not have an iterative inter-coder agreement process throughout data analyses, and rather completed our inter-coder reliability check post-hoc, which was in contrast to Hruschka et al. (2004), which found that reliability increased as coders were trained in coding over the course of qualitative analyses.

Inter-coder reliability was calculated based upon agreement of codes within episode descriptions (e.g., if both L.M. Brownstone and the research assistant agreed that the SBE involved an experience of *sadness/depression*) as compared to agreement that would have resulted if one rater provided random codes. L.M. Brownstone and the research assistant looked together at inter-coder disagreements, and found that disagreements arose because of

discrepancies in our nuanced understandings of what was stated versus implied in the data. For example, in some instances, the research assistant coded episodes as occurring at *home*, not because the participant specified that they were at home, but because they described cooking, which likely occurred at home. L.M. Brownstone, on the other hand, only coded *home* if the participant specified that they were at home. Similarly, there was some disagreement based upon differences in each coders' interpretation of what it meant when a participant specified that an episode was "satisfying." While L.M. Brownstone interpreted a statement about satisfaction as a positive feeling state (and, more specifically, coded it as *tasted good/pleasurable*), the research assistant wondered if satisfaction signified a "satisfaction" of physical hunger needs that did not necessarily imply a pleasurable experience. For example, one of the participants described the following episode that led to a discrepancy in coding regarding *tasted good/pleasurable*:

> I made the pizza myself so I was hungry already as I was making it. I knew I would have at least 2 slices plus the ice cream cone. Once I dug in though I became super hungry and then ate an additional one after the 2 I knew I would eat for sure. Then I was already pretty full but went for a last one to feel completely satisfied. I have a sweet tooth so I always need dessert after dinner. I knew I wanted the ice cream. The Kit Kat desire came up when my husband asked for one then I felt like eating those as well. [regarding a recent OBE]

The concept of satisfaction in the context of eating warrants future research. In this exemplar, it was difficult to decipher whether this participant felt that the episode *tasted good* or was *pleasurable*; however, the participant described a taste-based eating process in which they were craving certain flavors and looking for a "satisfied" feeling. In spite of there being some lack of clarity regarding this code, we decided to code the episode as *tasted good/pleasurable* when a participant reported being "satisfied," which is indicated in our codebook.

See Appendix D for a full description of the Study 1 qualitative codebook. The codebook was determined by means of an inductive coding methodology in which the researcher read

through each participant description and identified up to one code per episode, per person, such that if a person reported a recent SBE, but not a recent OBE, he/she would only have the potential to receive one of each code. For example, if that participant reported that the SBE was accompanied by guilt multiple times in the narrative description of the SBE, the code *guilt/shame* was only noted once for that episode. As such, we used a content analytic approach, as described above, that focused on the existence of concepts within a given episode (Carley, 1993). Of note, we coded all qualitative responses together within a given episode, not factoring in which question in the survey prompted a given response. Five categories of codes emerged in this iterative, inductive process: (1) *episode descriptors*, (2) *context*, (3) *associated activities/behaviors*, (4) *feelings*, and (5) *implied functionality*. Not all individual descriptions necessarily included information pertaining to each of these categories; however, when considering all of the episodes together, all of these categories of codes emerged.

Episode descriptors, *associated activities/behaviors*, *context*, and *feelings* codes were descriptive, and determined based upon concrete content in participant responses. For example, if a participant reported that they were in a hurry during the episode, their response was coded as *fast*. Or, if a participant described that they felt an emotion such as sadness surrounding the episode, their response was coded as *negative feeling/concern* and, within that broader code, *sad/depressed*. Of note, since participants were asked questions specifically pertaining to context (i.e., who they were with during the episode, and where they were), more information regarding *context* was gathered with regard to SBEs as compared to OBEs (as specified in Appendix D).

Implied functionality codes, on the other hand, were interpretive codes that involved closely examining the language that the participant used to describe the loss of control eating experience for evidence of the participant's own theory of why the episode may have occurred.

Four themes emerged within the broader category of implied functionality. One such theme was *emotional need* which was coded if the participant described the episode as being sought out in order to change an emotion or feeling state. It was not enough for the participant to state that negative and/or positive emotions were present surrounding the episode to imply that the participant understood the eating as meeting an *emotional need*. Rather, the participant needed to have a statement about the episode being motivated by a need to change his/her emotion or feeling state. Two representative participant quotes that communicated *emotional need* were as follows:

> (1) I was very sad about something.... and every time i opened up a new box or bag of food i felt a little better, and when i saw that the bag/box was almost empty i felt sad again, so i would have to open up something new to feel better again. When i am putting something in my mouth i just feel better… [regarding a recent OBE]
>
> (2) I really wasn't even hungry, but I kept eating because the food tasted good and I was bored. It made me feel better. I couldn't stop. [regarding a recent SBE]

Another such theme within the implied functionality codes was *I should eat/need energy*, which was used if the description of the eating implied that the participant was motivated to eat based upon a physical need for food. This code sometimes coincided with a reported feeling of hunger, but the presence of hunger was not sufficient for a response to be given this code. The participant had to imply that they ate due to a depletion of physical resources (i.e., "needing" to eat) and a sense that they "should" eat, not merely because they felt hunger. Some participants described this "need" for food in a more intellectual way by stating that since they had not eaten in some time, they realized they "should" eat. Other participants incorporated a description of hunger in their process of realizing that they needed food. Several representative participant quotes that communicated the *I should eat/need energy* theme are as follows:

> (1) i don't want to eat but i've learned that i have to. [regarding a recent SBE]

(2) I was beginning to seriously feel the effects of not eating for a prolonged period of time, so I made myself something that I thought was sensible enough to eat at that time. [regarding a recent SBE]

(3) I was very hungry. So I decided to eat. I calculated calories and decided on a food. But soon after starting to eat it all feels WAY too much. The feeling of ANY food inside me is just gross and too much. I eat a "normal" or even "less then normal amount" I feel OVERLY full and guilty. I immediately purge. And then I'm hungry again. I repeat the whole process. I was dizzy and numb I knew I needed to eat… [regarding a recent SBE]

Another such theme within the implied functionality codes was *sensory positive*, which was used if the description of the eating implied that the participant was motivated to eat based upon a sensory-based craving for food. Participants who endorsed this code described intense cravings and a feeling of having difficulty achieving a sense of satisfaction in the eating experience. Descriptions in this category also involved in-depth discussions of the gustatory, appetitive, and hedonic response to eating. Several representative participant quotes that communicated the *sensory positive* theme are as follows:

(1) "I had literally just come home from the grocery store with the ice cream. I had a craving that night for something sweet. I guess I was bored and felt like eating. So right after I unloaded the groceries, I took a tub out of the freezer and started eating." [regarding a recent OBE]

(2) "I liked the way it tasted so I just kept eating it long after my stomach felt like it was completely full. My brain wanted it and so I just kept going. I knew I should have stopped but I really wanted it all. Though to be honest I don't think I could have stopped if I tried." [regarding a recent OBE]

(3) "Consuming the food intentionally felt like a way to increase sensory input and pleasure, which I craved in my boredom." [regarding a recent OBE]

A final theme within the implied functionality codes was *no cause theorized*, which was used if the description of the eating notably did not imply the participant's own theory of why the episode took place. Participants who endorsed this code described other aspects of their eating experience (e.g., that the episode was preceded by stress or sadness) without alluding to

their underlying motivation. Representative participant quotes that communicated the *no cause theorized* theme are as follows:

> (1) "I wasn't very hungry, I was on my 3 day of starving. And out of nowhere I just ate the food and I remember feeling so full that I could have puked, but my friends told me that the amount I ate wasn't much." [regarding a recent SBE]
>
> (2) "I knew I wasn't hungry at all but I was home alone after school and I wasn't feeling all that happy. I wanted to grab a bite before work but I ended up eating way too much, I walked around the house opening cabinets literally hunting for food. Right after the episode I felt horrible because I didn't mean to eat that much. After quitting drugs I've gained a lot of weight, I didn't want to gain any more." [regarding a recent SBE]

Qualitative analytic process. After the codebook was completed, we employed both content and map analytic methods to explore the phenomenology of SBEs. Part of that process involved further describing which content codes appeared within SBE descriptions, and then comparing the codes in SBEs to OBE codes in order to inform our understanding of potentially unique aspects of SBEs. Our map analyses were completed within SBE descriptions to see which codes might relate to one another (or seem to share meaning within a person's SBE experience). We also compared these shared meanings within SBE descriptions to OBE descriptions, again to inform our understanding of the unique aspects of SBE phenomenology.

Pertaining to content analyses of SBEs (as compared to OBEs), we examined codes among the SBE and OBE descriptions by creating a matrix that specified how many people reported a given code with regard to a recent SBE and/or OBE. See Table 2 for a summary of code occurrences within SBE versus OBE descriptions.

Pertaining to map analysis, we used code co-occurrence matrices as tools to investigate relationships among the codes, and to see if any patterns emerged regarding such relations. As suggested by Namey, Guest, Thair, and Johnson (2008), a code co-occurrence allows the researcher to see when two concepts have overlapping meaning, and these overlapping meanings

can inform a map analysis. We carefully examined co-occurrence matrices of codes among participants who reported only SBEs (i.e., SBE-only, SBE and other) in order to increase our understanding of shared meaning and linked concepts within the experience of SBEs. We also examined the co-occurrence matrix of participants who reported only OBEs (i.e., OBE-only, OBE and other) with the specific goal of informing our understanding of SBE phenomenology (i.e., by noting differences between code co-occurrences in the SBE and OBE co-occurrence matrices). If a participant provided information on an "other" episode, we did not analyze their description of the other episode, and only focused on qualitative data pertaining to the SBE or OBE that met size criteria.

See Tables 3-5 for full summaries of the number of times that codes co-occurred within SBE and OBE episode descriptions. Given the potential for redundant information across tables, we focus in particular on how other codes relate to *episode descriptors* (Table 3) and *implied functionality* (Table 4) codes. *Context* code co-occurrences are only presented with regard to SBEs, because of the lack of questions regarding context for OBEs (Table 5). Unless otherwise specified, for consistency, we decided a priori to further examine code co-occurrences only when such co-occurrences happened over five times in the sample. While keeping the five co-occurrence guideline in mind, we focused our summary of results on particularly notable conclusions drawn from this approach.

Of note, a five co-occurrence guideline could not be employed when examining relationships between *context* codes and other codes. This was because for *context* codes we were particularly interested in whether being at *home* versus *not home* (or *alone* versus *not alone*) during a recent SBE might influence which other codes emerged in the participant's description. As such, we focused our analytic approach on noting when codes were more

common in one category versus the other (e.g., is a participant more likely to report an *emotional need* being pursued if the episode is at *home* versus *not home*?). For this set of questions, we focused on frequencies in a given context that were disproportionate to the number of episodes in one context versus the other. More specifically, since an equal number of SBEs were reported to occur *alone* versus *not alone*, we focused on instances when a code appeared substantially more often in one of these context codes than the other. Since approximately five times as many SBEs occurred *home* as compared to *not home*, we noted instances in which frequencies of codes occurred in a substantially different ratio than 5:1.

As another analytic tool, we examined a joint display matrix in order to compare quantitative variables across *implied functionality* qualitative codes. The goal was to explore on a descriptive level how functionality codes pertaining to SBEs and/or OBEs corresponded to associated symptoms that were assessed quantitatively in the sample (i.e., eating disorder behaviors/symptoms, negative affect, and interpersonal difficulties). See Appendix E, which includes the joint display matrix for SBEs and OBEs. This analytic tool was not a central part of our analyses, but provided some quantitative information regarding *implied functionality* and associated symptoms.

Results

Descriptive statistics. Group differences in demographic information for each group (SBE-included, OBE-only, and non-LOC eating) are presented in Table 6. No significant group differences were found for race or ethnicity between the SBE-included, OBE-only, and non-LOC eating groups. On the other hand, significant group differences were found regarding age, such that the non-LOC eating sample was significantly older ($M_{\text{non-LOC eating}}$ = 38.57 years) than both the OBE-only ($M_{\text{OBE-only}}$ = 27.63 years) and the SBE-included groups ($M_{\text{SBE-included}}$ = 24.13

years); the OBE-only group was also significantly older than the SBE-included group. There was also an overall significant difference in gender across the three groups (i.e., SBE-included, OBE-only, and non-LOC eating). After completing a z-score cell comparison follow-up, we found that the SBE-included group had significantly more participants who identified as female (95.46%; *n* = 126) than the OBE-only group (84.44%; *n* = 114), but not significantly different than the non-LOC eating (90.23%; *n* = 120) group. The SBE-included group also had significantly fewer participants who identified as male (2.27%; *n* = 3) as compared to both the OBE-only (14.07%; *n* = 19) and non-LOC eating (9.77%; *n* = 13) groups. On the other hand, the groups did not significantly differ regarding the number of participants in each group who identified as "other" regarding gender.

Additionally, the SBE-included group had significantly more participants with a history of AN (17.42%; *n* = 23) than the OBE-only group (8.15%; *n* = 11). Regarding treatment history, the SBE-included (72.73%; *n* = 96) and OBE-only (67.41%; *n* = 91) groups did not significantly differ on number of participants who had received previous psychological treatment; however, the non-LOC eating group (36.09%; *n* = 48) included significantly fewer participants who had received previous psychological treatment. Also pertaining to treatment history, all three groups significantly differed on the number of participants who had received previous eating disorder treatment history, such that significantly more participants in the SBE-included (34.85%, *n* = 46) group had a history of receiving eating disorder treatment than the OBE-only group (16.30%, *n* = 22), which had more participants in this category than the non-LOC eating group (2.26%, *n* = 3).

Phenomenology. Results regarding phenomenology were divided into two sections: quantitative and qualitative findings.

Quantitative findings. Regarding reported time of day that the most recent SBE occurred, 12 SBEs (9.09%) occurred in the morning, 31 (23.48%) occurred in the afternoon, 70 (53.03%) occurred in the evening, and 19 (14.40%) occurred during nighttime/dawn. The average reported SBE length of time was 30.89 minutes (*SD* = 26.34 minutes, minimum = 2 minutes, maximum = 120 minutes). Regarding level of reported hunger prior to the SBE, 17 participants (13.08%) reported that they were "not hungry at all," 41 participants (31.54%) reported that they were "a little bit hungry," 38 participants (29.23%) reported that they were "moderately hungry," 24 participants (18.46%) reported that they were "very hungry," and 10 participants (7.69%) reported that they were "extremely hungry/famished." Regarding level of reported fullness following the SBE, 4 participants (3.10%) reported that they were "not full at all," 18 participants (13.95%) reported that they were "a little bit full," 23 participants (17.83%) reported that they were "moderately full," 28 participants (21.71%) reported that they were "very full," and 56 participants (43.41%) reported that they were "extremely full/stuffed." Of note, pre-SBE hunger was not significantly correlated with post-SBE fullness ($r = 0.10$, $p = .280$).

We were able to compare SBEs and OBEs using an episode comparison approach on some of the quantitative phenomenology-related questions that were asked of both SBEs and OBEs (i.e., number of episodes in the past three months and when the loss of control began). Average total number of SBEs reported over the past three months was 17.69 (*SD* = 21.87); whereas, average number of OBEs reported over the past three months was 9.88 (*SD* = 13.96). This difference in number of SBEs versus OBEs was statistically significant when factoring in within-person correlations between SBEs and OBEs using a mixed model (t (143.20) = -4.61, $p < .001$).

We also compared SBEs and OBEs on when loss of control began related to the episode, and found no significant differences using a Rao-Scott chi-square that adjusted for multiple observations within a person (Rao-scott chi square (2) = 0.33, p = .849). For both SBEs and OBEs, more than 92% of individuals reported that loss of control began either "at or near the start," or "midway through the episode." Fifty-one SBE (44.35%) and 72 OBE (47.37%) descriptions specified that loss of control began "at or near the start of" the episode, 55 SBE (47.83%) and 70 OBE (46.05%) descriptions specified that loss of control began "midway through" the episode, while only 9 SBE (7.83%) and 10 OBE (6.58%) descriptions specified that loss of control began "at or near the end" of the episode.

Qualitative findings. As mentioned in the data analytic plan, we focus on particularly notable patterns in the current summary of results. Therefore, not all potential patterns and co-occurrences are discussed in the present results section. The reader is directed to the tables and appendices for full information.

Regarding *episode descriptor* codes, in the sample, it appeared that OBEs were more likely to be coded as occurring in *secret* and in the *nighttime* than SBEs. OBEs were also more likely to be coded as being *intended/anticipated* than SBEs. In fact, none of the SBE descriptions were coded as *intended/anticipated* (see Table 2). This does not necessarily mean that no SBE was intended or anticipated, but does mean that participants did not mention an intentional quality to the SBE experience in open-ended descriptions, and, therefore, intentionality may be a less salient aspect of SBEs.

We also found some relevant patterns when examining *implied functionality* codes and their co-occurrences. First of all, it appeared that OBEs were more likely to be described as being pursued to fulfill an *emotional need* than SBEs (see Table 2). Relatedly, OBEs were more

likely to be described as involving *mixed emotions/feelings* than SBEs, which may suggest an emotion regulation function of OBEs allowing for the experience of some *positive emotions/feelings* close in time to *negative feelings/concerns*. The fact that this was not as often the case among SBEs was in line with our hypothesis that SBEs may be less likely to be pursued as emotion regulation strategies than OBEs.

That said, some SBEs (albeit not as commonly as OBEs) were described as meeting an *emotional need*. SBEs categorized in this way were also often coded with *interpersonal stressors* (e.g., caretaker stress, recent romantic relationship endings, conflicts with friends) (see Table 4). For example, one participant stated the following regarding a recent SBE that served an *emotional need* function in the context of an *interpersonal stressor*:

> I had a bad day and was feeling particularly stressed, this usually comes out through my eating habits - sometimes I forget to eat and others I eat too much. The previous episode I had pressures from school, universities, my home life - my mother is disabled and depressed. Once I started eating it felt like I feel better when I have something to distract myself so once I started I did not stop…Immediately prior my mum had passed out in the kitchen due to her neurological damage problems, I had been working on three coursework deadlines, student finance and had found out, that afternoon, that my boyfriend of a year and three months had been cheating on me with various people for at least six months.

While other stressors are present in this participant description, the role of the mother's physical illness and the romantic relationship distress were particularly salient, and representative of other participant descriptions of *emotional need* SBEs. Therefore, it could be that SBEs serving an emotional function may be sought out particularly in the context of interpersonal or social pressures.

Related to the interpersonal context of SBEs, it was also found that *others' influence/reassurance* was more commonly mentioned in the context of SBEs than OBEs (see Table 2). Participants described the role of interpersonal reassurance in the SBE experience, in

particular, in which romantic partners, friends, or family members reassured the participant that they had not eaten too much food (e.g., "i don't normally eat popcorn but the last time i ate 2 cups worth maybe a little more and my boyfriend said that was hardly nothing but i thought i overindulged"). Therefore, SBEs may also tend to coincide with interpersonal reassurance from others regarding episodes size, and, more broadly, SBEs may be particularly related to momentary interpersonal interactions and/or stressors.

Also regarding *implied functionality*, it appeared that in contrast to the *emotional need* function which was more commonly observed among OBEs, SBEs were more likely to be coded as *I should eat/need energy* than OBEs. This was even in the context of *dietary restriction* being observed to similar degrees among SBE and OBE qualitative responses (see Table 2). Of note, *dietary restriction* was coded in the context of more and less extreme dieting behaviors (i.e., fasting/extreme restriction and dieting were both coded as *dietary restriction*). It could be that SBEs are more related to extreme dietary restriction and starvation (suggested by our quantitative findings described below), which in turn may motivate someone to eat in order to meet a basic need (i.e., *I should eat/need energy* implied functionality); whereas, less extreme dieting may motivate a craving that results in a more *sensory positive* loss of control episode. Given the relatively small number of episodes coded with *I should eat/need energy*, more research is needed to see if this code emerges in other data sets, and, if so, how it might be related to dietary restriction severity.

While some SBEs were described as meeting a *sensory positive* function, this implied functionality code was more often observed among OBEs. It was notable that OBEs coded as *sensory positive* were more likely to be described in a nuanced way than SBEs in this category with more discrete emotion states and other facets of experience. More specifically, *sensory*

positive SBEs were likely to be coded as involving some *positive emotion/feelings*, *mixed feelings*, and *hunger*. On the other hand, *sensory positive* OBEs were described with the same codes as for SBEs, as well as the following other codes: *busy with activity*, *nothing happening*, *interpersonal stressors*, *boredom*, *lack of perceived fullness*, *too full*, *fast,* and *secret.* As such participants describing *sensory positive* OBEs seemed to have a clearer way of verbalizing detailed and sensory aspects of their experiences (see Table 4).

Additionally, it seemed that OBEs, for some participants, might have resulted from a seeking of sensation and activity, perhaps in the context of *boredom*. Such a hypothesis is more difficult to propose with regard to SBEs given the lack of co-occurrences of codes among *sensory positive* SBEs. Also pertaining to the *sensory positive* code, mixed method analyses suggested that, in the current sample, this particular subtype of loss of control eating (regardless of size) may have indicated a higher risk of engagement in vomiting episodes than the other *implied functionality* codes on a descriptive level (see joint display matrix in Appendix E). Additionally, the implied functionality codes of *emotional need* and *sensory positive* co-occurred among 11 participants reporting OBEs, while these codes did not co-occur among SBEs. As such, *sensory positive* OBEs appeared to also often be pursued as a means of modulating affect; whereas, this intersection was not the case for SBEs.

Regarding context codes, we found that participants were more likely to report *negative feelings/concerns* if they were *alone* during the SBE than if they were *with others*. More specifically, participants were more likely to report the following feelings when *alone* than *with others*: *stress* and *sad/depressed*. The presence of others may have facilitated seeking of reassurance (as mentioned above), which, in turn, may have decreased negative emotions in that moment. On the other hand, more participants reported feelings of *sickness/discomfort* if they

were *with others* as compared to if they were *alone* during the SBE. This might suggest that being alone may be a risk factor for experiencing distress with regard to SBEs; whereas, being with others may be more related to physical responses (i.e., sickness/discomfort) than emotional responses (see Table 5).

Also regarding *context* codes, we found that participants were more likely to report *negative feelings/concerns*, *hungry*, *not intended*, *sensory positive*, *no cause theorized*, and *tasted good/pleasurable* codes if the SBE occurred at *home* as compared to *not home*. This suggests that being at *home* may be a particularly risky environment for distress-inducing SBEs, not to mention seeking of *sensory positive* eating experiences in an unintended way.

Regarding *feelings* codes, in the sample, it appeared that OBEs were more likely to be described as involving *mixed emotions/feelings*, *negative feelings/concerns*, and *positive emotions/feelings* than SBEs. In particular, OBEs appeared to coincide with experiences of the following emotions/feelings/concerns more than SBEs in the sample: *stressed*, *sad/depressed*, *tasted good/pleasurable*, *comforting*, *boredom*, *sickness/discomfort*, and *lack of perceived fullness*. SBEs, on the other hand, appeared to coincide with more experiences of *guilt/shame* and feeling *not hungry* than OBEs.

On the broadest level, therefore, SBE descriptions had fewer code co-occurrences as compared to OBE descriptions (see Tables 3 and 4). This suggested that OBE descriptions were richer in terms of ways in which participants described related concepts within their OBE experiences. For example, a wider range of discrete emotions were used to describe OBE experiences, and these emotions were found to co-occur with other aspects of experience, on the whole, more than within SBE descriptions. The comparative lack of co-occurrences between these codes among descriptions of SBEs may suggest a less nuanced and verbalized experience

of SBEs that does not allow for individuals to describe connections between different aspects of the SBE process. Related to this relative lack of descriptive richness among SBEs, SBEs were more likely to be described such that no causal theory was offered (*no cause* theorized) than OBEs (see Table 4). This further corroborated the idea that those with SBEs may have difficulty articulating nuanced aspects of the SBE psychological experience.

Intentionality ratings. We compared ratings of intentionality between SBEs and OBEs, factoring in within-person correlations of SBEs and OBEs using a mixed model, and found that participants rated SBEs (M_{SBE} = 1.69, *SD* = 0.57) as significantly less "planned" than OBEs (M_{OBE} = 1.86, *SD* = 0.67) (*t* (215.38) = 2.27, *p* = .024), and significantly less "intentional" (M_{SBE} = 2.41, *SD* = 1.65) than OBEs (M_{OBE} = 2.98, *SD* = 1.94) (*t* (260.10) = 2.77, *p* = .006). On the other hand, there were no significant differences between SBEs and OBEs in ratings of how much they could be "anticipated" or how "surprised" participants were by episode occurrence.

Given that no prior measure has been developed to assess the construct of intentionality in loss of control eating, we completed a preliminary analysis of internal consistency with the items mentioned above. We found that Cronbach's alpha of the z-scores of the four intentionality items for SBEs and OBEs (0.69 and 0.74, respectively), were somewhat low, but in the "acceptable" range for preliminary/basic research according to Nunnally (1967).

Momentary emotion. Few statistically significant differences in momentary emotion ratings were observed when comparing SBEs to OBEs using a mixed model that factored in within-person correlations between episodes. There was, however, a significant difference in momentary ratings of sadness with participants reporting higher levels of sadness during a recent SBE (M_{SBE} = 4.20, *SD* = 1.74) than a recent OBE (M_{OBE} = 3.85, *SD* = 1.83) (*t* (110.52) = -2.02, *p* = .046). This significant difference became marginally significant (*p* = .073) when controlling

for average number of total episodes (i.e., average of total SBEs and OBEs). See Figure 2 for average ratings of each momentary emotion during a recent SBE versus OBE. It is apparent from Figure 2 that during both SBEs and OBEs, participants reported more negative emotions than positive emotions.

Associated features. See Table 7 for a summary of all group differences (SBE-included, OBE-only, non-LOC eating) regarding associated features. Of note, all significant MANOVA finding were followed up with individual ANOVA tests.

Eating disorder symptoms and body shame. There was a significant group difference in number of episodes of eating disorder behaviors over the prior 28 days, F (8, 654) = 9.64, Wilks' Lambda = 0.80, $p < .001$. The SBE-included group had higher numbers of vomiting, laxative misuse, and hard exercise episodes over the prior 28 days than both the OBE-only and non-LOC eating groups. On the other hand, the OBE-only and non-LOC eating groups did not significantly differ on vomiting, laxative misuse, or hard exercise. Regarding number of diuretic misuse episodes over the prior 28 days, the SBE-included and OBE-only groups did not significantly differ; whereas, the SBE-included group was higher on diuretic misuse episodes than the non-LOC eating group (which did not differ from the OBE-only group).

Groups were also significantly different on dietary restriction (F (2, 330) = 37.18, $p <$ .001) and body shame (F (2, 334) = 89.39, $p < .001$) with the SBE-included group reporting higher dietary restriction and body shame than the OBE-only group, which in turn reported higher dietary restriction than the non-LOC eating group.

