

Reciprocal Relations between Adolescent Depressive Symptoms and Binge Eating

By

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## CHAPTER I

### INTRODUCTION

How are depression and unhealthy eating related during adolescence? Depressive symptoms are significantly associated with three types of unhealthy eating behaviors in adolescents: overeating, loss of control eating, and binge eating (Goossens, Braet, & Bosmans, 2010; Morgan et al., 2002; Zaider, Johnson, & Cockell, 2000; Stice & Agras, 1998). Although related, these three behaviors have key differences. Overeating is defined as eating an objectively large amount of food. Loss of control eating (abbreviated as LOC) describes an eating episode during which the individual feels out of control, though an “objectively large” amount of food does not have to be eaten. Binge eating is an eating episode that includes both overeating and LOC and is defined in the DSM-5 as “eating significantly more food in a short period of time than most people would eat under similar circumstances, with episodes marked by feelings of lack of control” (American Psychiatric Association, 2013).

Because what constitutes a larger-than-normal amount of food can be ambiguous for growing adolescents, some researchers are placing greater emphasis on LOC relative to overeating as the key component of binge eating (e.g., Tanofsky-Kraff, Marcus, Yanovski, & Yanovski, 2008). Despite this development, relatively little research has compared the importance of LOC and overeating in the development of psychopathology for this age group. In addition, studies of the relations between depressive symptoms and binge eating (or binge eating components) have not examined factors that may moderate these relations. The overarching purpose of this study is to examine the longitudinal

reciprocal relations between depressive symptoms and three eating behaviors: overeating, LOC, and binge eating in adolescents as well as potential moderators of these relations.

Within this aim, extant theory and research supports three specific goals.

### **Goal 1**

The first goal of the study is to examine bidirectional relations between depressive symptoms and three eating behaviors: overeating, loss of control eating (LOC), and binge eating. Research in three areas lays groundwork for this examination: (1) studies of the prospective relations of depressive symptoms to the three eating behaviors, (2) studies of the prospective relations of the three eating behaviors to depressive symptoms, and (3) studies of the reciprocal relations between depressive symptoms and the three eating behaviors.

#### *Depressive Symptoms as Predictors of Eating Behavior*

Although individuals may overeat for a variety of reasons that are not necessarily connected to depression (e.g., holidays, restaurant meals), a meta-analysis of ecological momentary assessment studies by Haedt-Matt & Keel (2011) indicates that negative emotions often precede binge eating. Individuals who binge eat often report a sense of emotional numbing and a narrowing of cognitive focus during a binge (e.g., Heatherton & Baumeister, 1991; Tanofsky-Kraff et al., 2007). These features of binge eating are important to its relation to depression, as binge eating may be a maladaptive way for depressed individuals to escape emotional distress. Binge eating is often conceptualized as a form of affect regulation (e.g., Allen, Bryne, La Puma, McLean, & Davis, 2008; Marcus & Kalarchian, 2003). The affect regulation model states that binge eating is a maladaptive regulation strategy (Hawkins & Clement, 1984). In this theory, binge eating

provides temporary relief from negative emotions but ultimately increases negative emotions as the individual feels shame and guilt about losing control over his or her eating. Research supports this conceptualization of binge eating as affect regulation. Eating to control one's negative emotions is prospectively related to future binge eating in children (Allen et al., 2008). In addition, the belief that eating can help manage negative emotions is associated with increased binge eating in adolescents (Combs, Smith, & Simmons, 2011). In sum, theory and research on the affect regulation model of binge eating suggest that this eating behavior may be used to cope with negative emotional states such as depression.

A small body of research examines the prospective relation of depressive symptoms at baseline to overeating, LOC, or binge eating at follow-up. A study by Zaider et al. (2002) found that adolescents who met criteria for dysthymic disorder at baseline were over four times more likely to meet criteria for eating disorders with a bingeing component (i.e., either binge eating disorder or bulimia nervosa) at follow-up, compared to adolescents who did not meet criteria for mood disorders. Chen and colleagues found a significant prospective relation between depressive symptoms and binge eating in community samples of preadolescent and adolescent girls with a large effect at 2-year follow-up and a moderate effect at 4-year follow-up (Chen, McCloskey, & Keena, 2009). Stice et al. (2002) found a small but significant prospective relation between depressive symptoms and binge eating in community samples of preadolescent and adolescent girls. An examination of data from the Growing Up Today Study by Skinner and colleagues used binge eating and overeating as outcome variables (Skinner, Haines, Austin, & Field, 2012). Results indicated that adolescent girls and young adult



women reporting higher levels of depressive symptoms were 1.9 times more likely to overeat and 2.3 times more likely to binge eat than participants with low levels of depressive symptoms. Goossens and colleagues used LOC as the outcome variable and found a small but significant prospective relation between depressive symptoms and LOC in a sample of overweight male and female adolescents who participated in a weight loss program (Goossens, Braet, Verbeken, Decaluwe, & Bosmans, 2011).

Research indicates that negative affectivity (a key component of depression) is also a significant predictor of overeating, LOC, and binge eating. Stice and Agrass (1998) found a small but significant relation between negative affect at baseline and the onset of binge eating nine months later in a community sample of adolescent girls. Stice and colleagues (Stice, Killen, Hayward, & Taylor, 1998) also found that negative affectivity at baseline had a small but significant relation to both binge eating and LOC four years later in another community sample of adolescent girls. Taken together, this research provides evidence for a significant prospective relation between depressive symptoms (or negative affectivity) at baseline and overeating, LOC, or binge eating at follow-up in children and adolescents.

#### *Eating Behavior as a Predictor of Depressive Symptoms*

The criteria for binge eating disorder state that binge eaters may feel depressed following a binge episode (American Psychiatric Association, 2013). A diverse theoretical basis exists for the eating behavior to depressive symptoms relation. First, the shame and guilt that an individual may experience after engaging in disordered eating behaviors such as binge eating can increase risk of depression (e.g., Keel, Mitchell, Miller, Davis, Crow, 2000). Second, rumination about one's inability to control

food intake is another risk factor (e.g., Nolen-Hoeksema, Stice, Wade, & Bohon, 2007). Finally, impairment in social functioning associated with disordered eating is also thought to put individuals at increased risk for depression (e.g., Stice, Hayward, Cameron, Killen & Taylor, 2000).

A number of studies have examined how bulimic symptoms, which include binge eating with the addition of compensatory behaviors, predict later depressive symptoms (e.g., Stice & Bearman, 2001; Stice, Hayward, Cameron, Killen, & Taylor, 2000; Wertheim, Koerner, & Paxton, 2001). Two studies have examined the relation of binge eating, LOC, and overeating without compensatory behaviors to later depressive symptoms in children and adolescents. Tanofsky-Kraff and colleagues (2011) examined loss of control eating and depressive symptoms in overweight and normal weight children ages 6-13 and found a significant relation between LOC and later depressive symptoms. Skinner and colleagues (Skinner et al., 2012) examined the longitudinal relations of both binge eating and overeating to depression. Overeaters and binge eaters were both 1.9 times as likely to report higher depressive symptoms at follow-up as individuals who did not engage in either behavior. In conclusion, evidence indicates that the three eating behaviors predict future depressive symptoms in youth.

### *Reciprocal Relations*

Although most longitudinal studies have focused on unidirectional effects of depressive symptoms on overeating, LOC, or binge eating, theory and evidence point to their reciprocal nature. Evidence from the bulimia literature suggests that the relations between depressive symptoms and binge eating are reciprocal (e.g., Presnell, Stice, Seidel, & Madeley, 2009; Stice, Burton, & Shaw, 2004). Depressive symptoms may drive

overeating, LOC, and binge eating, which in turn may lead to increased depressive symptoms in adolescents. Skinner and colleagues (2012) have examined the reciprocal relations between depressive symptoms and binge eating and depressive symptoms and overeating; their results provide evidence for reciprocal relations. LOC without binge eating was not measured; therefore, the study tells us little about the potential reciprocal relation between depressive symptoms and LOC. The current study will build from the previous research by examining reciprocal relations between depressive symptoms and all three eating variables: overeating, LOC, and binge eating in both adolescent males and females.

## **Goal 2**

The second goal of the current study is to examine the incremental predictive utility of LOC for depressive symptoms. While both LOC and overeating have been shown to predict depression, this study will examine whether LOC predicts depressive symptoms over and above overeating.

