EATING BEHAVIORS IN OVERWEIGHT CHILDREN OF BINGE EATING MOTHERS

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Obesity has significant medical and psychosocial morbidity and is increasingly prevalent among children. Available evidence suggests that children report binge eating and maladaptive eating behaviors and attitudes, which may contribute to overweight. Further, maternal eating attitudes and behaviors may influence children's eating and weight, yet little is known about the relationship among these variables. Thus, the current study investigated aberrant eating and its cognitive correlates in overweight children of mothers with binge eating problems. Sixty-eight mothers and their biological children were interviewed using the Eating Disorder Examination, adult (EDE) and child (ChEDE) versions, to assess binge eating and associated attitudes and behaviors. Participants also completed the Children's Depression Inventory, EAS Temperament Survey, and a demographic questionnaire. Height and weight was measured in mothers and children to determine BMI (kg/m^2). Mothers were on average, obese (BMI = 32.71 $\pm$ 7.83 kg/m^2), 38 years old, and predominantly Caucasian (63%). Children were 9.5 years old ($\pm$ 1.4), and 63% were female. The children were on average 97.61 ($\pm$ 2.23) percentile of ideal body weight for their age, height, and gender according to the World Health Organization charts (Jelliffe, 1966). Results indicated that 38% of the children reported recent loss of control over their eating, a feature related to binge eating in adults. Moreover, similar to findings in adults with BED, children with loss of control also endorsed more eating disorder cognitions and

depression compared to children without loss of control (*p*s < .01). However, the percentage of children reporting loss of control over their eating did not differ in children of mothers with and without binge eating (50.0% versus 35.9%; X^2 (1, N = 53) = .85, p = .355. Secondary analyses utilizing continuous measures of mother and child aberrant eating suggested a relationship between maternal and child aberrant eating, as well as relationships among child BMI, child depression, and child aberrant eating. In contrast, child temperament was not related to child aberrant eating in this sample of overweight children. Findings from this study will contribute to future work examining factors related to the treatment and prevention of childhood overweight.

TABLE OF CONTENTS

1.0 INTRODUCTION……1

1.1 SIGNIFICANCE……2

1.2 BINGE EATING IN ADULTS……3

1.2.1 Binge eating and overweight……...4

1.3 ABERRANT EATING IN CHILDREN……..……..5

1.3.1 Eating behaviors in children……5

1.3.2 Measurement of aberrant eating in children……6

1.3.3 Binge eating and related eating behaviors in children……8

1.3.4 Relationship between binge eating and overweight in children…...…….11

1.4 FAMILIAL INFLUENCES ON THE DEVELOPMENT AND MAINTENANCE OF ABERRANT EATING AND OBESITY IN CHILDREN……12

1.4.1 Genetic influences on weight and aberrant eating……14

1.4.2 Parental eating attitudes and behaviors and child eating……...……15

1.4.3 Eating problems in the offspring of mothers with eating disorders……...17

1.5 BINGE EATING, MOOD, AND RELATED PSYCHOPATHOLOGY IN ADULTS..18

1.5.1 Binge eating and mood in children……....19

1.6 BINGE EATING AND TEMPERAMENT IN ADULTS……..……..19

1.6.1 Binge eating and temperament in children……20

1.7 STATEMENT OF THE PROBLEM……...21

1.7.1 Study aims and hypotheses……22

2.0 METHOD……...24

2.1 PARTICIPANTS……24

2.1.1 Eligibility Criteria……..24

2.2 PROCEDURE……25

2.2.1 Participant Recruitment…….25

2.2.2 Study Procedure…….26

2.2.3 Costs and Payments……...28

2.2.4 Adult Measures……..28

2.2.5 Child Measures…….29

2.3 DATA ANALYSIS……...31

2.3.1 Preliminary Analyses……31

2.3.2 Data analysis: Aim 1…….31

2.3.3 Data analysis: Aim 2…….32

2.3.3.1 Maternal Binge Eating…….32

2.3.3.2 Aim 2……...34

2.3.3.3 Aim 3……34

2.3.4 Exploratory analyses……..36

3.0 RESULTS……38

3.1 EATING DISORDER BEHAVIORS AND ATTITUDES IN OVERWEIGHT CHILDREN……...38

3.2 COMPARISON OF LOC+ AND LOC- CHILDREN……..38

3.3 AIM 2: COMPARISON OF DISORDERED EATING BEHAVIORS AND ATTITUDES BETWEEN OVERWEIGHT CHILDREN OF BE+ AND BE- MOTHERS…….41

3.4 AIM 3: COMPARISON OF MOOD AND TEMPERAMENT BETWEEN OVERWEIGHT CHILDREN OF BE+ AND BE- MOTHERS..……..43

3.5 EXPLORATORY ANALYSES……...44

4.0 DISCUSSION……..48

4.1 ABERRANT EATING IN OVERWEIGHT CHILDREN……48

4.2 CHARACTERISTICS OF CHILDREN WITH AND WITHOUT LOSS OF CONTROL OVER EATING…….52

4.3 ABERRANT EATING IN OVERWEIGHT CHILDREN OF BINGE EATING MOTHERS…….……54

4.4 DEPRESSION AND TEMPERAMENT IN OVERWEIGHT CHILDREN OF BINGE EATING MOTHERS…….……....…....…….…54

4.5 EXPLORATORY ANALYSES…….……..56

4.5.1 Aberrant eating and degree of overweight in children……...56

4.5.2 Aberrant eating and maternal eating in children……56

4.5.3 Aberrant eating and mood in children…….……...……57

4.5.4 Aberrant eating and temperament in children……58

4.6 SUMMARY…….60

4.7 STRENGTH AND LIMITATIONS……60

4.8 FUTURE DIRECTIONS…….63

4.9 CONCLUSIONS…….66

APPENDIX A. PARTICIPANT FLOW CHART……68

APPENDIX B. RESULTS OF COMPARISONS OF CHILDREN'S DEMOGRAPHIC CHARACTERISTICS AND CHEDE SUBSCALE SCORES BASED ON EATING BEHAVIOR……...69

APPENDIX C. RESULTS OF MANN-WHITNEY U ANALYSES COMPARING LOC+ VS LOC- CHILDREN ON CHEDE AND EAS SUBSCALES……..70

APPENDIX D. RESULTS MANN-WHITNEY U TESTS COMPARING OVERWEIGHT CHILDREN OF BE+ AND BE- MOTHERS ON CHEDE AND EAS SUBSCALES……71

APPENDIX E. COMPARISONS OF DEMOGRAPHIC CHARACTERISTICS AND CHEDE, CDI, AND EAS SUBSCALES AMONG OVERWEIGHT CHILDREN OF BE+, INFREQUENT LOSS OF CONTROL, AND BE- MOTHERS……...……72

BIBLIOGRAPHY……..74

LIST OF TABLES

I. Table 1: Studies examining binge eating and loss of control in preadolescent children…….. 9

II. Table 2: Mother Characteristics and EDE scores ……27

III. Table 3: Results of Comparisons of Demographic Characteristics and EDE Subscale Scores of BE+, Infrequent loss of control, and BE- Mothers……35

IV. Table 4: Child Scores on ChEDE, CDI, and EAS……..39

V. Table 5: LoC+ versus LoC- Child Characteristics ……..40

VI. Table 6: Comparisons of Demographic Characteristics and ChEDE, CDI, and EAS Subscales between Overweight Children of BE+ and BE- Mothers ……42

VII. Table 7: Correlations among Variables…….44

VIII. Table 8: Summary of Linear and Hierarchical Regression Analyses Predicting ChEDE Global Score from Maternal Disordered Eating, Child Depression, and Child Temperament …46

LIST OF FIGURES

I. Figure 1: Proposed Model of Vulnerabilities for Child Aberrant Eating …..……13

1.0 INTRODUCTION

Obesity is increasingly prevalent among adults and has significant medical and psychosocial morbidity. The prevalence of childhood overweight also is increasing, and current estimates of overweight range from 16% to 18% of children in the United States (Ogden, Carroll, Curtin, McDowell, Tabak, & Flegal, 2006). The growing prevalence of pediatric overweight is of concern because an estimated 70% of obese adolescents become obese adults (Serdula et al., 1993). Moreover, overweight children and adolescents suffer from significant health consequences including type 2 diabetes, hypertension and psychosocial problems (Hardy, Harrell, & Bell, 2004).

The heritable component of obesity is substantial with estimates documenting that the genetic contribution to body mass index (BMI) is between 50 and 90 percent (Maes, Neale, & Eaves, 1997). However, given recent increases in prevalence of overweight and obesity, it is apparent that environmental and behavioral factors also are significant. These are of particular interest because behavioral and psychological factors may be amenable to modification. For example, family factors including parent eating behaviors and attitudes may affect child overweight. Additionally, children report binge eating and maladaptive attitudes about eating, shape, and weight, which may be associated with the development and maintenance of overweight (Graber, Brooks-Gunn, Paikoff, & Warren, 1994) and eating disorders (Stice et al., 1999). However, despite consensus regarding the presence of binge eating and maladaptive

attitudes, information about the prevalence and correlates of aberrant eating in children is lacking.

The current investigation was designed to characterize aberrant eating behaviors in children who may be at elevated risk for problematic eating by virtue of family eating problems and weight. Specifically, factors relating to binge eating and its cognitive correlates were examined in a group of overweight children. We also compared eating behaviors and correlates in overweight children of mothers with and without binge eating problems to determine whether overweight children of mothers with binge eating are at increased risk for problematic eating.

1.1 SIGNIFICANCE

There are several reasons to study disordered eating behaviors and attitudes in overweight children, a high-risk pediatric population. As noted above, overweight children are at risk for medical and psychosocial consequences of obesity. Second, available evidence suggests that overweight children are more likely to report aberrant eating behaviors, including loss of control over eating and related eating, weight, and shape concerns than are normal weight children (Tanofsky-Kraff et al., 2004). Moreover, aberrant eating is associated with distress and dysfunction (Grilo, 2002; Wilfley, Pike, Striegel-Moore, & Fairburn, 2001). Third, aberrant eating behaviors in overweight children may suggest the need for targeted treatment. For example, management of overweight may be more complex for these children, and dealing with problematic eating behaviors may be required to ensure optimal response to obesity treatment programs. Finally, overweight children of mothers with significant eating problems may be at particularly increased risk for the development of diagnosable eating disorders in adolescence. Thus, this study is significant as an effort to use state-of-the-art methodology to better

understand eating problems in children of mothers with and without binge eating. These data will contribute to future work examining factors related to the treatment and prevention of childhood overweight.

The following sections review the literature on binge eating and weight in adults and children. Issues relating to the definition and measurement of eating behaviors in children are presented. Next, current evidence regarding binge eating and related eating behaviors in children are reviewed. Familial contributions to obesity and aberrant eating in children are discussed. Finally, the relationships among binge eating, overweight, mood, and temperament in adults and children are explored.

1.2 BINGE EATING IN ADULTS

Binge eating is defined as the consumption of an unusually large amount of food in a circumscribed period of time coupled with a feeling of loss of control over eating (Fairburn & Wilson, 1993; Spitzer et al., 1992; Stunkard, 1959). Recurrent binge eating without the regular compensatory behaviors seen in bulimia nervosa (BN) is the hallmark of binge eating disorder (BED), a research diagnostic category of the *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.; *DSM-IV*; American Psychiatric Association, 1994).

The prevalence rate of adult BED is estimated to be between 1% and 6% in nonclinical community samples and between 20% and 30% in university medical center weight reduction program samples (Marcus, Moulton, & Greeno, 1995; Spitzer et al., 1993; Striegel-Moore & Franko, 2003). Retrospective studies of adults with BED indicate that for many individuals, the onset of binge eating problems occurs in early-to mid-adolescence (Marcus et al., 1995; Mussell et al., 1995), and cross-sectional studies suggest that a number of adolescents report binge eating

(e.g., Decaluwe, Braet, & Fairburn, 2002). However, less is known about the presence of binge eating behaviors in preadolescents, or how these behaviors are related to overweight or the development of clinically diagnosable eating disorders.

1.2.1 Binge eating and overweight

Binge eating disorder is associated with considerable medical and psychiatric morbidity (Johnson, Spitzer, & Williams, 2001; Newman et al., 1996). In particular, binge eating is strongly associated with overweight in adults. The majority of adult patients with BED are obese, and severity of binge eating is associated with degree of overweight in both clinical and non-treatment-seeking samples (de Zwann et al., 1994; Smith, Marcus, Lewis, Fitzgibbon, & Schreiner, 1998). Risk factor studies of community-based samples of adults suggest that individuals with BED display increased vulnerability to obesity than healthy control individuals and that a history of childhood obesity is more common in individuals with BED than individuals with other eating disorders (Fairburn et al., 1998). Obese individuals with binge eating have an earlier onset of obesity (Fairburn et al., 1998) and have elevated prevalence of lifetime mood disorders, anxiety disorders, substance use disorders, insomnia, and psychosocial distress than do individuals without BED (Johnson et al., 2001; Wilfley, Friedman, Dounchis, Stein, Welch, & Ball, 2000).