Negative affect. There was a significant group difference in negative affect, F (6, 662) = 12.42, Wilks' Lambda = 0.81, $p < .001$. The SBE-included group was found to have higher levels of anxiety and depression symptoms than the OBE-only group, which in turn reported

higher depression and anxiety than the non-LOC eating group. See Table 7 for a summary of findings regarding negative affect.

Interpersonal difficulties. There was a significant group difference in interpersonal difficulties, $F(4,664) = 22.28$, Wilks' Lambda = 0.78, $p < .001$. Groups were significantly different on loneliness (F (2, 334) = 47.57, $p < .001$) and perceived social support (F (2, 333) = 20.82, $p < .001$) with the SBE-included and OBE-only groups not significantly differing, but both groups significantly differing from the non-LOC eating group in terms of greater levels of loneliness and less perceived social support (see Table 7).

Perceptions of hypothetical eating experiences. There was a significant group difference in perceptions of imagined carbohydrate eating experiences, F (6, 656) = 29.59, Wilks' Lambda = 0.62, $p < .001$. The SBE-included group reported a higher likelihood of interpreting the eating experience as "out of control," "too much food," and "bad/unhealthy" than the OBE-only group, which in turn reported a higher likelihood of these negative interpretations than the non-LOC eating group. See Table 7 for a summary of findings regarding carbohydrate imagined eating experience perception.

There was also a significant group difference in perceptions of imagined fruit/vegetable eating experiences, F (6, 656) = 16.08, Wilks' Lambda = 0.76, $p < .001$. A different pattern of group differences emerged as compared to the carbohydrate eating experience perception: The SBE-included group reported a higher likelihood of interpreting the eating experience as "out of control," "too much food," and "bad/unhealthy" than the OBE-only and non-LOC eating groups. On the other hand, the OBE-only group did not significantly differ from the non-LOC eating group on these fruit/vegetable eating experience interpretations. See Table 7 for a summary of findings regarding fruit/vegetable imagined eating experience perception.

All group differences between SBE-included and OBE-only groups remained even after controlling for average number of episodes (total SBEs and OBEs), thus, for parsimony, we reported MANOVA findings without the inclusion of average number of episodes as a covariate.

Discussion

Regarding the descriptive phenomenology of SBEs, we found that SBEs were more likely to occur in the evening hours and that their average length in time was approximately a half an hour with considerable variability in duration. Most (55.38%) reported that they were at least moderately hungry prior to the SBE. Additionally, most (82.95%) reported feeling at least moderately full after the SBE with almost half reporting that they felt extremely full. Participants tended to report significantly less intentionality regarding a recent SBE than a recent OBE. Given that our measurement of intentionality was novel, replication is needed, thus we tested the same items that we used regarding intentionality in Study 2.

Our findings also suggested that SBEs were not described with as rich of descriptions as OBEs, particularly as evidenced by the relative lack of co-occurrences among codes within SBE descriptions. As such, it appeared that participants had more of an established understanding of how different aspects of their experiences during OBEs were related (e.g., specific emotions and *associated activities/behaviors* with OBEs), and how OBEs might function for the person (e.g., by meeting a *sensory positive* need). Additionally, building upon our quantitative finding regarding the relative lack of intentionality of SBEs as compared to OBEs, participants never described their SBEs as intended or planned in open-ended qualitative descriptions. This unintended quality was associated with negative feelings and concerns for both SBEs and OBEs. Therefore, the unintended quality of loss of control eating might be particularly distressing, and particularly characteristic of SBEs. As will be discussed in more depth in the broader discussion

section of this report, the unintended and less easily articulated qualities of SBEs may be targets of intervention in the context of treatment.

Of note, the increased number of co-occurrences among OBE descriptions was notable given that there were more qualitative questions asked regarding SBEs than OBEs, thus more opportunities for participants to describe SBE experiences in an in-depth way than OBEs. That said, there were more OBEs than SBEs (132 SBEs versus 176 OBEs) in the sample; therefore, there were also more OBES, and, as a consequence, more opportunities for code co-occurrences.

It was also noted from qualitative data that OBEs were more likely to be described as meeting an *emotional need* than SBEs, and that OBEs tended to coincide with mixtures of positive and negative feelings states more than SBEs. As such, our qualitative data align with our hypothesis that SBEs may be less likely to serve as emotion regulation techniques than OBEs.

Regarding momentary emotions experienced during a recent SBE versus OBE, we found no significant quantitative differences except in the intensity of sadness, which suggests that, in general, SBEs and OBEs are equally related to psychological distress during the eating episode. This aligns with Witt (2014), which found no differences in trajectories of negative affect between SBEs and OBEs across their occurrence in an EMA study. Significantly higher levels of sadness were reported during SBEs than OBEs; however, this difference in sadness became marginally significant after controlling for average total number of episodes. This suggests that increased sadness during loss of control eating episodes might be more related to total number of episodes (regardless of episode type), a possible indicator of overall higher severity in symptomatology, than type of loss of control episode.

Also pertaining to emotions, drawing upon the qualitative analyses, it appeared that OBE descriptions were more likely to be coded as involving (not specified whether before, during, or

after) *sad/depressed*, *stress*, *tasted good/pleasurable*, and *comforting* than SBEs. SBEs, on the other hand, were more likely to be coded as coinciding with *guilt/shame* than OBEs. As such, there appeared to be some differences in the emotional experiences of SBEs versus OBEs (at least in the sample) when participants were asked to describe their experiences in an open-ended way, but fewer differences were observed quantitatively when participants were asked to rate emotions experienced during the episode.

Regarding associated disordered eating symptomatology and body shame, those who reported at least one recent SBE in the prior three months (regardless of whether OBEs were also present) indicated significantly higher rates of disordered eating symptomatology (i.e., dietary restriction, as well as number of vomiting, laxative misuse, and hard exercise episodes in the past 28 days) and greater body shame than OBE-only and non-LOC eating individuals. The quantitative finding that dietary restriction was higher in the SBE-included group than the other groups was in line with the existence of the implied functionality code, *I should eat/need energy*, which was particularly observed among SBEs, and associated with qualitative reports of dietary restriction. Both findings, in turn, align with previous work that has found associations between SBEs and dietary restraint (Fitzsimmons-Craft et al., 2014). Those with only OBEs reported significantly higher levels of dietary restriction and body shame than non-LOC eating individuals, but did not significantly differ from non-LOC eating individuals on any other disordered eating symptomatology. These findings suggest that the presence of SBEs among the general population may be more indicative of disordered eating symptomatology than OBEs.

Regarding other associated features, the SBE-included group reported significantly higher anxiety and depression symptoms than both the OBE-only and non-LOC eating groups. The OBE-only group also reported significantly higher anxiety and depression than the non-LOC

eating group. These findings suggested that while SBEs may indicate more severe levels of negative affect, OBEs on their own may also indicate disturbance in negative affect, albeit to a lesser extent than SBEs, which is in line with previous work (i.e., Brownstone et al., 2013; Fitzsimmons-Craft et al., 2014).

It appeared that the SBE-included and OBE-only groups did not significantly differ in their reporting of interpersonal difficulties (i.e., loneliness and perceived social support), but both groups reported higher levels of difficulties in these areas than the non-LOC eating group. This, in contrast to Brownstone et al. (2013), suggests that SBEs may not indicate greater interpersonal difficulties than OBEs, and that, rather, either form of loss of control eating may be accompanied by loneliness and lack of perceived social support. That said, our qualitative findings suggest that individuals were more likely to mention *others' influence/reassurance* with respect to SBEs than OBEs, not to mention, *emotional need* SBEs often were described as co-occurring with *interpersonal stressors*. Therefore, there may be specific aspects of interpersonal stress and/or difficulties that relate to SBEs (e.g., reassurance) that are in need of further study.

Regarding perceptions of imagined eating experiences, the SBE-included group reported significantly higher likelihood of perceiving both carbohydrate and fruit/vegetable consumption experiences as "out of control," "too much food," and "bad/unhealthy" as compared to both the OBE-only and non-LOC eating groups. Additionally, the OBE-only group reported significantly higher likelihood of interpreting carbohydrate consumption experiences as "out of control," "too much food," and "bad/unhealthy" as compared to the non-LOC eating group; however, the OBE-only group did not differ from the non-LOC eating group on these interpretations with regard to fruit/vegetable consumption. As such, it appears that individuals with SBEs may experience a more global tendency to experience eating as out of control and negative regardless of type of

food consumed compared to individuals with only OBEs. As a result, those with SBEs may tend to experience loss of control and negative evaluations of eating experiences in a wider range of eating contexts than those with only OBEs.

All group differences between SBE-included and OBE-only groups remained even after controlling for average number of episodes (i.e., average of number of SBEs and OBEs). Therefore, we can more confidently conclude that there is something about SBEs specifically that results in the association of those types of loss of control eating episodes with the variables under consideration in the current study, and that the associations found are not merely markers of higher numbers of loss of control episodes and therefore higher symptom severity. A future direction would involve looking at SBE-only versus SBE and OBE versus OBE-only groups to even more rigorously investigate whether perhaps the combination of both types of loss of control eating is indicative of particularly high symptomatology. Our sample sizes in each of these groups were substantially different; therefore, we focused on SBE-included versus OBE-only (and non-LOC eating) group differences in the current project; however, for the reader's reference, Appendix F provides descriptive information regarding associated symptoms among SBE-only, SBE and OBE, SBE and other, and OBE-only groups not further discussed in the current report.

Conclusions

Study 1 allowed for a mixed method analysis of SBEs (and OBEs) in a broad range of domains (i.e., phenomenology, momentary emotions, and associated features), as well as a comparison of SBE-included and OBE-only groups to non-LOC eating groups. In the following two studies (Studies 2 and 3), we aimed to complete more focal studies that would allow for in-depth explorations of SBE phenomenology. Study 2 was designed as a quantitative follow-up to

Study 1 that gather quantitative information regarding motivations behind eating (based upon the unfolding of the qualitative *implied functionality* codes in Study 1), momentary emotions experienced before versus after a recent SBE, as well as other associated features pertaining to emotion and cognition (e.g., emotion regulation and dissociation). Study 3 was designed as an entirely qualitative follow-up to Study 1 by means of a telephone qualitative interview focusing on the experience of a recent SBE, and additionally examined how a participant might experience several hypothetical and imagined eating experiences.

CHAPTER 3: STUDY 2

Method

Participants. Participants included 429 individuals who reported having experienced at least one loss of control eating episode in the prior three months. Of these, 172 individuals reported having engaged in an SBE (with or without OBEs), while 257 individuals reported having engaged in only OBEs.

In order to verify the size of self-reported SBEs and OBEs, participants provided an example of a recent SBE and/or OBE as part of the survey if they endorsed the given episode type. A subset of participants reported amounts for a given episode type that did not meet size criteria. For more information regarding such episodes, see Study 1. These binge examples did not fit clearly into the episode type that the participant identified, and thus were categorized as "other." Additionally, some participants endorsed having had an SBE (or OBE) in the prior three months, but did not provide an example or did not provide enough detail to determine whether the episode met size criteria; these episodes were also categorized as "other" for the relevant binge.

Given that some participants responded to SBE and OBE questions in unexpected ways, the following groups emerged that were not easily classified: 1. Those with "other" under SBE and no reported OBEs (SBE-other Only; $n = 6$), 2. Those with "other" under OBE and no reported SBEs (OBE-other Only; $n = 148$), 3. Those with "other" for both binge types (Other; $n = 83$), 4. Those with "other" for SBE and an example episode that met criteria for OBE (OBE and Other; $n = 8$), and 5. Those with "other" for OBE and an example episode that met criteria

for SBE (SBE and Other; *n* = 41). There were also individuals who provided example episodes that met size criteria, such that the following more expected groups emerged: 1. Those with only SBEs (*n* = 26), 2. Those with both SBEs and OBEs (*n* = 8), and 3. Those with only OBEs (*n* = 109). See Table 1 for a summary of each of these groups that emerged in the recruitment process. The same groups emerged in the current study as Study 1, except that we did not recruit non-LOC eating individuals for Study 2.

Given that some analyses in the current paper focused on the presence versus absence of SBEs (by comparing those with SBEs to those with only OBEs; group difference analyses) and other analyses focused on momentary differences between before and after a recent SBE (e.g., comparing emotion-ratings before versus after a recent SBE), we excluded different subgroups depending upon which analyses were being completed. These inclusions/exclusions will be specified along with the results from each unique analysis. See Figure 3 for a depiction of the participant groups.

Of note, the sizes of participants' example loss of control episodes were coded based upon EDE size criteria (Fairburn, 1997) by L.M. Brownstone, and 20% of the examples were coded separately by a post-baccalaureate research assistant with one and a half years of eating disorder assessment experience. Percent agreement between the two coders for SBE and OBE example amounts was 90.14%. For discrepancies, L.M. Brownstone looked closely, and determined which codes were most representative. L.M. Brownstone sought a third opinion from a fellow Ph.D. student specializing in eating disorder research for particularly questionable discrepancies to allow for final consensus.

Recruitment. We recruited individuals who reported SBEs using the same snowball method as for Study 1. See Study 1 for further information about the snowball recruitment

method. Also, see Appendix A for examples of the social media pages on which our research team posted Study 2 recruitment information.

Procedure. Given that the snowball recruitment announcement called for those with loss of control eating, participants reported having SBEs and/or OBEs. Those who reported both SBEs and OBEs first answered the in-depth SBE questions, followed by a briefer set of questions regarding the OBE experience, as well as questions regarding broader psychological functioning. Those who reported OBEs without SBEs were immediately skipped to the questions about their most recent OBE, followed by questions regarding broader psychological functioning. Individuals who reported only SBEs were skipped to questions regarding broader psychological functioning after responding to in-depth questions related to SBEs. Those who did not endorse any loss of control eating were skipped to questions about broad psychological functioning, and not included in the present analyses due to the nature of the research questions for Study 2. A chart depicting the skip logic of the survey is included in Appendix B. The inclusive nature of this survey allowed for a focus on SBEs, while still collecting brief information on other loss of control eating experiences.

Regarding compensation, participants were given an opportunity to include their name in a drawing, which offered four chances of receiving a $25 gift card to Amazon.com.

Measures. The online survey began with demographic questions regarding gender, racial identity and ethnic identity, followed by questions about psychological treatment history (i.e., whether a person had sought mental health services, and, if applicable, services for which psychological difficulty), the country in which the participant currently resides (and, if United States, which state), and whether or not the person had participated in a previous online study about loss of control eating in recent months (i.e., Study 1).

Weight and weight suppression. Participants were asked to report current weight and height, highest non-pregnant weight and height, as well as questions to determine history of AN. Weight suppression was defined as the difference between participants' self-reported highest non-pregnant Body Mass Index (BMI) and current BMI. This definition was based upon Butryn, Lowe, Safer, and Agras (2006), which used a similar definition of weight suppression. One difference between the current study and Butryn et al.'s (2006) definition was that the current study relied entirely on self-reported weight, whereas, Butryn et al. compared measured current weight to self-reported highest weight. Additionally, the current study used BMI to calculate weight suppression. Regarding the validity of self-reported past weight (i.e. highest non-pregnant weight), previous work has found adequate agreement between self-reported weights from 25 years earlier and measured weight from that previous time (Tamakoshi et al., 2003). As such, there is a precedent from which to assume that participant self-reported highest weight may be valid and somewhat correlated to those actual highest weights.

Phenomenology. If participants reported recent SBEs, they were asked to provide an example of a recent episode, as well as how many SBEs on average they had experienced per week over the prior three months (followed by brief questions regarding OBEs, if applicable). Those who did not specifically endorse SBEs, but who did report experiences of OBEs were skipped to a question in which they provided an example episode of an OBE, and also indicated how many OBEs on average they had experienced per week over the prior three months.

Intentionality of SBEs. Participants were asked a set of quantitative questions regarding the intentionality of their most recent SBE. We asked the same questions regarding intentionality as Study 1, including how intentional the episode was, how surprised the participant was by the episode, and to what extent the episode could have been anticipated, with each item rated on a 0-

6 Likert scale. We also attempted to assess intentionality with a question regarding to what extent the episode was planned in advance with the following three options: "Not planned at all; I was surprised that I felt a sense of loss of control while I was eating," "Not so much planned as much as something I could anticipate in advance; I was not surprised that it happened," and "I planned for this loss of control episode prior to it occurring; that is, prior to the eating episode, my intent was to experience some loss of control while eating."

Given that these four items were shown to have adequate internal consistency in Study 1 according to preliminary research standards (Nunnally, 1967), and based upon adequate item-total correlations of the z-scores of the items in the current study ranging from 0.59 to 0.79, all of which were statistically significant (Nunnally & Bernstein, 1994), we summed the z-scores of the four intentionality items to create a total intentionality score (after reverse coding the surprise-related item). Of note, the Cronbach's alpha for the four intentionality items in the current study was 0.62, which is only considered adequate in preliminary and exploratory research contexts (Nunnally, 1967); therefore, all findings related to intentionality must be interpreted with caution, as further psychometric validation and scale development is needed regarding the construct of intentionality in loss of control eating.

Momentary emotion. Momentary emotions experienced before and after the most recent SBE were assessed with the mDES (Fredrickson et al., 2003). See the Study 1 method for a full description of the mDES. Of note, we added the same descriptors of feeling states particularly relevant to eating experiences as Study 1, which included "gross," "zoned out", "sick", and "uncomfortable." We also added three additional descriptors based upon qualitative "other" responses in Study 1, which included "sleepy/tired," "bored," and "comforted." We chose to focus on emotions felt only before and after the most recent episode and not during in order to

minimize participant burden, and build upon information gleaned from Study 1 regarding emotions felt during loss of control eating episodes. In addition to these specific descriptors, we also asked participants to separately report how "unpleasant" and how "energetic" they felt before and after the most recent SBE (response scale from 0 to 5) in an effort to provide more broad and diffuse descriptors of affect that may have been more easily determined for individuals who struggled with difficulties describing emotions.

Associated features. Findings regarding associated features were divided into several subcategories as specified below: other disordered eating symptoms and behaviors, eating motivations, as well as cognitive and affective processing.

Other disordered eating symptoms and behaviors. In order to assess other disordered eating symptoms and behaviors, we used the EDE-Q (Fairburn & Beglin, 1994), as well as the restrained eating subscale of the Dutch Eating Behavior Questionnaire (DEBQ; Van Strien, Frijters, Bergers, & Defares, 1986).

The EDE-Q (Fairburn & Beglin, 1994) is a 36-item self-report survey adapted from the in-person EDE interview. See the Study 1 method section for a full description of the EDE-Q. In order to assess eating disorder behaviors, we used items from the EDE-Q that assess the number of episodes over the prior month of the following behaviors: vomiting, laxative misuse, diuretic misuse, and hard exercise. We also included an item from the EDE-Q that asked participants to specify the number of days in the past 28 days that they had deliberately engaged in dietary restriction.

The DEBQ is a 33-item measure using a 5-point scale (1 = *never* to 5 = *very often*) that assesses three types of eating: restrained, emotional, and external (Van Strien et al., 1986). In the current study, we included all ten items within the restrained eating subscale. The restrained

eating subscale has been found to have adequate internal reliability with a Cronbach's alpha of 0.95 (Van Strien et al., 1986). Construct validity has also been established based upon significantly elevated scores on the restrained eating subscale among those with AN and BN diagnoses as compared to healthy controls (Wardle, 1987). In the current sample, the coefficient alpha for the restrained eating subscale of the DEBQ was 0.89.

Eating motivations. In order to assess eating motivations, we selected items based upon thematic content and item-total correlations from the Motivations To Eat Scale (9 items; MTES; Jackson, Cooper, Mintz, & Albino, 2003). The MTES is a 20-item measure of psychological motivations behind eating, which uses a 4-point scale (1 = *never* to 4 = *always*) and yields four scales (Jackson et al., 2003). The *coping* scale refers to a stress or emotionally motivated reason for eating, the *social* scale refers to a social event motivated reason for eating (e.g., being in a social situation in which others are eating), the *compliance* scale refers to an interpersonally directed motivation to eat (e.g., someone stating that you should eat), and the *pleasure* scale refers to a hedonic motivation to eat (i.e., because the food feels or tastes good). The MTES scales have been found to have good internal reliability as indicated by alphas between 0.82 and 0.88 (Jackson et al., 2003). Validity from each scale has also been demonstrated based upon concordance with established measures of similar domains as the MTES. For example, the pleasure scale of the MTES was correlated with the External Eating subscale of the DEBQ, and the coping scale was correlated with the Emotional Eating subscale of the DEBQ (Jackson et al., 2003).

Of the nine items selected from the MTES, two to three items were selected from each scale based upon factor loading and thematic content of the item (Jackson et al., 2003). More specifically, two items were each selected from the coping, social, and compliance scales, while

three items were selected from the pleasure scale. In the current sample, the correlations between the two items selected from the coping, social, and compliance scales were 0.75 ($p < .001$), 0.85 ($p < .001$), and 0.79 ($p < .001$), respectively. The coefficient alpha for the three items chosen from the pleasure scale of the MTES in the current sample was 0.83.

Cognitive and affective processing. In order to assess cognitive and affective processing, we selected items based upon thematic content and item-total correlations from the Dissociative Experiences Scale (five items; DES-II; Bernstein & Putnam, 1986) and the Difficulties with Emotion Regulation Scale (12 items; DERS; Gratz & Roemer, 2004).

Given prior evidence that those with SBEs have elevated cognitive distortion (Brownstone et al., 2013), we further explored a related construct, dissociation, in the current study. In order to assess the extent to which participants experience dissociative symptoms in their day-to-day lives, we used five items from the DES-II (Bernstein & Putnam, 1986), which is a 28-item self-report survey in which participants are asked to indicate the percentage of the time in which a given dissociative experience has happened in increments of 10 percentage points from 0% to 100% of their day-to-day lives. An example item from this measure is: "Some people sometimes feel as if they are looking at the world through a fog so that people or objects appear far away or unclear." Test-retest reliability for the DES-II is 0.84, and scores appear to be related to more dissociative diagnostic presentations (Bernstein & Putnam, 1986; Frischholtz, Braun, Sachs, & Hopkins, 1990). In the current sample, the coefficient alpha for the selected items from the DES-II was 0.86.

Given the preliminary trend-level evidence that SBEs are related to affect lability (Brownstone et al., 2013), we further explored possible relations between SBEs and emotion regulation by means of twelve items selected from the DERS (Gratz & Roemer, 2004), which is

a 36-item self-report measure. The DERS asks participants to indicate how often each item applies with responses ranging from 1 to 5 (1 = *almost never (0–10%)*, 2 = *sometimes (11–35%)*, 3 = *about half the time (36–65%)*, 4 = *most of the time (66–90%)*, and 5 = *almost always (91–100%)*). The DERS includes six subscales: non-acceptance of emotional responses (nonacceptance), difficulties engaging in goal directed behavior (goals), impulse control difficulties (impulse), emotional awareness (awareness), limited access to emotion regulation strategies (strategies), and lack of emotional clarity (clarity). The DERS has been found to have good internal consistency with an alpha coefficient of 0.93 for the overall scale, as well as alpha coefficients over 0.80 for each of the subscales (Gratz & Roemer, 2004). Construct validity has also been demonstrated based upon correlations with other measures of emotion regulation, such as the Negative Mood Regulation Scale (Catanzaro & Mearns, 1990). In the current sample, the correlations between the two items selected from each of the nonacceptance, goals, impulse, awareness, strategies, and clarity subscales were 0.69, 0.89, 0.70, 0.70, 0.79, and 0.68, respectively (all p-values < .001).

Data analytic plan. There were two broad categories of analyses in Study 2: (1) group comparisons between those with SBEs (n = 75) and those with only OBEs (n = 109), and (2) within-episode comparisons of emotions experienced before versus after a recent SBE.

Group difference analyses involved those who had reported some SBE occurrence over the prior three months (i.e., "SBE-included" group, which included the following groups: SBE-only, SBE and OBE, as well as SBE and other) and those with only OBE occurrence (i.e., an "OBE-only" group). See Table 1 for a review of these groups. We compared these groups using multivariate analyses of variance (MANOVA) for each of the following conceptual groupings of dependent variables: eating disorder behaviors (number of vomiting, laxative misuse, diuretic

misuse, and hard exercise episodes), measures of dietary restraint (i.e., number of days of dietary restriction in the past 28 days, restrained eating subscale), scales of the MTES (motivations for eating), and subscales of the DERS (emotion regulation). Significant multivariate findings were followed up with univariate analyses of variance (ANOVA) for each specific dependent variable of interest, as well as, where applicable, post-hoc Tukey tests. Dissociative experience was investigated using an ANOVA. All significant ANOVAs were followed up with Tukey post-hoc tests. While we focused group level analyses on SBE-included and OBE-only groups, for the reader's reference, we present descriptive information regarding more specific loss of control eating groups (i.e., SBE-only, SBE and OBE, SBE and other, OBE-only, and OBE and other) in Appendix G.

We also further characterized these groups by examining group differences on demographic variables (i.e., age, gender, ethnicity, race), treatment history, and history of AN. For categorical variables, we used a chi-square approach to determine if groups statistically differed. Omnibus chi-squares were followed up with cell comparisons using a z-score comparison approach with Bonferroni correction, as proposed by Goodman (1969) and, more recently, as suggested by Scharpe (2015). This cell comparison approach allowed us to probe significant omnibus chi-square tests to investigate how groups differed.

Of note, as was done in Study 1, given the possibility that those with different types of loss of control eating might differ on frequency of loss of control episodes (e.g., those with SBEs may tend to engage in more episodes of loss of control than those with OBEs), and that these differences may be related to overall severity levels of disordered eating or other psychological difficulties, we entered the average number of SBEs and OBEs (i.e., average of SBEs and OBEs together) as a covariate for each group-level and episode-level analysis. Since adding this

covariate did not affect our findings, for parsimony, we report results from the MANOVAs without the covariate throughout our results.

Given the repeated measures design related to momentary emotion in which we had multiple data points collected at two time points per person (i.e., before and after the recent SBE), we used a 2-level hierarchical model in which Level 1 was episode-level data (e.g., the rating of emotion reported at each time point), and Level 2 was person-level data (e.g., which participant corresponds to the emotion ratings). Additionally, we entered level of intentionality as a trait characteristic into the model in order to investigate whether it influenced the progression of *unpleasantness* ratings surrounding the recent SBE.

Results

Descriptive statistics. Group differences in demographic information for each group (SBE-included, OBE-only) are presented in Table 8. No significant group differences were found for age, ethnicity, race, history of AN, psychological treatment history, or eating disorder treatment history between the SBE-included and OBE-only groups. On the other hand, there was a significant overall group difference with regard to gender (Pearson chi-square = 8.48, p = .014). Using a z-score comparison approach with Bonferroni adjustment, we found that while there was no significant difference in the number of females in the SBE-included (n = 71) versus OBE-only (n = 91) groups, there was a significant difference in number of males, such that there were significantly more males in the OBE-only group (n = 14) than in the SBE-included group (n = 2). Of note, two individuals in the SBE-included identified as "other" regarding gender, while no individuals identified in this way in the OBE-only group, and this difference was not statistically significant.