### *Incremental Predictive Utility of LOC*

The focus on LOC is a recent development in the study of eating disorders that allows researchers to measure unhealthy eating behaviors that do not meet full criteria for a binge eating episode but are still related to psychopathology. This development is especially important for researchers who study adolescents, as caloric intake increases during puberty, and what constitutes overeating in this population may be unclear. The LOC concept takes the factors that obscure binge eating during adolescence into account and allows researchers to focus particularly on a problematic component of eating behavior: loss of control. After a paper by Tanofsky-Kraff et al. (2008) provided research

criteria for LOC, many studies of children and adolescents have measured only LOC; however, others continue to focus on overeating. Although evidence exists that both LOC and overeating predict later depressive symptoms, the utility of the two in predicting depression is unlikely to be equal. Tanofsky-Kraff and colleagues (2008) argue that LOC, as opposed to the amount of food eaten, may be the more important component of binge eating behavior and the component most strongly predictive of psychopathology, including depressive symptoms. A correlational study from this research group found that children who experience LOC have greater disordered eating attitudes and behaviors, anxiety symptoms, and depressive symptoms than children who report overeating without LOC (e.g., Shomaker et al., 2010). The current study aims to provide longitudinal support for this theory by examining the incremental predictive utility of LOC for depressive symptoms over and above overeating.

### **Goal 3**

The third goal of this study is to examine potential moderators of the depressive symptoms and eating behaviors relations, specifically sex and BMI.

#### *Sex as a Potential Moderator*

Most studies on depressive symptoms and the three eating behaviors (overeating, LOC, and binge eating) in children and adolescents include females only. A smaller body of research includes both male and female participants and finds significant relations between depressive symptoms and the three eating behaviors; however, sex is not usually examined as a moderator in these studies. On the one hand, girls may be driving the significance of relations in these studies. On the other hand, adolescent boys are not immune to depressive symptoms and eating concerns (although they have lower rates of

depression and eating disorders than do adolescent girls) (e.g., Olivardia et al., 2004). In addition, the relation between depressive symptoms and certain types of eating behaviors may be stronger for boys than the relation between depressive symptoms and other types of eating behaviors. For example, Striegel et al. (2009) found that men were more likely to self-report overeating while women were more likely to self-report LOC. If this finding is true in adolescence, a study that only examines one type of eating behavior (e.g., LOC) will fail to measure eating pathology in boys who engage in other unhealthy eating behaviors (e.g., overeating), therefore underestimating the overall eating pathology in boys. The current study will examine the three types of eating behavior and use sex as a moderator in order to address this issue.

#### *BMI as a Potential Moderator*

Body mass index (BMI) is a number calculated from a person's weight and height. BMI is a fairly reliable indicator of body fatness for most people (Mei et al., 2002). Evidence suggests that children with higher BMIs engage in more overeating, LOC, and binge eating than children with lower BMIs (e.g., Stice, Presnell, & Spangler, 2002; Decaluwé & Braet, 2003); however, whether BMI affects the longitudinal relation between these eating behaviors and depressive symptoms in adolescence is unclear. Correlational research on overweight adolescents indicates that those who report binge eating also report greater depressive symptoms than overweight adolescents who do not endorse binge eating, suggesting that BMI may moderate the relation of eating behaviors to depression (Glasofer et al. 2007); however, as a low BMI group was not included in the study, this interaction could not be tested. In addition, research indicates that higher BMI adolescents report using eating to cope with negative emotions more than

adolescents with lower BMIs do (e.g., Martyn-Nemeth, Penckofer, Gulanick, Velsor-Friedrich, & Bryant, 2009). Adolescents with higher BMIs experiencing the negative emotions characteristic of depression may use unhealthy eating behaviors to cope. The proposed study will examine BMI as a moderator to determine its effect on the relations between depressive symptoms and the three eating behaviors.

### *Summary of Study Goals*

In sum, evidence suggests that overeating, LOC, and binge eating are all prospectively associated with depressive symptoms. Theory and research indicate that these relations are likely bidirectional. In addition, theory and correlational research suggests that LOC may predict depressive symptoms over and above overeating. Finally, studies have not examined potential moderators of these relations, including sex and BMI. This study will (1) examine the bidirectional relations between depressive symptoms and the three eating behaviors (2) test the incremental predictive utility of LOC for depressive symptoms over and above overeating and (3) examine sex and BMI as potential moderators of these relations.

## CHAPTER II

### METHODS

#### Participants

Participants were freshmen through seniors taking physical education and health classes in three public high schools in middle Tennessee. The number of students who participated at Time 1 was 353. The number of students who also participated four months later at Time 2 was 265 (88%). An additional 55 students who had obtained parental consent but were absent on the first day of data collection joined at Time 2 for a total of 320 students at Time 2. There were no significant differences between these groups of students except that sophomores were more likely to drop out after Time 1 and juniors and seniors were more likely to join at Time 2 ( $\chi^2_{df=3} = 27.28, p = .001$ ). Time 1 participants were 57.8% girls and 42.2% boys. Time 2 participants were 57.5% girls and 42.5% boys. Time 1 participants were self-reported as 1.7% black, 95.2% white, 5.1% Hispanic, .8% Asian, 3.1% Native American, and .8% other. Time 2 participants were self-reported as 2.5% black, 94.7% white, 5.3% Hispanic, .3% Asian, 2.5% Native American, and 1.3% other. Participants were allowed to check more than one race. Time 1 participants were 48.1% freshmen, 34.2% sophomores, 8% juniors, and 8% seniors, and 1.7% unreported grade. Time 2 participants were 50% freshmen, 27.5% sophomores, 9.4% juniors, 9.7% seniors, and 3.4% unreported grade.

## Measures

### *Depressive Symptoms*

Participants completed the Children's Depression Inventory (CDI; Kovacs, 1985), the Reynolds Adolescent Depression Scale 2 (RADSD2; Reynolds, 2002), and the Patient Health Questionnaire Mood Subscale (PHQ-9) (Spitzer et al., 1999). The CDI is a 27-item self-report measure assessing affective, cognitive, and behavioral symptoms. The item pertaining to suicide was removed at the school district's request. Each item consists of three statements scored in order of increasing severity from 0 to 2. Respondents select one sentence from each group that best describes themselves for the previous two weeks. The CDI has high levels of internal consistency and test-retest reliability, especially in nonclinical samples (Carey et al., 1987; Saylor et al., 1984; Smucker et al., 1986). Cronbach's alpha was .91 at Time 1 and .91 at Time 2.

The RADSD2 is a self-report measure designed to assess depressive symptoms in adolescents. The RADSD2 is comprised of 30 items and measures 4 subscales: Dysphoric Mood, Anhedonia/ Negative Affect, Negative Self Evaluation and Somatic Complaints. The scale uses a 4-point Likert-type response format that asks students to indicate whether the symptom-related item has occurred, "Almost Never," "Hardly Ever," "Sometimes," or "Most of the Time." The RADSD2 has high levels of internal consistency and test-retest reliability, especially in nonclinical samples (Osman, Gutierrez, Bagge, Fang & Emmerich, 2010). Cronbach's alpha was .94 at Time 1 and .94 at Time 2.

The PHQ-9 is a self-report measure of depressive symptoms taken from the larger Patient Health Questionnaire. The Patient Health Questionnaire measures a wide range of



mental health problems included anxiety symptoms, mood symptoms, and somatic complaints. The Mood Subscale consists of nine items that correspond directly the DSM defined symptoms of depression. The item pertaining to suicide was removed at the school district's request. The scale uses a 4-point Likert response format. The PHQ-9 has high levels of validity and internal consistency for adolescents (Martin, Rief, Klaiberg, & Braehler, 2006). Cronbach's alpha was .80 at Time 1 and .86 at Time 2.

The three measures of depressive symptoms were highly correlated, so we converted them to z-scores and then calculated the average of those z-scores to create the composite Depressive Symptoms Total.