However, the relationship between overweight and binge eating is complex. Sustained periods of binge eating may lead to substantial weight gain and therefore, contribute to the development or maintenance of overweight. In contrast, some individuals may become overweight, attempt to lose weight by dieting, and start binge eating consequent to dietary restriction. Thus, the temporal relationship of binge eating and overweight requires clarification.

Moreover, what is known concerning binge eating and overweight has been gathered from adult samples, and an examination of these factors in childhood may elucidate this relationship.

1.3 ABERRANT EATING IN CHILDREN

Estimates of the prevalence of aberrant eating in children are variable for a number of reasons including measurement difficulties associated with the assessment of eating disorders and the nature of children's eating behaviors. This section describes normal eating behaviors in children and discusses challenges in the measurement of aberrant eating. A number of terms have been used to capture aberrant eating in children, and the use of multiple terms contributes to a lack of consensus in the field. For the purpose of this study, aberrant eating behaviors are defined as eating and weight attitudes and behaviors that reflect eating disorder symptomatology, particularly binge eating, in adolescents and adults. Moreover, a number of studies have investigated disordered eating in early childhood that may have conceptual relevance to binge eating. Specifically, food-intake regulation problems such as loss of control, overeating, eating in the absence of hunger, and eating in response to emotional cues are discussed. Such behaviors have been linked to overweight, depression, binge eating, and body dissatisfaction in adults (e.g., Marcus et al., 1995), and they may be associated with these problems in children, as well.

1.3.1 Eating behaviors in children

Eating behaviors in childhood are characterized by variability and experimentation, and consequently, defining normal eating in children is difficult. In early childhood, eating occurs primarily in response to hunger and satiety cues, and thus appears to be biologically-driven (Weingarten, 1985). However, repeated exposure to foods and a number of other influences have been shown to override these predispositions and may contribute to the development of

aberrant eating behaviors. Another characteristic of eating behaviors in early childhood is variability. Energy intake fluctuates both within and between children as much as 20% over or under the daily calorie requirements based on body weight (National Research Council, 1989). Despite this fluctuation, most children are able to maintain stable growth.

Eating behaviors in childhood also are influenced by children's developmental stages, and early childhood is a time during which independence and autonomy are established (Fisher & Birch, 2001). Children learn to exert control over their environment as verbal skills develop, and they are able to make choices about what to eat or not to eat. Moreover, as they interact with the environment, they learn about the meaning of food and eating through multiple influences that include parents, caregivers, and peers. For example, young children learn the meaning of eating and food through repeated exposure to eating situations in a variety of settings such as home, day-care, and friends' homes. These experiences teach children about eating including where eating is acceptable, times of day when meals occur, how foods are eaten, and the types of foods eaten at common events (e.g., parties). Moreover, children learn that these rules vary in different social environments (Fisher & Birch, 2001). Family and social influences interact with children's developmental changes and in time, override innate mechanisms for control of food intake (Fisher & Birch, 2001). In summary, the development of normal eating behavior in children is complex, and individual, familial, and social influences on eating behaviors are apparent. Such factors likely contribute to the development of aberrant eating behaviors, as well.

1.3.2 Measurement of aberrant eating in children

Given the fluidity and variability of children's eating, the behaviors and attitudes associated with eating disorders can be difficult to identify and conceptualize, and consequently, the measurement of aberrant eating in children is challenging. Children's differing physical

development and variability in nutritional requirements contribute to the complexity of assessment of eating behaviors. In addition, the measurement of aberrant eating is challenging for reasons specific to children's developmental stages.

It is unclear how children interpret eating disordered concepts such as "binge" and "diet," yet the majority of studies that have evaluated aberrant eating in children have relied on self-report questionnaires to capture symptoms. Subsequently, it remains unknown whether young children comprehend the meaning of such terms. For example, Maloney and colleagues (1989) reported that 16.5% of third graders reported binge episodes compared to only 6.8% of sixth graders, suggesting that younger children are more likely to endorse binge eating than are older children. Although these findings may well be due to actual changes in binge frequency between childhood and early adolescence, they also could result from differences in children's cognitive abilities to understand the meaning of the term "binge."

Young children also have difficulty with accurate recollection of events over a three month period, which is the time span of relevance for meeting threshold for several criteria for eating disorders (Bryant-Waugh, Cooper, Taylor, & Lask, 1996). Moreover, reliable self-report of the chronology of events may be limited in young children. Techniques such as the use of a timeline or calendar and adult assistance have been recommended to improve reliability, yet few studies have utilized such techniques.

Finally, children have been found to be more suggestible to questioning about dieting and related behaviors than are adults (Huon, Godden, & Brown, 1997). Young children also may find it difficult to understand and verbalize their experience, and consequently, the affective and cognitive responses of children to eating are not well documented (Maloney et al., 1988). In the adult literature, binge episodes are related to feelings of guilt and distress (Marcus, Moulton, &

Greeno, 1995; Stice & Agras, 1998), yet it is unknown if children experience similar responses. Thus, the emotional development of children must be considered in evaluating aberrant eating behaviors and attitudes. To address these challenges, specialized interview techniques to assess eating are recommended (Tanofsky-Kraff et al., 2003), but few studies have utilized interviews with children.

A final issue concerning the measurement of aberrant eating relates to the assessment of eating disorders. Certain features of eating disorders can be difficult to objectively measure. For example, the definition of a "binge" is challenging in adults. Considering the different calorie requirements for individuals of varying physical sizes (normal weight versus overweight; men versus women), the identification of an objectively large amount of food is difficult. Studies in adults (Niego, Pratt, & Agras, 1997; Pratt, Niego, & Agras, 1998) and children (Morgan et al., 2002) have suggested that it is the feeling of loss of control rather than the amount of food consumed that is most salient for identifying those with problematic eating. Additionally, many individuals are reticent to admit to behaviors associated with eating disorders (e.g., bingeing, vomiting) for reasons such as shame or denial, and children may fear punishment for engagement in such behaviors. Thus, studies utilizing comprehensive assessment of eating are needed to document the prevalence of eating disorders in children.

1.3.3 Binge eating and related eating behaviors in children

As seen in Table 1, the frequency of reported binge eating in children is variable (1% to 36%), which may be an artifact of sampling variability. Studies have investigated binge eating in treatment seeking overweight children, community samples of children, and school children. Additionally, studies have included children across the weight range from normal weight to overweight. Most studies evaluating binge eating in children have utilized self-report

Table 1: Studies examining binge eating and loss of control in preadolescent children

Author (Date)	Sample (N)	Mean Age (years; SD)	Mean ± SD BMI	ED measure (Interview or questionnaire)	Frequency of binge eating
Childress, Brewerton, Hodges, & Jarrell (1993)	School girls and boys (3129)	12.0 ± 1.2; (range- 9-16 years)	19.5 ± 3.9 kg/m^2	Kids' Eating Disorder Survey (KEDS)- self report questionnaire	16.2% reported binge eating
Decaluwe, Braet, & Fairburn (2002)	Treatment seeking overweight boys and girls in residential care (126)	12 ± 2 (range- 10-16 years)	31 ± 5 kg/m^2 (mean adjusted BMI of 172% ± 26)	Eating Disorder Examination-Questionnaire (EDE-Q); Dutch version; questionnaire	36.5% reported binge eating episodes
Field, Camargo, Taylor, Berkey, Frazier, Gillman, & Colditz (1999)	Population-based sample of boys and girls (16114)	9-14	Descriptive data not available	McKnight Risk Factor Survey; questions about weight control methods; self report questionnaire	1.9% girls & .8% boys binged at least monthly
Goossens, Braet, & Decaluwe (2006)	Treatment seeking overweight children (196)	12.74 + 1.75 (range- 10-16 years)	BMI z-scores: 1.31 to 2.76	Eating Disorder Examination for children (ChEDE); interview	17.9% reported loss of control
Johnson, Grieve, Adams, & Sandy (1999)	School boys and girls (367)	13.2 ± 1.89 (range- 10-18 years)	20.87 ± 4.47 kg/m^2	Parent and child versions of Questionnaire of Eating and Weight Patterns- Adolescent version (QEWP-A); ChEAT; self-report questionnaire	1.09% met BED criteria; 10.35% met nonclinical binging
Lamerz, Kuepper-Nybelen, Bruning, Wehle, et al. (2005)	Population-based German sample of boys and girls (1979)	5-6 year olds	15.8 kg/m^2 (range of normal-overweight)	Parent report; questions about eating behaviors; questionnaire	2.0% binge ate
Levine, Ringham, Kalarchian, Wisniewski, & Marcus (2006)	Treatment seeking overweight children (27)	10.07 ± 1.6 (range- 6.5 to 13.0)	33.5 ± 4.5 kg/m^2 (range- 27.4 to 45.5)	Eating Disorder Examination for children (ChEDE); interview	14.8% reported S/OBEs
Maloney, McGuire, Daniels, & Specker (1989)	School boys & girls (318)	9.7 (range- 7 to 13 years)	Not assessed	ChEAT; self-report questionnaire	16.5% 3rd grades; 7.1% 4th graders; 9.3% 5th graders; 6.8% 6th graders reported binge eat

Author (Date)	Sample (N)	Mean Age (years; SD)	Mean ± SD BMI	ED measure (Interview or questionnaire)	Frequency of binge eating
Morgan, Yanovski, Nguyen, McDuffie, Sebring, Jorge, Keil, & Yanovski (2002)	Overweight (BMI ≥ 85th percentile) children participating in metabolic studies at the National Institutes of Health (112)	6-10	26.25 ± 4.2 kg/m^2	ChEAT; QEWP-A; battery of questions; self-report questionnaires	33.1% reported at least one episode of loss of control, with (17.9%) or without (15.2%) overeating
Rolland, Farnill, & Griffiths (1997)	School boys & girls (244)	10.07± 1.1 (range- 8.08 to 12.70 years)	Not assessed	ChEAT; self-report questionnaire	28% children reported binging sometimes or more
Tanofsky-Kraff, Yanovski, Wilfley, Marmarosh, Morgan, & Yanovski (2004)	Normal and overweight children participating in metabolic studies at the National Institutes of Health (162)	10.0 ± 1.8 (range- 6.1 to 13.8 years)	22.1 ± 7.4 kg/m^2 (range- 12.9 to 46.3)	Eating Disorder Examination for children (ChEDE); interview	9.3% S/OBEs; 14.7% S/OBEs in overweight kids
Veron-Guidry & Williamson (1996)	School children (109 boys & 148 girls)	ages 8-13	Not assessed	ChEAT; self-report questionnaire	14.1% reported binge eating

Note. BMI = Body Mass Index (kg/m^2).

questionnaires (e.g., Child Eating Attitudes; Kids' Eating Disorder Survey; Questionnaire of Eating and Weight Patterns; McKnight Risk Factor Survey), which do not fully assess binge behaviors. For example, one questionnaire (KEDS; Childress, Brewerton, Hodges, & Jarrell, 1993) queries about large amounts of food consumed within 2 hours, but does not evaluate loss of control or distress over binge eating, both of which are features of the DSM-IV definition of binge eating.

The failure of these studies to define a binge and to capture related symptoms in children has led to further investigation of associated parameters of binge eating, particularly loss of

control over eating. Using the QEWP-A, Morgan and colleagues (2002) evaluated loss of control over eating in overweight children ages 6-10 years. Results showed that 5.3% of the children met BED criteria, and 33.1% of children reported loss of control over eating. Loss of control was associated with overeating in 17.9% of the children and was not associated with overeating in 15.2% of children. Among those children who reported loss of control, no differences between children who did and did not report overeating were found, and consequently, these children were grouped together for further analyses. Children who reported loss of control over eating had significantly higher BMI (kg/m^2) and more adiposity than those who did not. Moreover, after controlling for BMI, children with loss of control reported more anxiety, negative mood, depressive symptoms, body dissatisfaction, and weight and shape concerns than children with no loss of control. Thus, in children, there is preliminary evidence that loss of control may be more relevant to disordered eating than overeating (Marcus & Kalarchian, 2003).