Average number of SBEs per week over past three months was 3.38 (*SD* = 3.96), while average number of OBEs per week over past three months was 3.11 (*SD* = 5.97). This difference in number of SBEs versus OBEs was not statistically significant when factoring in within-person correlations between SBEs and OBEs using a mixed model (t (21.93) = -1.68, p = .107).

Regarding current BMI, we found that the SBE-included group reported significantly lower self-reported current BMI ($M_{\text{SBE-included}}$ = 26.04 kg/m^2, *SD* = 1.52) than the OBE-only group ($M_{\text{OBE-only}}$ = 31.69 kg/m^2, *SD* = 1.48), F(1, 75) = 7.09, p = .009. The two groups did not, however, significantly differ on weight suppression (difference in BMI between highest non-pregnancy BMI and current BMI) with the SBE-included group reporting similar weight suppression ($M_{\text{SBE-included}}$ = 4.22 kg/m^2, *SD* = 0.64) as the OBE-only group ($M_{\text{OBE-only}}$ = 2.88 kg/m^2, *SD* = 0.63), F(1, 75) = 2.20, p = .142.

Of note, the majority of participants included in analyses in Study 2 did *not* report having also participated in a previous similar study about loss of control in the prior 6 months (i.e., most likely Study 1) (n = 151; 93.79% of the sample who answered this question). The majority of participants reported currently residing in the United States (n = 170; 92.39% of the sample who answered this question). Of these individuals, the majority of participants also reported that they currently resided in North Carolina (n = 111; 60.33% of the sample who answered this question).

Momentary emotion. See Table 9 for a full summary of momentary findings surrounding SBEs. There were many statistically significant differences in emotion intensity ratings before versus after a recent SBE. Participants reported significant increases in unpleasantness before versus after, factoring in within-person correlations across time, t (68.47) = -9.84, p < .001. Negative emotions/feelings that showed significant increases across time were angry, sad, disgust, hatred, embarrassed, guilt, shame, uncomfortable, gross, and sick.

Additionally, boredom was reported to significantly decrease after the SBE. Positive emotions that showed significant decreases across time were interested, hopeful, and proud, which, surprisingly, combined with significant increases in comfort. Of note, we set the alpha level to .00178 based upon a Bonferroni correction to account for increased type I error as a result of performing multiple group comparisons (i.e., alpha of .05 divided by 28, because we performed 28 tests).

Momentary moderator analyses. Using a mixed model, we also found a statistically significant moderator effect of total intentionality score on unpleasantness ratings before versus after the recent SBE within each person, t (96.12) = -3.10, p = .003. Figure 4 depicts changes in unpleasantness rating across time depending upon whether a person reported low, medium, or high intentionality (low and high intentionality defined as 1 standard deviation from the mean). Less intentional SBEs were marked by a slightly larger change from before to after (i.e., feeling better than the other groups before the SBE, and worse than the other groups after the episode). All three groups had the same pattern of change in unpleasantness (i.e., from less to more unpleasant) across the episode, such that there were significant increases in unpleasantness ratings across time at low intentionality, (t(94.37) = 9.59, p < .001), medium intentionality (t(95.92) = 10.34, p < .001), and high intentionality (t(97.63) = 26.13, p < .001).

Associated features. See Table 10 for a summary of all group differences regarding associated features. All significant MANOVA findings were followed up with individual ANOVA tests.

Other disordered eating symptoms and behaviors. Using a MANOVA analytic method with each eating disorder behavior entered into the model together (i.e., vomiting, laxative misuse, diuretic misuse, and hard exercise frequencies), there was not a significant group

difference in number of episodes of eating disorder behaviors over the prior 28 days, F (4, 156) = 0.69, Wilks' Lambda = 0.98, p = .598. Also using a MANOVA analytic method with each measure of dietary restraint entered into the model together, there was a significant group difference in dietary restraint, F(2, 157) = 7.08, Wilks' Lambda = 0.92, p = .001. Groups were significantly different on the single item measure of dietary restriction from the EDE-Q and a restrained eating scale with the SBE-included group reporting higher dietary restraint on both measures than the OBE-only group.

Eating attitudes. Groups also significantly differed on motivations to eat, F (4, 160) = 3.62, Wilks' Lambda = 0.92, p = .007. The SBE-included group had significantly higher endorsement of compliance related eating than the OBE-only group. In addition, the OBE-only reported marginally higher endorsement of eating in order to cope than the SBE-included group. The two groups did not significantly differ on social or pleasure related motivations to eat.

Cognitive and affective processing. There was no significant difference between the SBE-included and OBE-only groups on dissociation, F(1, 160) = 0.93, p = .337. Similarly, there was no significant group difference in emotion regulation skills between the SBE-included and OBE-only groups, F(5, 158) = 1.73, Wilks' Lambda = 0.95, p = .131.

All group differences between SBE-included and OBE-only groups remained even after controlling for average number of episodes (total SBEs and OBEs), thus, for parsimony, we reported MANOVA findings without the inclusion of average number of episodes as a covariate.

Discussion

Regarding descriptive information, we found that SBE-included and OBE-only groups had similar demographic characteristics. Groups differed with regard to self-identified gender identity, such that the SBE-included group had significantly fewer individuals who identified as

male as compared to the OBE-only group. Future work would benefit from specifically recruiting males with SBEs to gain a better understanding of the phenomenology of SBEs in this group, and to see what factors may combine to increase a male identified person's chances of experiencing SBEs (e.g., a history of AN).

Building upon findings from Study 1, in Study 2 we also found that SBEs were related to restrictive symptomatology. Those with SBEs were found to have higher dietary restraint than those with only OBEs. Additionally, the SBE-included group was found to have a significantly lower self-reported current BMI than the OBE-only group. On the other hand, it appeared that those who reported SBEs (whether or not those were combined with OBEs) had similar levels of disordered eating behavior frequencies as those with only OBEs. Therefore, unlike Study 1, we did not find that SBEs marked higher engagement in bulimic behaviors than OBEs on their own.

It was also noted that while the two groups significantly differed on current BMI, they did not significantly differ on weight suppression. It should be noted, however, that the sample size for current BMI and weight suppression was particularly small in Study 2 (n = 80 among SBE-included and OBE-only groups); this was due to later inclusion of questions pertaining to this topic midway through data collection. It is likely that power to detect significant effects was low. Given that the SBE-included group had more pronounced weight suppression when examining the means within the sample, future work should continue to investigate the role of low weight and weight suppression in SBEs using larger sample sizes to increase power. Previous work has found a relationship between weight suppression and OBEs (Lowe, Thomas, Safer, & Butryn, 2007), and it is likely that SBEs are also related to weight suppression. Furthermore, given that weight suppression has been associated with dieting (e.g., Keel & Heatherton, 2010), and SBEs appear to be more related to dietary restriction than OBEs (and,

thus, are likely more associated with dieting or fasting), weight suppression may be particularly associated with SBEs.

Regarding motivations to eat, the SBE-included group was more likely to report motivation to eat based upon compliance (i.e., eating because of interpersonal pressure) than the OBE-only group. This finding aligned with our qualitative finding in Study 1 that SBEs might be particularly related to interpersonal distress and reassurance proximal to SBEs.

Also regarding motivations to eat, there was a trend for the OBE-only group to more likely report motivation to eat for coping reasons (i.e., to feel better emotionally) than those with SBEs. This finding was in line with an established literature showing that OBEs serve an emotion regulation function (e.g., Engelberg et al., 2007; Fox & Froom, 2009; Jeppson et al., 2003; Moon & Berenbaum, 2009). While those with only OBEs were marginally more likely to endorse eating to cope as compared to those with SBEs, such individuals did not report elevated emotion regulation difficulties compared to those with SBEs. Therefore, those who struggle with OBEs may be more likely to turn to eating as an emotion regulation strategy, while those with SBEs, even if they struggle with equivalent emotion regulation difficulties as those with only OBEs, may be less likely to turn to eating for this same reason. Of note, we did not statistically compare the SBE-included and OBE-only groups to a non-LOC eating sample on difficulties with emotion regulation; however, a descriptive comparison of our sample to an undergraduate sample of males and females suggested that our sample may have struggled with somewhat elevated scores on some subscales of emotion regulation difficulties as compared to a non-clinical sample (i.e., average rating on each item in the undergraduate sample was 2.19, while subscale scores in the current sample ranged from 2.11 to 3.73) (Gratz & Roemer, 2004). Such a

conclusion is drawn with caution, as there are no established norms available to conduct item level comparisons for the subset of items included in the current study.

Regarding momentary emotions, participants reported increases in not only overarching negative affect (i.e., unpleasantness) from pre- to post- SBE, but also increases in many discrete negative emotions (i.e., anger, sadness, disgust, hatred, embarrassed, guilt, and shame), and several negative feeling states (i.e., sickness, gross, uncomfortable). Coinciding with these increases in dimensions of negative affect, participants reported significant decreases in boredom. Also of note, participants reported decreases in three positive emotions (i.e., interested, hopeful, and proud) coinciding with an increase in comfort. As such, the emotional/affective experience of SBEs was mixed, and seemed to involve combinations of discrete emotions with an overarching increase in unpleasantness. It could be that, in spite of the episodes bringing about increased unpleasant feelings, SBEs are negatively reinforced by also bringing about decreased boredom combined with increased comfort. This is merely a hypothesis of how emotions/feelings may combine to reinforce SBEs, but not testable given the current data analytic plan.

In future work, it would be useful to examine how discrete emotions combine within a person in order to gain a more nuanced understanding of possible SBE emotional heterogeneity and related subtypes. Such work could involve latent variable mixture modeling approaches to ascertain underlying subgroups with possible homogenous emotional experiences in the context of SBEs. If we look globally at the number of negative emotions and feeling states that increase across the SBE, however, it appeared that SBEs did not serve as effective emotion regulation strategies for decreasing negative affective experience after their occurrence. This is in line with our hypothesis that SBEs would not serve as effective emotion regulation strategies.

While there was a significant moderator effect of intentionality on ratings of unpleasantness before versus after the recent SBE (as described above), the moderation effect had questionable clinical meaningfulness given that at all levels of intentionality, participants reported increases in unpleasantness from before to after the SBE. Therefore, our hypothesis that more intentional episodes would be more likely serve an affect regulation function by leading to decreases in negative affect was not supported even if the overall moderation was statistically significant.

Conclusions

Study 2 provides further evidence that SBEs may be markers of dietary restraint (as shown by higher self-reported dietary restriction and eating restraint, and lower current BMI among the SBE-included group), and that SBEs may less likely be pursued as means of regulating emotion than OBEs. In contrast to trend-level preliminary evidence in Brownstone et al. (2013), findings in Study 2 did not suggest that individuals with SBEs have elevated difficulties with dissociation or emotion regulation difficulties as compared to those with only OBEs. With regard to the momentary experience of SBEs, Study 2 provided further information regarding shifts in affective experience across the episode. More specifically, unpleasantness ratings increased following SBEs, suggesting that even if a participant pursued SBEs as an emotion regulation strategy, such episodes may not effectively down-regulate negative emotions. Study 3, which involved a follow-up qualitative phone interview with a subset of Study 2 participants, was completed in order to gain a more detailed understanding of SBEs from participants' own perspectives. We aimed to follow up on questions regarding the momentary experiences of SBEs, while asking about sensory and motivational aspects of the eating experience, as well as several imagined hypothetical eating experiences.

CHAPTER 4: STUDY 3

Method

Participants. Participants included fourteen individuals who reported loss of control eating episode amounts that met SBE size criteria and that occurred at least twice per week over the prior three months. Average age of participants was 35.29 years (*SD* = 11.97) with ages ranging from 19 to 65. Eleven participants identified as female, two participants identified as male, and one participant identified as "other" with regard to gender. Regarding racial identity, 12 participants identified as Caucasian, and two participants identified as "other" with regard to race. Regarding ethnicity, 13 participants identified as not Hispanic or Latino, while one participant identified as Hispanic or Latino. All participants stated that they currently reside in the United States, with 13 out of 14 specifying that they reside in North Carolina.

Recruitment. Study 3 participants were recruited from Study 2, which asked participants to provide their e-mail addresses if they were interested in potentially participating in a follow-up phone interview study. Of note, participants were assured of their confidentiality should they choose to provide their e-mail address, as e-mail addresses would be converted into linkage codes, such that no e-mail addresses were stored with study data. Of the 429 Study 2 participants, 162 individuals (37.76%) provided their e-mail address to indicate interest in Study 3. Of the 162 volunteers, 40 individuals were in the SBE-included group and, thus, the main recruitment source for Study 3 occurred from this subgroup. Because we were able to complete follow-up questions in the interview regarding episodes in the other category that might have met SBE criteria, we also recruited from the 60 individuals who were in an "other" category that

could potentially include small-sized episodes (i.e., SBE-other only, OBE-other only, or Other). See Table 1 for further information about each of these groups of participants.

We followed up by e-mail with participants who reported binge sizes that met SBE criteria and occurred at least twice per week over the prior three months, beginning with those who provided this amount as an SBE example. Due to difficulties recruiting individuals reporting the frequency of SBEs targeted, our other recruitment strategy included following up with individuals who reported an OBE example where the amount was not objectively large from the "other" categories, from whom we were able to get additional, confirmatory details about the LOC episodes as part of the phone interview in a way that was not possible in the online survey. Therefore, 10 participants were recruited from the SBE-included group, while four participants were recruited from the "other" binge groups.

Regarding compensation, participants were given a $12 gift certificate to Amazon.com after completion of the Study 3 interview.

Procedure and measures. L.M. Brownstone completed a 30-minute semi-structured qualitative phone interview with each Study 3 participant. See Appendix H for the phone interview script. The phone interview began with a review of the participant's rights as a participant, followed by a description of the interviewer's bounds of confidentiality surrounding participant safety. Participants were also reminded that the interview would be recorded to allow for later transcription.

The interviewer drew from the event reconstruction method (ERM) to gather as detailed of information as possible about the participant's most recent SBE experience. The ERM method was developed as an adaptation of more intensive experience sampling methodologies (e.g., Csikszentmihalyi & LeFevre, 1989), which involve multiple days of naturalistic data collection

about the phenomenon of interest. ERM allows for in-depth "re-experiencing" of the "event" (i.e., the most recent SBE), such that participants are able to approximate the immediacy of experience sampling methods, and provide information on the emotions and thoughts surrounding the event of interest (Bless, Bohner, Schwarz, & Strack, 1990; Schwarz & Clore, 1983). ERM depends on evoking a re-experiencing of the event, such that retrospective recall difficulties are minimized. This re-experiencing is facilitated by having participants generate recall cues, such as the location and who they were with during the event, as well as by having participants describe how events occurred across a timeline rather than explaining theoretically "why" the event occurred (Grube, Schroer, Hentzschel, & Hertel, 2008).

Adapting ERM to the current study, we began by asking participants to report on their most recent SBE experience, defined as a time in which the participant felt out of control while eating an amount that they perceived as large in quantity even if others would not have perceived the amount as large. We confirmed the subjectively large amount of the loss of control eating experience by using a similar approach as the EDE by asking participants to report the types and amounts of food they ate during the most recent SBE (Fairburn & Cooper, 1993). If the first episode that was reported qualified as an OBE, we asked participants to report a recent episode that was smaller in size in order to generate an SBE example.

In addition to reporting the types and amounts of food consumed during this SBE, participants were also asked to generate recall cues for the SBE, including where the SBE occurred, who else might have been present (if applicable), and what was happening at the time. We then asked participants to provide information regarding "how it felt in [their] body" and to "describe the sensory experience of the episode" before, during, and after the most recent SBE. Participants were also asked to identify one or two main emotions felt during the episode as a

follow-up to the more in-depth quantitative questions regarding emotions experienced before and after the episode in Study 2. In addition, participants were asked if they engaged in any compensatory behaviors following the episode to make up for calories consumed, and, if so, how they felt before, during, and after the compensatory behavior.

Regardless of their response to OBE questions in Study 2, all participants were asked if they had experienced an OBE in the prior three months, and, if so, were asked to report on a recent OBE in order to confirm episode size. After providing a recent example of an OBE that met size criteria and establishing some context cues for the participant (drawing upon the ERM method), participants were asked questions comparing the recent OBE to the recent SBE. There were three comparison questions: (1) an open-ended question asking how the OBE was different and/or similar from the SBE they had just described, (2) a more focal question about how the "feelings in [the participant's] body" before, during, and after the OBE compared to the SBE, and (3) another more focal question about how the "sensory experience" before, during, and after the OBE compared to the SBE. Similarly to the SBE questions, participants were also asked if they engaged in any compensatory behaviors following the OBE, and, if so, how they felt before, during, and after the compensatory behavior.

The interviewer then asked participants a set of questions about their non-LOC eating experiences, including the following: (1) Are there instances when eating does NOT feel out of control?, (2) If so, what is eating like for you on a day-to-day basis?, and (3) How does eating affect you emotionally?

The interview ended by asking participants to respond to four pictures of food items that participants opened on a computer or phone during the interview (see Appendix I). Participants were asked to imagine having just eaten the food item in the picture after not eating anything for

four hours. Further, they were asked to describe: "what it would be like" to eat the item and what factors might influence their eating experience of the given item.

The interview also included follow-up, open-ended questions generated by the interviewer based upon participant responses.

Data analytic plan. The qualitative interviews were transcribed by a team of undergraduate and post-baccalaureate research assistants. L.M. Brownstone then completed a combined inductive and deductive coding process of the phone interviews (Saldaña, 2015). This coding process began with the creation of summary reports that extracted data from the interview transcript and reorganized it by topic area (e.g., moving pertinent quotes and information regarding the SBE experience to a section regarding the participant's recent SBE). Given the focus on whether or not codes were apparent in a given episode description within a person, and less on the narrative structure of the participant's responses, these summary reports were sufficient to summarize the key points from each segment of the interview, and were in line with a content analysis approach (Carley, 1993). By creating these summary reports and writing brief memos in response to the reports (i.e., a qualitative analysis technique in which the researcher writes comments regarding possible themes and/or codes in qualitative data), we were also able to begin a layering up coding process that included noting broader codes that tied across different segments of the interview. The use of memos as a data analytic tool has been suggested by Birks, Chapman, and Francis (2008), because it allows a tracking of ideas as they unfold across the analytic process.

These summary reports were then inductively coded (with some deductive coding based upon Study 1 qualitative findings), such that a codebook could be generated. To check for inter-coder reliability, a post-baccalaureate research assistant with one and a half years of eating

disorder assessment experience independently wrote summary reports for three of the interviews, and then coded those summary reports with the codebook that L.M. Brownstone had created. Cohen's kappa for the three interviews considered in the inter-coder reliability check was .64, which is considered to be at a level of substantial agreement according to Landis and Koch (1977), particularly for an inductive qualitative study that included some interpretive codes. Appendix J (the codebook) indicates which codes were included in this inter-coder reliability calculation.

We observed that while the research assistant chose nearly identical content from the interviews for her summary reports, she wrote summary reports that were of shorter length that included shorter extracted quotes than L.M. Brownstone. The research assistant was also less likely to code imagined eating experiences as involving a *loss of control/trigger concern* than L.M. Brownstone, which likely resulted from the complex task of generating more general codes for all of the imagined food stimuli together (i.e. looking holistically at all of the food stimuli together). This general coding process may have introduced subjectivity regarding what was counted as being a loss of control or trigger-related concern.

Coding process. See Appendix J for a full summary of the Study 3 codebook. The codebook was composed of several subsections that pertained to the different parts of the interview. One section of the codebook included codes regarding recent loss of control eating episodes (i.e., SBEs and, if applicable, OBEs), as well as participants' non-loss of control and day-to-day eating experiences. The codebook also included a set of broader codes regarding aspects of participants' experiences that were not specific to a given episode (e.g., whether the participant identified dietary *willpower/moderation* as an ideal). Additionally, a separate set of codes was established to describe the imagined eating experiences that participants were asked to

describe. As such, our codebook is divided into the following sections: (1) *eating descriptors* (pertaining to LOC episodes and participant descriptions of non-LOC eating), (2) *broader codes*, and (3) *imagined eating* codes.

Many of the codes within each of the sections were descriptive, and easily decipherable. On the other hand, some interpretive codes emerged in our analyses that require further explanation. Similarly to Study 1, codes pertaining to *implied functionality* emerged from participant responses as follows: *emotional needs* (same as Study 1), *physical need/hunger response* (similar to the *I should eat/need energy* code from Study 1), *sensory positive* (same as Study 1), and *social pressures/influence* (a new code regarding functionality in the present study).

The *emotional needs* code was applied to a description if the person described the episode as involving a relieving component related to emotional experience. This code only emerged in one participant's (#10) description of an SBE, and, for this participant, relief was described with regard to dissociative experiences that allowed for an escape from awareness of the body (e.g., "I was not aware of my body, which is very distracting and that's the majority of the appeal."). That said, the *emotional needs* code would have also pertained had a participant described more similar descriptions as seen in Study 1 regarding the episode being motivated by a desire to shift emotional experience (e.g., to "feel better"). In order to receive this code, a participant had to explicitly state that the episode served a relieving function.

The *physical need/hunger response* code was applied to descriptions of episodes that seemed to result from hunger and physical need for food, but not from cravings for particular tastes or food types, nor from an effort to modulate affective experience. For example, one participant (#5) described that an SBE occurred following a day of volunteer work in which she

did not eat. She described a strong sense of hunger that prompted an urgent need for food while driving home from work, which led her to pick up fast food and eat in an "out of control" way when she arrived at home. Another participant described a similar hunger that prompted her SBE in the following way:

> so before, I was just like really like super, super hungry cause it had been like a really long time since I had eaten…just kind of like oh this like tastes good or whatever, but you know I'd been hungry so I felt kind of like relief for eating... (participant #12)

While in Study 1, we focused on the idea that the participant reported a sense that they "should eat," in Study 3, this theme that one "should" eat did not emerge in participant responses. Therefore, in the current study, we focused on the hunger/starvation response that motivated loss of control experiences when assigning the *physical need/hunger response* code.

The *sensory positive* code was applied to a given episode if the participant described a motivation to eat based upon craving or appetitive urges. One participant (#7), for example, described a craving-based urge to sample brownie batter throughout the time that she baked brownies. Another participant described a strong "sweet tooth" craving, which led her to have an SBE that included chocolate cake. This participant described that she "wanted sugar really bad" as a motivator for engaging in the episode.

On the other hand, the *social pressures/influence* code, which was a new code that emerged in the present study, was used if the episode was motivated by a desire to engage with one's social environment in which eating was a central part of the experience. One participant (#14) reported, for example, that his friend had experienced a recent ending of a romantic relationship, and that he felt compelled to participate in a large loss of control eating experience at an "all-you-can eat" restaurant (an SBE) as a means of "being there" for his friend. Another participant (#4) reported that she had lost control over eating while sharing popcorn and candy

with friends at a movie theatre. She described the automatic quality of grabbing a handful of popcorn when the container was passed to her throughout the movie.

Regarding a broader code, another interpretive code used in Study 3 was *anhedonic description*, which was used to indicate when a participant was observed to describe eating across the interview as an activity that did not bring about pleasure or enjoyment. This was not only determined based upon the content of what participants said about their eating (i.e., with statements like "I guess" regarding any descriptions of food tasting "good") or needing to be prompted by the interviewer to report on how an episode tasted, but also based upon the overarching tone of the participant during the interview. The interviewer noted anhedonic quality to participant speech immediately following each interview to aid in this coding process. In particular, she noted instances when participants had a flat tone even while stating that a given food would be "satisfying" or "taste good." Of note, since the interview focused on eating experiences, it is impossible to know whether this anhedonic quality of description may have extended to other domains in the participant's life. Therefore, we cannot comment on whether an *anhedonic description* code might have implied a broader anhedonic/depressive presentation or a more focal anhedonic experience of eating.

Episodes were also coded based upon whether the participant had *dissociative/unmindful* experiences during or close in time to the episode. The majority of reported dissociative spectrum experiences involved "not thinking" or not being aware of the body (e.g., "didn't really have an emotional state, it was kind of an automatic process"). Fewer dissociative spectrum experiences involved being "distracted" or not being aware due to the presence of another stimulus. For example, one participant (#9) described that she "looked down" and found that her food was gone in the context of a romantic date in which she was so engaged in the conversation

that she lost awareness of eating. These varying dissociative spectrum experiences were coded as *dissociative/unmindful*.

Regarding *broader codes*, we also coded for participants' eating ideals, as communicated through their discussions of what it was like if they did not have loss of control eating. These codes pertaining to ideals included: *willpower/moderation ideal*, *planned/control ideal*, and *healthy eating ideal*. Such codes were used if the participant communicated that such ideals were a large part of the standards that they had about eating in their day-to-day lives. One participant (#1), for example, described that she tried to "eat clean" as a means of losing the last 20 pounds she aimed to lose in the coming months, which she elaborated on as follows: "like I don't eat processed foods then. I don't eat fried foods then I don't eat food with sugar then, I make sure to have like a regimented schedule like and a certain amount of you know like um foods for today, like 3 vegetables 4 proteins but they are all portioned out." This description highlights the *planned/control* and *healthy eating ideals* mentioned above. Regarding the *willpower/moderation* ideal, several participants would describe that they aspired to make "sensible" and "rational" choices about eating, and maintain "willpower" to not eat in ways that did not align with their diet plans. Participants were also assigned a broad code regarding whether or not they described a restrictive eating pattern on a broader basis than just surrounding loss of control eating. For example, the participant (#1) who aspired to "eat clean" was coded as having *general restrictive eating* based upon her reporting of having lost 30 pounds in recent months based upon her dieting, and her continued aim to lose 20 more pounds.

Participant responses to the *imagined eating* prompts were also coded based upon the main themes that emerged. The three codes that were particularly notable in these prompts were as follows: *satisfaction concerns*, *nutrient/balance concerns*, and *loss of control/trigger concerns*

Those assigned the *satisfaction concerns* code expressed particular interest in the extent to which a given food would likely "satisfy" them (e.g., "I love apples and [I'd] probably [be] full because a whole apple fills me up"). Others who endorsed this code expressed concern that the food would not be sufficiently satisfying (e.g., "I'd be thinking about eating again soon" [with regard to apple]). Participants assigned the *nutrient/balance concerns* code were particularly concerned that a given food did not have proper nutritional quality and/or was "incomplete" and in need of a different nutritional ingredient. Some participants, for example, were concerned that the grilled cheese was unhealthy on its own, but would be improved as a meal if it were accompanied with an apple. Other individuals expressed that the cereal was unhealthy, because it was a carbohydrate without nutritional value, while some also focused on the "greasy" and unhealthy quality of the grilled cheese. Those who were assigned the *loss of control/trigger concerns* code expressed concern that a food might prompt loss of control (e.g., "And I would feel like if I ate that after having not eaten anything for a couple of hours I would feel really tempted to continue eating.").