### *Eating Behavior*

Overeating, LOC, and binge eating were measured using The Youth Eating Disorder Examination-Questionnaire (YEDE-Q; Goldschmidt, Doyle, & Wilfley, 2007) and How I Eat (see below). The instructions that precede the YEDE-Q use words and pictures to explain the definitions of overeating, LOC, and binge eating and are adapted from instructions for adults created by Goldfein, Devlin, & Kamenetz (2005). The YEDE-Q generates four subscales: Restraint, Eating Concern, Weight Concern, and Shape Concern as well as a global score measuring the overall severity of eating disorder symptoms. The questions use a combination of 7-point Likert-type response format and "Yes" or "No" questions. A subset of questions is used to determine whether participants overeat, experience LOC in the absence of overeating, or binge eat. Participants also indicate the frequency of these behaviors. The YEDE-Q has adequate levels of internal consistency and test-retest reliability (Goldschmidt, Doyle, & Wilfley, 2007). Cronbach's alpha was .96 at Times 1 and 2.

How I Eat is a new self-report questionnaire designed for the current study to assess overeating, LOC, and binge eating. While the YEDE-Q uses just a subset of questions to place participants into four eating behavior groups (i.e. binge eaters, LOC, overeaters, and no eating pathology), How I Eat allows for eating behaviors to be examined on a continuum. Questions pertaining to overeating or loss of control eating were taken directly or adapted from the Binge Eating Scale (BES; Gormally, Black, Daston, & Rardin, 1982), Binge Scale Questionnaire (BSQ; Hawkins & Clement, 1980), the Bulimic Investigatory Test (BITE; Henderson & Freeman, 1987), the Bulimia Test-Revised (BULIT-R; Thelen, Farmer, Wonderlich, & Smith, 1991), the Eating Attitudes Test-Revised (EAT-26; Garner, Olmsted, Bohr, & Garfinkle, 1982), the Multifactorial Assessment of Eating Disorder Symptoms (MAEDS; Anderson, Williamson, Duchman, Gleaves, & Barbin, 1999), and the Three Factor Eating Questionnaire (TFEQ; Stunkard & Messick, 1985). The scale uses a 5-point Likert-type response format that asks participants to indicate whether the eating behavior items have occurred, “Never,” “Hardly Ever,” “Sometimes,” “Often,” or “Always.” The original scale consisted of 20 items and had 2 subscales: Overeating and Loss of control eating. The scale also measures binge eating, as binge eating is the combination of these two factors.

Principal axis factoring with oblique rotation of the items on How I Eat revealed two factors: an Overeating Factor and a Loss of Control Eating Factor. The factor structure replicated at Time 2. Questions that loaded highly onto Overeating at both time points but did not cross-load highly onto Loss of Control Eating became the new Overeating Subscale. Questions that loaded highly onto Loss of Control Eating at both time points but did not cross-load highly onto Overeating became the new Loss of

Control Eating subscale (Table 1). After dropping poorly loading items, the final How I Eat scale contained thirteen items: eight Overeating items and five Loss of Control items (see Appendix). Cronbach's alpha for the total measure was .85 at Time 1 and .83 at Time 2. Cronbach's alpha for the Loss of Control Eating subscale was .69 at Time 1 and .63 at Time 2. Cronbach's alpha for the Overeating subscale was .84 at Time 1 and .85 at Time 2.

All items pertaining to binge eating were taken from How I Eat and the YEDE-Q. Items that decreased Cronbach's alpha were not used in the analysis. The rest of the items were converted to z-scores and then the average of those z-scores was calculated to create the composite Binge Total. This same process was repeated for LOC items and overeating items to create the composites LOC Total and Overeating Total.

#### *Sex and BMI*

Participants filled out a demographic questionnaire that asked them to self-report their sex, height, and weight. BMI was calculated using the formula  $BMI = (\text{mass in pounds}) / (\text{height in inches}^2) \times 703$ , using participants' height and weight reports. Research with adolescent participants indicates that the correlation between BMI calculated from self-reported height and weight and BMI calculated from measured height and weight ranges from .80 to .89 (e.g., Brener, McManus, Galuska, Lowry, & Wechsler, 2003; Elgar, Roberts, Tudor-Smith, & Moore, 2005; Fonseca et al., 2009). BMI-for-age percentiles were then calculated using the Centers for Disease Control and Prevention's (CDC, 2010) BMI-for-age growth charts for children and adolescents. Percentiles indicate the relative position of the child's BMI among children of the same sex and age.

## Procedure

Prior to data collection, principals at the participating schools were contacted in order to set up a time to speak with teachers about the study. Informed consent documents were given to teachers at this time and collected later. At the pre-arranged time, informed consent documents were distributed to all students in each participating classroom. We offered a \$100 donation to each classroom if 90% of students returned consent forms signed by a parent or guardian, either granting or denying permission for their child's participation. Informed consent documents distributed totaled 1,086; of these, 520 (47.9%) were returned. After the informed consent process, 450 parents (86.5%) gave permission for their child to participate in the study. During regular school hours, the principal investigator and trained research assistants gathered students with parental consent into small groups and went over informed assent documents. We then administered the questionnaires (see Appendix), reading the instructions aloud and then allowing participants to complete the questionnaires at their own pace. The principal investigator and research assistants circulated among students to answer questions before, during, and after questionnaire administration. At the end of the data collection, students were given healthy snacks and a decorated pencil for their participation. The procedure was repeated again four months later at each school.

## CHAPTER III

### RESULTS

Table 2 contains correlations among all study variables, as well as descriptive statistics. Two of the study goals (1 and 3) were addressed with a series of multiple regression analyses. The regressions were done in AMOS with Full Information Maximum Likelihood (FIML) estimation to handle missing data. The first set of analyses tested the degree to which depressive symptoms predicted one of the three eating behaviors (first half of goal 1) and how sex and BMI moderated these relations (first half of goal 3). The second set of analyses tested the degree to which one of the three eating behaviors predicted depressive symptoms (second half of goal 1) and how sex and BMI moderated these relations (second half of goal 3). Our remaining goal (goal 2) was addressed with a regression that tested the relation of loss of control eating and overeating to depressive symptoms, after controlling for Time 1 depressive symptoms.

#### *Depressive Symptoms as a Predictor of the Three Eating Behaviors*

The full model for each of the three regression analyses with depressive symptoms as a predictor included the eating behavior at Time 1, Depressive Symptoms at Time 1, Sex, BMI, BMI x Depressive Symptoms, Sex x Depressive Symptoms, Sex x BMI, and Sex x BMI x Depressive Symptoms. A significant three-way interaction emerged between Sex, BMI, and Depression for the regressions with Binge Eating and Loss of Control Eating as the dependent variables. The effects of this interaction were very small when graphed (see Appendix for full regression model). We elected to remove the three-way interaction and examine the two-way interactions. None of the two-way

interactions were significant. We then examined the main effects. Depressive Symptoms at Time 1 was a significant predictor of Binge Eating, Loss of Control Eating, and Overeating (see Table 3).

#### *Binge Eating as a Predictor of Depressive Symptoms*

The full model for the regression with Binge Eating as a predictor included the Depressive Symptoms at Time 1, Binge Eating at Time 1, Sex, BMI, BMI x Binge Eating, Sex x Binge Eating, Sex x BMI, and the Sex x BMI x Binge Eating. The three-way interaction and two-way interactions were insignificant (see Appendix for full model). For the main effects model, significant main effects for binge eating and sex emerged (see Table 4). Binge eating and Sex were significant predictors of Depressive Symptoms at Time 2 while controlling for Depressive Symptoms at Time 1, Sex, and BMI.

#### *Loss of Control Eating as a Predictor of Depressive Symptoms*

The full model for the regression with loss of control eating as a predictor included the Depressive Symptoms at Time 1, Loss of Control Eating at Time 1, Sex, BMI, BMI x Loss of Control Eating, Sex x Loss of Control Eating, Sex x BMI, and Sex x BMI x Loss of Control Eating. The three-way interaction and two-way interactions were insignificant (see Appendix for full model). For the main effects model, a significant main effect for sex emerged (see Table 5). Sex was a significant predictor of Depressive Symptoms at Time 2 while controlling for Depressive Symptoms at Time 1, Loss of Control Eating, and BMI. Loss of Control Eating was not a significant predictor of Depressive Symptoms at Time 2.