1.3.4 Relationship between binge eating and overweight in children

Binge eating in adolescence appears to be a risk factor for the onset of overweight (Stice, Cameron, Killen, Hayward, & Taylor, 1999; Stice, Presnell & Spangler, 2002), and available evidence suggests that binge eating is related to overweight in preadolescent children as well. Specifically, heavier children report more binge eating behaviors than do less heavy children. The association between overweight and binge eating in children has been documented among school-aged children (e.g., Childress et al., 1993; Shisslak et al., 1998), and children seeking treatment for overweight (Braet & Van Strein, 1997; Decaluwe, Braet, & Fairburn, 2002; Decaluwe & Braet, 2003; Epstein, Paluch, Ernst, & Wilfley, 2001). For example, Field and colleagues (1999) documented that independent of pubertal development, overweight children

were more likely than normal weight children to report binge eating at least monthly. However, these studies have relied upon questionnaires to document eating pathology, and interview assessments of aberrant eating are needed.

Studies have documented that certain features of binge eating are related to overweight in children, as well (e.g., Morgan et al., 2002). Using an interview technique to capture eating behaviors, Tanofsky-Kraff and colleagues (2004) examined eating disorder pathology in overweight and normal weight children ages 6 to 13 years. Approximately 9% of children endorsed loss of control over eating, and 20% of children reported episodes of overeating. Loss of control over eating was more prevalent in overweight children and was associated with increased adiposity and eating disorder cognitions.

Thus, there is evidence that preadolescent children report binge eating and related eating behaviors, which are associated with overweight. The exact nature of this relationship remains unknown, and overweight may be a cause or consequence of aberrant eating in children. Moreover, the etiology of eating disorders is complex, and evidence suggests that individual, familial, and sociocultural factors contribute to the onset and maintenance of disordered eating (Figure 1). Three relevant factors to children's eating (i.e., parental eating behaviors, mood, and temperament) were examined in this study.

1.4 FAMILIAL INFLUENCES ON THE DEVELOPMENT AND MAINTENANCE OF ABERRANT EATING AND OBESITY IN CHILDREN

There are several lines of evidence documenting the influence of parents on aberrant eating in children. As discussed below, genetic variables and environmental factors such as modeling,

Figure 1: Proposed Model of Vulnerabilities for Child Aberrant Eating

parental control over types of foods permitted in the home, and interactions with children in the feeding context are likely to influence child eating behaviors. Family environmental factors may be more readily modifiable than other salient factors (i.e., sociocultural influences) and thus have important implications for the prevention and treatment of aberrant eating. This study focused on familial risk factors, specifically maternal binge eating, and aberrant eating in children. This represents an important step in understanding familial patterns of eating behaviors and attitudes, which may contribute to our understanding of pathways involved in the etiology of aberrant eating and obesity.

1.4.1 Genetic influences on weight and aberrant eating

Genetic influences on eating behaviors and weight are significant. First, familial transmission of overweight is well-documented, and weight is considered to be a heritable trait (Keller, Pietrobelli, & Faith, 2003; Maes, Neale, & Eaves, 1997). Second, twin studies have suggested that a substantial proportion of the variance in the development of eating disorders is attributable to additive genetic components (Bulik, Sullivan, Wade, & Kendler, 2000). A recent study by Hudson and colleagues (2006) documented that BED aggregated strongly in families independently of obesity. Additionally, relatives of probands with BED displayed a markedly higher prevalence of severe obesity in adulthood than did relatives of probands without BED. Thus, the authors conclude that BED is a familial disorder caused in part by factors distinct from other familial factors for obesity.

Finally, there is evidence that eating behaviors and food intake have a genetic component as well. For example, twin studies estimate that the heritability of binge eating symptoms ranges from 46% to 82% (Bulik et al; 2000; Reichborn-Kjennerud et al., 2003). Moreover, there is evidence of small genetic contributions to child food preferences, which are important

determinants of food intake (Fisher & Birch, 2001). Specifically, young children show correlations of .07 to .14 with their parents on a variety of food preferences (Birch, 1980). Thus, there is substantial evidence documenting the heritability of weight and eating disorders.

1.4.2 Parental eating attitudes and behaviors and child eating

Parental eating attitudes and behaviors also contribute to child eating, and such factors may be more readily modifiable than genetic influences. First, parents are powerful models of eating behaviors for children. Harper and Sanders (1975) reported that toddlers put foods in their mouths more readily when they followed the example of their mothers versus the same behavior of a stranger. Additionally, parents may model aberrant eating behaviors including disturbed eating practices and weight concerns. Smolak and colleagues (1999) reported that parental modeling of weight concerns and weight control was related to daughter's attempts to lose weight.

Second, parents may create an environment that focuses on thinness, and they may make direct comments about children's body shape or eating habits. Evidence from case-control studies of BN and BED suggest that critical comments by family about weight, shape, and eating differentiated eating disorder patients from other psychiatric patients (Fairburn et al., 1997; 1998). Thelen and Cormier (1995) reported that parents of fourth grade girls who encouraged their daughters to control their weight had daughters who dieted more frequently. Similarly, Smolak, Levine, and Schermer (1999) reported that mothers were more likely to comment on weight of 4th and 5th grade daughters than sons, and these comments were significantly correlated with weight loss attempts, particularly for girls.

Third, parents have direct authority over the types of foods served in the home and control over feeding, and child-feeding practices have been shown to contribute to individual

differences in children's ability to regulate energy intake (Fisher & Birch, 2001). Laboratory studies examining eating in the absence of hunger (i.e., eating beyond fullness) highlight the interaction between girls' eating and maternal feeding habits (Fisher & Birch, 2002). The authors employed a protocol where small groups of 5-year-old girls participated in a standardized lunch that was followed by exposure to a variety of appealing snack foods. After they completed their lunch, participants were allowed to play with toys and given access to the snack foods. A subjective measure was obtained from each girl following the lunch, and only those girls who reported feeling full were included in the analyses. Intake of snack food was documented as a measure of eating in the absence of hunger. The authors found that girls whose mothers reported using higher levels of restriction when the girls were 5 years old ate more food in the absence of hunger at both 7 and 9 years of age than did those girls whose mothers reported lower levels of restriction. Moreover, girls who were overweight at 5 years of age and who reported higher levels of maternal restriction had both the highest eating in the absence of hunger scores and the greatest increase in these scores at 9 years. The authors argue that eating in the absence of hunger may reflect a stable phenotypic behavior of young overweight girls that is comparable to disinhibited eating in adults. As noted by Marcus and Kalarchian (2003), given the association between disinhibited eating and binge eating, eating in the absence of hunger may be a risk factor for disordered eating in adolescence and adulthood.

The relationship between parental influences and child disordered eating has been most closely examined between mothers and their children. Several studies have documented the association between maternal feeding habits (Birch & Fisher, 2000) and maternal comments (Smolak et al., 1999) and child eating and weight. Moreover, studies have highlighted mother-daughter similarities in problematic regulation of intake. For example, in a study by Cutting and

colleagues (1999), mothers' reports of their own disinhibited eating were positively associated with their preschool daughters' intake of food beyond fullness. Moreover, the daughters displayed an enhanced responsiveness to external cues in eating; their intakes resembled their mothers' reports of disinhibited eating (Fisher & Birch, 2002).

In a prospective study, Stice and colleagues (1999) followed a community sample of children from birth to 5 years and examined parental eating characteristics and the emergence of child eating disturbances indicative of eating disorders. Maternal disinhibition, hunger, body dissatisfaction, bulimic symptoms, and maternal BMI predicted the emergence of secretive eating in children, and maternal restraint and drive for thinness and infant BMI predicted the emergence of overeating in children. Thus, specific maternal eating disorder characteristics appear to be related to features of disordered eating in early childhood.

In sum, numerous studies have documented the influence of maternal characteristics on problematic eating behaviors in children including increased maternal restriction, disinhibition, hunger, body dissatisfaction, bulimia, and BMI (Birch, Fisher, & Davison, 2003; Fisher & Birch, 2002; Jacobi et al., 2001; Stice et al., 1999). However, existing studies have relied on non-clinical samples of mothers and children and limited evaluation of problematic eating in the participants. Given the association between parental psychiatric disorder and childhood psychiatric disorder and physical health (Rutter, 1989), studies examining mothers with eating disorders and the eating behaviors and attitudes of their children are needed.

1.4.3 Eating problems in the offspring of mothers with eating disorders

Preliminary evidence suggests that the children of mothers with eating disorders are at increased risk for eating problems. Case reports have documented that mothers with eating disorders have more difficulty breast-feeding (Evans & le Grange, 1995), are less likely to cook for their

children (Woodside & Shekter-Wolfson, 1990), restrict the amount of food in the house (Stein & Fairburn, 1989), are less likely to eat in front of their children (Evans & le Grange, 1995), and are less able to provide positive modeling and reinforcement to their children (Stein, Wooley, Cooper, & Fairburn, 1994). Moreover, studies of offspring of women with eating disorders have suggested that the feeding environment is problematic in these families. Maternal eating disorders have been associated with more problematic feeding practices of infants, increased eating problems for preschool children, and BN in adult daughters (Agras, Hammer, & McNicholas, 1999; Stice, Agras, & Hammer, 1999; Whelen, & Cooper, 2000). However, the majority of these studies are case studies of mothers and children younger than 5 years of age, and little is known about these relationships in school-age children. Moreover, the majority of studies of mothers with eating disorders and their offspring have utilized samples of mothers with AN or BN. It is unclear whether similar relationships exist for mothers with binge eating symptomatology and their children.

In sum, the rapid increase in the prevalence of obesity suggests that psychological and behavioral factors, rather than biological factors, are primarily responsible for this trend (Wadden, Brownell, & Foster, 2002). Maternal eating attitudes and behaviors are of particular concern as they influence children's eating and weight attitudes and behaviors and may impact overweight. Moreover, mood and temperament have been examined as risk factors for eating disorders and are discussed below.

1.5 BINGE EATING, MOOD, AND RELATED PSYCHOPATHOLOGY IN ADULTS

Numerous studies have documented that binge eating is associated with increased emotional distress and psychopathology, particularly depression, in adults (Newman et al., 1996; Spitzer et al., 1993; Telch & Stice, 1998; Wilfley et al., 2000). Depressive symptoms have been shown to

predict the onset of binge eating and compensatory behaviors in female adolescents (Stice & Agras, 1998), and some, but not all, laboratory studies have shown that negative mood is a frequent antecedent to binge episodes (Davis, Freeman, & Garner, 1988; Lingswiler, Crowther, & Stephens, 1989; Telch & Agras, 1996). Treatment-seeking binge eaters have reported moderate to high levels of depressive symptomatology (Marcus et al., 1995; Ruderman & Besbeas, 1992) with reported lifetime prevalence rates for major depressive disorder in patients with eating disorders varying from 25% to 80% (Cooper, 1995). Moreover, binge eating is related to other disturbed eating attitudes and behaviors such as restrictive dieting, vomiting, and body dissatisfaction (Newman et al., 1996; Spitzer et al., 1993).

1.5.1 Binge eating and mood in children

The relationship between aberrant eating and depression in children is unclear. Some studies have suggested that children reporting binge eating or loss of control over eating also report increased depression (Goossens et al., 2006; Isnard et al., 2003), while other studies have not documented this finding (Decaluwe et al., 2002; Tanofsky et al., 2004). This is an important relationship to understand as several studies have documented major depression or depressive symptoms to be predisposing factors for subsequent weight gain among children and adolescents (Field et al., 2003; Stice et al., 1999; 2002). Moreover, given the relationship between depression and binge eating in adults, identification of similar relationships in childhood may suggest the need for early intervention.

1.6 BINGE EATING AND TEMPERAMENT IN ADULTS

Recent work documenting biological risk factors and heritability of eating disorders has suggested that temperament may be a significant risk factor for bulimic eating behaviors.

Temperament refers to relatively stable, observable, individual differences in goal-directed behaviors, which are moderately heritable and biologically-influenced (Clark & Watson, 1999; Plomin & Caspi, 1999). There is evidence that certain temperamental traits, particularly negative emotionality and impulsivity, are associated with binge eating (Bulik, Sullivan, Weltzin, & Kaye, 1995). However, only one study has examined the relationship between temperament and BED. Using the Temperament and Character Inventory (TCI), Fassino and colleagues (2002) examined temperament in overweight patients with and without BED and normal-weight control individuals. Overweight BED and non-BED individuals reported significantly higher levels of impulsivity and harm avoidance than normal weight individuals, but the overweight groups failed to differ from each other in terms of temperament. Given findings documenting an association between temperament and binge behaviors, it appears that examination of temperament and binge eating in children is warranted.