Analytic process. After the codebook was finalized, we compared SBE to OBE descriptions in order to better understand unique aspects of SBE phenomenology. In order to make these comparisons, we used two approaches. First, participants described a recent OBE, if applicable, which allowed for us to code OBE descriptions and compare them to SBE codes. Given the difference in interview questions asked pertaining to OBEs (See Appendix H), however, we did not focus our analysis on quantitatively comparing codes for OBEs with SBEs. Rather, we looked at codes on a more descriptive and holistic level. Additionally, in the context of participant descriptions of a recent OBE, many participants provided their own thoughts about

how a recent OBE compared to a recent SBE in terms of bodily, sensory, and emotional experiences.

Second, we also generated a summary matrix that allowed us to examine which codes appeared to co-exist within each person. This approach allowed us to look holistically at each person, and across participants to see if any relevant combinations of codes might pertain across participants. We also included broader codes, as well as some pertinent information from Study 2 (e.g., gender, age, BMI, dietary restraint) in this summary matrix to allow for a fuller understanding of possible factors that might influence particular categories of SBE experiences. See Table 11, which includes full a summary matrix from which we drew in our analytic process.

Additionally, we extracted participant quotes pertaining to physical/feeling states before, during, and after the recent SBE (See Table 12). This allowed for a more holistic analytic process to decipher patterns in how feelings shifted across the SBE experience. We drew from the codebook in examining these quotes in order to see if particular patterns emerged in how feelings states shifted from before the SBE to during the SBE to after the SBE.

Given our interest in the function of SBEs in the current project, we focused some of our analytic process on grouping participants by the *implied functionality* code of their recent SBE to see if certain combinations of codes were particularly salient for some functionality codes over others. In our current results, we focus on particularly notable patterns without addressing every possible pattern within and across participants.

Results

Descriptive statistics. Average BMI in the present study was 28.60 kg/m^2, and ranged from 17.93 to 45.61. Weight suppression among this group of participants, which was calculated by subtracting current BMI from highest non-pregnant BMI (data derived from Study 2), was

3.19 kg/m^2, and ranged from 0 to 10.10. Participants also varied regarding whether or not they reported a recent OBE in the prior three months in the interview. While seven participants reported an episode that met OBE size criteria, six participants reported episodes that they believed were OBEs, but which were not large enough to meet OBE size criteria (some of which had occurred more than three months prior to the interview), and one participant reported never having engaged in an OBE.

Subjective versus objective binge eating. Several themes emerged in the process of closely examining SBE as compared to OBE descriptions. This comparison allowed us to better understand the unique phenomenology of SBEs that may be distinct from OBEs.

One such theme was that OBEs tended to be described in more *appetitive and craving oriented* ways than SBEs. While a subset of those with SBEs were coded as being motivated by *sensory positive* urges (3/14; 21.43%), a majority of the OBE descriptions were coded as *sensory positive* (5/7; 71.43%), because participants described their motivation to experience certain tastes and fulfill cravings as primary motivations behind such episodes. Participant #13 communicated this theme with several statements that directly compared SBEs to OBEs. She stated that OBEs are "more enjoyable physically" than SBEs, and that while SBEs involve "more of a physical hunger," OBEs are "more like just a compulsive desire to taste the thing that was in front of me." This theme was also communicated in participant #8's description of a recent OBE, which she described in the following way: "like I wanted some sugar, I wanted something sweet, I wanted something—I wanted a treat." She contrasted this "wanting" experience during her OBE with a "needing" experience during her SBE, as such: "I just felt like I needed something." As such, OBEs may tend to be more appetitive, while SBE may tend to be more in response to physical need for food.

Another theme that emerged regarding differences between SBEs and OBEs was that OBEs were generally more *planned in advance* than SBEs. Participant #10 elaborated that this results from needing to buy specific foods that "are easier to take down" in large quantities, which she stated can sometimes give her time to prevent an OBE from occurring: "sometimes I am able to stop myself because there's more steps" of preparation before an OBE begins.

Additionally, this same participant (#10) reported that she tends to be more "cognizant" and aware of the sensory aspects of eating experience during OBEs than during SBEs. Perhaps most reflective of this more "cognizant" quality of her OBE, this participant described a recent OBE in which she ate 30 peppermint lifesaver candies and a protein energy bar: "the peppermints were really crunchy, but I do—I didn't feel quite as disconnected while I was—I was really mechanical, but I didn't feel disconnected—I remember how crunchy they were, I was just like crunching them and following them immediately, not sucking them…" This participant (#10), therefore, described a more present and "cognizant" experience in which appetitive and sensory responses occupied her mind and allowed her to remember and be present to the experience more readily than her recent SBE.

Another two participants highlighted the *intensity* of OBEs that leads to exhaustion following their occurrences. For example, participant #12 stated that SBEs feel like an "echo" of what OBEs used to be like for her when she used to experience larger episodes between the ages of 13 to 15 (approximately 8-10 years before the present study) in that she "just feels like ugh you know gross, like whatever, but like okay I'll just put that aside and not think about it for the time being…wake up tomorrow and hopefully forget about it" regarding SBEs. Also pertaining to the intensity of OBEs, participant #1 stated that her OBEs tend to be more "rapid" and involve more "disgust" than SBEs, and that her "stomach always like kills me [her]" after an OBE.

Over-control in SBEs. Throughout almost all of the interviews, participants expressed that they held themselves to very high standards regarding controlled, planned, and healthy eating. This over-control was defined by participants as "logical," "sensible," and "clean;" whereas, loss of control eating was described in a variety of ways, such as "automatic," "dissociative," "fast," and against the person's plan.

For example, participant #9 described a recent SBE, in which she ate five bite-size candies instead of the one candy she planned to eat as follows: "I didn't have a lot of awareness of what I was eating. I was eating kind of automatically, I wasn't even aware of it…" This same participant also identified that her ideal involves "making better choices…like healthier choices" on a day-to-day basis, and she elaborated as follows:

> And then, if I start to make a choice, I know that—you know, maybe I'll be standing in line sometimes and I'll be like 'I'm gonna get this' and then by the time I get to the front of the line I change my mind and choose something else and if it's not a healthier choice then I start to feel like 'oh gosh.' (Participant #9)

Similarly, a different participant (#1) identified that during her recent SBE, she ate in a way that was outside of her definition of "logic" with regard to eating:

> like I mean I knew logically when I sat down I should not eat burgers and fries but I do anyway you know like cause I know I don't do well with portion controlling it. And I know it's going to provoke anxiety but I do it anyway. (Participant #3)

In contrast, she reported that she feels "happy…that I have the will power to resist overeating" if she does not find herself engaging in loss of control eating. As such, participant #9 and #1's descriptions represent many participants' reports of drastic contrasts between what they deemed to be ideal with regard to eating and what they experienced as "out of control."

Related to over-control with regard to eating, most of the participants emphasized concerns about *nutrients/balance* of imagined eating scenarios (9/14; 64.29%). Therefore, it appeared that participants generalized their concerns about eating in a healthy way when asked to

imagine their responses to particular items of food. The majority of participants also expressed concerns about whether or not food items (among the imagined eating experience stimuli) would be sufficiently "satisfying" (10/14; 71.43%). This attention to whether or not items would satisfy may also be related to an over-controlled attitude toward eating in which all eating experiences are evaluated according to whether an item might be sufficiently sustaining on its own (e.g., "would make me feel like I was full" or "I'd be temporarily satisfied"). This stance in which eating experiences are analyzed according to their potential to satisfy and/or meet a nutritional standard, in contrast to, for example, a focus on whether the item would taste good or be enjoyable, aligned with the overarching observation that those in the current sample seemed to have an over-regulated and self-monitored approach to eating.

Tendencies for over-control in the sphere of eating may contribute to dichotomous notions of "sensible" versus "out of control" eating, such that loss of control may have been defined by the participant as times in which they ate in a less controlled or comparatively indulgent way. Therefore, in the current sample, SBEs seemed to result from, and be markers of over-control in the domain of eating.

Functionality and the SBE experience. It appeared that SBEs were more likely to be related to *physical need/hunger response* and *social pressures/influence* than *emotional needs* or *sensory positive* motivations in the current sample. Further, the function of the SBE seemed to indicate different affective/bodily experiences and behavioral responses associated with the episode. Only one participant (#10) indicated that her recent SBE served an *emotional need* function, and she specified that her needs were met by means of the dissociative and distracted state she could attain during the SBE. This dissociative experience was not unique to this

participant; however, she was the only participant who specifically stated that the dissociation provided "relief."

With regard to two of the other functional groups, it appeared that while *physical need/hunger response* SBEs coincided with *guilt/shame* and *disgust*, *sensory positive* SBEs coincided with *mixed emotions*, *positive emotions*, *boredom*, and *sick/discomfort* feelings. It was also notable that while *physical need/hunger response* SBEs were often preceded by *hunger* and given *anhedonic descriptions*, *sensory positive* SBEs were preceded by *craving* and were not coded as anhedonic. As such, while *physical need/hunger response* SBEs appeared to be less appetitive and hedonic, *sensory positive* SBEs appeared to be more driven by appetitive urges and positive emotional experiences.

For example, participant #12 reported that her *physical need/hunger response* SBE involved eating half of a frozen pizza after not having "eaten in a long time." She described a feeling of intense hunger preceding the loss of control experience, as well as a rushed quality to the eating. This participant used few positive words to describe the eating experience, and when she did, such statements were tempered with minimizing language. For example, she stated that the pizza "just looked kind of I donno kind of greasy but still kinda good," and the use of "kinda" in this instance emphasized her reluctance to label the taste as good. Such hesitant language occurred throughout the interview accompanied by a flat tone that contributed to a code assignment of *anhedonic description*. The somewhat positive emotional experience that this participant used to describe the eating experience was "relief" in response to satiating herself after a prolonged period of hunger: "you know I'd been hungry, so I felt kind of relief for eating," and this corroborates the more *hunger* driven, rather than *craving* driven nature of *physical need/hunger response* SBEs.

This description was in contrast to another participant's (#2) description of a *sensory positive* SBE that occurred while at work when she was feeling boredom ("I'll say there was some boredom"). This participant explained that she and several colleagues walked to buy food together, but that she brought her food (a muffin and a slice of cake) to her office to eat alone. She specified that she "was hungry, just craving something sweet. And my intention was just to eat a part of a dessert. Like allow myself a little bit of that… but once I started eating it and tasting it. Um, that didn't feel like enough to satisfy me." A need for satisfaction and a response to appetitive experiences during the episode, for this participant, appeared to motivate her loss of control experience.

Of note, this same participant (#2) did not report having engaged in a compensatory behavior in response to the episode, nor did any participant with a *sensory positive* SBE. This was in contrast to two of the participants with *physical need/hunger response* SBEs reporting recent vomiting episodes in response to SBEs (only three total participants reported vomiting episodes in the current study). Those with *physical need/hunger response* SBEs also generally reported higher dietary restraint than those with *sensory positive* SBEs (see Table 11). Therefore, it appeared that *physical need/hunger response* motivations might have indicated higher restrictive and bulimic pathology than *sensory positive* motivations in the current sample.

There were fewer clear patterns regarding *social pressures/influence* SBEs with regard to associated emotional experiences (e.g., specific emotions experienced during this type of SBE). We did observe, however, that feeling *too full* was a particularly salient part of participant experiences who reported this motivation for their SBE. Another theme, particularly for female-identified participants, was a feeling of distraction facilitated by the social experience that accompanied the eating. For example, participant #9 reported that she "looked down" and saw

that her "plate was empty" in the context of a romantic date in which she was engaged in dialog and momentarily unaware of food consumption. Another participant (#4) found herself engaged in a social movie-going event, in which popcorn and candy were being passed along by friends, and she stated that "they kept passing it around and, like, I wasn't hungry at all, but I just kept eating it because it was there."

It was notable that there were only two male-identified participants (#11 and #14) in the current study, and that they both reported loss of control eating episodes (SBEs and OBEs) that fit the *social pressures/influence* implied functionality code. These individuals reported quite different phenomenology regarding their loss of control eating than their female-identified counterparts who also endorsed *social pressures/influence* implied functionality. Participant #14 described that his friend was struggling with a difficult romantic relationship ending, and that he felt compelled to participate in what he experienced as a large "all-you-can" meal at a barbeque restaurant with the friend in order to provide emotional support. Similarly, participant #11 described that he had engaged in an OBE, while at the "Olive Garden" with friends. He described this "Olive Garden" episode as being planned in advance, and that losing control was part of the social experience: "It just happened to be like we were out there visiting friends, so we were like oh let's go to Olive Garden and I got really excited…I don't know maybe I went into the mindset that I was probably going to eat a lot…so I had like—like there was no inkling of regret whatsoever."

Participant #11's SBE, similarly to his OBE, also occurred in a social context in which the social influence was a large part of the function of the episode. He reported that his SBE had occurred while out to lunch with several women co-workers who were impressed by how much food he was able to "take down." This participant identified "pride" about being able to eat this

larger quantity of food in front of his co-workers. Of note, participant #11 was recruited from the "OBE-other only" category in Study 2, and his SBE example, while not objectively large in size, was experienced by him (and his coworkers) as large. Therefore, his "SBE" was difficult to categorize, and was included in the present interview study only because we were able to follow up in a more in-depth way than was possible in Study 2. Overall, it appeared that among the male-identified participants in the current sample, there was a theme of loss of control eating being a social activity with friends, and that there was a social expectation to eat a lot of food during these experiences.

Thus, for female-identified participants who reported *social pressures/influence* functionality, the influence of others in their environments was central to their loss of control (e.g., conversation and group eating contexts impacting awareness of eating while it was occurring). On the other hand, for male-identified participants (both of whom reported *social pressures/influence* functionality), there may have been more pressure to lose control as part of participating in a social experience.

Dissociation and SBEs. In examining participant descriptions of their physical, sensory, and emotional states before, during, and after their recent SBE, several patterns emerged. First, eight of the fourteen (57.14%) participants reported *dissociative/unmindful* experiences during their recent SBE. Participant #5 described a lack of awareness of her physical/emotional state (e.g., "while I was eating um I didn't really notice how it felt"). Participant #6 described a lack of feeling emotions during the episode at all: "I wasn't feeling anything…there was like no emotion during the process of eating." Several participants, on the other hand, described more of a distracted/unmindful state regarding eating due to being occupied in conversation or other activities (e.g., participant #3 stated: "During, I mean I was fine. We were talking and I was

eating."). Therefore, the pattern of *dissociative/unmindful* states during SBEs was varied in terms of whether this looked more like dissociation or distraction. It was notable that none of the participants with *sensory positive* SBEs reported this *dissociative/unmindful* state during their recent SBE.

A common feeling state reported before SBEs that had a dissociative component was hunger (6/8; 75.00%), and a common set of feelings reported after SBEs that had a dissociative component was physical *sickness/pain* or heaviness (7/8; 87.50%). As such, episodes that involved dissociation/unmindful states seemed to have a bodily component before and after their occurrence in which participants were particularly aware of physical distress (i.e., hunger, fullness, pain, discomfort, heaviness). See Table 12 for quotes demonstrating these themes.

Vomiting episodes meeting emotional needs. Three participants reported having engaged in vomiting in response to a recent SBE (participants #1, 6, 10). Of note, all three of these participants also reported having vomited after a recent OBE. The three individuals who struggled with vomiting after SBEs and OBEs also reported substantial dietary restriction (on all 28 days of the prior month) and relatively high quantitative dietary restraint scores compared to the rest of the sample (see Table 11). Also of note, two of the three individuals who reported vomiting during the interview reported SBEs that were coded as occurring in response to a *physical need/hunger response*. As such, vomiting appeared to occur most commonly, in the current sample, among individuals with high dietary restraint and who experienced SBEs in response to the resulting hunger from likely insufficient caloric intake.

Regarding feeling states that participants reported experiencing surrounding their recent vomiting episode, participants described an emotionally and physically relieving quality of

vomiting. Participant #10, for example, described her vomiting episode following an SBE in which she ate a chocolate bar as follows:

> I think that's the part of the cycle where I get relief, I think sensory wise my head has a lot of pressure and I kind of feel like I'm under water…and I think I often –like that's kind of a nice feeling of you know like when you were a little in the pool and you go um and your head's up and you hear all these people talking and you go underwater and it's totally quiet. Um so it kind of reminds me of that…and also of like of increased heart rate and increased like breathing heavy, but in a way that I've made happen not like a panic way where I can't –like it feels kind of good…like you're pushing yourself a little bit.

This participant described her vomiting experiences as instances in which she can experience relief from physical exertion. She also highlighted a dissociative component in which the world can become "totally quiet." Another participant #6 described a similar relief (i.e., "good feeling") and physical ("physically drained") experience after vomiting.

Another way in which two out of three participants who reported vomiting experienced relief after vomiting was by getting rid of the food just consumed (regardless of episode size). Participant #6, for example, stated the following, regarding how she felt during the recent vomit episode: "I feel like everything turns off cuz all I feel is like um the rush of the need to get it up before everything digests more…after um it feels I feel like there's a good feeling because I got stuff out but I also feel like physically drained." This rushed process served an emotion regulating function for the participant, not only based upon its physically draining quality, but also based upon its role in compensating for calories consumed following the loss of control episode.

Discussion

Study 3 provided a means to establish a more in-depth understanding of SBEs from the perspectives of 14 individuals who struggle with this behavior. Given the small sample size of this group, conclusions should only be drawn regarding the current sample, and future research

should follow up to see if similar themes emerge in larger samples to make inferences about the population of those with SBEs.

These interviews, taken together suggest that, at least in the current sample, SBEs are related to experiences of distress, perhaps to varying degrees depending upon the functionality of the episode. SBEs were more likely related to *physical need/hunger response* and *social pressures/influence* in the current sample than *emotional needs* or *sensory positive* motivations. It was also notable that the one participant who identified an *emotional need* being met by her SBE specified that this need was met through a dissociation from body awareness, which has been described by the escape theory of binge eating with regard to OBEs (Heatherton & Baumeister, 1991). Therefore, SBEs that serve an emotion regulation function may do so by means of escape. On the other hand, OBEs may provide relief, not only by means of facilitating an escape process, but also by means of an appetitive and sensory experience.

Also pertaining to the meeting of *emotional needs*, vomiting after SBEs (and OBEs) appeared to have an emotion regulation function, which aligns with previous work by Jeppson et al. (2003) on the emotional regulation function of vomiting in BN. In the current study, vomiting appeared to meet an *emotional need* by providing a "relieving" and "physically draining" experience, and by decreasing negative feelings/concerns following the participant's consumption of what they believed to be too much food.

Additionally, by examining participant descriptions of their physical/emotional/sensory states before, during, and after the recent SBE, we were able to further examine SBEs on a momentary level. This analysis revealed that, in the current sample, individuals who were <u>not</u> motivated by a *sensory positive* or *craving*-based need to engage in the SBE tended to experience *dissociative/unmindful* states during the SBE. These dissociative/unmindful states were not

generally described as relieving (i.e., only one participant described the dissociation as relieving); however, it is possible that the dissociation/unmindful state was reinforcing even if participants were not aware of their motivation to experience it. Further research, therefore, should specifically examine relationships between momentary dissociation and SBEs during their occurrence. Additionally, treatments would likely benefit from helping clients build insight about the role of dissociation/unmindful states in SBE experiences.

Also of note, throughout almost all of the interviews, participants expressed that they held themselves to high standards regarding controlled, planned, and healthy eating. For many of the participants, this ideal was combined with dietary restriction and hunger, which likely motivated SBEs (i.e., episodes meeting a *physical need/hunger response* function). This tendency for over-control may have created a context in which any deviation from the dietary ideal was considered "out of control." Additionally, the over-controlled nature of the current sample may shed light on the overarching finding that SBEs were rated as less planned/intended than OBEs. It might be that the fact that SBEs are *not intended* is precisely why SBEs are defined as "out of control" by those who experience such behaviors. As such, SBEs seem to occur in a context of over-control and idealization of planned and healthy eating. Clinical implications of this finding will be discussed below in the broader discussion.

CHAPTER 5: DISCUSSION

The present set of studies are the first to use a mixed-method approach to examine the phenomenology, momentary emotions, and associated features of SBEs, and the first to do so in samples recruited on the basis of SBEs. Most notably, in line with our hypotheses and previous work on SBEs (e.g., Brownstone et al., 2013; Fitzsimmons-Craft et al., 2014), we found that SBEs were indicative of similar, if not higher, levels of disordered eating and trait-level negative affect, as OBEs on their own. Further, we found that SBEs were related to dietary restraint and idealization of moderation and/or healthy eating. Therefore, our findings suggest that not only are SBEs markers of broader difficulties (i.e., anxiety and depressive symptoms), but that, in addition, they likely mark a restrictive and over-controlled pattern of eating in day-to-day life.

Also in line with our initial hypothesis, we found across studies and methodologies that SBEs were described as occurring in a more unplanned/unintended way as compared to OBEs. Additionally, SBEs were found to coincide with equivalent levels of negative emotions during their occurrence as OBEs. As such, this is among the first two studies (along with Witt (2014)) to find that SBEs are associated with in-the-moment distress. Further, when examining the before and after emotions surrounding a recent SBE, we found that a multitude of negative emotions and feeling states increased across the episode. As such, in line with our hypothesis, there was no momentary quantitative evidence to suggest that SBEs serve an emotion regulation function by decreasing negative emotions from pre- to post-episode, even though in Study 1 and Study 3, there was some (limited) qualitative endorsement of this function.

We had no a priori hypotheses regarding which themes would unfold in the process of qualitative analyses. While descriptive codes were as might be expected across these studies (e.g., the emergence of codes like *guilt/shame* or *hunger*), we discovered several sets of interpretive codes that might be particularly important to understanding the phenomenology of SBEs (and OBEs), which included codes about the functionality of episodes, as well as participant eating ideals. A more detailed description of results in the context of the existing literature, limitations, implications, and future directions for research are discussed below.

Phenomenology

Intentionality. Not only were SBEs rated as significantly less intended and planned on a quantitative level than OBEs, but also no participant mentioned a planned or expected quality to SBEs in qualitative open-ended descriptions in either Study 1 or 3. The unintended nature of SBEs may be a particularly salient aspect of the SBE experience that is related to the distress associated with SBEs, as evidenced by co-occurrence of *negative feelings/concerns* and *not intended* codes among SBE qualitative descriptions.

Further research is needed regarding how to best measure the construct of intentionality in loss of control eating, as the current studies were the first to specifically examine this construct. It will be important to investigate whether intentionality is experienced on a continuum, or more categorically as present versus not present with regard to a given episode. Additionally, it will be important to investigate whether "unplanned" has a different meaning depending upon the standards that a person has regarding eating. For example, if a person has high standards for dietary health, eating a food item that is not on their list of "clean" or "sensible" foods may be conceptualized as unplanned only because it is outside of the person's dietary ideal.

Functionality/motivations. Implied functionality codes, which emerged in both studies 1 and 3, were particularly informative as we tried to better understand the reasons why participants may engage in loss of control eating. This set of codes allowed us to notice patterns across SBEs versus OBEs, including that SBEs were less likely to be coded as involving a *sensory positive* or *emotional need* function, and more likely to be coded as *I should eat/need energy* or *no cause theorized* than OBEs.

That said, some individuals did report that SBEs met an *emotional need*, and those who did often highlighted that the SBE occurred proximally to an *interpersonal stressor*. Additionally, the relief achieved through the SBE may have resulted more from dissociative spectrum experiences, as described by Study 3 participants than from shifts in affect across the episode. OBEs likely also provide relief by means of a dissociative escape process (i.e., Heatherton & Baumeister, 1991), but given that OBEs were more likely to involve co-occurrences of *sensory positive* and *emotional needs* functions in the current study, OBEs may also be more likely to provide relief by means of a sensory and appetitive experience, as well as shifts in the positive affect system.

The *I should eat/need energy* (in Study 1) and *physical need/hunger response* (in Study 3) codes, which were particularly salient in many SBE descriptions, suggested that SBEs may be likely to result from insufficient caloric intake and a resulting "need" for food that does not necessarily involve appetitive and craving responses. It is possible that those who have SBEs that fit this more restrictive functional category are the most likely to have high dietary restraint and disordered eating symptoms (as suggested by Study 3), which in turn contributes to the findings that those with SBEs had higher restrained eating across Studies 1 and 2, and in previous work (Fitzsimmons-Craft et al., 2014).

Additionally, in Study 1, SBE descriptions often notably lacked an implied motivation behind the eating episode (*no cause theorized*). As such, it appeared that participants with SBEs were less likely to generate and articulate their own theories of why the SBE had occurred in open-ended responses. This coincided with less nuanced and rich descriptions among SBEs as compared to OBEs. One possible explanation behind this finding is that those with SBEs may be particularly high on alexithymia and low on emotion recognition as compared to those with only OBEs, and, therefore, may struggle to use words to describe their inner emotional experiences relating to SBEs. This would align with previous findings that those with more restrictive-type disordered eating (i.e., those with SBEs in the current studies) struggle with alexithymia and emotion recognition at particularly high levels (e.g., Bourke, Taylor, Parker, & Bagby, 1992; Harrison, Sullivan, Tchanturia, &Treasure, 2009).

On the other hand, in Study 2, we found no differences between SBE-included and OBE-only groups on a broader measure of difficulties with emotion regulation, which included items about emotional awareness. Therefore, another possibility is that a more established social script regarding the functionality of risk behaviors like OBEs might facilitate a clearer understanding of how OBEs influence emotion among the general population (e.g., girl is broken up with and consumes a gallon of ice cream), which in turn may have increased participants' abilities to provide in-depth and nuanced accounts of OBEs to a greater extent than lesser known and understood SBEs.

Another theme that emerged regarding functionality/motivation to engage in SBEs and OBEs was related to social pressures or influences. We found that many (five out of fourteen) of the Study 3 participants described a social experience that motivated or facilitated an SBE experience. Participants described a distracted state in which they ate more than they wanted to,

because of being occupied in conversation and "not noticing" the eating process, or a sense of interpersonal pressure to lose control as part of the social experience. In related quantitative findings, we found that those with SBEs endorsed higher "compliance" motivation to eat than those with only OBEs. Therefore, it appears that those with SBEs may be more likely to eat due to perceived pressures from others that they should eat based upon the social experience. All of these findings related to social and other oriented motivations to eat suggest that there may be specific facets of social pressure that relate to SBEs in different ways than OBEs.