#### *Overeating as a Predictor of Depressive Symptoms*

The full model for the regression with Overeating as a predictor included the Depressive Symptoms at Time 1, Overeating Eating at Time 1, Sex, BMI, BMI x Overeating, Sex x Overeating, Sex x BMI, and the Sex x BMI x Overeating. The three-way interaction and two-way interactions were insignificant (see Appendix for full model). For the main effects model, significant main effects for overeating and sex emerged (see Table 6). Overeating and Sex were significant predictors of Depressive Symptoms at Time 2 while controlling for Depressive Symptoms at Time 1, Sex, and BMI.

*Incremental Predictive Utility of Loss of Control Eating and Overeating*

For this analysis, Depressive Symptoms at Time 2 were regressed onto Depressive Symptoms at Time 1, Overeating at Time 1, and Loss of Control Eating at Time 1. Neither Overeating nor Loss of Control Eating was a significant predictor of Depressive Symptoms at Time 2 (see Table 7). That is, neither Overeating nor Loss of Control Eating demonstrated incremental predictive utility over-and-above the other variable.

## CHAPTER IV

### DISCUSSION

This study is the first of its kind to examine reciprocal prospective relations, incremental predictive utility, and potential moderators in the relations between depressive symptoms and three eating behaviors: overeating, loss of control eating, and binge eating in adolescent boys and girls. Five key findings emerged. First, depressive symptoms were significant predictors of later binge eating, loss of control eating, and overeating behaviors. Second, sex and BMI were not clinically significant moderators of the depressive symptoms to later eating behavior relations. Third, binge eating and overeating were significant predictors of later depressive symptoms. Fourth, sex and BMI were not significant moderators of the relations between binge eating, LOC, and overeating to later depressive symptoms. Fifth, results do not provide evidence for the predictive utility of LOC over and above overeating. Each of these results is elaborated below.

The first finding was that depressive symptoms at Time 1 were significant predictors of all three eating behaviors at Time 2: binge eating, loss of control eating, and overeating. These results support previous research (e.g., Skinner et al., 2012; Goossens et al., 2011) as well as affect regulation theory (e.g., Allen et al., 2008). Adolescents may use maladaptive eating behaviors to cope with the negative emotion characteristic of depression. This study extends previous research by examining the connection of depressive symptoms to all three binge eating-related behaviors and by including both adolescent girls and boys in the sample. The second finding was that sex was a



statistically significant, but not a clinically significant moderator of the relations, suggesting that the connection between depressive symptoms and maladaptive eating is present in both sexes. Although some researchers have begun to focus on eating disorders and body image in young men (e.g., Domine, Berchtold, Akre, Michaud, & Suris, 2009; Muise, Stein, & Arbess, 2003), the majority of eating disorder research continues to focus on young women. Results of this study provide evidence for greater inclusion of adolescent boys as participants in studies of the connections between binge eating behavior and depression. Rates of binge eating disorder are roughly equal for *adult* men and women (e.g., Hudson, Hiripi, Pope, & Kessler, 2007). This equivalence may be true for adolescents as well. The results of the current study and others suggest that binge eating symptoms may be more “gender-neutral” than symptoms of anorexia and bulimia.

In addition, BMI was a statistically significant, but not a clinically significant moderator of the relation between depressive symptoms to later binge eating and loss of control eating, suggesting that the relation exists across the weight spectrum. This finding is noteworthy, as binge eating behaviors are often associated with primarily overweight and obese adolescents (e.g., Stice et al., 2002). The fact that depressive symptoms put adolescents across the weight spectrum at increased risk for developing unhealthy eating behaviors suggests one avenue through which depression can increase weight gain and obesity over time. All three eating behaviors are associated with factors that can put adolescents at risk for obesity, including the increased consumption of high-carbohydrate and high-fat foods and inadequate intake of fruits and vegetables (Tanofsky-Kraff et al., 2009; Neumark-Sztainer, Story, Resnick, & Blum, 1996). These behaviors can have a negative impact on physical and emotional health for all adolescents,

not just those who are already overweight. Future research should examine binge eating as a mediator of the longitudinal relation between depression and weight gain.

The third finding was that both binge eating and overeating predicted later depressive symptoms while controlling for sex and BMI. These results provide support for and extend previous research on the longitudinal relation of eating behavior to depressive symptoms in adolescents and suggest reciprocal relations between depressive symptoms and these two eating behaviors (e.g., Skinner et al. 2012). Fourth, no significant sex and BMI differences emerged for the binge eating, LOC, and overeating relations. These findings reinforce the points that relations between eating behaviors and depressive symptoms exist across the weight spectrum and for both adolescent girls and boys and that studies of these relations should not focus solely on overweight adolescents or adolescent girls.

Finally, this study does not provide evidence for the predictive utility of LOC over and above overeating for depressive symptoms. Neither LOC at Time 1 nor overeating at Time 1 had predictive utility for Time 2 depressive symptoms over and above depressive symptoms at Time 1, as Time 1 depressive symptoms explained the majority of the variance. The fact that LOC and overeating are highly correlated may cause the two eating behaviors to cancel each other when examined in concert. In separate analyses, overeating was a predictor of depressive symptoms at Time 2 while controlling for sex, BMI, and Time 1 depressive symptoms. Conversely, LOC was not a significant predictor of depressive symptoms. Tanofsky-Kraff and colleagues focused on children under twelve in their initial research on loss of control eating (Tanofsky-Kraff et

al., 2008). This study is one of the first to assess whether the loss of control concept is a significant one for adolescents. For high school age adolescents, full-blown binge eating episodes and overeating may be the forms of maladaptive eating more predictive of depressive symptoms than the loss of control eating concept. Though the results of this study suggest that depressive symptoms predict loss of control eating for adolescents and loss of control is a component of the binge eating episodes that were in turn predictive of depressive symptoms, loss of control eating alone may not be enough to increase depressive symptoms for this age group. Future research should assess whether loss of control eating is connected to other forms of psychopathology in adolescence in order to further examine its predictive utility.

The results of the current study have clear clinical implications. First, results suggest that both girls and boys who experience depressive symptoms are at increased risk of maladaptive eating behaviors including binge eating, loss of control eating, and overeating. These behaviors may result in the development of eating disorders, including binge eating disorder and, if adolescents engage in compensatory behaviors such as restricting or purging in an attempt to make up for their eating, anorexia and bulimia. In addition, these behaviors can lead to unnecessary weight gain that can put adolescents at risk for obesity. Second, results suggest that male and female adolescents who report binge eating and overeating are at increased risk for depressive symptoms. The reciprocal nature of these relations can create an unfortunate cycle in which one set of symptoms exacerbates the other set. Clinicians treating adolescents should assess their clients for both depressive symptoms and eating disorder symptoms, even if their primary focus is on just one of these diagnoses. Positively, the reciprocal nature of the symptoms also

suggests that reductions in one area may result in reductions in the other. For example, helping adolescent clients improve eating habits may be a supplemental method of reducing depressive symptoms.

Limitations of the current study provide avenues for future research. First, this study measured depressive symptoms and eating behaviors and not depressive disorder or eating disorder diagnosis; relatively few adolescents in this sample had clinically concerning levels of depressive or eating disorder symptoms. Future research could use clinical samples to determine if relations found in the current study hold true for adolescents who meet full diagnostic criteria for depression or eating disorders. In addition, clinical interviewing would result in depressive and eating disorder diagnoses and administering clinicians could provide additional definitions and examples beyond the ones included in self-report measures that may help adolescents better distinguish between the three eating behaviors. A second limitation is the fact that this study relies on adolescents to self-report their eating behaviors and depressive symptoms from as far back as the past month. In addition, the time between Time 1 and Time 2 was four months. This was a convenience time frame requested by the school district. An ecological momentary assessment that sampled students at shorter and longer intervals would 1) allow participants to report on their eating behaviors and emotions in real time and 2) allow researchers to analyze a variety of temporal relations between eating and depressive symptoms. Third, this study focused on high school-age adolescents. The relations between eating behaviors and depressive symptoms may differ with age. Future research could include a wider age range to determine if relations between eating behaviors and depressive symptoms change as adolescents move into adulthood. Finally,

this study focused on two moderators, sex and BMI, and found that BMI was a significant moderator for the loss of control eating to depressive symptoms relation. A myriad of other moderators can be studied when assessing these relations in adolescence, including age and pubertal status. Future research could examine these and other moderators that may further qualify the reciprocal pathways between depressive symptoms and binge eating behaviors.