1.6.1 Binge eating and temperament in children

Temperament, combined with other risk factors, may exert some etiological influence on the development of psychopathology (Prior, 1992). A "difficult" temperament in childhood has predicted later behavior problems (Prior, Sanson, & Oberklaid, 1989; Sanson, Smart, Prior, Oberklaid, & Pedlow, 1994) and psychiatric disorders (Kashani, Expeleta, Dandoy, Doi, & Reid, 1991), but surprisingly few studies have examined temperament and eating disorders in children. Martin and colleagues (2000) examined the relationship between child temperament and later development of eating and body concerns in early adolescents. They measured temperament at infancy and eating and body concerns at 12 to 13 years of age. High negative emotionality and low persistence were the factors most associated with risk status over time, particularly in girls.

Studies designed to examine the relationship between temperament and aberrant eating in preadolescents are warranted.

1.7 STATEMENT OF THE PROBLEM

Rates of obesity are increasing, and like adults, children are at risk for psychiatric and medical sequelae of overweight. Available evidence suggests that children report aberrant eating behaviors and attitudes, which may relate to overweight and full-syndrome eating disorders. Studies utilizing interview techniques to fully assess eating behaviors and attitudes in children are needed, yet few studies have been completed with such techniques. Moreover, few studies have evaluated binge eating in children ages 8 to12 years. This is an important age range for the evaluation of problematic eating for several reasons. Adolescence is a known period of risk for the onset of eating disorders (Stice et al., 1999), and it is reasonable to examine aberrant eating in children prior to the onset of risk. Children at this age also have the ability to make choices about what and how much they eat. Moreover, in contrast to younger children, they have the cognitive ability to understand and respond to questions about eating behaviors and attitudes (Tanofsky-Kraff et al., 2004). Thus, this is an important age group in which to characterize aberrant eating.

It also is important to examine eating disorder attitudes and behaviors in overweight children of women with binge eating. Parental influences on child eating are substantial and may contribute to the development and maintenance of problematic eating. Evidence suggests that children of mothers with eating disorders are at increased risk for problematic eating and may benefit from targeted interventions. Thus, this study was designed to fully assess aberrant eating, mood, and temperament in overweight children of mothers with and without binge eating. Given

the association between maternal eating and weight attitudes and behaviors and those of their children (e.g., Cutting et al., 1999), and the mother's role as the primary influence in the feeding environment (Baughcum et al., 2001), this study focused on mother-child pairs only.

1.7.1 Study aims and hypotheses

The current study had three aims. First, we sought to document aberrant eating, particularly loss of control over eating and cognitive correlates, in overweight children using a standardized interview to evaluate eating behaviors. Second, we sought to compare aberrant eating behaviors and cognitive correlates in overweight children of mothers with and without binge eating to determine if maternal disordered eating was associated with child aberrant eating over and above overweight. The third aim of the study was to examine differences in mood and temperament between overweight children of mothers with and without binge eating. The following hypotheses were tested:

1) It was hypothesized that a higher proportion of overweight children of binge mothers would endorse loss of control over eating than overweight children of mothers without binge eating.
2) Second, we predicted that overweight children of binge mothers would report more eating, shape, and weight concerns than overweight children of mothers without binge eating. However, we did not expect that levels of dietary restraint would differ between the children as levels of dietary restraint do not differ in overweight adults with and without BED (e.g., Marcus et al., 1995; Wilfley et al., 2000).
3) It was hypothesized that overweight children of binge mothers would report more depression than overweight children of mothers without binge eating.

4) Further, it was expected that overweight children of binge mothers would have more emotionality and shyness and decreased levels of activity compared to overweight children of mothers without binge eating.

Secondary analyses were conducted to explore the relationships among aberrant eating, weight, mood and temperament in children and their mothers.

2.0 METHOD

2.1 PARTICIPANTS

2.1.1 Eligibility Criteria

Mothers were required to be the biological parent of a child between the ages of 8 and 12 years with a minimum child BMI $\geq 85^{th}$ percentile for age and gender (Must, Dallal, & Dietz, 1991). All mothers were required to be at least 18 years of age and not currently enrolled in a structured weight loss program. Exclusion criteria for mothers included pregnancy or inability to participate in the study interview (e.g., non-English speaking; inability to travel to study site). Additionally, we excluded women with current anorexia nervosa (AN) or bulimia nervosa (BN). Women with BN were excluded because research has shown that individuals with BN and BED have differing clinical profiles and risk factors associated with their eating disorder (e.g., Fairburn et al., 1997; 1998). We also excluded women who had gastric bypass surgery as the nature of the medical procedure alters the amount of food that the individual can consume. Exclusion criteria for children included developmental delays that would preclude accurate completion of study assessments, use of a medication that affects body weight such as oral steroids or antipsychotic medications, or recent initiation (less than 4 months) of stimulant or antidepressant medications.

2.2 PROCEDURE

2.2.1 Participant Recruitment

Participants were recruited from advertisements in local newspapers and letters sent to local physicians soliciting mothers of overweight children. To maximize the number of mothers who experienced out of control eating, advertisements with the phrase, "Are you a mother who suffers from overeating? And do you have an overweight child?" were alternated with more general advertisements that did not ask about maternal eating. Additionally, flyers were posted throughout the Pittsburgh area, and advertisements were made on the local hospital voicemail system and posted in the hospital newsletter. Finally, two Public Service Announcements were run.

Potential participants contacted the program by phone, and the study was briefly explained. Mothers who expressed an interest in participating were asked to provide demographic and health information, including child and parent height and weight. Mothers also answered preliminary screening questions about their experience with overeating, feeling out of control with their eating, and use of extreme weight control behaviors (e.g., vomiting, laxative abuse).

Two hundred fifty-nine parents responded, and after hearing about the study, 194 (74.9%) mothers expressed interest in participating and were screened for eligibility. Thirty-one (12.0%) participants could not be reached due to an invalid return phone number, or they did not return our calls. One hundred thirty (67.0 %) mothers were eligible for the study, and 127 families were scheduled for an appointment. Seventy three (57.5%) participants attended their appointment (See Appendix A). Two families failed to complete all assessments and their data were excluded. Additionally, during their interview, 2 mothers reported regular purging

behaviors consistent with a current diagnosis of BN and subsequently were excluded from analyses. Finally, one mother failed to report having had gastric bypass surgery during her phone screening, but revealed this in her interview, and her data were excluded from analyses.

The final sample consisted of 68 mother-child pairs. On average, mothers were 38.24 years (*SD* = 5.70; range: 26 to 49), and their average BMI (kg/m^2) was 32.71 (*SD* = 7.83). The majority of mothers were Caucasian (63.3%, *n* = 43); 36.8% (*n* = 25) were African-American. Approximately 63% of the mothers were married, and 67.6% (*n* = 46) had graduated from high school and completed some college or technical training (Table 2).

The children ranged in age from 7 years 11 months to 12 years 3 months (*M* $\pm$ *SD;* 9.56 $\pm$ 1.41). Approximately 62% of the group was female (*n* = 42), and most of the children were Caucasian (58.8%; *n* = 40) or African-American (41.2%; *n* = 28). The children's BMI ranged from 19.28 to 35.58 kg/m^2 (*M* $\pm$ *SD;* 26.66 $\pm$ 3.65). The majority (88.2%; *n* = 60) of children were overweight (BMI $\geq$ 95^{th} percentile for age and gender; Must, Dallal, & Dietz, 1991).

2.2.2 Study Procedure

Families meeting study criteria were scheduled for a 2-hour appointment where they completed a psychological assessment battery consisting of questionnaires and semi-structured interviews. At the beginning of their appointment, mothers signed consent forms approved by the University of Pittsburgh Institutional Review Board, and children provided assent. Mothers and children completed their interviews and self-report questionnaires separately. To avoid bias in determining binge ratings, independent master's or doctoral-level assessors interviewed the mother and child. Interviewers were trained on the use of the semi-structured interviews and were blind to mother and child eating status. Following completion of all the assessments, mother and child were weighed and measured separately.

Table 2: Mother Characteristics and EDE scores (N = 68)

	M (SD)
Age	38.24 (5.70)
BMI (kg/m^2)	32.71 (7.83)
Ethnicity	*% (n)*
Caucasian	63.2 (43)
African-American	36.8 (25)
Marital Status	% (*n*)
Married	63.2 (43)
Never Married	22.1 (15)
Separated	5.9 (4)
Divorced	8.8 (6)
Maternal Education	*% (n)*
Some High School	4.4 (3)
High School Graduate	7.4 (5)
Some College/ Technical Training	55.8 (38)
Graduate 4 year College	16.2 (11)
Graduate School	16.2 (11)
	M (SD)
EDE- Restraint	1.04 $\pm$ 1.01
EDE – Eating Concern	0.51 $\pm$ 0.76
EDE- Shape Concern	2.04 $\pm$ 1.24
EDE- Weight Concern	2.27 $\pm$ 1.23
EDE- Global Score	1.47 $\pm$ 0.83

Note. BMI = Body Mass Index (k/m^2); EDE = Eating Disorder Examination.

2.2.3 Costs and Payments

Participants received $25 and children received a $10 gift certificate for a local store upon completion of assessments.

2.2.4 Adult Measures

Demographic Questionnaire An investigator-designed measure was used to document maternal and child age, ethnicity, maternal education level, gender of child, and child's grade in school.

The Eating Disorder Examination version 12OD/C.2 (EDE; Fairburn & Cooper, 1993) with additional questions to document DSM-IV criteria for BED was used to determine maternal binge status and to obtain additional information about other eating disorders. The EDE is an investigator-based interview designed to assess binge eating and eating disorders. The EDE contains 21 items that assess disordered attitudes and behaviors related to eating, body-shape, and weight and 13 items designed to diagnose specific DSM-IV (American Psychiatric Association, 1994) eating disorders. Responses are coded via four subscales: Restraint, Eating Concern, Weight Concern, and Shape Concern. Restraint is a measure of an individual's conscious efforts to limit food intake. Eating Concern refers to preoccupation with food and eating. Shape Concern is a measure of dissatisfaction or preoccupation with body shape, and Weight Concern refers to dissatisfaction or preoccupation with weight. An overall Global score consisting of the average of the 4 subscales is generated. EDE subscale items are rated on a 7-point forced-choice format (0-6), with higher scores reflecting greater severity or frequency.

The EDE also identifies three types of eating episodes: objective binge eating (OBE, overeating with loss of control), subjective binge eating (SBE, loss of control without objective overeating as assessed by the interviewer, but viewed as excessive by the interviewee), and

objective overeating (OO, overeating without loss of control). The original EDE assessed eating episodes over the past 28 days (Fairburn & Cooper, 1993). However, consistent with studies of BED (Wilfley et al., 2000), eating behaviors were assessed over a 6 month period to determine BED diagnosis. Psychometric studies of the EDE have reported high inter-rater reliability (Cooper & Fairburn, 1987; Rizvi, Peterson, Crow, & Agras, 2000), adequate internal consistency (Beumont, Kopec-Schrader, Talbot, & Touyz, 1993; Cooper & Fairburn, 1987), good discriminant validity (Beumont et al., 1993; Cooper, Cooper, & Fairburn, 1989), and good test-retest reliabilities (Grilo, Masheb, Lozano-Blanco, & Barry, 2003). In the current study, all interviews were taped and eating episodes reviewed during a consensus meeting to confirm eating episode ratings.

The EAS Temperament Survey for Children: Parental Ratings (EAS; Buss & Plomin, 1984) is a parent report of child temperament in children aged 4-13 years. Three subscales are measured: Emotionality, Activity, and Shyness. Emotionality is defined as the tendency to become upset easily and intensely (e.g., "Child gets upset easily"). Activity refers to the child's tempo and vigor (e.g., "Child is always on the go"). Shyness refers to a measure of inhibition and tension when with unfamiliar others (e.g., "Child takes a long time to warm up to people"). Several studies have documented good internal consistency of the EAS subscales (Rowe & Plomin, 1977; Boer & Westenberg, 1994).

2.2.5 Child Measures

The Eating Disorder Examination version 12OD/C.2 (EDE; Fairburn & Cooper, 1993) adapted for children (ChEDE; Bryant-Waugh, Cooper, Taylor, & Lask, 1996) is an investigator-based interview that has been adapted to make it more accessible to children ages 8-14 years (Tanofsky-Kraff, et al., 2003; 2004). As with the adult version, the ChEDE contains 21 items

that assess disordered attitudes and behaviors related to eating, body-shape, and weight and 13 items designed to diagnose specific DSM-IV eating disorders. The ChEDE's interview-based, interactive nature allows for questions to be explained so that each individual understands the question. In addition, special care is taken, and examples are provided, to explain difficult concepts such as "loss of control," or the sense of being unable to stop eating once started. For example, when a child does not readily understand the concept of "loss of control," one of the standardized descriptions used is that the experience is "like a ball rolling down a hill, going faster and faster." Additionally, a calendar is used to orient the child to the past 3 months' timeframe.