The fact that these implied functionality codes emerged among both SBE and OBE descriptions, albeit at different frequencies depending upon the code, suggests that functionality is a relevant categorization of loss of control eating that transcends episode size. Future qualitative and quantitative research is needed to further replicate and establish functionality codes within loss of control eating. Once these codes are established, and measures of functionality are psychometrically validated, it is possible that size will become less important than the behavioral function/motivation behind the episode with regard to clinical symptom associations and treatment adaptations. For example, if someone reports that their SBE/OBE resulted from a *physical need/hunger response,* a clinician might consider a treatment that more directly addresses dietary restriction and flexibility surrounding eating to allow for occasional eating that the person does not believe is necessarily "sensible" and moderate. On the other hand, for a person who reports an SBE/OBE motivated by *sensory positive* urges, a clinician might aim to target boredom and sensation seeking, such that the person generates new ways of responding to boredom and cravings besides loss of control eating (as described further below).

Over-control. Another theme that emerged, particularly in Study 3 interviews, was over-control and willpower with regard to eating. Almost all Study 3 participants identified this

moderation ideal as a central guiding principle of their eating outside of loss of control episodes. This idealization of moderation combined with dietary restriction likely combines to put people at risk for experiencing loss of control whenever an eating experience does not align with rigid notions of "sensibility" with regard to food.

This brings up a broader question of whether those with SBEs who have this ideal of moderation are describing the same loss of control as those with larger and/or more appetitive episodes. If a participant identifies that eating a quarter of an eight-inch cake is too large and "out of control," is that loss of control the same as someone's experience of loss of control while eating a gallon of ice cream? The first may be more related to the eating being outside the standards of what the person considers reasonable, while the second may be more similar to traditional "ball rolling down a hill" notions of loss of control (Fairburn & Beglin, 1994). Further research is needed to elucidate possible differences in the meaning of the term "loss of control" across episodes of different sizes and/or functions.

Over-control and rigidity with regard to eating, as briefly mentioned above, is likely an important target of intervention for those with this ideal who struggle with SBEs. A central tenet of cognitive behavioral therapy for binge eating involves helping the client discontinue dietary restriction and plan regular meals across their day to prevent the occurrence of a cycle of restriction followed by binge eating (Fairburn, Wilson, & Schleimer, 1993). This principle is likely important for the treatment of those with SBEs as well, but it would also be important for the clinician to help a person with SBEs adjust beliefs about healthy and ideal eating to allow for increased flexibility with regard to eating. This increased flexibility might decrease a person's tendency to experience any eating that deviates from their ideal as "out of control."

Momentary Emotions

During. We found no meaningful differences in self-reported emotions experienced during a recent SBE versus OBE. Further, we found that during both of these episodes, participants reported higher negative emotions than positive emotions. As such, our findings align with Witt (2014) by finding that SBEs are associated with subjective distress during their occurrence. Further, our findings suggest that SBEs appear to be associated with equivalent levels of distress during their occurrence as OBEs. We make this conclusion with caution, however, because of the profound limitation of asking participants to retrospectively report on emotions during a past episode. Reporting these emotions more proximal to the episode would reduce recall bias. It could be that regret following such episodes led participants to misremember negative emotions during the episode that were not actually present at that point in time.

Additionally, the presence of dissociative spectrum and unmindful states reported in both Studies 1 and 3 related to SBE (and OBE) experiences suggests that participants may have not been present or aware of emotions during their recent loss of control eating episodes. In particular, Study 3 participant reports illustrated the importance of *dissociative/unmindful* states during SBEs (particularly among those who reported non-*sensory positive* SBEs). Our findings, therefore, suggest that some combination of negative emotions and dissociation co-exist during SBEs. Regardless of whether the self-reported emotion states and dissociative spectrum experiences occurred during recent episodes of loss of control eating, it is still notable that both SBEs and OBEs had similar self-reported emotion intensities when reported retrospectively.

Before versus after. Most broadly, we found that individuals reported increases in negative emotions/feelings after as compared to before a recent SBE. The positive emotion

system, on the other hand, appeared to be less present in the SBE experience, as there were fewer significant decreases in positive emotions from before to after the SBE (besides interest, hope, and pride). Somewhat surprisingly, we noticed significant increases in feeling "uncomfortable" coinciding with increases in feeling "comforted" across the episode. This combination may suggest that SBEs involve both uncomfortable and comforting facets of experience, or that some individuals experience discomfort, while others experience comfort. Future work should examine the role comfort and discomfort play in loss of control eating, including examining whether discomfort is more related to physical feelings states, while comfort is more related to emotional experience.

It was also notable that boredom decreased from before to after a recent SBE. This suggests that some SBEs may be related to experiences of low stimulation and difficulty entertaining oneself prior to their occurrence (as described by Vodanovich, Verner, & Gilbride, 1991). Boredom might have been particularly salient among *sensory positive* SBEs, as suggested by several of the individuals in Study 3 who reported *sensory positive* SBEs that involved boredom. Of note, boredom was found to be an even more salient aspect of OBE qualitative descriptions, which were also more likely to serve a *sensory positive* function in Study 1. This is in line with previous work finding that boredom is an antecedent of OBEs (Stickney & Miltenberger, 1999). Therefore, for at least some loss of control episodes, it seems that boredom plays an important role. Future work should further examine the role of boredom proneness in one's risk of struggling with *sensory positive* binge episodes.

Additionally, treatment of episodes in which boredom is salient may benefit from addressing several tendencies that have been found to be related to boredom proneness, including high customary activation and external orientation (as reviewed by De Chenne, 1988).

Customary activation refers to the set point at which an individual experiences excitement, interest, and/or physiological arousal (Leong & Schneller, 1993), while external orientation refers to a person's tendency to orient toward the external environment more so than inner experiences (Maddi, Propst, & Feldinger, 1965). Therapeutic interventions could specifically focus on helping a person "turn inward" and observe and describe inner states, such that a need for external stimulation is less needed. Pertaining to high customary activation among those with high boredom proneness, treatments may benefit from increasing client awareness of their higher set point for arousal, which in turn may motivate client situation selection that meets their arousal and interest needs in such a way that loss of control eating is less likely to occur.

SBEs and emotion regulation. Much of the past literature on OBEs has operationalized whether an episode serves an emotion regulation function based upon if negative emotions/affect precede the episode (e.g., Engelberg et al., 2007) or if negative emotions/affect decrease following the episode (e.g., Haedt- Matt & Keel, 2011; Wegner et al., 2002; Witt, 2014). These definitions assume a simplified definition of emotionally regulating behaviors: that the behavior is in response to negative emotions and/or that it serves to *decrease* negative emotions. Applying this definition, we found no evidence to suggest that SBEs decrease negative feelings across their occurrence. Therefore, we confirmed our hypothesis that SBEs do not serve an emotion regulation function (again, assuming the previous definition).

It did appear, however, that SBEs resulted in decreased boredom (for at least some participants), not to mention increased perceived "comfort." As such, it could be that SBEs, even if they are unintended, have a reinforcing impact on boredom and comfort. OBEs also seemed to coincide with shifts in the positive emotion/feeling system, based upon the fact that more OBE qualitative descriptions were described as coinciding with *positive feelings*, appetitive

experiences (e.g., *tasted good/pleasurable*), and *mixed feelings*. Therefore, OBEs appeared to be related to co-occurrences of positive and negative emotions that corroborate previous theories that they may serve an emotion regulation function (e.g., Berg et al., 2013; Engelberg et al., 2007; Wegner et al., 2002; Witt, 2014). Future work should continue to examine specific emotions that relate to SBEs versus OBEs and track such emotions across the episode to better understand complex ways in which each behavior may shift emotional experience, and thus serve a regulatory function.

Also pertaining to SBEs and emotion regulation, participants were less likely to describe SBEs as meeting an *emotional need* than OBEs, and individuals with SBEs were marginally less likely to endorse coping as their eating motivation. Further, those with SBEs often noted the dissociative/unmindful state that occurred during the episode. Therefore, if SBEs do serve an emotional function, it seems that they may do so by encouraging a state of dissociation during their occurrence. It is not clear, however, that individuals are aware of specific motivations to engage in SBEs as a means of facilitating this dissociative/unmindful state.

Associated Features

Those with SBEs appeared to struggle with more pronounced disordered eating symptomatology than those with only OBEs or no loss of control eating. More specifically, SBEs appeared to mark restrictive eating across studies and methodologies as evidenced by higher self-reported dietary restraint and restriction in Studies 1 and 2, higher likelihood of AN history among the SBE-included group in Study 1, and lower average BMI among the SBE-included group in Study 2. It was also notable that those with SBEs reported higher body shame than those with only OBEs. This finding replicates Brownstone et al. (2013), which found that SBEs (and not OBEs) accounted for unique variance in weight/shape concern. Taken together, this

suggests that SBEs may be markers of disordered eating and dietary restriction, particularly among the general population recruited online. This information could be useful for targeting prevention programs, as the presence of SBEs may be a helpful way to flag individuals more likely to struggle with restrictive symptomatology, body shame, and compensatory behaviors like vomiting, laxative use, and hard exercise. It was notable that the OBE-only group in Study 1 did not differ from the non-LOC eating group on compensatory behaviors, but did report higher body shame and dietary restraint. This could indicate that when recruiting from an online general population, OBEs, on their own, may be less likely to indicate bulimic symptomatology.

Regarding broader psychological difficulties, we found further evidence in support of Brownstone et al.'s (2013) claim that SBEs may be markers of broader psychopathology. In particular, we found that SBEs were more related to depressive and anxiety symptoms than OBEs (in line with Fitzsimmons-Craft et al., 2014). On the other hand, we found no differences between those with SBEs and those with only OBEs on interpersonal difficulties, but did find that either type of loss of control eating seemed to indicate higher interpersonal difficulties compared to those without loss of control eating. As such, loss of control eating, regardless of size, may uniquely relate to experiences of loneliness and lack of perceived social support. Qualitative findings, however, suggested that there may be unique interpersonal experiences that are more likely to accompany SBEs than OBEs (e.g., interpersonal reassurance) and particular salience of interpersonal stressors when SBEs are reported to meet an *emotional need*.

We found no differences on self-reported dissociation or emotion regulation difficulties among those with SBEs versus only OBEs. However, our qualitative findings highlighted the role of momentary dissociation and unmindful/distracted states during SBEs, as mentioned

above; therefore, further research should continue to examine the role of dissociative spectrum experiences in SBEs (and OBEs).

Imagined eating. It also appeared from Study 1 that those with SBEs were more likely to have global concerns that imagined eating experiences (regardless of type of food) would be "out of control," "too much," and "bad/unhealthy." Similarly, in Study 3, participants described similar concerns regarding health/nutrition, completeness, potential for loss of control, and potential for satisfaction when asked to imagine eating certain items of food. Those with SBEs, therefore, may have a hypervigilance regarding all foods that encourages a lower threshold at which eating is experienced as out of control. Further research should continue to examine how those with SBEs versus OBEs respond to both imagined and in vivo eating stimuli/experiences in order to explore unique ways in which those with these difficulties respond to food in their day-to-day lives.

Strengths and Limitations

The present set of studies was the first to recruit individuals with SBEs in general, and also the first to investigate SBEs using an online data collection method. Therefore, we had no precedent from which to draw in developing an in-depth online assessment of SBEs apart from past versions of the EDE-Q (Fairburn & Beglin, 1994), which in its most recent version, no longer assesses SBEs. The item assessing SBEs was removed in the current version based upon low test-retest reliability for self-reported SBE frequencies (Reas, Grilo, & Masheb, 2006). Therefore, it was necessary for us to use a more thorough online assessment tool that would be more likely to reliably assess SBEs. To this end, we used language commonly used in the EDE interview to more fully operationalize SBEs for our participants, unlike the EDE-Q, which provides a brief question regarding SBEs without a detailed definition. Additionally, we asked

for example episodes from participants to confirm size and to help them focus on a particular episode to report on throughout the survey. Given the lack of retesting in the current study, we were not able to determine test-retest reliability of SBE assessment. We did find, however, that using our approach, many participants were able to provide an example episode that corresponded to the size definition. Thus, we were able to identify individuals meeting SBE criteria using a novel online assessment tool that could be applied in future research.

Another strength of our approach was that the online recruitment method allowed us to recruit a larger sample and draw from a wider geographic range than an in-person study would have allowed. We did not assess the geographic range of participants in Study 1; however, given that we used Amazon Mturk, it is likely that this sample evidenced geographic diversity. On the other hand, we asked Study 2 participants to specify which country (and state, if United States) they currently resided. It was notable that even though online recruitment ideally could have allowed for more geographic diversity, we recruited the majority of Study 2 participants from the state of North Carolina. Therefore, we were not able to capitalize on the strength of generalizable samples that online recruitment can often promote in Study 2 (Kraut et al., 2004).

Another limitation of our recruitment approach was that there was variability in eating disorder symptom severity when comparing the Study 1 SBE-included group to the Study 2 SBE-included group (e.g., 5.92 and 2.16 average number of vomiting episodes in the past 28 days reported among Study 1 and Study 2 SBE-included groups, respectively). Therefore, while we used similar recruitment strategies (i.e. snowball), it is difficult to make generalizations across Studies 1 and 2 and assume that the SBE-included groups across these studies were comparable. In addition to there being lower severity among the SBE-included group in Study 2, we had more difficulties recruiting a large number of participants with SBEs in Study 2, which

likely resulted in lower power to detect group differences. These differences were not likely due to the inclusion of Mturk recruited participants in the SBE-included group of Study 1 (n = 31), as snowball recruited participants (n = 101) had equivalent, if not, higher levels of disordered eating symptomatology as compared to Mturk participants. For example, snowball recruited SBE-included individuals reported higher dietary restriction (m = 5.19) than Mturk recruited SBE-included individuals (m = 4.07) (F (89) = 5.70, p = .019), but reported equivalent frequencies of vomiting and laxative use in the past 28 days in Study 1. It is possible that differences among Study 1 and 2 SBE-included groups accurately reflect the heterogeneity of individuals with SBEs in terms of clinical severity, which was also demonstrated across the 14 Study 3 interviews (i.e., Study 3 participants differed substantially regarding severity of disordered eating and distress regarding loss of control eating). Further research is needed in a variety of settings and populations (e.g., non-clinical and clinical) in order to better understand differences and similarities among those who have SBEs.

Another limitation of the current studies is that each of the studies required participants to report on episodes that did not necessarily occur close in time to the time of data collection. While we drew from ERM methods to facilitate the participant's memory of the experience, we relied heavily on participant memory of past episodes and participant ability to articulate inner experiences using words. Given past research that has found elevated alexithymia and emotion recognition difficulties among those with binge eating (e.g., Carano et al., 2006) and restrictive-type disordered eating (e.g., Bourke et al., 1992), it is likely that participants struggled to report on specific emotions in the quantitative questions regarding emotions before, during, and after SBEs (or OBEs) across studies. Additionally, open-ended qualitative questions require sufficient verbal ability to describe one's experiences, and it is possible that differences observed between

SBEs and OBEs may have been broadly explained by differences in emotion recognition and ability to articulate inner experiences.

Another limitation was that in order to limit participant burden, we only used subsets of items from psychometrically validated instruments. This limited our psychometric validity and ability to draw comparisons between the present samples and normative data, but also allowed for greater ease of recruitment and the ability to provide smaller monetary incentives for participation.

Clinical Implications

While some clinical implications were interspersed throughout our discussion of findings, in the current section we will make broader recommendations regarding the treatment of SBEs. First, since over-control and rigidity surrounding eating seems to be a broader difficulty that those with SBEs struggle with, treatments would benefit from encouraging flexibility in the domain of eating. This flexibility could be encouraged with a cognitive restructuring approach in which clients identify beliefs that guide their eating (e.g., that having "willpower" is of key importance during eating) and explore the more overarching core beliefs and schemas that guide such beliefs (e.g., "I am intrinsically damaged, and therefore in need of rigid rules to compensate"). Clinicians could help a client understand such schemas, including their possible origins, and also help them challenge and adjust beliefs to facilitate a more flexible approach to eating (and possibly other life experiences). This approach is in line with cognitive behavioral therapy, and specifically targets cognitive rigidity and overregulation that may serve as a context for SBEs.

Given the high dietary restraint observed among those with SBEs, it would also be important to follow Fairburn et al.'s (1993) suggestion of helping clients discontinue dietary

restriction as part of the treatment of binge eating. This would involve encouraging regular eating of meals to prevent accumulations of hunger that may prompt SBEs. As mentioned above, clinicians would possibly increase the effectiveness of this intervention by focusing on eating that is not overly planned or controlled (even though it is regularly spaced throughout the day to prevent hunger), particularly among those with SBEs.

Another clinical implication from the current findings is that clinicians may benefit from ascertaining the behavioral function of SBEs (which may differ from OBEs), such that interventions can be tailored according to their unique features. Episodes that meet an *emotional need* may be particularly related to interpersonal stress. Therefore, an interpersonal focus in treatment could particularly benefit *emotional needs* SBEs. For example, Interpersonal Psychotherapy is an empirically supported treatment for BN, and may be particularly useful for the treatment of SBEs (e.g., Fairburn, Jones, Peveler, Hope, & O'Connor, 1993). Episodes that meet a *sensory positive* function, on the other hand, may benefit from a focus on boredom response (as described above) and helping the client generate new ways of fulfilling appetitive urges (e.g., with planned episodes in which particularly "craved" foods are consumed in a way that minimizes the likelihood of loss of control). The idea of planned "binges" has been proposed in a case study by Friedman (2008) in the context of Binge Eating Disorder, and may be particularly relevant to SBEs given their unintended nature. Additionally, distress tolerance skills taught in dialectical behavior therapy may also be beneficial with regard to boredom response (i.e., by helping clients tolerate and sit with boredom without necessarily engaging in a behavior to decrease the boredom) (Linehan, 1993; Safer, Telch, & Agras, 2001). On the other hand, SBEs that have an *I should eat/need energy* and/or *physical need/hunger response* function are likely most related to caloric insufficiency, and therefore may particularly respond to

interventions focused on dietary restraint. Regulation of eating and refeeding processes may be most immediately pertinent with those who report SBEs (as described in Fairburn et al. (1993)).

Given the role of *dissociative/unmindful* experiences in SBEs (particularly during their occurrence), interventions for SBEs should include mindfulness approaches that help individuals stay present even in the midst of eating experiences. Such mindfulness exercises might include in vivo eating during sessions to help clients consume items of food with prompts by the therapist to observe and describe each bite of food. This is in line with previous work that has suggested the clinical usefulness of mindfulness-based interventions for Binge Eating Disorder (e.g., Baer, Fischer, & Huss, 2005; Godfrey, Gallo, & Afari, 2015). As such, SBEs may benefit from similar mindfulness approaches as OBEs.

On a broader level, the current findings suggest that treatments would likely benefit from clinicians asking about episode size as part of their assessment and information gathering process. Knowing the size(s) of recent episode(s) may inform the clinician's case conceptualization and understanding of possible associated difficulties that the client may struggle with (e.g., anxiety or depressive symptoms). Additionally, given that the phenomenology of SBEs seems to differ from OBEs, clinicians should assume that episodes might serve different functions or be associated with different emotion/feeling states depending upon size.

Future Directions

"**Other" episodes.** Our online assessment of SBEs and OBEs led us to discover two types of binge episodes not previously classified that were out of the scope of the current study. These included large episodes reported when participants were asked about SBEs (i.e., large SBEs), and small episodes reported when participants were asked about OBEs (i.e., small

OBEs). These episodes were characterized by miscalculations of what the participant imagined other people might think would qualify as a large episode. Such a calculation requires an ability to take another person's perspective and have insight regarding what qualifies as large. Being able to imagine others' perspectives requires a certain amount of social cognitive ability (e.g., theory of mind) and socio-emotional understanding of other people; therefore, those who provided example episodes that fit SBE or OBE criteria were likely higher on this capacity to imagine others' perspectives in an accurate way than those who provided large SBEs or small OBEs. Previous research has implicated socio-emotional deficits in disordered eating (e.g., difficulties imitating emotion expressions; Dapelo, Bodas, Morris, & Tchanturia, 2016); therefore, it is not surprising that some participants were not able to make accurate guesses of how others would categorize their episode according to size.

It is also likely that one's cultural and interpersonal context influenced their prediction of whether others would deem the episode to be large. For example, if a male-identified, 20-year-old college student endorsed a large SBE, which involved eating a large pizza, while several friends also each ate a large pizza, the participant might have himself felt it was "too much food," but also might have acknowledged that many of his peers would have disagreed that it was large. In this case, the participant's age, gender identity, and social environment would have influenced his judgments regarding size. As another example, a participant who grew up in an environment in which parents and siblings regularly stated that reasonable dinner portions were "too large" might have a lower threshold for labeling an eating experience as large. For example, this participant might report a small OBE that is an entrée-portion salad at a restaurant, and this report might have been heavily influenced by extreme messages regarding what counts as large.

Future research should investigate whether there are clinically meaningful differences between SBEs, OBEs, large SBEs, and small OBEs as posited above. In-person assessment of such episodes would allow for further follow-up by researchers to elucidate possible differences.

Functionality. Further research is needed regarding the functions behind SBEs versus OBEs. We used inductive qualitative methods in the current study, and discovered that implied functionality was communicated in participant descriptions. Additionally, we found that functionality seemed to meaningfully categorize loss of control episodes according to emotion/feeling states, dietary restraint, and reinforcement mechanisms. Further quantitative and deductive qualitative work is needed to specify which functions SBEs and OBEs can serve. We may find in this future research that function is more clinically meaningful than size, and that the differences we observe based upon size are actually explained by function of the episode more than size. In other words, size may be a proxy for function in that small episodes may tend toward different functions than large episodes. Established measures regarding motivations to eat (e.g., the DBEQ, Van Strien et al., 1986; MTES, Jackson et al., 2003; Palatable Eating Motives Scale; Boggiano et al., 2015) might be important to corroborate with qualitative reports to better understand phenomenology of SBEs and OBEs.

Emotional reinforcement in loss of control eating. The methodologies we used in order to examine the emotions and feeling states of SBEs (and OBEs), as well as the question of whether SBEs serve an emotion regulation function, are limited in that they do not reveal which combinations of emotions tend to co-occur within each person's episode description. As mentioned above, future work should examine whether there are certain combinations of emotions that tend to co-occur, which in turn may motivate engagement in a loss of control episode. For example, there may be something particularly reinforcing about the combination of

decreased boredom and positive taste experiences that reinforces loss of control eating for some people, and that combination might not be identifiable by looking at changes in each emotion separately across recent episodes. Latent variable mixture modeling approaches would be an ideal statistical approach for examining this question regarding more complicated ways in which combinations of emotions (not just singular emotions) may reinforce loss of control eating.

Conclusions

This set of studies provides empirical support for there being a unique phenomenology of SBEs that is distinct from OBEs. In particular, SBEs are often experienced as out of control *in contrast* to general eating that is overregulated and calorically insufficient. SBEs also are associated with equivalent levels of in-the-moment distress as OBEs, and further appear to be associated with increases in distress across their occurrence (from pre- to post-episode). As such, we hesitantly conclude that SBEs are unlikely to serve a simple emotion regulation function by decreasing negative emotions. Given that SBEs seem to mark dietary restraint, bulimic behaviors, and depressive/anxiety symptoms when observed in the general population (as recruited online), the current project corroborates findings from Brownstone et al. (2013) in encouraging health providers to assume that SBEs are clinically concerning behaviors that may require treatments that differ from OBEs. Further, they appear to be markers of both eating disorder and broader psychopathology.

Table 1

Participant Groups According to Type(s) of Loss of Control Eating

Group name	Types of LOC eating reported	Analyses in Study 1	Study 1 sample size	Study 2 sample size
Non-LOC Eating	1. No loss of control eating in the prior 3 months. 2. No self-reported history of AN. 3. Recruited through Mturk.	1. Group difference analyses	*n* = 133	N/A
SBE-only	1. At least one SBE in the prior 3 months that met size criteria.	1. Group difference analyses 2. Episode level comparisons	*n* = 42	*n* = 26
SBE and OBE	1. At least one SBE in the prior 3 months that met size criteria. 2. At least one OBE in the prior 3 months that met size criteria.	1. Group difference analyses 2. Episode level comparisons	*n* = 29	*n* = 8
OBE-only	1. At least one OBE in the prior 3 months that met size criteria.	1. Group difference analyses 2. Episode level comparisons	*n* = 135	*n* = 109
OBE and other	1. At least one OBE in the prior 3 months that met size criteria. 2. Participant reported an SBE example that did not meet SBE size requirements (e.g., an objectively large episode as an SBE example) or they did not provide enough information to determine whether the episode met SBE criteria.	1. OBE used in episode-level comparisons	*n* = 12	*n* = 8

Table 1 (continued)

Group name	Types of LOC eating reported	Analyses in Study 1	Study 1 sample size	Study 2 sample size
SBE and other	1. At least one SBE in the prior 3 months that met size criteria. 2. Participant reported an OBE example that did not meet OBE size requirements (e.g., a subjectively, but not objectively, large episode as an OBE example) or they did not provide enough information to determine whether the episode met OBE criteria.	1. Group difference analyses 2. SBE used in episode-level comparisons	*n* = 61	*n* = 41
SBE-included	1. SBE-only 2. SBE and OBE 3. SBE and other	Group difference analyses	*n* = 132	*n* = 75
SBE-other Only	4. Participant reported an SBE example that did not meet SBE size requirements (e.g., an objectively large episode as an SBE example) or they did not provide enough information to determine whether the episode met SBE criteria.	Not used in analyses	*n* = 14	*n* = 6
OBE-other Only	1. Participant reported an OBE example that did not meet OBE size requirements (e.g., a subjectively, but not objectively, large episode as an OBE example) or they did not provide enough information to determine whether the episode met OBE criteria.	Not used in analyses	*n* = 77	*n* = 148

Table 1 (continued)

Group name	Types of LOC eating reported	Analyses in Study 1	Study 1 sample size	Study 2 sample size
Other	1. Participant reported an SBE example that did not meet SBE size requirements (e.g., an objectively large episode as an SBE example) or they did not provide enough information to determine whether the episode met SBE criteria. 2. Participant reported an OBE example that did not meet OBE size requirements (e.g., a subjectively, but not objectively, large episode as an OBE example) or they did not provide enough information to determine whether the episode met OBE criteria.	Not used in analyses	*n* = 183	*n* = 83

Note. LOC = Loss of control. SBE = Subjective binge eating. OBE = Objective binge eating. AN = anorexia nervosa. Italicization notes when a group was not used in the present analyses. The non-LOC eating group was not recruited for Studies 2 and 3.