Table 1.  
*How I Eat Factor Analysis Waves 1 and 2.*

How I Eat Items	Wave 1 Loss of Control Eating	Wave 1 Overeating	Wave 2 Loss of Control Eating	Wave 2 Overeating
1. I eat until completely stuffed.	-.056	<b>.605</b>	-.145	<b>.650</b>
2. I eat even when not hungry.	.263	<b>.419</b>	.032	<b>.527</b>
3. How hungry I feel determines how much I eat.	.332	-.466	.422	-.370
4. I eat until I can't eat anymore.	.090	<b>.638</b>	-.142	<b>.751</b>
5. I eat and eat until I am physically uncomfortable.	.239	<b>.416</b>	.218	<b>.612</b>
6. Sometimes, when I start eating, I just can't seem to stop.	.485	.467	.264	.633
7. I eat amounts of food that others would consider unusually large.	.145	<b>.570</b>	-.082	<b>.612</b>
8. I eat alone because I am embarrassed of how much I'm eating.	.369	.075	.246	.261
9. I rarely eat so much food that I feel uncomfortably stuffed afterwards.	.274	-.035	.302	.029
10. There are times when I rapidly eat a very large amount of food.	.192	<b>.556</b>	.038	<b>.724</b>
11. When I see my favorite food, I find it very difficult to keep from eating it, even if I have just finished a meal.	.117	<b>.626</b>	.048	<b>.605</b>
12. Some things just taste so good that I keep on eating even when I am no longer hungry.	.140	<b>.685</b>	.049	<b>.706</b>
13. I lose control when eating.	.459	.315	.362	.593
14. I have control over the amount of food I consume.	<b>.582</b>	.120	<b>.566</b>	-.007
15. Compared to most people, my ability to control my eating behavior seems to be good.	<b>.584</b>	.162	<b>.484</b>	.170
16. It is not difficult for me to leave something on my plate.	.199	-.053	.422	-.052
17. I feel that food controls my life.	.476	.294	.187	.487
18. I display self-control around food.	<b>.466</b>	.076	<b>.526</b>	.145
19. I can stop eating when I want to.	<b>.466</b>	.013	<b>.425</b>	.065
20. I have no control over how much I eat.	<b>.520</b>	.122	<b>.307</b>	.263

*Note.* Items with loadings below .3 were removed from further analysis. Items that cross-loaded onto both factors were removed from further analysis.

Table 2.  
*Correlations, Means, and Standard Deviations.*

Measure	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
1. Dep Total 1	1										
2. Dep Total 2	.802**	1									
3. Binge Total 1	.365**	.372**	1								
4. Binge Total 2	.428**	.467**	.753**	1							
5. LOC Total 1	.386**	.348**	.763**	.576**	1						
6. LOC Total 2	.400**	.419**	.549**	.711**	.642**	1					
7. OE Total 1	.316**	.336**	.917**	.704**	.486**	.391**	1				
8. OE Total 2	.375**	.412**	.701**	.927**	.430**	.431**	.722**	1			
9. Sex Time 1	-.282**	-.321**	-.027	-.088	-.155**	-.183**	.028	-.046	1		
10. Sex Time 2	-.307**	-.307**	-.066	-.075	-.173**	-.188**	-.025	-.027	1.00**	1	
11. BMI Percentile	.107*	.107	.098	.126*	.245**	.206**	.014	.038	.002	-.034	1
Means	1.50	1.43	-.005	-.128	.002	-.082	.001	-.121			65.62
SD	2.29	2.44	.581	.535	.591	.586	.673	.687			27.21

*Note.* Dep Total = Composite of Depressive Symptoms, Binge Total = Composite of Binge Eating, LOC Total = Composite of Loss of Control Eating, OE Total = Composite of Overeating, Sex is coded 0 = girls, 1 = boys, BMI Percentile = Body Mass Index Percentile \*\* =  $p < .01$ , \* =  $p < .05$

Table 3.  
*Depressive Symptoms as a Predictor of Eating Behavior.*

Predictor	Unst. B	SE(B)	<i>B</i>	<i>t</i>	<i>p</i>
DV = Binge Eating Time 2					
Binge Eating Time 1	.668	.037	.706	17.829	< .001
Depressive Symptoms Time 1	.042	.010	.175	4.117	< .001
Sex	.011	.043	.010	.263	.792
BMI Time 1	.001	.001	.046	1.889	.234
DV = Loss of Control Eating Time 2					
Loss of Control Eating Time 1	.564	.049	.566	11.529	< .001
Depressive Symptoms Time 1	.047	.013	.182	3.611	< .001
Sex	-.039	.054	-.032	-.724	.469
BMI Time 1	.001	.001	.059	1.241	.215
DV = Overeating Time 2					
Overeating Time 1	.704	.043	.686	16.371	< .001
Depressive Symptoms Time 1	.047	.014	.153	3.380	< .001
Sex	.033	.058	.024	.576	.565
BMI Time 1	.001	.001	.025	.606	.544



Table 4.  
*Binge Eating as a Predictor of Depressive Symptoms.*

Predictor	Unst. B	SE(B)	<i>B</i>	<i>t</i>	<i>p</i>
DV = Depressive Symptoms Time 2					
Depressive Symptoms Time 1	.804	.042	.743	19.205	<.001
Binge Eating Time 1	.409	.164	.096	2.494	.013
Sex	-.449	.179	-.090	-2.507	.012
BMI Time 1	.004	.003	.049	1.353	.176

Table 5.  
*Loss of Control Eating as a Predictor of Depressive Symptoms*

Predictor	Unst. B	SE(B)	<i>b</i>	<i>t</i>	<i>p</i>
DV = Depressive Symptoms Time 2					
Depressive Symptoms Time 1	.829	.042	.767	19.858	<.001
Loss of Control Eating Time 1	.142	.167	.034	.848	.396
Sex	-.413	.180	-.083	-2.294	.022
BMI Time 1	.004	.003	.047	1.257	.209

Table 6.  
*Overeating as a Predictor of Depressive Symptoms*

Predictor	Unst. B	SE(B)	<i>b</i>	<i>t</i>	<i>p</i>
DV = Depressive Symptoms Time 2					
Depressive Symptoms Time 1	.810	.041	.750	19.582	< .001
Overeating Time 1	.303	.139	.083	2.184	.029
Sex	-.457	.180	-.092	-2.532	.011
BMI Time 1	.005	.003	.057	1.566	.117

Table 7.  
*Predictive Utility of Loss of Control Eating and Overeating*

Predictor	Unst. B	SE(B)	<i>b</i>	<i>t</i>	<i>p</i>
DV = Depressive Symptoms Time 2					
Depressive Symptoms Time 1	.838	.042	.776	20.162	< .001
Loss of Control Eating Time 1	.116	.180	.028	.644	.520
Overeating Time 1	.232	.154	.063	1.511	.131

## Appendix A

### How I Eat Measure and Normative Data (After Factor Analysis)

Listed below are some things about how people eat. Read each and then mark how often each thing happens to you: never, hardly ever, sometimes, often, or always. Remember, there are no right or wrong answers. Just choose the answer that best fits you.

	Never	Hardly ever	Some-times	Often	Always
1. I eat until completely stuffed.					
2. I eat even when not hungry.					
3. I have control over the amount of food I consume.					
4. I eat until I can't eat anymore.					
5. When I see my favorite food, I find it very difficult to keep from eating it, even if I have just finished a meal.					
6. Some things just taste so good that I keep on eating even when I am no longer hungry.					
7. I eat and eat until I am physically uncomfortable.					
8. Compared to most people, my ability to control my eating behavior seems to be good.					
9. I eat amounts of food that others would consider unusually large.					
10. I display self-control around food.					
11. I can stop eating when I want to.					
12. I have no control over how much I eat					
13. There are times when I rapidly eat a very large amount of food.					