There have been a limited number of published studies that have used the ChEDE (Burrows & Cooper, 2002). In a sample of young girls (8-14 y) diagnosed with AN, selective eating (Bryant-Waugh & Kaminski, 1993), food avoidance emotional disorder (Higgs, Goodyer, & Birch, 1989), or no eating problems, disordered eating behaviors and cognitions were assessed using the ChEDE. Girls with a clinical diagnosis of AN had very similar subscale scores to adults with the same disorder, while those with selective eating or food avoidance emotional disorder scored similarly to normal controls. Further, most of the individual responses were found to be consistent with clinical observation, supporting the validity of the instrument (Christie, Watkins, & Lask, 2000). Inter-rater reliability (Spearman rank correlations for the individual questions ranged from .91 to 1.00), internal consistency, and discriminant validity are satisfactory (Frampton, 1996).

The Child Depression Inventory (CDI; Kovacs, 1982) is a 27-item widely-used, well-validated self-report measure of depressive symptoms. A total score and five subscale scores (Negative Mood, Interpersonal Problems, Ineffectiveness, Anhedonia, and Negative Self-

Esteem) are generated. The CDI has demonstrated adequate internal consistency, test-retest reliability, and discriminant validity (Costello & Angold, 1988; Curry & Craighead, 1993).

Height and Weight Height and weight were used to calculate BMI [wt (kg)/ht (m^2)] of both mothers and children. Participants were weighed and measured in street clothes without shoes using a digital scale and stationary stature board following the completion of their assessments.

2.3 DATA ANALYSIS

2.3.1 Preliminary Analyses

Preliminary analyses were conducted to examine normality of the distributions of the outcome and predictor variables, and several variables were found to be non-normally distributed including the EAS Shyness and Emotionality subscales, ChEDE Restraint, Eating Concern, Shape Concern, and Weight Concern subscales, and adult EDE Restraint and Eating Concern subscales. Analyses involving these variables were completed using both parametric and non-parametric tests (i.e., independent t-tests and Mann Whitney *U* tests). As results of parametric and non-parametric tests were concordant, results of the parametric analyses are presented here, and results of non-parametric tests can be found in the Appendices. Parametric and nonparametric statistics were used to describe the demographics of participants in terms of continuous and categorical variables, respectively.

2.3.2 Data analysis: Aim 1

To document and characterize loss of control over eating and cognitive correlates in overweight children, scores on the ChEDE were reported. Loss of control in children was examined as a categorical variable (LoC+ vs. LoC-). Per Tanofsky- Kraff et al. (2004), children endorsing

either of the two types of loss of control over eating distinguished in the ChEDE (OBEs or SBEs) were grouped into one variable (LoC+). Children were categorized as having experienced loss of control over eating when they described at least one OBE or SBE in the past 3 months. Children who did not report any episodes of loss of control in the past 3 months were classified as part of the LoC- group. Frequencies of LoC+ and LoC- children were reported, as well as the number of loss of control episodes per month.

Additionally, overweight children's mean scores on the four subscales of the ChEDE and the Global score were reported. Next comparisons of demographic variables between LoC+ and LoC- children were examined using chi-square tests with one degree of freedom and Yates' correction for 2x2 tables or Fisher's exact tests where appropriate and independent samples t-tests. In particular, we examined whether there were any differences in age, gender, BMI, ethnicity, or SES between LoC+ and LoC- children. Additionally, we compared LoC+ and LoC- children's scores on the ChEDE, CDI, and the EAS using independent t-tests and Mann Whitney *U* tests where appropriate. All studies utilizing the ChEDE have reported their findings using parametric analyses (Gosseens et al., 2006; Levine et al., 2006; Tanofsky-Kraff et al., 2004). Because results of parametric and non-parametric analyses were concordant and to facilitate comparison of these data with others' findings, results of parametric tests are reported and results of non-parametric tests can be found in the Appendices.

2.3.3 Data analysis: Aim 2

2.3.3.1 Maternal Binge Eating. Mothers were categorized as binge eating (BE+) or no binge eating (BE-) based on the presence or absence of recurrent binge eating, which was determined using the EDE. Specifically, the BE+ group was comprised of the following: 1) mothers who endorsed binge eating (experiencing loss of control over their eating, rated as OBE or SBE)

twice weekly for the past 6 months and met all other diagnostic criteria for full-syndrome BED, and 2) mothers who endorsed binge eating once per week on average for the past 6 months and met all other diagnostic criteria for BED. This subthreshold BED group of mothers was included in the BE+ group as recent studies have found few differences between subthreshold and full-syndrome BED on a number of psychological and weight-related measures (Striegel-Moore, Dohm, Solomon, Fairburn, Pike, & Wilfley, 2000; Striegel-Moore, Wilson, Wilfley, Elder, & Brownell, 1998). Women were classified as BE- if they did not report any subthreshold or full-syndrome eating disorders. A number of women reported binge eating symptoms during their EDE interview, but failed to meet subthreshold or full-syndrome criteria for BED. These women were grouped as an infrequent loss of control group. Comparisons of demographic characteristics and EDE scores between the groups were performed using one-way analysis of variance (ANOVA) with Bonferroni-Hochberg's correction, a conservative test accounting for multiple comparisons applied to each family of post hoc means.

Approximately 43% (n = 29) of mothers reported loss of control over their eating in the past 6 months. However, the frequency of their eating varied considerably. Approximately 21% (n = 14) of mothers reported that they experienced loss of control over their eating (OBE or SBE) at least one day per week on average for the past 6 months, and these mothers were grouped into the BE+ group.

An additional 22.1% (n = 15) of mothers reported infrequent loss of control over their eating in the past 6 months. The majority of these women endorsed infrequent SBEs (range 1-12 episodes) and were grouped into the infrequent loss of control group. Finally, the BE- group consisted of 39 (57.4%) mothers who did not report any loss of control over their eating.

Binge mothers were compared to the infrequent loss of control group of mothers and BE- mothers on demographic variables and EDE subscale scores (Table 3). Results indicated that there were no differences among the groups on age, BMI, marital status, ethnicity, or mother's education level. As expected, there were significant differences between BE+ and BE- mothers in eating pathology. Specifically, BE+ mothers reported significantly greater scores on Eating Concern, F (2,65) = 18.18, p = .000, Shape Concern, F (2,65) = 8.44, p= .001, and Weight Concern, F (2,65) = .3.99, p = .021, compared to BE- mothers. EDE Global scores also differed between groups, F (2,65) = 7.30, p=.001. As expected, BE+ and BE- mothers' scores on Restraint did not differ, F (2,65) = .238, p = .789.

We excluded the infrequent loss of control group of mothers and their children from further analyses of the second and third aims of the study for two reasons. First, women in the infrequent loss of control group failed to differ from BE+ or BE- mothers on demographic characteristics and EDE subscale scores. Further, our original study hypotheses specified comparisons of children of mothers with and without current, regular binge eating.

2.3.3.2 Aim 2: Comparison of demographic characteristics and aberrant eating of overweight children of BE+ and BE- mothers. Comparisons of demographic variables between children of BE+ and BE- mothers were completed using chi-square tests with one degree of freedom and Yates' correction for 2x2 tables or Fisher's exact tests, where appropriate, and independent sample t-tests. Comparison of the proportion of overweight children reporting loss of control between BE+ and BE- mothers was examined using a chi-square test, and comparisons of ChEDE scores were examined using Mann-Whitney U tests and independent samples t-tests.

2.3.3.3 Aim 3: Comparison of mood and temperament between overweight children of BE+ and BE- mothers. To examine differences in mood and temperament between overweight children of

Table 3: Results of Comparisons of Demographic Characteristics and EDE Subscale Scores of BE+, Infrequent loss of control, and BE- Mothers (N = 68)

M (SD)	BE+ Mothers (*n* = 14) **A**	Infrequent Loss of Control Mothers (*n* =15) **B**	BE- Mothers (*n* = 39) **C**	*p*-value	
Age	37.00 (4.02)	37.2 (5.41)	39.08 (6.27)	.373	
BMI (kg/m^2)	33.32 (6.54)	35.65 (6.54)	31.36 (8.58)	.189	
Ethnicity (% Caucasian)	64.3% (*n* = 9)	60.0% (*n* = 9)	64.1% (*n* = 25)	.958	
Marital Status (% married)	64.3% (*n* = 9)	46.7% (*n* = 7)	69.2% (*n* = 27)	.635	
Maternal Education (% completed some post high school training)	64.3% (*n* = 9)	80.0% (*n* = 12)	64.1% (*n* = 25)	.511	
EDE-Restraint	1.14 (1.26)	0.89 (0.80)	1.07 (1.00)	.789	
EDE-Eating Concern	1.34 (1.09)	0.55 (0.64)	0.19 (0.32)	.000	A>C
EDE- Shape Concern	2.94 (1.30)	2.38 (0.86)	1.58 (1.14)	.001	A>C
EDE- Weight Concern	3.00 (1.51)	2.35 (0.86)	1.98 (1.15)	.023	A>C
EDE-Global	2.11 (0.99)	1.54 (0.61)	1.20 (0.73)	.001	A>C

Note. BE = Binge Eating; BMI = Body Mass Index (kg/m^2); EDE = Eating Disorder Examination.

BE+ and BE- mothers, independent samples t-tests and Mann-Whitney *U* tests were conducted. Specifically, scores on the CDI subscales and the EAS subscales were compared between children of BE+ and BE- mothers.

2.3.4 Exploratory analyses

Multiple linear regression analysis was used to explore the relationships between child disordered eating (dependent variable) and maternal disordered eating, child depression, and child temperament (predictor variables). To examine the continuum of binge eating in mothers, all 68 mother-child pairs were included in these analyses. Additionally, to examine disordered eating behaviors and attitudes in children and mothers, continuous measures of child and maternal disordered eating (i.e., Global scores on the ChEDE and EDE) were used.

Pearson bivariate correlations and Spearman rho correlations were employed to examine the relationships among child BMI, child CDI Total score, child EAS scores, maternal BMI, maternal Global EDE score, and child Global ChEDE score. Collinearity diagnostics based on variation inflation factors (VIF) and tolerances for individual variables were examined to assess multicollinearity among the predictor variables. Specifically, per Bowerman and O'Connell (1990), VIF greater than 10 and tolerances below 0.2 are indicative of problems, and examination of these statistics indicated that there were no problems with multicollinearity in the data.

We conducted three linear regression analyses to determine the contribution of maternal disordered eating, child depression, and child temperament to child disordered eating after controlling for child BMI. We controlled for child BMI for two reasons. First, our original aim of the study targeted risk factors for child disordered eating over and above child overweight. Second, previous studies' findings have documented the relationship between overweight and

disordered eating behaviors in children and adults (e.g., Tanofsky-Kraff et al., 2004). Thus, we controlled for child BMI in all regression analyses. Finally, to examine a full model of child aberrant eating, we used hierarchical regression analyses and entered child BMI, maternal disordered eating, child depression, and child temperament separately into the model. All regressions were screened for violations of the assumptions made by multiple regression: multicollinearity, linearity, homoscedasticity of residuals, and outliers. SPSS 13.0 was used for all statistical analyses.

3.0 RESULTS

3.1 EATING DISORDER BEHAVIORS AND ATTITUDES IN OVERWEIGHT CHILDREN

Scores on the ChEDE are reported in Table 4. No child met DSM-IV criteria for BN. However, a significant number of overweight children reported disordered eating behaviors and attitudes. Approximately 38% (n = 26) of children endorsed loss of control over eating during the past 3 months. Of these, 42.3% (n = 11) reported eating an objectively large amount of food (OBEs), and 57.7% (n = 15) reported consuming a subjectively large amount of food (SBEs). On average, the frequencies of eating episodes in which children reported feeling out of control were low and ranged from 1 to 4, with two children reporting 20 to 26 episodes per month. Of the remaining children, 11.8% (n = 8) reported engaging in objective overeating (OOs) episodes, which were low in frequency as well (range 1-4). Fifty percent (n = 34) of children did not report any episodes of out of control eating or overeating (NE).

3.2 COMPARISON OF LOC+ AND LOC- CHILDREN

Consistent with previous studies utilizing the ChEDE to assess eating behaviors, children reporting OBEs or SBEs were grouped into one category, Loss of Control + (LoC+; n = 26), and children reporting OOs or NEs were grouped into Loss of Control – (LoC-; n = 42). [For results of comparisons of demographic characteristics and ChEDE subscale scores between children categorized in differing eating episodes, see Appendix B].