Table 2

Code Totals within SBE and OBE Participant Qualitative Descriptions in Study 1

Codes	SBE	OBE
Episode descriptors		
Secret	5	**12**
Fast	15	15
Intended	0	**10**
Not expected	23	22
Nighttime	11	**19**
Associated activities/behaviors		
Busy with activity	30	**36**
Others' influence/reassurance	**15**	3
Nothing happening	8	13
Interpersonal stressor	15	**26**
Dietary restriction	20	17
Compensatory behavior mentioned	**19**	13
Feelings		
Mixed feelings	13	**30**
Negative feelings/concerns	70	**102**
Self-conscious and judgment	12	16
Weight/body concern	16	11
Regret	5	7
Stress	21	**38**
Sad/depressed	12	**24**
Guilt/Shame	**29**	22
Lonely	1	6
Disgusting	11	15
Anxiety	9	11
Positive emotions/feelings	20	**52**
Tasted good/pleasurable	14	**30**
Comforting	6	**20**
Boredom	11	**17**
Dissociative spectrum	18	18
Lack of perceived fullness	9	**18**
Too full	10	11
Sick/discomfort	14	**33**
Not hungry	**14**	6
Hungry	25	23
Implied functionality		
Emotional need	21	**50**
I should eat/need for energy	**18**	4
Sensory positive	28	**55**
No cause theorized	**41**	32

Note. SBE = Subjective Binge Eating. OBE = Objective Binge Eating. Code total is bolded for SBE or OBE only if the frequencies differ by more than 5. The table compares all SBEs to all OBEs regardless of whether or not episodes co-occurred within a person.

Table 3

Code Co-Occurrence Matrix of Episode Descriptors with All Other Codes for SBEs versus OBEs in Study 1

	Secret		Fast		Intended/ anticipated		Not expected		Nighttime	
	SBE	**OBE**	**SBE**	**OBE**	**SBE**	**OBE**	**SBE**	**OBE**	**SBE**	**OBE**
Total	5	12	11	12	0	6	17	20	7	17
Episode descriptors										
Secret	0	0	2	2	0	0	1	2	0	2
Fast	2	2	0	0	0	0	3	1	2	4
Intended/anticipated	0	0	0	0	0	0	0	0	0	0
Not expected	1	2	3	1	0	0	0	0	0	2
Nighttime	0	2	2	4	0	0	0	2	0	0
Associated activities/behaviors	0		0		0		0		0	0
Busy with activity	0	1	2	1	0	0	1	**6**	2	0
Others' Influence/reassurance	0	0	1	0	0	0	2	1	3	4
Nothing happening	1	1	1	1	0	1	1	3	0	0
Interpersonal problem/stressor	0	3	0	1	0	2	3	2	1	1
Dietary Restriction	2	2	3	2	0	0	5	2	1	3
Compensatory behavior mentioned	0	1	1	2	0	0	3	3	2	3
Feelings	0		0		0		0		0	0
Mixed feelings	0	2	0	2	0	1	2	2	1	3
Negative feelings/concerns	4	**10**	**7**	**9**	0	2	**10**	**14**	4	**12**
Self-conscious and judgment	1	1	0	2	0	0	0	2	1	4
Weight/body concern	1	0	0	0	0	0	2	3	1	1
Regret	1	0	1	2	0	0	0	3	0	0
Stress	0	4	2	2	0	0	**6**	4	1	4
Sad/depressed	0	1	1	2	0	1	3	1	1	1
Guilt/Shame	3	3	3	3	0	0	5	4	2	2
Lonely	0	1	0	0	0	0	0	0	0	1
Disgusting	1	2	1	1	0	0	1	4	1	0
Anxiety	1	1	1	2	0	0	1	2	0	1

Table 3 (continued)

	Secret		Fast		Intended/ anticipated		Not expected		Nighttime	
	SBE	**OBE**	**SBE**	**OBE**	**SBE**	**OBE**	**SBE**	**OBE**	**SBE**	**OBE**
Positive emotions/feelings	0	3	0	4	0	3	2	2	1	**6**
Tasted good/pleasurable	0	2	0	3	0	1	2	1	0	4
Comforting	0	1	0	1	0	1	0	2	1	1
Boredom	0	2	0	3	0	1	2	1	0	4
Dissociative spectrum	1	1	1	3	0	1	3	0	1	1
Lack of perceived fullness	0	1	0	0	0	0	1	2	0	0
Too full	0	0	2	3	0	0	2	0	0	5
Sick/discomfort	1	3	3	5	0	3	0	**7**	1	**7**
Not hungry	0	0	1	0	0	0	2	0	1	0
Hungry	1	2	3	**6**	0	1	**6**	3	1	4
Implied functionality										
Emotional need	0	4	1	3	0	2	3	5	2	**6**
I should eat/need energy	2	0	2	0	0	0	3	0	1	1
Sensory positive	2	2	4	**6**	0	2	4	**6**	2	**9**
No cause theorized	0	4	3	2	0	1	4	5	2	1

Note. Co-occurrences between codes were only counted among individuals who reported either an SBE or an OBE, but not both types of episode. Co-occurrence frequencies over 5 are bolded and outlined.

Table 4

Code Co-Occurrence Matrix of Implied Functionality Codes with All Other Codes for SBEs versus OBEs in Study 1

Codes	Emotional need		I should eat/need energy		Sensory positive		No cause theorized	
	SBE	**OBE**	**SBE**	**OBE**	**SBE**	**OBE**	**SBE**	**OBE**
Total	17	44	13	4	22	52	31	24
Episode descriptors								
Secret	0	4	2	0	2	2	0	4
Fast	1	3	2	0	4	**6**	3	2
Intended/anticipated	0	2	0	0	0	2	0	1
Not expected	3	5	3	0	4	**6**	4	5
Nighttime	2	**6**	1	1	2	**9**	2	1
Associated activities/behaviors								
Busy with activity	4	**10**	2	1	5	**13**	**10**	5
Others' influence/reassurance	2	0	2	0	5	1	3	1
Nothing happening	0	1	0	0	1	**6**	2	2
Interpersonal stressor	**8**	**12**	0	0	2	**8**	2	4
Dietary Restriction	2	5	**8**	4	4	3	1	2
Compensatory behavior mentioned	3	4	2	0	1	4	5	3
Feelings		0		0		0		0
Mixed feelings	3	**17**	0	1	**7**	**14**	0	1
Negative feelings/concerns	**15**	**34**	**10**	2	**16**	**31**	**16**	**18**
Self-conscious and judgment	4	**8**	2	0	1	**6**	2	3
Weight/body concern	1	3	1	0	2	3	**6**	3
Regret	0	1	2	0	1	4	2	2
Stress	**7**	**17**	4	1	5	**9**	4	**6**
Sad/depressed	4	**9**	0	1	2	5	4	4

Table 4 (continued)

Codes	Emotional need		I should eat/need energy		Sensory positive		No cause theorized	
	SBE	OBE	SBE	OBE	SBE	OBE	SBE	OBE
Guilt/Shame	5	3	**6**	0	**9**	**7**	3	**6**
Lonely	0	1	0	0	0	3	0	0
Disgusting	3	5	1	0	1	3	1	2
Anxiety	3	4	3	0	0	3	1	1
Positive emotions/feelings	5	**23**	0	1	**9**	**30**	0	1
Tasted good/pleasurable	2	**7**	0	0	**7**	**24**	0	1
Comforting	3	**17**	0	1	2	**6**	0	0
Boredom	2	**6**	0	1	1	**8**	3	0
Dissociative spectrum	3	**6**	2	0	2	4	**6**	3
Lack of perceived fullness	0	3	0	0	3	**6**	0	1
Too full	1	3	2	1	2	**6**	5	1
Sick/discomfort	0	**10**	3	0	4	**13**	5	**9**
Not hungry	1	2	1	0	1	3	5	0
Hungry	3	4	**8**	2	**6**	**12**	0	0
Implied functionality		0		0		0		0
Emotional need	0	0	1	2	2	**11**	0	0
I should eat/need energy	1	2	0	0	1	0	0	0
Sensory positive	2	**11**	1	0	0	0	0	0
No cause theorized	0	0	0	0	0	0	0	0

Note. Co-occurrences between codes were only counted among individuals who reported either an SBE or an OBE, but not both types of episode. Co-occurrence frequencies over 5 are bolded and outlined.

Table 5

Code Co-Occurrence Matrix of Context Codes with All Other Codes for SBEs in Study 1

	Home	Not home	Alone	With others
SBE	69	15	41	41
Context				
Home	0	1	**37**	29
Not home	1	0	3	**10**
Alone	**37**	3	0	1
With others	29	10	1	0
Episode descriptors				
Secret	3	1	4	1
Fast	8	2	5	5
Intended/anticipated	0	0	0	0
Not expected	**15**	1	9	5
Nighttime	3	0	2	4
Associated activities/behaviors				
Busy with activity	**17**	1	9	10
Others' influence/reassurance	**5**	0	1	**7**
Nothing happening	4	1	2	2
Interpersonal stressor	7	3	4	5
Dietary Restriction	**12**	0	7	3
Compensatory behavior mentioned	9	2	5	7
Feelings				
Mixed feelings	8	1	6	4
Negative feelings/concerns	41	9	**31**	21
Self-conscious and judgment	6	3	4	6
Weight/body concern	9	2	5	9
Regret	4	1	3	2
Stress	**15**	2	**12**	5
Sad/depressed	**7**	1	**7**	1
Guilt/Shame	**20**	3	12	9
Lonely	0	0	0	0
Disgusting	4	2	4	4
Anxiety	4	2	4	2
Positive emotions/feelings	10	2	6	7
Tasted good/pleasurable	**8**	1	4	6
Comforting	2	1	1	2
Boredom	5	1	4	3
Dissociative spectrum	10	2	6	7
Lack of perceived fullness	4	1	2	2
Too full	6	2	4	6
Sick/discomfort	9	4	2	**10**
Not hungry	**7**	0	3	5

Table 5 (continued)

	Home	Not home	Alone	With others
Hungry	**16**	2	9	6
Implied functionality				
Emotional need	10	4	10	5
I should eat/need energy	10	2	7	4
Sensory positive	**16**	2	9	11
No cause theorized	25	6	13	**19**

Note. Co-occurrences between codes were only counted among individuals who reported either an SBE or an OBE, but not both types of episode. Given the ratio of 69 to 15 for Home versus Not home among the SBEs, differences between home and not home on each code were only highlighted if the frequency co-occurring with Home was greater than five times that co-occurring with Not home for the given code. Regarding co-occurrences between being *alone* versus *with others* and each code, we highlighted a frequency if one was more than 5 greater than the other.

Table 6

Demographic Group Differences in Study 1

	SBE-included	OBE-only	Non-LOC eating	Significance
Age (mean, *SD*)	24.13 (8.38)[a]	27.63 (10.35)[b]	38.57 (13.88)[c]	$F(2,397) = 61.12$, $p < .001$
Gender				Pearson chi-square = 14.59, $p = .006$
Female (%, *n*)	95.46% (*n*=126)[a]	84.44% (*n*=114)[b]	90.23% (*n*=120)[a,b]	
Male (%, *n*)	2.27% (*n*=3)[a]	14.07% (*n*=19)[b]	9.77% (*n*=13)[b]	
Other (%, *n*)	2.27% (*n*=3)[a]	1.48% (*n*=2)[a]	0.00% (*n*=0)[a]	
History of AN (%, *n*)	17.42% (*n*=23)[a]	8.15% (*n*=11)[b]	N/A	Pearson chi-square = 6.92, $p = .031$
Race and Ethnicity				
Caucasian/White (%, *n*)	86.36% (*n*=114)	85.93% (*n*=116)	81.95% (*n*=109)	Pearson chi-square = 1.21, $p = .545$
Not Hispanic/Latino (%, *n*)	89.39% (*n*=118)	91.85% (*n*=124)	96.24% (*n*=128)	Pearson chi-square = 4.60, $p = .100$
Treatment History				
History of Psychological Treatment (%, *n*)	72.73% (*n*=96)[a]	67.41% (*n*=91)[a]	36.09% (*n*=48)[b]	Pearson chi-square = 43.00, $p < .001$
Eating Disorder Treatment (%, *n*)	34.85% (*n*=46)[a]	16.30% (*n*=22)[b]	2.26% (*n*=3)[c]	Pearson chi-square = 48.50, $p < .001$

Note. SBE = subjective binge eating. OBE = objective binge eating. SBE-included = includes those in the SBE-only, SBE and OBE, and SBE and other groups ($n = 132$). OBE-only = includes those with only OBEs ($n = 135$). Non-LOC eating = individuals without self-reported loss of control eating in the prior three months, nor history of anorexia nervosa ($n = 133$). Differing superscripts indicate which groups are significantly different from one another. For age, we used an analysis of variance (ANOVA), followed by a post-hoc Tukey test to determine which groups were significantly different from one another. For all other variables, we used omnibus chi-square tests, followed by z-square cell comparison tests with Bonferroni correction when omnibus chi-square tests were significant as suggested by Goodman (1969).

Table 7

Group Comparison Using MANOVA and ANOVA Between SBE-included, OBE-only, and Non-LOC Eating Groups in Study 1

	SBE-included	OBE-only	Non-LOC	Significance
Eating Disorder Symptoms				
Dietary restriction	4.86[a]	3.88[b]	2.50[c]	$F(2,330) = 37.18$, $p < .001$
Compensatory behavior frequency				**$F(8,654) = 9.64$, Wilks' Lambda = 0.80, $p < .001$, Partial $\eta^2 = 0.11$**
Vomiting	5.92[a]	0.47[b]	0.00[b]	$F(2,330) = 14.81$, $p < .001$
Laxative use	1.57[a]	0.26[b]	0.01[b]	$F(2,330) = 17.21$, $p < .001$
Diuretic use	1.36[a]	0.48[a,b]	0.01[b]	$F(2,330) = 5.01$, $p = .007$
Hard exercise	7.10[a]	2.05[b]	1.44[b]	$F(2,330) = 25.07$, $p < .001$
Body shame	4.08[a]	3.71[b]	2.43[c]	$F(2,334) = 89.39$, $p < .001$
Negative Affect				**$F(6,662) = 12.42$, Wilks' Lambda = 0.81, $p < .001$, Partial $\eta^2 = 0.10$**
Anxiety	2.11[a]	1.69[b]	1.34[c]	$F(2,333) = 27.56$, $p < .001$
Depression	2.32[a]	2.02[b]	1.48[c]	$F(2,333) = 26.63$, $p < .001$
Interpersonal Difficulties				**$F(4,664) = 22.28$, Wilks' Lambda = 0.78, $p < .001$, Partial $\eta^2 = 0.12$**
Loneliness	3.08[a]	3.01[a]	2.20[b]	$F(2,334) = 47.57$, $p < .001$
Perceived Social Support	4.18[a]	4.28[a]	5.21[b]	$F(2,333) = 20.82$, $p < .001$
Imagined Eating Interpretation				
Carbohydrate image				**$F(6,656) = 29.59$, Wilks' Lambda = 0.62, $p < .001$, Partial $\eta^2 = 0.21$**
"Out of control"	4.77[a]	3.43[b]	1.90[c]	$F(2,330) = 80.66$, $p < .001$
"Too much food"	5.07[a]	3.44[b]	2.22[c]	$F(2,330) = 74.99$, $p < .001$
"Bad/unhealthy"	5.82[a]	5.06[b]	3.58[c]	$F(2,330) = 57.41$, $p < .001$
Fruit/Vegetable image				**$F(6,656) = 16.08$, Wilks' Lambda = 0.76, $p < .001$, Partial $\eta^2 = 0.13$**
"Out of control"	2.32[a]	1.37[b]	1.23[b]	$F(2,330) = 32.39$, $p < .001$
"Too much food"	2.80[a]	1.50[b]	1.37[b]	$F(2,330) = 45.47$, $p < .001$
"Bad/unhealthy"	1.84[a]	1.27[b]	1.30[b]	$F(2,330) = 12.40$, $p < .001$

Note. SBE = Subjective Binge eating. OBE = Objective Binge Eating. Non-LOC = Group of individuals with neither a history of loss of control eating in the prior three months, nor a lifetime history of anorexia nervosa. Results from multivariate tests are indicated in bold. Compensatory behavior frequencies were reported as number of episodes in the past 28 days. Superscripts specify which groups are statistically significantly different from one another based upon post-hoc Tukey tests.

Table 8

Demographic Group Differences in Study 2

	SBE-included	OBE-only	Significance
Age (mean, *SD*)	31.64 (1.59)	34.03 (1.32)	$F(1, 182) = 1.34$, $p = .249$
Gender			Pearson chi-square = 8.48, $p = .014$
Female (%, *n*)	94.67% (*n*=71)[a]	87.16% (*n*=95)[a]	
Male (%, *n*)	2.67% (*n*=2)[a]	12.84% (*n*=14)[b]	
Other (%, *n*)	2.67% (*n*=2)[a]	0.00% (*n*=0)[a]	
Race and Ethnicity			
Caucasian/White (%, *n*)	88.00% (*n*=66)	84.40% (*n*=92)	Pearson chi-square = 0.47, $p = .491$
Not Hispanic/Latino (%, *n*)	93.33% (*n*=70)	97.25% (*n*=106)	Fisher's exact test $p = .274$
History of AN (%, *n*)	18.67% (*n*=14)	9.17% (*n*=10)	Pearson chi-square = 3.53, $p = .060$
Treatment history			
History of Psychological Treatment (%, *n*)	77.33% (*n*=58)	67.89% (*n*=74)	Pearson chi-square = 1.95, $p = .182$
History of Eating Disorder Treatment (%, *n*)	30.67% (*n*=23)	19.27% (*n*=21)	Pearson chi-square = 3.85, $p = .146$

Note. SBE = subjective binge eating. OBE = objective binge eating. SBE-included = includes those in the SBE-only, SBE and OBE, and SBE and other groups ($n = 75$). OBE-only = includes those with only OBEs ($n = 109$). AN = anorexia nervosa. Differing superscripts indicate which groups are significantly different from one another (if applicable). For age, we used an analysis of variance (ANOVA). For all other variables, we used omnibus chi-square tests, followed by z-square cell comparison tests (if applicable) with Bonferroni correction when omnibus chi-square tests were significant as suggested by Goodman (1969).

Table 9

Before versus After Self-Reported Emotions for Subjective Binge Eating Episodes in Study 2

	Before	**After**	***t*-statistic**	***p* -value**	**Change (if significant)**
Unpleasant*	3.46	5.26	-9.84	< .001	**1.80**
Energetic	3.07	2.53	2.69	.009	
Angry*	3.11	4.09	-4.25	<.001	**0.98**
Sad*	3.56	4.38	-3.89	<.001	**0.82**
Scared	2.54	2.94	-1.68	.097	
Disgust*	2.18	4.18	-8.99	<.001	**2.00**
Hatred*	1.99	2.88	-4.48	<.001	**0.89**
Embarrassed*	2.54	3.81	-7.17	<.001	**1.27**
Guilty*	2.50	4.43	-8.91	<.001	**1.93**
Ashamed*	2.29	3.99	-7.57	<.001	**1.70**
Sick*	1.75	3.10	-5.90	<.001	**1.35**
Uncomfortable*	2.78	4.24	-6.72	<.001	**1.46**
Gross*	2.24	4.32	-9.34	<.001	**2.08**
Zoned out	2.71	2.74	-0.12	.907	
Bored*	2.96	2.07	4.40	<.001	-0.89
Sleepy	3.32	3.99	-2.83	.006	
Grateful	1.96	1.71	1.50	.139	
Interested*	1.96	1.50	3.61	.001	-0.46
Love	2.01	1.79	2.65	.010	
Amused	2.03	1.66	2.48	.016	
Glad	2.10	1.69	3.02	.004	
Hopeful*	1.97	1.57	3.86	<.001	-.40
Inspired	1.73	1.46	2.24	.029	
Proud*	1.79	1.38	3.46	.001	-.41
Content	1.81	1.82	-0.12	.909	
Awe	1.35	1.40	-0.47	.643	
Sympathy	1.79	1.56	1.62	.110	
Surprised	1.43	1.51	-0.87	.390	
Comforted*	1.68	2.18	-3.26	.00174	**.50**

Note. SBE = Subjective Binge Eating. Alpha level set at .00178 to correct for multiple comparisons using the Bonferroni correction. * = Statistical significance. Bolded change values note increases in emotion from pre- to post-SBE.

Table 10

Group Comparison Findings Using MANOVA and ANOVA Between SBE-included, and OBE-only Groups in Study 2

	SBE-included	OBE-only	Significance
Disordered Eating Symptoms and Behaviors			
Compensatory behavior frequency			***F*(4, 156) = 0.69, Wilks' Lambda = 0.98, *p* = .598, Partial η^2 = 0.02**
Vomiting	2.16	1.73	
Laxative misuse	1.05	1.20	
Diuretic misuse	1.02	0.68	
Hard exercise	3.72	2.34	
Dietary restraint measures			***F*(2, 157) = 7.08, Wilks' Lambda = 0.92, *p* = .001, Partial η^2 = 0.08**
Dietary Restriction*	4.88	3.94	$F(1, 158) = 8.40$, $p = .004$
Restrained eating*	3.48	3.01	$F(1, 158) = 14.14$, $p < .001$
Eating Attitudes			
Motivations To Eat			***F*(4, 160) = 3.62, Wilks' Lambda = 0.92, *p* = .007, Partial η^2 =0.08**
Coping^	3.08	3.53	$F(1, 160) = 8.84$, $p = .051$
Social	3.45	3.62	$F(1, 160) = 1.51$, $p = .221$
Compliance*	2.27	1.91	$F(1, 160) = 4.48$, $p = .036$
Pleasure	3.08	3.22	$F(1, 160) = 0.83$, $p = .363$
Cognitive and Affective Processing			
Dissociation	3.13	3.43	$F(1, 160) = 0.93$, $p = .337$
Difficulties with Emotion Regulation			***F*(5, 158) = 1.52, Wilks' Lambda = 0.95, *p* = .174, Partial η^2 = 0.06**
Non-acceptance	2.79	2.57	
Goals	3.73	3.47	
Impulsiveness	2.65	2.83	
Awareness	3.42	3.40	
Strategies	2.38	2.51	
Clarity	2.16	2.11	

Note. SBE = subjective binge eating. OBE = objective binge eating. * $p < .05$. ^ $.05 < p < .10$.

Table 11

Summary Matrix of Codes for Each Participant in Study 3

Codes/Variables	**10**	**1**	**5**	**12**	**13**	**6**	**7**	**8**	**2**	**4**	**9**	**3**	**11**	**14**	**Totals**
Gender	F	F	F	F	F	Other	F	F	F	F	F	F	M	M	
Age	29	36	30	23	29	22	65	42	40	19	38	48	32	41	
BMI	17.9	26.5	35.7	22.3	22.3	45.6	40.2	35	X	21.6	22.8	33	23.8	35	
Weight suppression (BMI change)	4.30	10.10	0.00	2.10	5.10	5.32	1.00	5.30	X	1.10	0.80	2.40	3.20	5.20	
OBE	1	1	0	0	1	1	1	0	0	0	0	0	1	1	7
"OBE"	0	0	1	1	0	0	0	1	0	1	1	1	0	0	6
Restrained eating	41	40	17	40	41	42	26	34	33	31	32	33	18	32	
# Vomiting Episodes	15	8	0	0	0	10	0	0	0	0	0	0	0	0	
# Days Restriction	28	28	1-5	23-27	28	28	6-12	13-15	16-22	13-15	13-15	28	6-12	13-15	
# Laxative misuse Episodes	0	0	0	0	5	0	0	0	0	0	0	0	0	0	
Eating descriptors															
Pacing/speed concern		1						1							2
Automatic/mechanical	1				1		1	1							2
Satisfaction concern							1		1				1		3
Alone			1						1						2
Secretive			1												1
Feelings/Inner Experiences															
Taste															

Table 11 (continued)

Codes/Variables	10	1	5	12	13	6	7	8	2	4	9	3	11	14	Totals
Tasted good				1			1		1		1	1		1	6
Taste dissipates			1					1			1				3
Satiety cues															
Hunger		1	1	1	1	1		1				1	1		8
Craving		1			1		1	1	1	1					6
Too full		1	1			1				1	1	1	1		7
Other feelings															
Mixed emotions	1			1		1	1		1						3
Positive emotions	1			1		1	1		1	1			1		5
Dissociative/unmindful	1	1	1		1	1				1	1	1			6
Boredom								1	1		1				3
Negative feelings/concerns	1	1	1	1		1	1	1	1	1	1	1		1	12
Disgust, gross	1			1		1		1							4
Fat concern			1	1											2
Guilt/shame		1	1						1					1	4
Anxiety	1	1													2
Sick, pain	1						1	1				1			4
Disappointed				1			1				1	1		1	4
Implied functionality															
Emotional Need	1														1

Table 11 (continued)

Codes/Variables	10	1	5	12	13	6	7	8	2	4	9	3	11	14	Totals
Physical need/hunger response		1	1	1	1	1									5
Sensory positive							1	1	1						3
Social pressures/influence										1	1	1	1	1	5
Compensatory behaviors															
Vomit	1	1				1									3
Compensatory restriction										1				1	2
None			1	1	1		1	1	1		1	1	1		9
Broader codes															
General restrictive eating		1	1	1										1	4
Willpower/moderation ideal		1	1	1	1	1	1	1	1	1	1	1		1	11
Planned/control ideal	1	1	1			1		1	1	1	1	1			9
Healthy eating ideal		1	1		1			1			1				5
Anhedonic description	1	1	1	1	1										5
Imagined eating															
Satisfaction concerns			1		1	1	1	1	1	1	1	1	1	X	6
Nutrient/balance concerns	1	1	1	1	1	1		1		1	1			X	4
LOC/trigger concerns	1	1					1					1		X	3

Note. Participant columns are organized by *implied functionality* code with fine lines separating those who reported each functionality code for their recent subjective binge eating episode. LOC = loss of control. X = not ascertained during interview. OBE = objective binge eating. "OBE" = participant reported that they had an OBE, but size was not objectively large. For # of vomiting episodes, # days restriction, and # of laxative misuse episodes, number reflect frequencies of the behavior in the past 28 days. For restrained eating, the range of scores was 0 to 50.