### Norms by Gender

	N	Minimum	Maximum	Mean	Standard Deviation
Girls Time 1	204	2	47	16.54	8.21
Boys Time 1	149	2	38	16.09	7.67
Girls Time 2	183	0	42	15.29	7.70
Boys Time 2	137	1	31	13.98	7.08

### Norms by Age Time 1

	N	Minimum	Maximum	Mean	Standard Deviation
14	122	3	37	16.58	7.10
15	144	2	47	15.55	8.12
16	50	2	34	16.28	8.49
17	31	8	45	19.70	9.34
18	6	6	21	14.35	6.87

### Norms by Age Time 2

	N	Minimum	Maximum	Mean	Standard Deviation
14	79	2	42	14.70	7.42
15	121	1	34	14.93	7.21
16	69	0	29	12	6.78
17	29	6	36	17.98	7.78
18	21	9	39	18.23	8.07

**Appendix B**

All Study Measures

**Demographics**

What is your first and last name? \_\_\_\_\_

Are you \_\_\_\_\_ Male \_\_\_\_\_ Female

What is your birth date? \_\_\_\_\_  
(month) (day) (year)

What grade are you in? \_\_\_\_\_

Teacher Name and Current Class Period \_\_\_\_\_

Your race? Check all that apply:

\_\_\_\_\_ Black \_\_\_\_\_ White \_\_\_\_\_ Hispanic or Mexican-American

\_\_\_\_\_ Asian or Asian-American \_\_\_\_\_ American Indian or Native-American

\_\_\_\_\_ Other: \_\_\_\_\_

How tall are you (feet, inches)? \_\_\_\_\_

How much do you weigh (pounds)? \_\_\_\_\_

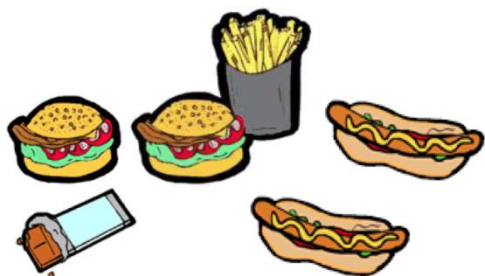
## EATING QUESTIONNAIRE—YOUTH VERSION

### PLEASE READ THIS BEFORE ANSWERING THE QUESTIONS

Some of these questions will ask about any binges that you might have had during the past four weeks (28 days). A binge has two parts: 1) eating a really big amount of food given the situation and 2) feeling out of control.

#### What is a —really big amount of food?

A really big amount of food is much more than most people would eat in the same situation. Some examples might be: 1) eating two full meals (such as two plates of salad/first course, two main dishes, two desserts, etc.); 2) eating three main courses (such as 3 plates of pasta); or 3) eating a really big amount of one food (such as 4 brownies) or a few different kinds of foods (such as a big bowl of ice cream, 8 cookies, a donut, and a handful of candy). Below are some pictures of a really big amount of food to help you.



**REALLY BIG**



**NOT REALLY BIG**

#### 1. What is —feeling out of control?

Feeling out of control while eating might mean different things for different people. It may mean that you're: 1) feeling **DRIVEN** to eat; 2) feeling like you **JUST** can not stop eating; 3) feeling like you're not able to stop yourself from starting to eat in the first place; or 4) feeling like you shouldn't even try to control your eating because you know that, no matter what, you're going to eat too much. Some kids describe feeling out of control like a ball rolling down a hill, that it just keeps going and going.

#### Examples of a binge:

1. **REALLY BIG AND OUT OF CONTROL.** After school one evening, Jenny ate 2 pieces of chicken, a large package of frozen vegetables, 3 cups of rice, 1/2 of a coffee cake and a piece of fruit. This is a really big amount of food. While she ate, Jenny felt like she **JUST** could not stop eating, ate more quickly than usual, and ate until she felt really, really full. Afterwards Jenny was very upset about how much she'd eaten, and said she felt sad, guilty, and mad at herself.

#### Examples that are not binges either because they are too small or the person does not feel out of control while eating:

1. **REALLY BIG BUT NOT OUT OF CONTROL.** A few times a week, Katie ate lunch at McDonald's with 2 friends. Her usual order was a Big Mac, a fish fillet sandwich, 2 large orders of fries, and a large chocolate shake. This is a really big amount of food. Although she ate more than her friends did and knew she was eating a lot of high-fat food, she didn't feel like she **JUST** could not stop eating, and she did not feel upset afterwards about how much she'd eaten.



2. **OUT OF CONTROL BUT NOT REALLY BIG.** For lunch one day, Joey had a ham and cheese sandwich with mayonnaise on a roll, a small bag of potato chips, a candy bar, and a Diet Coke. Joey felt out of control because he'd planned to have turkey on whole wheat with lettuce and tomato plus a piece of fruit for dessert, but couldn't stop himself from changing his order. Although this was a big meal, it was not really big, so we wouldn't consider it a binge.

3. **OUT OF CONTROL BUT NOT REALLY BIG.** Lizzie ate 2 donuts someone brought to homeroom one morning. She had started a diet that day and planned to skip breakfast. At first, Lizzie said no to the donuts, but after everyone else had gone to their other classes she snuck back into homeroom and very quickly ate the donuts so no one would see her eating. She felt very guilty and embarrassed after and hated feeling so out of control of her eating, promising to start dieting again the next day. Although Lizzie felt bad about eating the donuts, this was not a really big amount of food, so it would not be considered a binge.

**YEDE-Q: These questions are about the PAST FOUR WEEKS ONLY (28 days). In order to help you remember your eating patterns over the past 28 days, try to think of any events that might have changed the way you normally eat, such as holidays, parties, vacations, or stressful events (such as a school project being due, or getting in a fight with your parents). Please read each question carefully. Please answer all of the questions. Thank you very much!**

Questions 1 to 16: Please circle the number that is most like your behavior. Remember that the questions are only about the past four weeks (28 days).

**ON HOW MANY OF THE PAST 28 DAYS. . . :**

**1. On how many of the past 28 days have you on purpose been trying to cut down on what you eat to change your shape or weight? (Circle one.)**

None of the days	A few of the days (1-5 days)	Less than half the days (6-12 days)	Half the days (13-15 days)	More than half the days (16-22 days)	Most of the days (23-27 days)	Every day
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**2. On how many of the past 28 days have you gone for most of the day (8 hours or more) without eating anything in order to change your shape or weight? (Circle one.)**

None of the days	A few of the days (1-5 days)	Less than half the days (6-12 days)	Half the days (13-15 days)	More than half the days (16-22 days)	Most of the days (23-27 days)	Every day
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**3. On how many of the past 28 days have you tried not to eat any foods that you like in order to change your shape or weight? (Circle one.)**

None of the days	A few of the days (1-5 days)	Less than half the days (6-12 days)	Half the days (13-15 days)	More than half the days (16-22 days)	Most of the days (23-27 days)	Every day
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**4. On how many of the past 28 days have you tried to stick to strict rules about your eating in order to change your shape or weight; for example, only letting yourself eat a certain type or amount of food, or certain number of calories? (Circle one.)**

None of the days	A few of the days (1-5 days)	Less than half the days (6-12 days)	Half the days (13-15 days)	More than half the days (16-22 days)	Most of the days (23-27 days)	Every day
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**5. On how many of the past 28 days has thinking about food or calories made it hard for you to pay attention to things you are interested in (for example, watching TV, reading, or playing on the computer)? (Circle one.)**

None of the days	A few of the days (1-5 days)	Less than half the days (6-12 days)	Half the days (13-15 days)	More than half the days (16-22 days)	Most of the days (23-27 days)	Every day
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**6. On how many of the past 28 days have you been afraid of losing control over eating (afraid that you won't be able to stop eating)? (Circle one.)**

None of the days	A few of the days (1-5 days)	Less than half the days (6-12 days)	Half the days (13-15 days)	More than half the days (16-22 days)	Most of the days (23-27 days)	Every day
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**7. On how many of the past 28 days have you felt like you did lose control over your eating? (Circle one.)**

None of the days	A few of the days (1-5 days)	Less than half the days (6-12 days)	Half the days (13-15 days)	More than half the days (16-22 days)	Most of the days (23-27 days)	Every day
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**8. On how many of the past 28 days have you binged (eaten a really big amount of food and felt that you had lost control over your eating)? (Circle one.)**

None of the days	A few of the days (1-5 days)	Less than half the days (6-12 days)	Half the days (13-15 days)	More than half the days (16-22 days)	Most of the days (23-27 days)	Every day
------------------	---------------------------------	--	-------------------------------	---	----------------------------------	-----------

**9. Over the past 28 days, how many days have you eaten in secret? Do not count binges. (Circle one.)**

None of the days	A few of the days (1-5 days)	Less than half the days (6-12 days)	Half the days (13-15 days)	More than half the days (16-22 days)	Most of the days (23-27 days)	Every day
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**10. On how many of the past 28 days have you wanted a completely flat stomach (as flat as a board)? (Circle one.)**