Table 4: Child Scores on ChEDE, CDI, and EAS

	M (SD)
ChEDE-Restraint	0.96 (0.83)
ChEDE- Eating Concern	0.48 (0.47)
ChEDE-Shape Concern	1.71 (1.23)
ChEDE- Weight Concern	2.29 (1.14)
ChEDE-Global	1.36 (0.66)
CDI- Total	8.31 (4.64)
CDI- Negative Mood	1.81 (1.20)
CDI- Interpersonal Problems	0.85 (1.35)
CDI- Ineffectiveness	0.96 (1.22)
CDI- Anhedonia	3.27 (2.07)
CDI- Self-esteem	1.42 (1.30
EAS Shyness	2.23 (0.71)
EAS Emotionality	2.39 (0.84)
EAS Activity	2.99 (0.78)

Note. ChEDE = Eating Disorder Examination, Child version; CDI = Children's Depression Inventory; EAS = EAS Temperament Survey for Children, Parent rating.

Table 5: LoC+ versus LoC- Child Characteristics

M (SD)	*LoC+ (*n = *26)*	*LoC-* (n = *42*)	p- value
Age (years)	9.38 (1.39)	9.67 (1.44)	.462
BMI (kg/m^2)	27.15 (4.26)	26.36 (3.24)	.605
Gender (% Female)	73.1% (19)	54.8% (23)	.199
Ethnicity (% Caucasian)	69.2% (18)	61.9% (26)	.608
Maternal Education (% completed some post high school training)	41.3% (*n* = 19)	58.7% (*n* = 27)	.451
ChEDE-Restraint	0.96 (0.83)	0.43 (0.60)	.007
ChEDE- Eating Concern	0.48 (0.47)	0.07 (0.19)	.000
ChEDE-Shape Concern	1.71 (1.23)	0.61 (0.72)	.000
ChEDE-Weight Concern	2.29 (1.14)	1.21 (1.03)	.000
ChEDE-Global	1.36 (0.66)	0.58 (0.51)	.000
CDI-Total	8.31 (4.64)	5.48 (4.50)	.015
CDI- Negative Mood	1.81 (1.20)	1.36 (1.54)	.209
CDI- Interpersonal Problems	0.85 (1.35)	0.55 (0.83)	.262
CDI- Ineffectiveness	0.96 (1.22)	0.90 (1.12)	.845
CDI- Anhedonia	3.27 (2.07)	1.98 (2.15)	.017
CDI- Self-esteem	1.42 (1.30)	0.69 (0.92)	.016
EAS Shyness	2.23 (0.71)	2.50 (0.73)	.154
EAS Emotionality	2.39 (0.84)	2.69 (1.11)	.211
EAS Activity	2.99 (0.78)	3.37 (0.84)	.063

Note. LoC = Loss of Control; BMI = Body Mass Index (k/m^2); ChEDE = Eating Disorder Examination, Child version; CDI = Children's Depression Inventory; EAS = EAS Temperament Survey for Children, Parent rating.

As seen in Table 5, there were no differences in age, gender, BMI, ethnicity, or SES between LoC+ and LoC- children. However, there were significant differences between children on eating disorder cognitions and related psychopathology. When ChEDE subscale scores were examined, LoC+ children had significantly more Restraint, $t(66) = -2.85$, $p < .01$, Eating Concern, $t(66) = -4.19$, $p < .001$, Shape Concern, $t(66) = -4.16$, $p < .001$, and Weight Concern, $t(66) = -4.05$, $p < .001$, than did LoC- children. ChEDE Global score also differed between groups, $t\ (66) = -5.49$, $p < .001$.

Children with and without loss of control over their eating also differed with respect to their scores on the CDI subscales (Table 5). Specifically, LoC+ children reported significantly greater scores on the CDI Anhedonia subscale, $t\ (66) = -2.45$, $p < .05$, CDI Self Esteem subscale, $t\ (66) = -2.51$, $p < .05$, and CDI Total score, $t\ (66) = -2.49$, $p < .05$, than LoC- children. There were no significant group differences on the EAS Shyness, Emotionality, or Activity subscales (Table 5). [Results of non-parametric analyses comparing ChEDE subscale scores and EAS Shyness and Emotionality subscales between LoC+ and LoC- children can be found in Appendix C].

3.3 AIM 2: COMPARISON OF DISORDERED EATING BEHAVIORS AND ATTITUDES BETWEEN OVERWEIGHT CHILDREN OF BE+ AND BE- MOTHERS

Because we hypothesized that a larger proportion of overweight children of BE+ mothers would endorse loss of control over their eating than children of BE- mothers, we compared overweight children of mothers in the two extreme groups. As seen in Table 6, there were no differences in age, gender, BMI, or ethnicity between children of BE+ or BE- mothers. Approximately 50% ($n = 7$) of children of BE+ mothers reported loss of control over their eating compared to 35.9%

Table 6: Comparisons of Demographic Characteristics and ChEDE, CDI, and EAS Subscales between Overweight Children of BE+ and BE- Mothers (N = 53)

M (SD)	Children of BE+ mothers (*n*= 14)	*Children of BE- mothers* (n = *39*)	p- *value*
Age (years)	9.50 (1.61)	9.44 (1.43)	.890
BMI (kg/m^2)	26.95 (4.50)	26.69 (3.76)	.832
Gender (% Female)	78.6% (*n* = 11)	69.2% (*n* = 27)	.506
Ethnicity (% Caucasian)	71.4% (*n* = 10)	64.1% (*n* = 25)	.620
ChEDE-Restraint	0.74 (0.88)	0.60 (0.68)	.537
ChEDE- Eating Concern	0.29 (0.49)	0.25 (0.38)	.758
ChEDE-Shape Concern	1.53 (1.40)	0.98 (0.99)	.117
ChEDE-Weight Concern	1.82 (1.31)	1.61 (1.09)	.561
ChEDE-Global	1.10 (0.82)	0.86 (0.62)	.270
CDI-Total	6.79 (3.83)	6.31 (4.76)	.737
CDI- Negative Mood	1.57 (1.02)	1.51 (1.67)	.903
CDI- Interpersonal Problems	0.71 (0.91)	0.64 (1.22)	.839
CDI- Ineffectiveness	0.79 (0.80)	0.85 (1.09)	.850
CDI- Anhedonia	2.57 (1.83)	2.31 (2.24)	.694
CDI- Self-esteem	1.14 (1.29)	1.00 (1.15)	.701
EAS Shyness	2.55 (0.80)	2.36 (0.69)	.388
EAS Emotionality	2.31 (1.13)	2.64 (1.04)	.327
EAS Activity	2.85 (0.81)	3.38 (0.83)	.046

Note. BE = Binge Eating; BMI = Body Mass Index (k/m^2); ChEDE = Eating Disorder Examination, Child version; CDI = Children's Depression Inventory; EAS = EAS Temperament Survey for Children, Parent rating.

(n = 14) of children of BE- mothers; however, this finding was not statistically significant, X^2 (1, N = 53) = .85, p = .355.

Also, contrary to expectations, there were no significant differences between children of BE+ and BE- mothers on Restraint, t (51) = -.621, p =.537, Eating Concern, t (51) = -.310, p = .758, Shape Concern, t (51) = -1.59, p = .117, Weight Concern, t (51) = -.585, p = .561, or ChEDE Global score, t (51) = -1.11, p = .270 (Table 6). [Results of non-parametric analyses comparing ChEDE subscale scores and EAS Shyness and Emotionality subscales between overweight children of BE+ and BE- mothers can be found in Appendix D. Results of comparisons of demographic characteristics, loss of control and ChEDE subscale scores among children of BE+, infrequent loss of control, and BE- mothers can be found in Appendix E].

3.4 AIM 3: COMPARISON OF MOOD AND TEMPERAMENT BETWEEN OVERWEIGHT CHILDREN OF BE+ AND BE- MOTHERS

As seen in Table 6, there were no differences in reported levels of depressive symptomatology (as measured by CDI Total Score) between overweight children of BE+ and BE- mothers, t (51) = -.338, p = .737. Overweight children of BE+ and BE- mothers also did not differ on Shyness, t (51) = -.870, p = .388, or Emotionality, t (51) = .989, p = .327. However, overweight children of BE+ mothers did have lower levels of Activity, t (51) = 2.04, p = .046, compared to children of BE- mothers (Table 6). [Results of comparisons of mood and temperament among children of BE+, infrequent loss of control, and BE- mothers can be found in Appendix E].

3.5 EXPLORATORY ANALYSES

To further explore the relationships among mother and child disordered eating, weight, mood, and temperament, linear regression analyses were employed using all 68 mother-child pairs. As seen in Table 7, there were a number of significant correlations between many of the

Table 7: Correlations among Variables (N = 68)

Variable	BMI Child	CDI Total	EAS Shyness	EAS Emotionality	EAS Activity	EDE Global	ChEDE Global
BMI Child	—	.105	.108[a]	.127[a]	-.091	.310*	.427**
CDI Total		—	.014[a]	.208[a]	-.196	.150	.291*
EAS Shyness			—	.269*[a]	-.214[a]	.015[a]	.214[a]
EAS Emotionality				----	-.207[a]	.150[a]	.034[a]
EAS Activity					----	-.145	-.154
EDE Global						---	.279*
ChEDE Global							—

Note. BMI = Body Mass Index (k/m^2); CDI = Children's Depression Inventory; EAS = EAS Temperament Survey for Children, Parent rating; EDE = Eating Disorder Examination; ChEDE = Eating Disorder Examination, Child version.
[a] Spearman's rho correlation; Pearson product-moment correlation coefficients for all others. *p < .05.**; p < .01.

predictor variables. However, examination of all multicollinearity statistics indicated this was not problematic. Child BMI correlated significantly with child disordered eating (r = .427; p = .000), and maternal disordered eating and child depression were significant correlates of child disordered eating (r = .279; p = .021; r = .291; p = .016, respectively), as well.

A series of hierarchical regression analyses were conducted to examine the relationship between maternal disordered eating, child depression, and child temperament and child aberrant eating. Results are summarized in Table 8. The regression analysis examining whether maternal disordered eating predicted child disordered eating was significant, R^2 =.206, adjusted R = .181, F (2, 65) = 8.41, p = .001. However, maternal disordered eating did not significantly predict child disordered eating over and above child BMI, R^2 change = .024, F (1, 65) = 1.94, p = .169.

When entered into the regression analyses, child depression proved to be a significant predictor of child disordered eating, R^2 =.243, adjusted R = .220, F (2, 65) = 10.45, p < .001. Moreover, child depressive symptoms significantly predicted child disordered eating over and above child BMI, R^2 change = .061, F (1, 65) = 5.27, p = .025. Results differed, however, regarding child temperament and child disordered eating. The regression analysis including temperament, as measured by the Emotionality, Shyness, and Activity subscales of the EAS was significant, R^2 =.219, adjusted R = .169, F (4,62) = 4.35, p = .004. However, child temperament did not significantly predict child disordered eating over and above child BMI, R^2 change = .038, F (3,62) = 1.01, p = .396.

Finally, the complete model including child BMI, maternal disordered eating, child depression, and child temperament was significant, R^2 =.301, adjusted R = .231, F (6, 60) = 4.30, p = .001. Examination of changes in R^2 suggested that child BMI and child depression were the two predictors that significantly contributed to the prediction of child aberrant eating (R^2 =.240; p < .001). Maternal disordered eating and child temperament did not make significant contributions to the model of child aberrant eating.

Table 8: Summary of Linear and Hierarchical Regression Analyses Predicting ChEDE Global Score from Maternal Disordered Eating, Child Depression, and Child Temperament (N = 68)

Variable	*B*	*SE B*	**B**
Step 1			
Child BMI	.07	.02	.38**
Step 2			
Maternal Global EDE	.13	.10	.16

Note. BMI = Body Mass Index (k/m^2); EDE = Eating Disorder Examination. R^2 = .21 for Step 1 (Adjusted = .182); ΔR^2 = .02 for Step 2; (overall model *p*s < .001). **p* < .05. ***p* < .01

Variable	*B*	*SE B*	**B**
Step 1			
Child BMI	.08	.02	.40**
Step 2			
Child Depression	.04	.02	.25*

Note. BMI = Body Mass Index (k/m^2). R^2 = .18 for Step 1 (Adjusted = .17); ΔR^2 = .06 for Step 2; (overall model *p*s < .001). **p* < .05. ***p* < .01.

Variable	*B*	*SE B*	**B**
Step 1			
Child BMI	.07	.02	.40**
Step 2			
EAS Shyness	.16	.11	.17
EAS Emotionality	-.03	.08	-.04
EAS Activity	-.07	.10	-.09

Note. BMI = Body Mass Index (k/m^2). R^2 = .21 for Step 1 (Adjusted = .17); ΔR^2 = .04 for Step 2; (overall model *p*s < .001). ***p* < .01.