Table 12

Body/Feeling State Participant Quotes Before, During, and After Recent SBE in Study 3

ID #	Before	During	After
1	"anxiety provoking...brain starts spinning thoughts, and negativity, kind of start pacing back and forth"	"I eat really fast and I don't really measure my fullness so I'm like oh I'll make something else"	"20 minutes later I'm getting uncomfortable, like uncomfortably full, and like I should've waited, I should have paced it different, I should've you know like, now I'm too full, I shouldn't have had that many fries"
2	"I was hungry, just craving something sweet. And my intention was just to eat a part of a dessert. Like allow myself a little bit of that but not…boredom too"	"once I started eating it and tasting it...didn't feel like enough to satisfy me…at the end of the cake I still wanted more and I knew that it would be more sensible to stop at that point but I wanted to um get to a point where I felt satisfied so I kept eating…there might be pleasure in the middle."	"after I didn't feel bad physically but I felt guilty and um felt sort of out of control that I couldn't stick with my intentions to just eat a little bit."
3	"before, I was hungry"	"During I, I mean I was fine. We were talking and I was eating. Um it was funny because we were making observations of the people around us, that's kind of what we enjoy" doing.	"like I had eaten too much. Like I was full like up to my Adam's apple…I felt like a stuffed bird…disappointment because I felt like I had not paid attention to what I was eating and therefore I was stuffed and it felt nauseating because I was so full." "
4	"I mean before I felt fine like we had just…were bowling so it was fine and we had fun… I was excited because we were going to see this movie [recording skip], um and I mean I was excited for the popcorn"	"I just like kept wanting more because, especially when your in a movie you're just kind of blankly staring at a screen so I mean um it's just kind of the fact that it was there, and I felt, I mean I felt fine until like I kept eating more… don't even know if there was like an emotion, it was almost just like mindless. It was like um I don't even know if I really like registered like eating it as much. Like I think I was so into the movie that I didn't really, wasn't really paying attention "	"after I was like holy cow I just ate way more than I should have…I just felt really like full. Um like I didn't need to eat dinner because of it… I guess…I don't know the word, almost like upset, not upset with myself but like um, I don't really have a word for that. It was like oh how could I have eaten, how could I have kept eating…"

Table 12 (continued)

ID #	Before	During	After
5	"before I was really hungry, um I hadn't eaten since, um, before I started volunteering so I was really, really hungry."	"while I was eating um I didn't really notice how it felt. Um, but I could tell like near the end I was starting to get full but I kept eating. Like I got sort of distracted by the TV I think"	"but then afterwards there was sort of that like guilt because I felt not like a good, just happy, content, I was like more full than I wanted to feel…felt kind of heavy…tired…sluggish"
6	"Umm hunger. And uhh sadness…kind of nauseous. And hunger."	"I wasn't feeling anything… There was like no emotion during the process of the eating…It was all before and after. 'Cause like when I eat and it feels like it's a binge. I don't even, I'm not even mindful or aware. I mean that happens a lot of the times when I eat but especially those moments."	"Umm, heavy <pause> disgust. Disgust and stressed and sad at the loss of control, again."
7	"before I ate it, I really wanted it…and probably before and while I ate it I was happy."	"while I was eating it was good an…Oh while I ate it was delicious –I make the best brownies in the world. It wa- it was very satisfying while I ate it…cause because I don't eat when I'm hungry. I eat because somethin's goin on around me. So very satisfying while I ate it."	"after I got thru with the brownie batter and the brownies then I was really feelin sick…and I was also feeling really disgusted with myself … But it wasn't so satisfying after I ate it… after I was disappointed in myself and I was really self-critical, that's not an emotion, but…"
8	"I was, like, thought I was gonna starve to death like if I could've somehow gotten the cake in my face while I was still in the car driving it home I-I would have… got it home, didn't- I just started eating it with a fork out of the box. I didn't even like cut a slice."	"And probably midway through I was feeling pretty gross cause it was so rich…and I didn't stop I kept going, you know, probably another 8 bites <pause> and then I felt disgusting."	"Nauseous", "disgusting"

Table 12 (continued)

ID #	Before	During	After
9	"I mean, I was really hungry when I got there… I noticed that. I noticed that my stomach growled like when I was standing next to the stove, and I, um, and I remember telling him that I was starving, like I made this like big deal out of it. And then, um, and then I think when I was actually eating I wasn't noticing anything because I was-we were just talking and I was paying attention to that."	"And I wasn't really paying attention at all to the actual eating… Even though that was-you know, the food was great, um. Now that I think about it, even though the food was awesome, at that point, I was just paying attention to what we were talking about, I was just eating…I don't remember-I don't remember what it felt like at all…Yeah, when we sat down, and then it-and I was, you know, we were actually talking about the food at first, and, um <pause> and I remember noticing it then, um, and then I think it kind of faded a little bit as we were talking, I wasn't really noticing as much."	"having a good time, so I think I just, all of a sudden I looked down and I noticed like how much I had eaten and I was like "Wow!" <laughs>… You know, I didn't even notice how much I had eaten already… and then when I stopped, um I don't think I noticed I was full right then… But then I remember afterwards when we were cleaning up and we were talking about the cookies, I was like, "No, I'm too full to eat the cookies." So I know I felt full at that point."
10	"I think I was having a lot of anxiety that I was feeling in my body before and so um my shoulders had started –they were sort of in a tense feeling in my shoulders and my jaw…And I was having a little bit of trouble breathing…Not like medical trouble, but just like panicky breathing."	"as I ate I think not much changed, I feel like what I when I binge eat, whether it's subjective or objective, I tend to not disassociate in the clinical sense, but I am not aware of my body it's very distracting and I think that's probably the majority of the appeal, um and…so I was not aware of my body as I was eating except the um I think the panic maybe got- yeah I don't actually know that it even changed, I think- I just don't remember much about any body sensations while I was eating, um except for remembering thinking that it tasted- it wasn't enjoyable."	"um and then afterwards I felt nauseous, which I think was probably less physical and more an anxiety response and kind of realizing I just ate the entire bar of chocolate… Um, and I knew I had had more than I wanted. Uh in terms- in terms of not just like guilty thinking, but just like my mouth tasted –there was just way too much sugar"

Table 12 (continued)

ID #	Before	During	After
11	"I don't know like I'm – I'm um, almost certain that I was – I can remember that I think I was pretty hungry that day."	"I'm sure it felt pretty good. Um, satisfying, and then of course it was – it was a day that I knew my wife was getting home late so… banking these calories because of not knowing when I would get my next meal… so ya know I'm 6'2", 185 pounds so I come across as kind of slender and then everybody at work is <mumble> always very I don't know amazed at how much food I can put away. Um so if… this makes any sense to you it was these three ladies I was with they just sort of stepped into that like oh *name*, sure I didn't finish our games. Um so I don't know if there was like a sense of pride like but that just sort of fueled the eating, if you would."	"and then afterwards um, you know, probably, no almost definitely I probably felt very full. Umm, I don't know if I was uncomfortable. Um, if not then I was definitely close to it… But then as far as the second emotion goes, like that is that probably not a good idea to start on that next basket of chips… with the baby like I-my wife diets like she limits calories and she, she eats a very well balanced diet. With me, like I've always controlled my weight with exercise so like I know that I can eat big meals and snacks because ya know I work out. Um or that's been my history. But um well unfortunately with the baby like that's not as easy to do."
12	"before I was just like really like super, super hungry cause it had been like a really long time since I had eaten, so I was like really hungry…"	"during it like felt good extremely good up until a certain point um and…Uh just kind of like oh this like taste good whatever, you know I'd been hungry so I felt kind of like relief for eating but then I donno like almost like immediately after I was like ugh, no longer like yeah felt good about it… I guess like during I felt pretty normal"	"then after I just felt like my stomach like felt really big and like looked really big in the mirror and I felt just kinda like gross…I mean during it I mean [cuts out] for sure um. After it just kind of looked kind of I donno kind of greasy but it still kinda good…after I just kind of felt like kind of like grossed out and kind of like disappointed in myself"
13	"Like right before I was pretty hungry um, but I knew rationally that if I have like one piece of this peperoni pizza then that's gonna be really enough and if I just sat on it and enjoyed it I'd feel fine…I really didn't feel apprehensive about it or anything…"	"during like I don't remember the act of picking up each piece um it just kinda felt like I was constantly hungry I was consistently hungry and that physical feeling over road what I knew rationally what I should be feeling… I kinda felt like I was moving automatically…once I started eating I stopped thinking."	"Afterwards, I felt kind of um <pause> not–and I still didn't feel full afterwards physically I was still like man I really want some more … And I wanted to scrounge around and try and find something else and I wanted to eat although I was starting to feel kind of disappointed in myself for eating so much and of … and not thinking that I needed another and knowing that I did not need that food, but physically my body was telling me I still wanted it"

Table 12 (continued)

ID #	Before	During	After
14	"I was you know hurting inside before cause I really didn't wanna eat the family style."	"While we were eating I was fine I mean I- I knew that I was trying to control myself better'n the Wednesday before"	"…I definitely emotionally had the guilt feeling"

Note. Participant quotes were extracted that pertained to before, during, and after emotional/bodily states related to their recent subjective binge eating example episode. SBE = subjective binge eating.

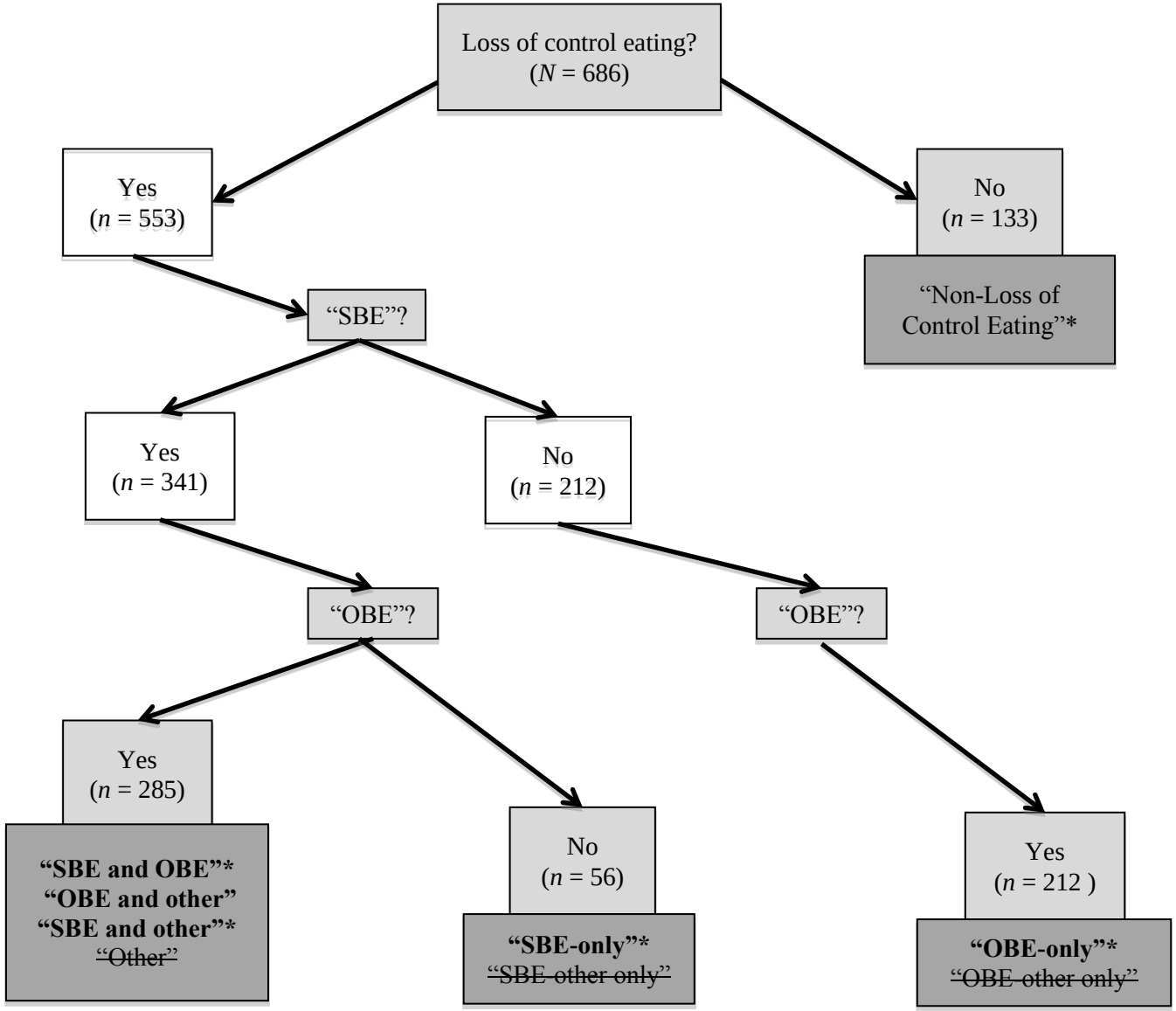


Figure 1. Recruitment flow chart by binge type in Study 1.

Note. Bolded groups were included in episode-level analyses (i.e., if it included one typical SBE and/or OBE). SBE = Subjective Binge Eating. OBE = Objective Binge Eating. Other = Episode did not meet criteria for either binge type. * = Included in group difference analyses (i.e., SBE-included versus OBE-only versus Non-loss of control eating groups). Groups that include a strikethrough are not included in any of the analyses in the current paper.

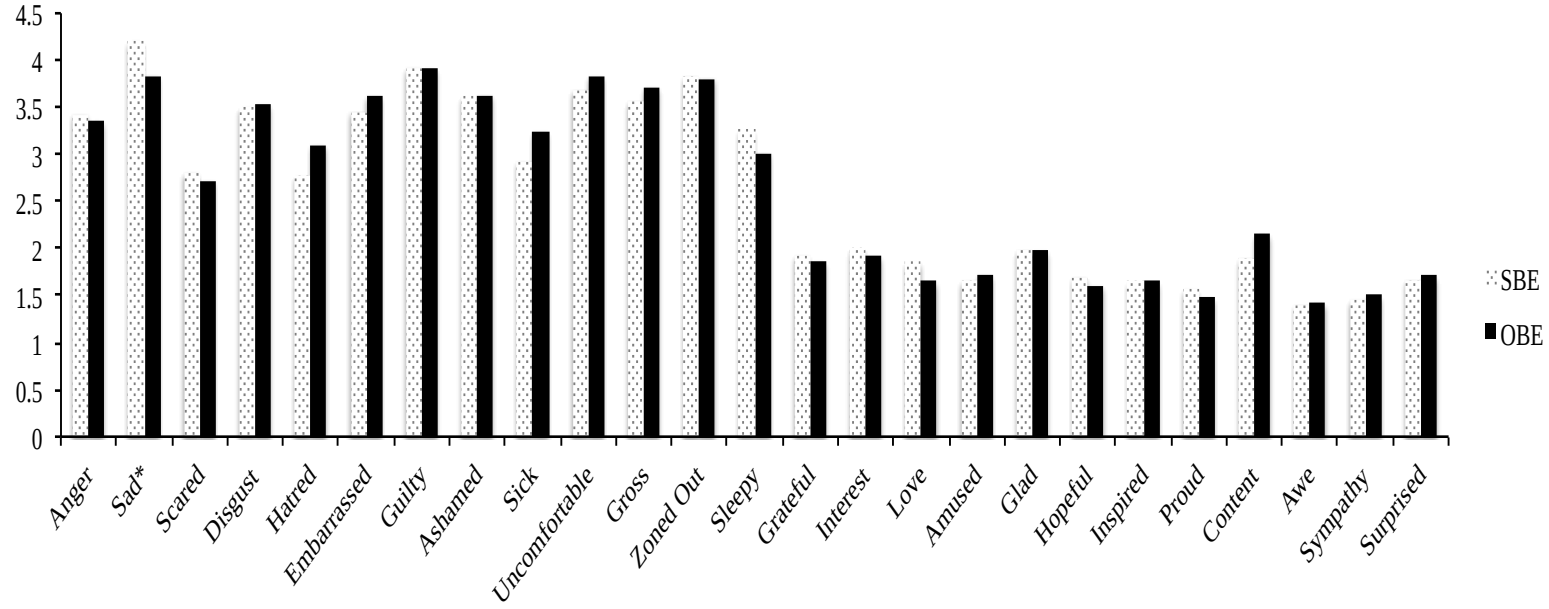


Figure 2. Average emotion ratings experienced during subjective binge eating and objective binge eating episodes in Study 1.

Note. Participants indicated the intensity of each emotion during the recent loss of control eating episode on a Likert scale from 0 to 5. SBE = Subjective Binge Eating episode. OBE = Objective Binge Eating episode. * = indicates a significant difference between SBE and OBE emotion intensity at alpha = .05.

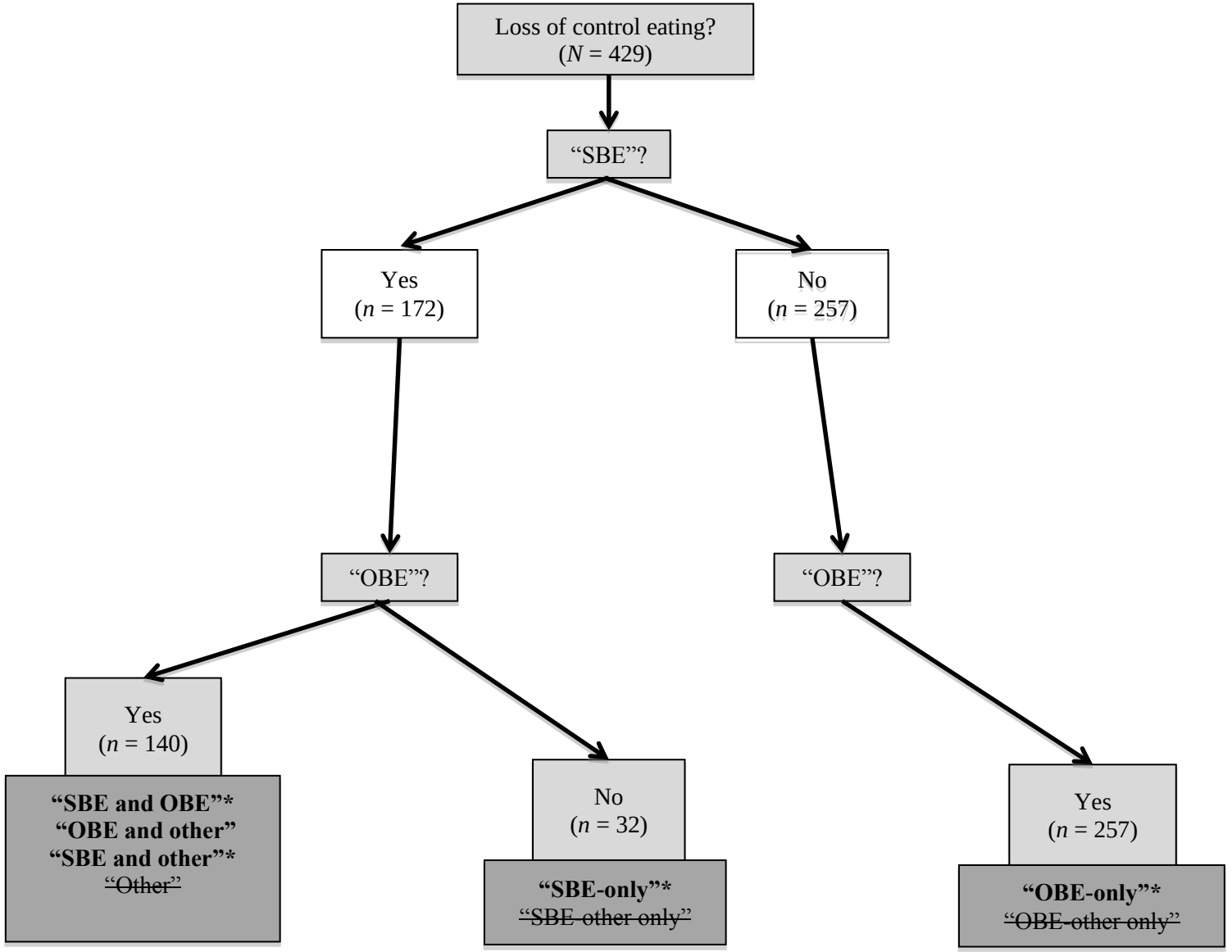


Figure 3. Recruitment flow chart by binge type in Study 2.

Note. SBE = Subjective Binge Eating. OBE = Objective Binge Eating. Other = Episode did not meet criteria for either binge type. Bolded groups were included in momentary analyses (i.e., if it included one typical SBE). * = Included in group difference analyses (i.e., SBE-included versus OBE-only group. Groups that include a strikethrough are not included in any of the analyses in the current paper.

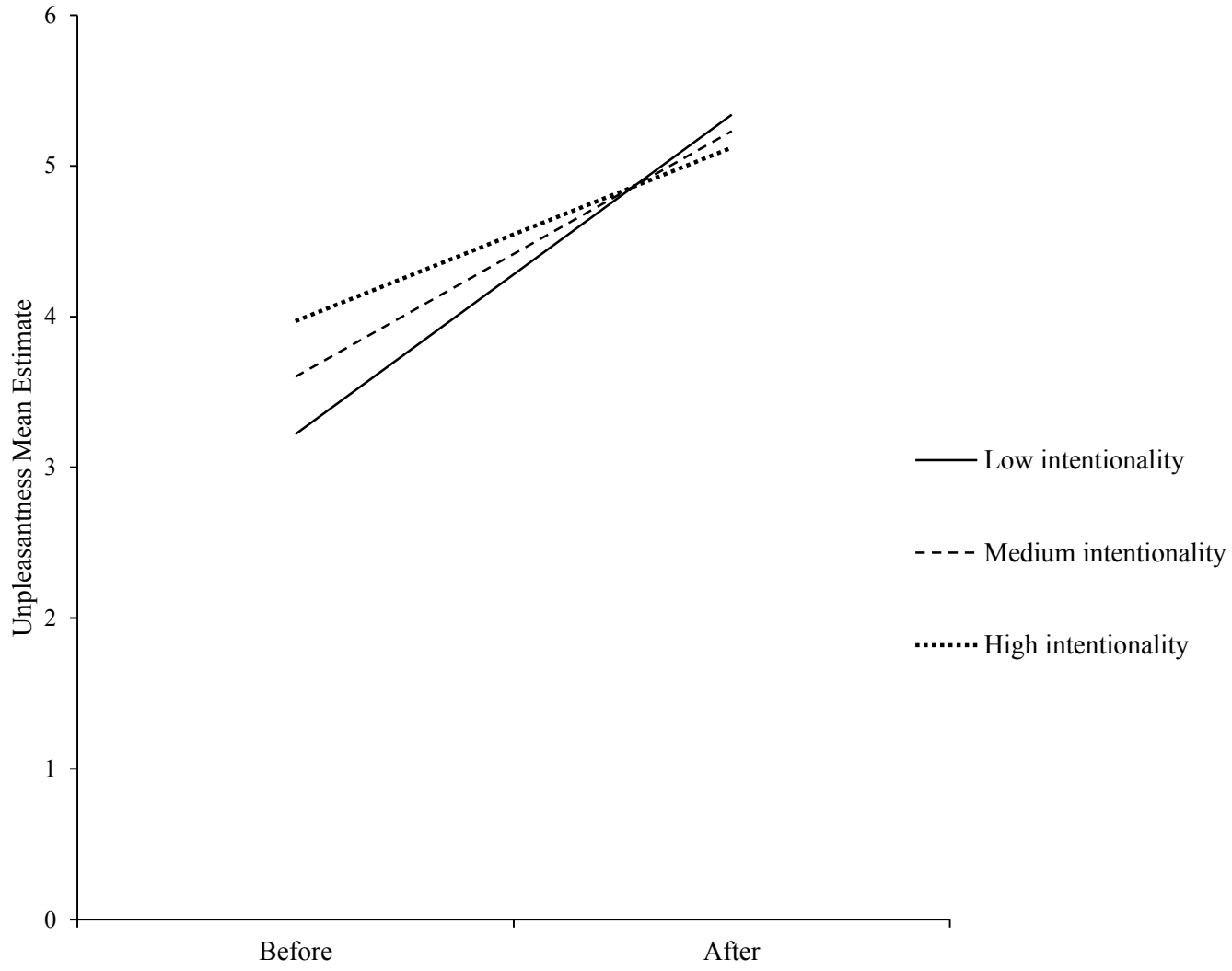
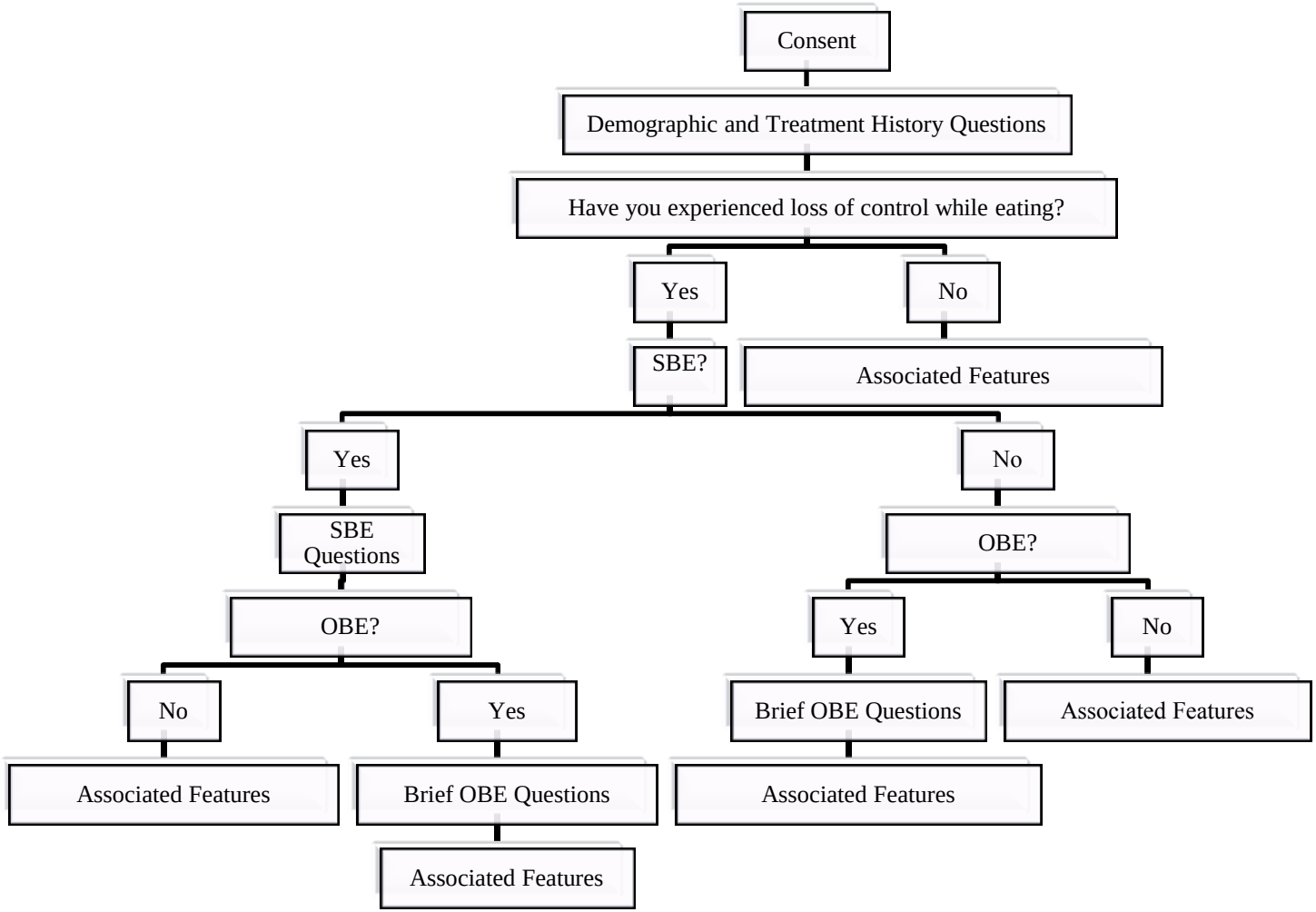


Figure 4. Intentionality as a moderator of shifts in unpleasantness ratings before versus after a subjective binge eating episode in Study 2.