None of the days	A few of the days (1-5 days)	Less than half the days (6-12 days)	Half the days (13-15 days)	More than half the days (16-22 days)	Most of the days (23-27 days)	Every day
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**11. On how many of the past 28 days have you wanted your stomach to be empty – to not have any food in it at all? (Circle one.)**

None of the days	A few of the days (1-5 days)	Less than half the days (6-12 days)	Half the days (13-15 days)	More than half the days (16-22 days)	Most of the days (23-27 days)	Every day
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**12. On how many of the past 28 days has thinking about your shape or weight made it hard for you to pay attention to things you are interested in (for example, watching TV, reading, or playing on the computer)? (Circle one.)**

None of the days	A few of the days (1-5 days)	Less than half the days (6-12 days)	Half the days (13-15 days)	More than half the days (16-22 days)	Most of the days (23-27 days)	Every day
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**13. On how many of the past 28 days have you been scared that you might gain weight? (Circle one.)**

None of the days	A few of the days (1-5 days)	Less than half the days (6-12 days)	Half the days (13-15 days)	More than half the days (16-22 days)	Most of the days (23-27 days)	Every day
------------------	---------------------------------	--	-------------------------------	---	----------------------------------	-----------

**14. On how many of the past 28 days have you felt fat? (Circle one.)**

None of the days	A few of the days (1-5 days)	Less than half the days (6-12 days)	Half the days (13-15 days)	More than half the days (16-22 days)	Most of the days (23-27 days)	Every day
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**15. On how many of the past 28 days have you had a very strong wish to lose weight? (Circle one.)**

None of the days	A few of the days (1-5 days)	Less than half the days (6-12 days)	Half the days (13-15 days)	More than half the days (16-22 days)	Most of the days (23-27 days)	Every day
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**16. Over the past 28 days, on how many of the times that you have eaten have you felt guilty (that you've done something wrong) because of how it might change your shape or weight? Do not count binges (Circle one.)**

None of the days	A few of the days (1-5 days)	Less than half the days (6-12 days)	Half the days (13-15 days)	More than half the days (16-22 days)	Most of the days (23-27 days)	Every day
------------------	---------------------------------	--	-------------------------------	---	----------------------------------	-----------

Questions 17-29: Please look at the first two pages for help answering these questions. Please circle the answer that is most like your behavior. When asked how many times, please use numbers. Remember that the questions only refer to the past four weeks (28 days).

**OVER THE PAST 28 DAYS. . . :**

**17. Over the past 28 days have there been times when you have eaten a really big amount of food, compared to what other kids your age would eat in the same situation? (Please circle.)**

No Yes

**18. How many times has this happened over the past 28 days? \_\_\_\_\_**

**19. On how many of these times did feel like you had lost control while eating? \_\_\_\_\_**

**20. Over the past 28 days have you had times where you felt that you had lost control over your eating, but have not eaten a really big amount of food? (Please circle.)**

No Yes

**21. How many times has this happened over the past 28 days? \_\_\_\_\_**

**22. Over the past 28 days have you made yourself throw up? (Please circle.)**

No Yes

**23. How many times has this happened over the past 28 days? \_\_\_\_\_**

**24. Over the past 28 days have you taken any medicines that make you go to the bathroom (have a bowel movement)? (Please circle.)**

No Yes

**25. How many times has this happened over the past 28 days? \_\_\_\_\_**

**26. Over the past 28 days have you taken water pills (pills that make you urinate or pee)? (Please circle.)**

No Yes

**27. How many times has this happened over the past 28 days? \_\_\_\_\_**

**28. Over the past 28 days have you exercised very hard in order to change your shape or weight (and not just for fun)? (Please circle.)**

No Yes

**29. How many times has this happened over the past 28 days? \_\_\_\_\_**

Questions 30 to 38: Please mark the spot on the line that best describes how you feel. Remember that the questions only refer to the past four weeks (28 days). For these questions, when we say “weight,” we mean the number on the scale, and when we say “shape,” we mean what you see in the mirror.

**OVER THE PAST 28 DAYS. . . :**

30. Over the past 28 days, has your weight (the number on the scale) made a difference in how you think (judge) yourself as a person? (Please circle the number.)

0	1	2	3	4	5	6
Not at all		A little bit		A lot		Very, very much

31. Over the past 28 days, has your shape (what you see in the mirror) made a difference in how you think (judge) yourself as a person? (Please circle the number.)

0	1	2	3	4	5	6
Not at all		A little bit		A lot		Very, very much

32. Over the past 28 days, how much would it upset you if you had been asked to weigh yourself once a week (no more and no less) for the next four weeks? (Please circle the number.)

0	1	2	3	4	5	6
Not at all		A little bit		A lot		Very, very much

33. Over the past 28 days, how unhappy have you been with your weight (the number of the scale)? (Please circle the number.)

0	1	2	3	4	5	6
Not at all		A little bit		A lot		Very, very much

34. Over the past 28 days, how unhappy have you been with your shape (what you see in the mirror)? (Please circle the number.)

0	1	2	3	4	5	6
Not at all		A little bit		A lot		Very, very much

35. Over the past 28 days, how thin have you wanted to be? (Please circle the number.)

0	1	2	3	4	5	6
Not at all		A little bit		A lot		Very, very much

36. Over the past 28 days, how worried have you been about other people seeing you eat? Do not count binge eating. (Please circle the number.)

0	1	2	3	4	5	6
Not at all		A little bit		A lot		Very, very much

37. Over the past 28 days, how uncomfortable or embarrassed have you felt seeing your own body (for example, in the mirror, reflected in a store window, getting undressed, having a bath or shower)? (Please circle the number.)

0	1	2	3	4	5	6
Not at all		A little bit		A lot		Very, very much

38. Over the past 28 days, how uncomfortable or embarrassed have you felt about other people seeing your shape or figure (for example, getting changed for swimming, in the swimming pool, wearing clothes that show off your shape)? (Please circle the number.)

0	1	2	3	4	5	6
Not at all		A little bit		A lot		Very, very much

39. Have your eating and your feelings about your shape and weight over the past four weeks been about the same as the past year? (Please circle)

No

Yes

If no, how has the past year been different from the past four weeks?

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**RADS-2****How I'm Feeling**

Listed below are some sentences about how you feel. Read each sentence and decide how often you feel this way. Decide if you feel this way almost never, hardly ever, sometimes, or most of the time. To answer each item, put a check under the answer that best describes how you really feel. Remember, there are no right or wrong answers. Just choose the answer that tells how you usually feel.

	Almost never	Hardly ever	Some-times	Most of the time
1. I feel happy				
2. I worry about school				
3. I feel lonely				
4. I feel my parents don't like me				
5. I feel important				
6. I feel like hiding from people				
7. I feel sad				
8. I feel like crying				
9. I feel that no one cares about me				
10. I feel like having fun with other students				
11. I feel sick				
12. I feel loved				
13. I feel like running away				
14. I feel like hurting myself				
15. I feel that other students don't like me				
16. I feel upset				
17. I feel life is unfair				
18. I feel tired				
19. I feel I am bad				
20. I feel I am no good				
21. I feel sorry for myself				
22. I feel mad about things				
23. I feel like talking to other students				
24. I have trouble sleeping				
25. I feel like having fun				
26. I feel worried				
27. I get stomachaches				



28. I feel bored				
29. I like eating meals				
30. I feel like nothing I do helps anymore				

## **How I Eat**

Listed below are some things about how people eat. Read each and then mark how often each thing happens to you: never, hardly ever, sometimes, often, or always. Remember, there are no right or wrong answers. Just choose the answer that best fits you.

	Never	Hardly ever	Sometimes	Often	Always
14. I eat until completely stuffed.					
15. I lose control when eating.					
16. I eat even when not hungry.					
17. I have control over the amount of food I consume.					
18. How hungry I feel determines how much I eat.					
19. I eat until I can't eat anymore.					
20. When I see my favorite food, I find it very difficult to keep from eating it, even if I have just finished a meal.					
21. Some things just taste so good that I keep on eating even when I am no longer hungry.					
22. I eat and eat until I am physically uncomfortable.					
23. Compared to most people, my ability to control my eating behavior seems to be good.					
24. Sometimes when I start eating, I just can't seem to stop.					