Table 8 (continued)

Variable	*B*	*SE B*	**B**
Step 1			
Child BMI	.06	.02	.34**
Step 2			
Maternal Disordered Eating	.12	.09	.15
Step 3			
Child Depression	.04	.02	.25**
Step 4			
Shyness	.19	.11	.20
Emotionality	-.02	.09	-.03
Activity	-.02	.09	-.03

Note. BMI = Body Mass Index (k/m^2). R^2 = .18 for Step 1 (Adjusted = .17); ΔR^2 = .02 for Step 2; ΔR^2 = .05 for Step 3; ΔR^2 = .04 for Step 4; (overall model *p*s < .01). **p < .01.

4.0 DISCUSSION

This study contributes to a growing body of literature documenting eating disorder attitudes and behaviors in school aged children. In this sample, 38% of overweight children reported recent loss of control over their eating. Moreover, similar to findings in adults with BED, loss of control was related to eating disorder cognitions and depression. Inadequate sample size precluded definitive conclusions concerning differences between overweight children of mothers with and without binge eating. However, exploratory analyses supported a relationship between maternal and child aberrant eating, as well as relationships among child BMI, child depression, and child aberrant eating. In contrast, child temperament was not related to aberrant eating in this sample of overweight children. Each of these findings will be discussed in turn.

4.1 ABERRANT EATING IN OVERWEIGHT CHILDREN

This study, which utilized the child version of the EDE, the gold-standard interview of eating disorders in adults, documented that overweight children report a range of aberrant eating behaviors and cognitive correlates. Approximately 38% of children in this study reported loss of control over their eating in the past 3 months. Consistent with previous studies, the majority of children endorsing loss of control described episodic consumption of subjectively large amounts of food. There were no differences, however, between children describing subjective and objective episodes of overeating, thus highlighting the importance of loss of control rather than amount of food consumed as a key feature of binge eating in children.

Three research groups have used the ChEDE to examine disordered eating in children (Goossens et al., 2006; Levine, Ringham, Kalarchian, Wisniewski, & Marcus, 2006; Tanofsky-Kraff et al., 2004). The proportion of children reporting loss of control in our group was the highest rate of available reports, which documented rates of loss of control of 9.3% (Tanofsky-Kraff et al., 2004), 15.0% (Levine et al., 2006), 17.9% (Goossens et al., 2006), and 31% (Morgan et al., 2002) in children. Although we cannot determine if the differences in rates of loss of control are significantly different, the range of rates of loss of control may reflect sampling variability among the studies. The study samples include children seeking treatment for overweight in the US (Levine et al., 2006) and in Europe (Goossens et al., 2006), and a sample of non-treatment seeking children participating in metabolic studies at the National Institutes of Health (Morgan et al., 2002; Tanofsky-Kraff et al., 2004). The children in the current study were recruited based on mothers' concern about their child's weight and maternal eating behaviors. Thus, the higher rates of loss of control in our sample might reflect this recruitment strategy.

Children in the current study also differed from children in the other samples in BMI and age, which may account for differences in children's rates of loss of control. The majority of children in the current study were at or above the recommended BMI cutoff for overweight (Must et al., 1991). Half of the children in the Tanofsky-Kraff et al. study (2004) were normal weight and half of the children were at risk for overweight or overweight (BMI $\geq$ 85th and 95th percentiles, respectively). Loss of control was significantly more prevalent in overweight than normal weight children (14.2% versus 3.8%, respectively) in their sample. Children in the Goossens et al. study (2006) were older (mean age of 12.74 $\pm$ 1.75 years) than children in the current study. Although children in the Levine et al. (2006) study were similar in age and weight to children in the current study, the assessment of loss of control varied slightly from the current

ChEDE protocol. At the time of subject recruitment in their study, interviewers using the ChEDE were instructed to ask about loss of control only if a participant reported an episode of overeating. Thus, not all children were queried about loss of control. Current ChEDE procedures assess loss of control in all participants regardless of overeating (Goossens et al., 2006; Tanofsky-Kraff et al., 2004), and this protocol was followed in the current study. Thus, the true rate of loss of control over eating may be underrepresented in the Levine et al. sample (2006).

Another methodological difference among the studies concerns the number of days in which loss of control was assessed and reported. Some studies assessed eating behaviors over the past 28 days (Levine et al., 2006; Tanofsky-Kraff et al., 2004), and some studies documented eating behaviors over the past 3 months using the ChEDE (Goossens et al., 2006). In line with current protocol for the ChEDE, we assessed child loss of control over eating for the past 3 months. Thus, despite differences in reported rates of loss of control among studies utilizing the ChEDE, available evidence suggests that a sizeable minority of children endorse loss of control over eating.

In addition to loss of control over eating, children reported cognitive correlates of eating disorders. Although children in this study's mean scores on the Restraint, Eating Concern, Shape Concern, and Weight Concern subscales of the ChEDE do not meet the high levels observed in adult eating disorder patients, they are comparable to those reported by children in these studies. Only one study has compared overweight and normal weight children's mean scores on the ChEDE subscales (Tanofsky-Kraff et al., 2004), and the authors reported that compared to normal weight children, overweight children reported significantly higher scores on all subscales of the ChEDE. Elevated scores of eating disorder cognitions are of concern

because evidence has shown that they are related to the development of clinically significant eating disorders. For example, prospective research has suggested that adolescent girls who score highly on measures of weight concern are at high risk for developing partial- or full-syndrome eating disorders (Killen et al., 1994, 1996). Overweight children reporting eating disorder attitudes and behaviors (e.g., weight concerns) also may be at high risk for developing significant eating disorder pathology.

The identification and classification of childhood eating disturbances remains challenging (Rosen, 2003) due to difficulties in the diagnosis and categorization of eating disorders and difficulties specific to children's development and eating behaviors in general. In light of recent arguments for more flexible, developmentally appropriate criteria for eating disorders in children (Bryant-Waugh, 2006), attention to key behaviors of eating disorders is needed (Marcus & Kalarchian, 2003). Although DSM-IV criteria for BED were not assessed in the children who participated in this study, 2 (2.9%) children reported loss of control over their eating on an almost daily basis, thus meeting binge frequency criteria for BED. Combined with the finding that approximately one-third of children reported loss of control over eating in the study, these findings suggest that the percentage of children experiencing loss of control over eating, a feature of binge eating, is greater than rates of AN or BN in children seen at eating disorder clinics (Bryant-Waugh, 2006). In contrast to the low numbers of children seeking treatment for eating disorders, a number of overweight children present for weight-loss treatment, and as discussed below, efforts should be made to assess aberrant eating in these children as they may require targeted treatment.

4.2 CHARACTERISTICS OF CHILDREN WITH AND WITHOUT LOSS OF CONTROL OVER EATING

Next, we compared children with and without loss of control over eating on demographic characteristics and eating disorder cognitive correlates. There were no differences between the groups on age, gender, ethnicity, or SES. Moreover, there was no difference between children with and without loss of control in BMI. However, they did differ on measures of eating and mood disturbances. Specifically, overweight children reporting loss of control endorsed more depression than children without loss of control, which confirms findings from several other studies (Goossens et al., 2006; Morgan et al., 2002) and will be discussed further below. Moreover, children reporting loss of control had significantly higher eating, shape, and weight concerns than children without loss of control. Other studies have documented similar differences between children with and without loss of control on the Eating Concern, Shape Concern, and Weight Concern subscales of the ChEDE (Goossens et al., 2006; Levine et al., 2006; Tanofsky-Kraff et al., 2004).

Children with loss of control also reported higher restraint than children without loss of control in this study. In studies examining adult samples of BED patients (e.g., Marcus et al., 1995; Wilfley, et al., 2000), BED patients do not differ from overweight individuals on EDE Restraint. There has been less consistency regarding differences in the ChEDE subscale, Restraint, with some studies documenting differences in Restraint scores between children with and without loss of control (Goossens et al., 2006), and other studies failing to document such differences (Decaluwe & Braet, 2003; Tanofsky-Kraff et al., 2004).

The relationship between dietary restraint and binge eating in children is unclear. Retrospective studies of adult binge eaters have examined the onset of binge eating in relation to

dieting and overweight (Marcus et al., 1995; Grilo & Masheb, 2000), and for a subgroup of BED patients, dietary restriction occurred after the onset of binge eating. Thus, binge eating in younger children may not be coupled with efforts at dietary restriction. Indeed, Marcus and Kalarchian (2003) suggest that binge eating in children and adolescents may occur without marked efforts to limit calorie intake. Thus, it remains unclear to what extent dietary restraint has a function in the maintenance of binge eating problems among obese children and adolescents.

In sum, the finding that overweight children experience aberrant eating behaviors and cognitive correlates is consistent with results of studies using questionnaires to assess the presence of eating disorder pathology in adolescents (Ackard, Neumark-Sztainer, Story, & Perry, 2003; Striegel-Moore et al., 1995) and adults (de Zwann et al., 2001; Fairburn et al., 1998) and highlights the need for further examination of the developmental trajectory of eating disorder attitudes and behaviors. Additionally, the finding that children with loss of control over eating report more aberrant eating behaviors and cognitive correlates than children without loss of control over eating is consistent with results comparing overweight adults with and without BED (Grilo & Masheb, 2000; Wilson, Nonas, & Rosenblum, 1993). Compared with overweight individuals who do not binge eat, individuals with BED report considerably less control over eating, more fear of weight gain, preoccupation with food, and body dissatisfaction. Further, evidence has shown that individuals with early onset binge eating experience earlier onset of overweight and dieting, more eating disorder psychopathology, more psychiatric co-morbidity, and more difficulties in treatment (Abbott et al., 1998; Grilo & Masheb, 2000; Marcus et al., 1995). Although the long-term consequences of loss of control in children are unknown, school

aged children who experience difficulties with eating may be at increased risk for eating disorders and weight problems in adolescence and adulthood.

4.3 ABERRANT EATING IN OVERWEIGHT CHILDREN OF BINGE EATING MOTHERS

In the current study, the findings concerning maternal disordered eating and child aberrant eating were inconclusive. There was no difference in the proportion of overweight children reporting loss of control over their eating between mothers with and without binge eating (50% versus 35.5%, respectively). Moreover, there were no differences between the groups in eating disorder cognitive correlates. Unfortunately, inadequate sample size limited power to detect significant differences between overweight children of mothers with and without binge eating in eating disorder behaviors and attitudes. However, as discussed below, exploratory analyses suggested a relationship between maternal disordered eating and child aberrant eating, and future studies with larger sample sizes are needed to examine aberrant eating of children of binge eating mothers.

4.4 DEPRESSION AND TEMPERAMENT IN OVERWEIGHT CHILDREN OF BINGE EATING MOTHERS

Findings concerning mood and temperament differences between children of mothers with and without binge eating were inconclusive, as well. Specifically, there were no differences in reported depressive symptoms between the children. Children of binge and non- binge eating mothers did not differ on the EAS Shyness or Emotionality subscales. However, children of binge eating mothers had lower scores on the EAS Activity subscale compared to children of mothers without binge eating suggesting that overweight children of binge eating mothers are

less active and energetic. Given the small sample size, however, these findings require replication with more children.

In sum, hypotheses concerning differences between children of mothers with and without binge eating could not be fully examined due to the limited sample size, and post hoc power calculations were conducted to determine the available power of the study. Power calculations were based on observed differences in rates of loss of control between children of mothers with and without binge eating. The current sample consisted of 14 BE+ and 39 BE- mothers, and we found that 50% of children of binge eating mothers reported loss of control versus 35.9% of children of mothers without binge problems. Thus the study had insufficient power (14.6%) to detect an effect of this magnitude. Assuming that the observed difference reflected a real distinction, an alpha of 0.05, and a 2-tailed test, a sample size of 392 (196 per group) would be needed to have sufficient power (>.80) to yield a significant result.

Given the magnitude of the observed differences, it may be that maternal binge eating has limited impact on already overweight children. Perhaps maternal binge eating has a stronger impact on younger children, as they are learning to self-manage food intake and that pediatric overweight per se, is more relevant to child aberrant eating in 8 to 12 year old children. Studies of younger children across a full range of weights are needed. Alternatively, it may be that the impact of maternal aberrant eating was not captured by consideration of binge status only, as suggested by preliminary analyses using continuous measures of a wider range of eating psychopathology. There was sufficient power for exploratory analyses utilizing the full sample (i.e., all 68 mother-child pairs) and continuous measures of aberrant eating to further explore the relationship among child aberrant eating and possible risk factors. Findings are discussed below.