APPENDIX A: ONLINE RECRUITMENT SUMMARY FOR STUDIES 1 AND 2

Facebook/Twitter posts	E-mail
Bingebehavior.com	UNC Center of Excellence for Eating Disorders
Eating Disorder Hope	Project Heal
Eating Recovery Center	Anti-"proana" website e-mail correspondence
National Eating Disorders Association	Embody Carolina
Tapestry Eating Disorder Program	British Psychological Society
Eating Disorder Center of Denver	Mental Health Commission of Canada
Eating Disorder Coalition of Arkansas	All UNC student/staff listserv
Men's Health	
Pita Pit New Zealand	
Ballreich Potato Chips and Snacks	
Celebrate Health	
March Against Monsanto	
Zumba Moves	
My Fitness Pal	
Haribo USA	
Starbucks	
Vegan Addict	
Wild By Nature	
JoyRide Cycling Studio	
Ballet Beautiful	
Barre Evolution	
Kickbox Cardio	
Division 39 Scholars	

APPENDIX B: STRUCTURE OF SURVEY FOR STUDIES 1 AND 2



APPENDIX C: FOOD IMAGES FOR STUDY 1 HYPOTHETICAL EATING EXPERIENCES

APPENDIX D: STUDY 1 CODEBOOK

Code label	Code definition	Was there a question directly pertaining to the code? (If "No," information pertaining to the code was offered by some participants in their responses without a direct question).
Episode Descriptors		
Secret*	Episode described as taking place in secret, concealed, or deliberately completed away from other people.	No
Fast*	Episode described as hurried, rushed, fast.	No
Intended/anticipated*	Episode described as something that could have been anticipated e.g., "I know this will happen, I am aware of the impending loss of control because I purchase the food right before eating it."	No
Not expected*	Episode described as occurring as a complete surprise to the person, and not in an anticipated or intentional way. e.g., "You never know when it is about to happen. Someone offers you something small and you remember how well you did that day, so you take it. It only takes a bite. It awakens a beast inside. You finish it, quickly."	No
Nighttime*	Episode described as occurring during the evening or late night.	No

Context		
Home*	Episode described as occurring somewhere in the participant's own home.	Yes (only regarding SBE)
Not home*	Episode described as occurring anywhere but the participant's own home. e.g., friend's house, restaurant, car, workplace	Yes (only regarding SBE)
Alone*	Participant has loss of control eating experience without anyone else present.	Yes (only regarding SBE)
With others*	Participant has loss of control eating experience in the presence of others (e.g., friends, family members, co-workers).	Yes (only regarding SBE)
Associated activities/behaviors		
Busy with activity*	Participant reported that close in time to episode they were busy with activity (e.g., exercise, TV watching, computer use, cooking).	No
Others' influence/reassurance*	Participant reported that another person(s)' influence and/or reassurance played a role in the eating episode.	No
Nothing happening*	Participant mentioned in description that "nothing" was happening and/or things were "normal" surrounding the episode.	No
Interpersonal stressor*	An interpersonal stressor (e.g., caretaker distress, romantic relationship conflict, friendship conflict) was described as occurring close in time to the episode.	No

Dietary restriction*	Participant described that dieting/dietary restriction occurred on the day of episode.	No
Compensatory behavior mentioned*	Participant mentioned an urge to engage in a compensatory behavior (whether or not the person actually engaged in the given behavior).	No
Feelings		
Mixed feelings*	Both Negative emotion/feelings AND Positive emotions/feelings coded within one person's episode description. e.g., "It was disgusting, but at the same time relieving. It was like finally I could let loose and just eat everything I wanted because I'm so used to watching what I eat. I knew as I was doing it that I would regret it and most likely attempt to purge it all after but it was still blissful in the moment. Nothing else matters, just the taste of the food in your mouth."	No
Negative emotions/feelings*	One or more of the following negative emotions/feelings reported in episode description: 1. Self-conscious and judgment 2. Weight/body concern 3. Regret 4. Stress 5. Sad/depressed 6. Guilt/shame 7. Lonely 8. Disgusting 9. Anxiety	No (There was one option to provide a text response under "other" when asked to report the intensity of emotions felt during the recent episode on a Likert scale. Most emotions were reported, however, in the qualitative descriptions of the episodes.)

Positive emotions/feelings*	One or more of the following positive emotions/feelings reported in episode description: 1. Tasted good/pleasurable (also coded if participant stated that episode was "satisfying") 2. Comforting	No (There was one option to provide a text response under "other" when asked to report the intensity of emotions felt during the recent episode on a Likert scale. Most emotions were reported, however, in the qualitative descriptions of the episodes.)
Boredom*	Participant reports boredom as part of episode description.	No (There was one option to provide a text response under "other" when asked to report the intensity of emotions felt during the recent episode on a Likert scale. Most emotions were reported, however, in the qualitative descriptions of the episodes.)
Dissociative spectrum*	Participant report suggests some dissociation surrounding the eating episode. Dissociation identified based upon descriptions that implied the participant's sense of no being "fully there," not remembering what happened, dissociating, or "numbing out." e.g., "I tend to lose complete feeling of hunger and fullness. I end up having the "trash the day" mindset and continue eating to my heart's desire. I feel guilty and angry and anxious at what the future will bring after this episode."	No
Lack of perceived fullness*	Participants reported that after or throughout the eating experience, they did not feel "full" or satisfied.	No
Too full*	Participant reports an experience of being overly full, "so full," or "beyond full" related to the eating episode.	No

Sick/Discomfort*	Participant reports an experience of being sick, bloated, uncomfortable, or in pain due to the eating episode.	No
Not hungry*	Participant reports not being hungry before, during, or after the episode.	No
Hungry*	Participant reports hunger before, during, or after the episode.	No
Implied Functionality		
Emotional need	Participant states something about the episode serving an emotion modulation function. e.g., "I felt sad and upset and I eat a lot when that happens. During the moment I feel great but afterwards I start feeling sick and regretting it."	
I should eat/need energy	Participant states something about the episode occurring as a result of realizing that he/she should eat due to a need for physical energy (sometimes coinciding with hunger). The eating seems motivated by realizing one's physical need for food. e.g., "I wasn't hungry, but I had a headache so I thought it might go away if I ate. I put the rice on the plate and sat at the table. Each bite I had to force down and I could barely swallow it."	No

Sensory positive	Participants states something about the episode fulfilling a craving or sensory urge (includes more of an appetitive description). e.g., “I just wanted to eat. Not because I was hungry, but because I really like the taste of food. I knew I didn't need to eat, and I knew that no matter what I ate, I probably wouldn't be satisfied. I had something salty and wanted sweet, then wanted salty gain. It wasn't about nutrition or hunger, just about the feeling of eating.”	No
No cause theorized	Participant notably does not imply a cause or motivation behind the loss of control eating episode. e.g., “I just start eating and eating and i cant stop.”	No

Note. SBE = Subjective Binge Eating. * = Code was included in the inter-coder reliability calculation (Cohen’s kappa).

APPENDIX E: JOINT DISPLAY MATRICES WITHIN EACH IMPLIED FUNCTIONALITY CODE FOR STUDY 1

Joint Display Matrix of Associated Features within Each Implied Functionality Code for SBEs and OBEs in Study 1

	Emotional Need		**I should eat/need energy**		**Sensory Positive**		**No Cause Theorized**	
	SBE (n = 21)	OBE (n = 50)	SBE (n = 18)	OBE (n = 4)	SBE (n = 28)	OBE (n = 55)	SBE (n = 41)	OBE (n = 32)
Eating Disorder Symptoms								
Vomiting (*M*, *SD*)	0 (0)	.12 (0.42)	1.25 (3.77)	.67 (0.58)	2.92 (10.45)	8.87 (45.28)	.32 (.99)	.27 (0.96)
Laxative misuse	0.07 (0.26)	.27 (1.10)	.44 (1.5)	1.67 (2.89)	.58 (2.47)	.72 (3.32)	.08 (.27)	0 (0)
Diuretic misuse	0 (0)	0 (0)	.31 (1.25)	0 (0)	0 (0)	.95 (4.54)	.23 (.86)	.12 (0.43)
Hard exercise	2.93 (5.39)	2.03 (4.67)	4.56 (9.56)	.67 (1.15)	4.29 (7.40)	2.66 (5.56)	1.31 (3.30)	3.77 (7.79)
Dietary Restriction	3.8 (2.48)	3.38 (2.20)	3.81 (2.71)	4.67 (2.08)	4.25 (2.64)	3.24 (2.02)	3.62 (2.39)	4.54 (2.32)
Body shame	3.47 (1.03)	2.94 (1.18)	2.81 (1.38)	2.50 (1.50)	3.46 (1.25)	3.12 (1.05)	3.28 (1.17)	3.21 (1.12)
Negative Affect								
Depression	1.78 (0.84)	1.56 (0.78)	1.65 (0.81)	1.89 (1.54)	2.03 (0.87)	2.08 (1.09)	1.69 (.81)	1.63 (0.57)
Anxiety	1.56 (0.72)	1.46 (0.61)	1.73 (0.79)	1.78 (0.69)	1.69 (0.90)	1.85 (0.83)	1.68 (.80)	1.50 (0.59)
Interpersonal Difficulties								
Perceived social support	4.5 (1.64)	4.92 (1.32)	5.06 (0.37)	4.17 (2.25)	4.21 (1.36)	4.68 (1.36)	4.79 (1.30)	5.10 (1.46)
Loneliness	2.58 (0.77)	2.43 (.81)	2.19 (1.12)	2.56 (1.26)	2.79 (1.0)	2.64 (0.87)	2.62 (.83)	2.44 (0.86)

Note. M = mean. *SD* = standard deviation. *SBE* = subjective binge eating. OBE = objective binge eating. This provides means and standard deviation values for those with a given binge episode that met criteria for the indicated implied functionality code.

APPENDIX F: DESCRIPTIVE INFORMATION REGARDING ASSOCIATED SYMPTOMS AMONG LOSS OF CONTROL EATING GROUPS IN STUDY 1: MEANS AND STANDARD DEVIATIONS

	SBE-only (n = 42)	SBE and OBE (n = 29)	SBE and other (n = 61)	OBE-only (n = 135)	OBE and other (n = 12)
Eating Disorder Symptoms					
Vomiting (*M*, *SD*)	5.05 (15.43)	7.46 (13.10)	5.68 (20.66)	0.47 (1.71)	0.70 (1.49)
Laxative misuse	1.31 (3.33)	2.77 (4.78)	0.72 (1.99)	0.26 (1.38)	0.00 (0.00)
Diuretic misuse	1.10 (4.62)	2.19 (6.61)	0.88 (4.00)	0.47 (2.89)	0.30 (0.95)
Hard exercise	7.64 (10.70)	8.85 (9.08)	4.44 (5.55)	2.06 (4.71)	2.20 (2.86)
Restriction	5.03 (2.01)	4.50 (2.14)	4.96 (2.19)	3.88 (2.10)	4.00 (2.54)
Body shame	3.93 (0.95)	4.17 (0.80)	4.24 (0.72)	3.71 (1.07)	4.00 (1.11)
Negative Affect					
Depression	2.24 (0.97)	2.26 (1.02)	2.52 (0.95)	2.02 (0.97)	2.30 (1.13)
Anxiety	2.02 (1.10)	2.12 (0.84)	2.24 (0.84)	1.69 (0.80)	2.03 (0.85)
Interpersonal Difficulties					
Perceived social support	4.28 (1.30)	4.10 (1.36)	4.10 (1.38)	4.28 (1.41)	4.15 (2.04)
Loneliness	2.99 (0.84)	3.14 (0.63)	3.16 (0.61)	3.01 (0.76)	3.00 (0.75)

Note. *M* = mean. *SD* = standard deviation. SBE = subjective binge eating. OBE = objective binge eating.

APPENDIX G: DESCRIPTIVE INFORMATION REGARDING ASSOCIATED SYMPTOMS AMONG LOSS OF CONTROL EATING GROUPS IN STUDY 2: MEANS AND STANDARD DEVIATIONS

	SBE-only (n = 26)	SBE and OBE (n = 8)	SBE and other (n = 41)	OBE-only (n = 109)	OBE and other (n = 8)
Disordered Eating Symptoms/Behaviors					
Compensatory behavior frequency					
Vomiting (*M*, *SD*)	1.20 (3.20)	2.00 (4.47)	2.97 (6.89)	1.73 (12.15)	0.00 (0.00)
Laxative misuse	0.44 (1.39)	0.00 (0.00)	1.71 (5.29)	1.20 (6.63)	0.17 (0.41)
Diuretic misuse	0.56 (2.80)	0.00 (0.00)	1.55 (6.08)	0.68 (3.30)	0.00 (0.00)
Hard exercise	3.32 (5.41)	2.60 (4.22)	4.23 (6.41)	2.34 (5.20)	3.50 (3.73)
Dietary restraint measures					
Dietary restriction	4.76 (1.99)	5.20 (1,64)	4.93 (1.95)	3.94 (2.04)	4.67 (2.07)
Restrained eating	3.48 (0.77)	3.58 (0.43)	3.45 (0.81)	3.01 (0.77)	3.18 (0.44)
Eating Attitudes					
Motivations To Eat					
Coping	2.83 (0.98)	3.50 (0.50)	3.23 (0.82)	3.53 (0.97)	3.36 (0.80)
Social	3.44 (0.84)	3.80 (0.84)	3.40 (0.90)	3.62 (0.82)	3.79 (1.08)
Compliance	2.29 (1.12)	1.80 (0.57)	2.32 (1.12)	1.91 (1.04)	2.14 (1.03)
Pleasure	3.05 (0.84)	3.53 (1.22)	3.03 (0.90)	3.22 (0.95)	3.14 (0.86)

Cognitive and Affective Processing					
Dissociation	2.93 (1.93)	4.00 (3.29)	3.15 (1.35)	3.43 (1.99)	3.80 (1.89)
Difficulties with Emotion Regulation					
Non-acceptance	2.72 (1.11)	3.00 (1.27)	2.81 (0.99)	2.57 (1.12)	3.00 (1.16)
Goals	3.70 (0.97)	3.60 (0.89)	3.77 (1.09)	3.47 (1.16)	3.43 (1.10)
Impulsiveness	2.58 (0.95)	2.60 (0.96)	2.71 (0.99)	2.83 (1.21)	2.79 (1.08)
Awareness	3.32 (1.02)	1.80 (1.04)	2.69 (1.26)	2.51 (1.23)	2.71 (1.55)
Strategies	2.10 (1.11)	1.80 (1.04)	2.69 (1.26)	2.51 (1.23)	2.71 (1.55)
Clarity	2.26 (1.18)	1.80 (1.26)	2.15 (0.95)	2.11 (1.02)	1.93 (1.02)

Note. M = mean. *SD* = standard deviation. SBE = subjective binge eating. OBE = objective binge eating.

APPENDIX H: STUDY 3 PHONE INTERVIEW SCRIPT

Hello, may I please speak with _____?

Hi, this is Lisa Brownstone from the Eating Experiences Interview Study and I'm calling for the phone interview part of the study. Is now still a good time for us to talk?

If no: When would be a better time for me to call you back? (Get answer & coordinate the rescheduling)…Okay I will call you then! Thank you!

If yes: Great!

Before we get started, our protocol requires that we get the physical address you're at. We do this in case any emergency occurs while we're on the phone so that I am able to direct emergency personnel to where you are if necessary.

Could I have the address of your current physical location?

[Write address on slip of paper]

After a successful phone call, scratch out address and destroy slip of paper. Do not store address.

If the participant says he/she is driving (or a passenger in a car), explain that we cannot do the interview in that scenario & reschedule for a time when she will be in a fixed geographic location and in private.

Thanks.

Also before we start, I want to remind you that what you say here is confidential and will be connected only to a number, not your name. The only reason I would need to break confidentiality is if you report knowledge of current child abuse, if you are in imminent danger of physically hurting yourself, or if you threaten serious harm to another person. In those cases, we would need to take action to ensure safety.

Do you have any questions about this?

Also, you received an online consent form that you filled out. Did any questions come up as you were reading it that you would like to ask right now?
Answer any questions participant may have about study procedures.

I want to remind you that this interview is being audio recorded. If you find that you would not like a certain response to be recorded, please tell me so, and I can pause the recorder in that moment. These recordings will be transcribed following the interview in a way that keeps you de-identified. What this means is that we will only connect the audio-recordings and transcriptions to a code, and we will not include names and other identifying information in the transcript in case those come up in this interview.

Okay, so if you're ready, let's get started.

I. Subjective Binge Eating questions:

You had reported in your recent online survey that you have experienced Subjective Binge Eating over the past few months, which we defined as when you feel out of control while you're eating *(Clarify loss*

of control if needed) and you feel like you ate too much food, while other people would disagree that it was large.

I want to talk to you about your most recent subjective binge eating episode. When was it?

Where were you and who were you with at the time? Describe the scene.

What did you eat?

Describe how it felt in your body when you had that episode of eating. Before? During? After?
Try to get a sense with elaborated questions about participant's experience of physical sensations and sense of their body surrounding SBE.

Describe the sensory experience of the episode.
If needed, elaborate with prompts about taste and smell (kinesthetic if applicable).

Can you identify 1 or 2 main emotions that you felt during a recent SBE? [Have participant elaborate on emotions as needed]

After this Subjective Binge Eating episode, did you engage in any behavior to make up for or get rid of the food just consumed? Like vomiting, laxative use, water pills/diuretics? If so, how did you feel before, during, after?

II. Objective Binge Eating questions (if applicable):

You had reported in your recent online surveys that you have experienced Objective Binge Eating over the past few months, which we defined as when you feel out of control while you're eating *(Clarify loss of control if needed)* and both you and others would agree that you ate too much food.

I want to talk to you about your most recent objective binge eating episode. When was it?

Where were you and who were you with at the time? Describe the scene.

What did you eat?

How does the experience of objective binge eating differ from subjective binge eating? How is it similar?

Compare how it felt in your body when you had that episode of eating to the subjective binge eating episode you spoke of earlier. Before? During? After?
Try to get a sense with elaborated questions about participant's experience of physical sensations and sense of their body surrounding SBE.

Describe the sensory experience of the episode compared to the subjective binge eating episode you spoke of earlier.
If needed, elaborate with prompts about taste and smell (kinesthetic if applicable).

After this Objective Binge Eating episode, did you engage in any behavior to make up for or get rid of the food just consumed? Like vomiting, laxative use, water pills/diuretics? If so, how did you feel before, during, after?

On a different note, what is your current approximate weight and height? Highest weight (when not pregnant) and height at that time?

III. General Eating Experiences

Now that I have asked you about these instances when you felt out of control while eating, I am wondering what eating is like for you outside of episodes like the ones you have described.

Are there instances when eating does NOT feel out of control?
If so, what is eating like for you on a day-to-day basis?
How does eating affect you emotionally?

Try to get a sense of whether loss of control eating is substantially different than general eating. Get a descriptive sense of the sensory/bodily experiences people have with food.

IV. Imagined Eating Experiences

Please look at the link that you have opened on your computer (or open the four images that were texted to you on your phone). [Problem solve surrounding phone on speaker to allow for viewing of images while talking if applicable]

Image 1 (Cornflakes cereal):

Imagine that you have not eaten in 4 hours, and that you have just eaten the bowl of cornflakes (1 cup) pictured in the photo <u>without</u> milk.

Describe what that would be like? What kinds of factors may influence how it would feel to eat this item of food (elaborate as needed with examples, such as environment, mood, whether other people are present)?
Ask questions to ascertain how likely they would feel out of control, how they would evaluate him/herself, anything particular about food type or nutritional info that catches eye?

Image 2 (Apple):

Imagine that you have not eaten in 4 hours, and that you have just eaten the apple pictured in the photo.

Describe what that would be like? What kinds of factors may influence how it would feel to eat this item of food (elaborate as needed with examples, such as environment, mood, whether other people are present)?
Ask questions to ascertain how likely they would feel out of control, how they would evaluate him/herself, anything particular about food type or nutritional info that catches eye?

Image 3 (Grilled Cheese):

Imagine that you have not eaten in 4 hours, and that you have just eaten the grilled cheese pictured in the photo.

Describe what that would be like? What kinds of factors may influence how it would feel to eat this item of food (elaborate as needed with examples, such as environment, mood, whether other people are present)?

Ask questions to ascertain how likely they would feel out of control, how they would evaluate him/herself, anything particular about food type or nutritional info that catches eye?

Image 4 (Salad):

Imagine that you have not eaten in 4 hours, and that you have just eaten the salad pictured in the photo.

Describe what that would be like? What kinds of factors may influence how it would feel to eat this item of food (elaborate as needed with examples, such as environment, mood, whether other people are present)?
Ask questions to ascertain how likely they would feel out of control, how they would evaluate him/herself, anything particular about food type or nutritional info that catches eye?

V. Debriefing/Resource Discussion

Thank you for taking the time to complete this phone interview. This study aims to better understand loss of control eating by asking participants to describe their own experiences using their own words. Your contribution is invaluable.

There are a lot of resources that can be helpful to people who struggle with loss of control eating. In particular, there are websites that can help provide information and set people up with help. I can either list off some of those resources or send a list by e-mail. Which would you prefer?

If participant wants verbal list (not e-mail), provide the following list:

National Eating Disorder Association (NEDA): http://www.nationaleatingdisorders.org/

Binge Eating Disorder Association (BEDA): http://bedaonline.com/

National Institute of Mental Health on Eating Disorders: http://www.nimh.nih.gov/health/topics/eating-disorders/index.shtml

Academy For Eating Disorders (AED): http://www.aedweb.org/web/index.php

Thank you again for your generous contribution of words and time about your eating experiences. If you have any follow-up questions, don't hesitate to e-mail me at lisa.brownstone@unc.edu. We will pay you for study contribution in the form of a $12 gift card to Amazon.com within the next week. Please contact me if you do not receive an e-mail with this gift card within a week. Any last questions?

It was a pleasure speaking with you today.

APPENDIX I: FOOD IMAGES FOR STUDY 3 INTERVIEW

APPENDIX J: STUDY 3 QUALITATIVE CODEBOOK

Code label		Code definition
Eating descriptors		
Pacing/speed concern*		Participant reported concerns regarding pacing/speed of the episode.
Automatic/mechanical*		Participant reported that the episode occurred in an automatic or unintentional way. e.g., **"**I kinda felt like I was moving automatically"
Satisfaction concern*		Participant expressed that satisfaction from eating was pertinent to the episode. e.g., "but once I started eating it and tasting it. Um, that didn't feel like enough to satisfy me…"
Alone*		Alone during the eating episode.
Secretive*		Secretive or preference for being alone during the episode or in general.
Feelings		
Taste		
	Tasted good*	Participant reported that the episode tasted good.
	Taste dissipates*	Participant reported that the initially good taste of the food dissipated or faded out across the episode. e.g., "the more food I ate, the less appealing and the less good it was"
Satiety cues		
	Hunger*	Participant reported physical hunger related to an episode.
	Craving*	Participant reported a craving experience for a particular taste or food related to the episode.
	Too full*	Participant reported feeling too full or "heavy" related to an episode of eating.
Mixed emotions*		Both Negative feelings/concerns AND Positive emotions coded within one person's episode description.

Negative emotions/feelings*	One or more of the following negative emotions/feelings reported in episode description: 1. Disgust/gross* 2. Fat/body concern* 3. Guilt/shame* 4. Anxiety* 5. Sick/Pain* 6. Disappointed*
Positive emotions*	Positive emotions/feelings reported in eating description (e.g., soothing, comforting relief, pride)
Dissociative/unmindful*	Participant report suggests some dissociation surrounding the eating episode. Dissociation identified based upon descriptions that implied the participant's sense of no being "fully there," not remembering what happened, dissociating, or "numbing out." Alternatively, the participant described feeling distracted to the point of not being present to their eating experience. e.g., "I was not aware of my body, which is very distracting and that's the majority of the appeal"
Boredom*	Participant reports boredom as part of episode description.
Implied functionality	
Emotional need*	Participant states something about the episode serving an emotion modulation function. e.g., "usually, beforehand I either feel frustrated or totally overwhelmed and so my body's usually kind of hurting … so I think that is, feels like a bit of a relief for the moment where I'm um just not aware of my body…anyway it's just like some pressure relief to be just kind of like checked out from my body "
Physical need/hunger response*	Hunger is a primary motivator reported by the participant for eating in that moment. e.g., "so before I was just like really like super, super hungry cause it had been like a really long time since I had eaten it had been like [undecipherable] after that point so it's like really hungry…"

Sensory positive*		Participants states something about the episode fulfilling a craving or sensory urge (includes more of an appetitive description). e.g., "really wanted it….very satisfying and delicious while I ate it."
Social pressures*		Participant describes episode as resulting from a social experience that prompted loss of control. e.g., "was having a good time and suddenly noticed" (regarding participant's social experience)
Compensatory behaviors		
Compensatory behaviors		
	Vomit*	Participant reported having engaged in a vomiting episode after the eating experience.
	Compensatory restriction*	Participant reported having engaged in compensatory dietary restriction after the eating experience.
	None*	No compensatory behavior was reported.
Broader codes		
General restrictive eating*		Participant mentions restrictive eating and/or dieting in responses.
Willpower/moderation ideal*		Participant coded as having a general eating ideal to have "willpower," "rational," and moderate eating. e.g., "happy that I have the willpower to resist overeating" (regarding non-loss of control eating)
Planned and controlled*		Participant communicates an ideal of having planned and controlled eating. e.g., "when I eat balanced…I did well today and am winning at life"

Healthy eating ideal*	Participant communicates an ideal of eating "healthy" on a day-to-day basis. Participants used words such as "healthy" and "clean" eating to communicate this code. e.g., "I eat clean"
Anhedonic description	Interviewer coded participant as not communicating experiences of pleasure from eating.
Imagined eating codes	
Satisfaction concerns*	Participant responded to imagined eating experience prompts with concerns about whether the item might be satisfying enough. e.g., "it would be okay. It's not what I would choose, but I would eat it maybe I would feel, probably feel somewhat satisfied."
Nutrient/balance concerns*	Participant responded to the imagined experience prompts with concerns about health and nutrition, and/or concerns about nutrient balance/completeness. e.g., "would not feel as good about that, because I'd want something healthier" e.g., "It's not a whole meal."
Loss of control/trigger concerns*	Participant responded to imagined eating experience prompts with concerns about whether a given food might prompt loss of control (i.e., be a "trigger" for bingeing). e.g., "[grilled cheese] is a childhood food and most of my binge foods are childhood foods"

Note. All example quotes are from subjective binge eating (SBE) descriptions. * = Code was included in the inter-coder reliability calculation (Cohen's kappa).

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