	Never	Hardly ever	Sometimes	Often	Always
25. It is not difficult for me to leave something on my plate.					
26. I eat amounts of food that others would consider unusually large.					
27. I feel that food controls my life.					
28. I eat alone because I am embarrassed of how much I'm eating.					
29. I display self-control around food.					
30. I can stop eating when I want to.					
31. I rarely eat so much food that I feel uncomfortably stuffed afterwards.					
32. I have no control over how much I eat					
33. There are times when I rapidly eat a very large amount of food.					

## CDI

### How I'm Feeling 2

Pick one sentence from each group that best fits you for the past two weeks. There are no right or wrong answers. Just be as honest as possible.

1.  I am sad once in a while  
 I am sad many times  
 I am sad all the time
  
2.  Nothing will ever work out for me  
 I am not sure if things will work out for me  
 Things will work out for me O.K.
  
3.  I do most things O.K.  
 I do many things wrong  
 I do everything wrong
  
4.  I have fun in many things  
 I have fun in some things  
 Nothing is fun at all
  
5.  I am bad all the time  
 I am bad many times  
 I am bad once in a while
  
6.  I think about bad things happening to me once in a while  
 I worry that bad things will happen to me  
 I am sure that terrible things will happen to me
  
7.  I hate myself  
 I do not like myself  
 I like myself
  
8.  All bad things are my fault  
 Many bad things are my fault  
 Bad things are not usually my fault

9.  I feel like crying everyday  
 I feel like crying many days  
 I feel like crying once in a while
10.  Things bother me all the time  
 Things bother me many times  
 Things bother me once in a while
11.  I like being with people  
 I do not like being with people many times  
 I do not want to be with people at all
12.  I cannot make up my mind about things  
 It is hard to make up my mind about things  
 I make up my mind about things easily
13.  I look O.K.  
 There are some bad things about my looks  
 I look ugly
14.  I have to push myself all the time to do my schoolwork  
 I have to push myself many times to do my schoolwork  
 Doing schoolwork is not a big problem
15.  I have trouble sleeping every night  
 I have trouble sleeping many nights  
 I sleep pretty well
16.  I am tired once in a while  
 I am tired many days  
 I am tired all the time
17.  Most days I do not feel like eating  
 Many days I do not feel like eating  
 I eat pretty well.

18.  I do not worry about aches and pains  
 I worry about aches and pains many times  
 I worry about aches and pains all the time
19.  I do not feel alone  
 I feel alone many times  
 I feel alone all the time
20.  I never have fun at school  
 I have fun at school only once in a while  
 I have fun at school many times
21.  I have plenty of friends  
 I have some friends but I wish I had more  
 I do not have any friends
22.  My schoolwork is alright  
 My schoolwork is not as good as before  
 I do very badly in subjects I used to be good in
23.  I can never be as good as other kids  
 I can be as good as other kids if I want to  
 I am just as good as other kids
24.  Nobody really loves me  
 I am not sure if anybody loves me  
 I am sure that somebody loves me
25.  I usually do what I am told  
 I do not do what I am told most times  
 I never do what I am told
26.  I get along with people  
 I get into fights many times  
 I get into fights all the time

**PHQ-9**

Over the last 2 weeks, how often have you been bothered by any of the following problems?

	Not at all	Several days	More than half the days	Nearly every day
1. Little interest or pleasure in doing things	0	1	2	3
2. Feeling down, depressed, or hopeless	0	1	2	3
3. Trouble falling or staying asleep, or sleeping too much	0	1	2	3
4. Feeling tired or having little energy	0	1	2	3
5. Poor appetite or overeating	0	1	2	3
6. Feeling bad about yourself — or that you are a failure or have let yourself or your family down	0	1	2	3
7. Trouble concentrating on things, such as reading the newspaper or watching television	0	1	2	3
8. Moving or speaking so slowly that other people could have noticed. Or the opposite — being so fidgety or restless that you have been moving around a lot more than usual	0	1	2	3

**Circle the number to indicate your answer.**

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If you circled any problems, how difficult have these problems made it for you to do your work, take care of things at home, or get along with other people? Check the box below the words that describe how difficult it was.

Not difficult at all

Somewhat difficult

Very difficult

Extremely difficult

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**Appendix C**  
Full Regression Models

Predictor	Unst. B	SE(B)	<i>b</i>	<i>t</i>	<i>p</i>
DV = Binge Eating Time 2					
Binge Eating Time 1	.666	.037	.702	18.019	< .001
Depressive Symptoms Time 1	-.028	.031	-.116	-.911	.362
Sex	-.025	.253	-.022	-.097	.923
BMI Percentile Time 1	.000	.001	.012	.224	.823
BMI x Dep	.000	.000	.348	2.582	.010
Sex x Dep	.058	.025	.345	2.320	.020
Sex x BMI	.002	.011	.039	.164	.869
Sex x BMI x Dep	-.001	.000	-.425	-2.657	.008
DV = Loss of Control Eating Time 2					
Loss of Control Eating Time 1	.575	.048	.569	11.956	< .001
Depressive Symptoms Time 1	-.058	.040	-.221	-1.477	.140
Sex	-.277	.322	-.229	-.861	.389
BMI Percentile Time 1	.000	.001	-.016	-.237	.813
BMI x Dep	.001	.000	.470	2.958	.003
Sex x Dep	.078	.032	.424	2.435	.015
Sex x BMI	.011	.014	.213	.771	.441
Sex x BMI x Dep	-.001	.000	-.526	-2.810	.005
DV = Overeating Time 2					
Overeating Time 1	.701	.043	.686	16.326	< .001
Depressive Symptoms Time 1	-.006	.043	-.019	-.137	.891
Sex	.218	.346	.156	.630	.528
BMI Percentile Time 1	.001	.002	.024	.388	.698
BMI x Dep	.000	.000	.223	1.504	.133
Sex x Dep	-.007	.034	.171	1.055	.291
Sex x BMI	-.007	.015	-.124	-.483	.629
Sex x BMI x Dep	-.001	.000	-.243	-1.388	.165



*Binge Eating as a Predictor of Depressive Symptoms*

Predictor	Unst. B	SE(B)	<i>b</i>	<i>t</i>	<i>p</i>
DV = Depressive Symptoms Time 2					
Depressive Symptoms Time 1	.801	.042	.738	19.150	< .001
Binge Eating Time 1	.789	.604	.182	1.307	.191
Sex	-.761	.943	-.152	-.807	.420
BMI Percentile Time 1	.003	.004	.034	.774	.439
BMI x Binge Eating	-.002	.008	-.038	-.272	.785
Sex x Binge Eating	-1.119	.927	-.150	-1.207	.227
S x BMI	.013	.040	.061	.320	.749
S x BMI x Binge Eating	.009	.013	.087	.695	.487

*Loss of Control Eating as a Predictor of Depressive Symptoms*

Predictor	Unst. B	SE(B)	<i>b</i>	<i>t</i>	<i>p</i>
DV = Depressive Symptoms Time 2					
Depressive Symptoms Time 1	.823	.042	.761	19.579	< .001
Loss of Control Eating Time 1	.698	.682	.165	1.024	.306
Sex	-.868	.989	-.174	-.878	.380
BMI Percentile Time 1	.003	.004	.033	.702	.483
BMI x LOC	-.006	.009	-.101	-.636	.525
Sex x LOC	-.957	1.061	-.124	.367	.367
S x BMI	.018	.042	.084	.671	.671
S x BMI x LOC	.007	.014	.071	.519	.604

*Overeating as a Predictor of Depressive Symptoms*

Predictor	Unst. B	SE(B)	<i>b</i>	<i>t</i>	<i>p</i>
DV = Depressive Symptoms Time 2					
Depressive Symptoms Time 1	.808	.041	.746	19.565	< .001
Overeating Time 1	.118	.477	.032	.248	.804
Sex	-.478	.929	-.096	-.514	.607
BMI Percentile Time 1	.005	.004	.055	1.249	.212
BMI x Overeating	.005	.007	.097	.762	.446
Sex x Overeating	-.391	.712	-.067	-.549	.583
S x BMI	.002	.040	.009	.047	.962
S x BMI x Overeating	.002	.010	.021	.168	.867

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