4.5 EXPLORATORY ANALYSES

4.5.1 Aberrant eating and degree of overweight in children

Child BMI was strongly related to child aberrant eating when the full sample was utilized along with continuous measures of aberrant eating (i.e., Global scores on ChEDE). Although there were no differences in BMI using categorical classification of loss of control over eating, differences emerged when continuous measures of child aberrant eating were utilized. Thus, even in a constrained range of BMI (the majority of the children were overweight ($\geq$ 95th percentile BMI for age and gender), heavier children report more eating disordered psychopathology.

Current data suggest that weight and binge eating are closely related (e.g., de Zwann et al., 1994; Smith et al., 1998). Binge eating is considered a risk factor for obesity (McGuire, Wing, Klem, Lang, & Hill, 1999; Stice et al., 1999) and overweight is considered to be a risk factor for binge eating (e.g., Fairburn et al., 1998), although the exact relationship between these variables is not known. Nevertheless, the findings of the current study are intriguing because they demonstrate that the association between overweight and binge eating is evident in school-aged children. Studies of aberrant eating in normal weight children are needed to more fully understand aberrant eating and weight.

4.5.2 Aberrant eating and maternal eating in children

Exploratory analyses utilizing the full sample suggested that there was a relationship between maternal Global subscale scores on the EDE and children's Global scores on the ChEDE in this

sample of overweight children. After controlling for child BMI, however, maternal eating disorder scores were no longer significantly related to child aberrant eating. One possible interpretation of this finding is that the relationship between mother and child disordered eating may be negligible once a child is overweight. In other words, once a child becomes overweight, the impact of maternal eating may lessen or no longer be consequential. Studies examining mother and child disordered eating in normal weight children are needed to clarify whether the impact of maternal eating attitudes and behavior on child aberrant eating differs in children without weight problems.

There are alternative interpretations of the relationship between mother and child aberrant eating. The relationship between mother and child disordered eating may not be germane in children ages 8 to 12 years. Numerous environmental factors influence eating and weight, and the relative importance and impact of these factors vary throughout development. For school aged children, peer or media influences may supersede the mother child eating relationship. Another consideration is that the relationship between mother and child eating and weight factors may be better captured via alternative characteristics of the mother-child eating relationship. For example, parental feeding, which has been shown to influence child weight, might be a better indicator of child risk for problematic eating. Faith and colleagues (2004) reported that parental feeding restriction was most closely associated with increased child eating and weight status in children. Thus, the relationship between mother and child eating behaviors and attitudes requires further study in samples including children of broader ranges of age and weight.

4.5.3 Aberrant eating and mood in children

Exploratory analyses provided further support of the relationship between mood and aberrant eating in children. Child depression and child aberrant eating were strongly associated in all

univariate and multivariate analyses. Specifically, independent of child BMI, children reporting symptoms of depression also endorsed more eating disorder psychopathology. There is a belief that overweight children are unhappy with their weight and experience more psychosocial distress, particularly depressive symptoms (Erickson, Robinson, Haydel, & Killen, 2000). Overweight is related to depressive symptoms in non-treatment seeking children (Striegel-Moore et al., 1995; Vander Wal & Thelen, 2000). Further, child depression is a risk factor for a number of related factors including overweight and eating disorders (Goodman & Whitaker, 2003; Pine et al., 2001; Stice, Presnell, Shaw, & Rhode, 2005). Research has shown that in adolescent girls, depressive and eating disorder symptoms are predictive of meeting criteria for a full-syndromal eating disorder (Steiger, Leung, & Puentes-Newman, 1992). In adults, binge eating is associated with elevated depression (e.g., Newman et al., 1996; Wilfley et al., 2000) though as mentioned previously, the exact relationship between depression, weight, and eating disorders is unclear. The current findings highlight the early presence of these factors in school aged children. Causality cannot be inferred from the current study, and future work is needed to clarify the relationship between mood and aberrant eating in children.

4.5.4 Aberrant eating and temperament in children

Exploratory analyses examining child temperament in relation to a continuous measure of child aberrant eating in the full sample of children failed to support an association between child temperament and child aberrant eating. As mentioned previously, children with loss of control did not differ from children without loss of control on the temperament subscales of the EAS, and child temperament was not related to continuous measures of child aberrant eating in regression analyses. Despite the current findings, there is reason to examine temperament in relation to eating and weight behaviors in children in future studies. There is consensus that the

measurement of temperament is challenging. Numerous measures have captured dimensions of temperament in children and adults resulting in conflicting findings regarding the relationship of temperament and eating disorders in the literature. Thus, alternative measures of child temperament may better capture the relationship between temperament and eating disorders.

Furthermore, in contrast to the dearth of research on temperament and aberrant eating in children, evidence supports a relationship between childhood temperamental traits and adiposity. For example, Agras and colleagues (2004) examined risk factors for the development of overweight in 150 children followed from birth to 9.5 years. Maternal perceptions of their children's temperament mediated the effects of parental overweight, such that children perceived as having relatively "easy" temperaments were at less risk for overweight at 9.5 years of age than those children perceived as having "difficult' temperamental characteristics. Moreover, there is evidence that temperament traits, particularly negative emotionality and hyperactivity, contribute to the accumulation of body fat in adulthood (Pulkki-Raback et al., 2005). The authors examined associations between temperament at ages 6 to 12 and BMI at ages 24 to 30 years and found that high negative emotionality predicted increased BMI in adulthood. Thus, it appears that child temperament is related to adiposity; however, the mechanism remains unclear and may be mediated by aberrant eating behaviors. Temperamental characteristics are not likely to directly lead to eating disorders; however, they may increase vulnerability in combination with other risk factors (Bulik et al., 1995; Leon et al., 1995). Given the relationship between temperament and adiposity in children (Carey, Hegvik, & McDevitt, 1988; Wells et al., 1997) and eating disorders and adiposity in adults (de Zwann et al., 1994; Smith et al., 1998), future studies are needed to further elucidate the relationship between temperament and disordered eating in children.

4.6 SUMMARY

Results of multivariate analyses documented that child BMI, depression, temperament, and maternal disordered eating accounted for approximately 30% of the variance of child aberrant eating. However, the majority of variance of child aberrant eating was explained by child BMI and child depression (24%), and maternal disordered eating and child temperament did not significantly contribute to the model. Future studies are needed to further examine posited correlates, which may be risk factors for child aberrant eating, and interactions among these variables as they may differentially contribute to the manifestation of eating disorders and overweight in children.

4.7 STRENGTHS AND LIMITATIONS

This study has several noteworthy strengths. It represents an important first step in the identification of high-risk children for problematic eating, and conceptually-relevant hypotheses drove data recruitment and analyses. Moreover, this is the first study to use the gold-standard interview for eating disorders with mothers and their children.

However, there are several limitations in the present study. First and foremost, the sample size was limited, which hindered the ability to draw conclusions from the data. Recruitment of binge mothers of overweight children was challenging for a number of reasons. The initial appointment with families was 3 hours, and many mothers were reluctant to participate. By reducing the number of self-report questionnaires that families completed and shortening the appointment to 2 hours, families were more willing to participate in the study.

Next, there were limited funds available to pay participants for their time. Families received a small amount of money, which may not have been sufficient compensation. Further, many mothers expressed interest in treatment for their child's overweight, which we were unable to offer. However, we gave referrals for treatment of pediatric overweight and spent time with interested families after their interview to answer questions about child overweight.

Additionally, the challenges of recruiting a clinical sample are evident in this study. Diagnosis of binge eating is notoriously difficult (Wilfley et al., 1997), and although we screened mothers' eating behaviors during the preliminary calls, many women failed to meet criteria for subthreshold or full-syndrome BED in their interview. Disordered eating exists on a continuum (Fitzgibbon, Sanchez-Johnsen, & Martinovich, 2003; Stice, Killen, Hayward, & Taylor, 1998; Striegel-Moore et al., 2000), and in the current study, approximately 22% of mothers reported loss of control over their eating, which failed to meet subthreshold or full-syndrome criteria for BED. The study as originally designed was intended to include mothers meeting BED or subthreshold BED and mothers without any eating disorders, and we examined the data as intended. However, we retained all mothers for exploratory analyses. More detailed screenings are needed to increase the likelihood of full-syndrome binge eaters participating in future studies.

It also is possible that many mothers, particularly binge eating mothers, may have been reluctant to participate in a study where they would be queried about their eating and weight control behaviors. Binge eating is associated with guilt, distress, and shame for many individuals (Marcus et al., 1995; Stice & Agras, 1998; Wilfley et al., 1997), and answering detailed questions about amounts of food consumed during a binge episode may have been a deterrent for some women. Further, binge mothers may have been unwilling to have their child

interviewed and asked questions about his or her eating for fear of being blamed for their child's overweight. Future work is needed to recruit and assess children of binge mothers.

Another limitation of the current study is the generalizability of the findings. As previously noted, recruitment targeted mothers of overweight children. Thus, the external validity of the study is limited, and findings concerning the children in this study cannot be generalized to all overweight children.

Next, we did not document pubertal status of the children. Evidence has shown that obesity is associated with early sexual maturation, particularly in girls (Wang, 2002). Moreover, evidence has shown that early onset puberty, weight, and age are related to increased risk for the development of aberrant eating in girls, highlighting the complex relationship among these variables (Field et al., 1999, 2001). Klump, McGue, and Iacono (2000) have shown etiological heterogeneity between eating disorders symptoms expressed prior to and after puberty. Specifically, prepubertal eating disorders symptoms appear to be primarily influenced by shared environmental factors and post-pubertal eating disorders symptoms largely influenced by additive factors. Genetic links were identified in adolescent girls but not in preadolescent girls, and it was hypothesized that there may be an activation of a portion of the inherited eating pathology during puberty. Thus, there is suggestion that puberty is a heightened time for eating disorder onset, but there may be markers in pre-adolescent childhood, which may be important for prevention and intervention. Further, the mother-child aberrant eating relationship may be different in childhood and adolescence.

Finally, the cross-sectional design of the study and lack of control group precludes any understanding of the causal nature of the relationships among the variables. Prospective studies

are needed to track the development, maintenance, and course of aberrant eating in overweight children.

4.8 FUTURE DIRECTIONS

As this is the first study to use the interview version of the EDE to document eating disorder behaviors and cognitions in overweight children and their mothers, it has several implications for future research. First, developmental studies are needed to better evaluate loss of control and other conceptually relevant features of binge eating in children and to confirm children's report of these behaviors. Next, prospective studies of aberrant eating in children are warranted to understand the trajectory of loss of control and binge eating in children at risk for overweight and eating disorders. Moreover, studies of children at high-risk for eating and weight problems will further clarify these relationships and facilitate prevention and intervention efforts. Finally, adaptations of treatment studies of pediatric overweight may be necessary. Each of these will be discussed in turn.

Studies incorporating a developmental perspective in studies of child eating behaviors and attitudes are needed to better identify and document the onset of aberrant eating. Specifically, consideration of children's developing cognitive, emotional, and physical stages in relation to their eating behaviors will contribute to our understanding of the manifestation of clinically significant eating problems in children. Further, prospective studies of children will elucidate the trajectory of aberrant eating attitudes and behaviors and subsequent development of clinically significant eating disorders or weight problems.

Next, studies using alternative assessment techniques are needed to further define the behaviors associated with problematic eating and to confirm the reliability of child report of loss

of control over eating. Interviews assessing aberrant eating are valuable because they elicit greater detail regarding thoughts and behaviors associated with eating disorders. However, further confirmation of child loss of control would provide reliability of children's self-report of their eating. Multiple perspectives such as sibling, parent, and teacher have been utilized for reports on child behavior (La Greca, 1990); however, several studies have documented poor concurrence between parent report and children's or adolescents' reports of their eating behaviors (Johnson et al., 1999; Steinberg et al., 2004; Tanofsky-Kraff et al., 2004). Given the secretive nature of disturbed eating behaviors (Wilfley, et al., 1997), parents may be unaware of their child's thoughts and eating behaviors.

Experimental designs of aberrant eating in children are necessary to better capture eating behaviors in children and to evaluate causes and consequences of these behaviors. In adults, laboratory studies have evaluated the effect of hypothesized antecedents (e.g., dietary deprivation, caloric preloads, negative mood inductions) on binge episodes. These studies typically measure the amount of food consumed post-manipulation and extend this to reported binge eating (Heatherton, Herman, & Polivy, 1991; Lingswiler, Crowther, & Stephens, 1989; Telch & Agras, 1996; Wardle & Beales, 1988; Woody, Costanzo, Liefer & Conger, 1981). As discussed previously, a limited number of laboratory studies of normal eating behaviors in children have provided evidence of children's eating in the absence of hunger and difficulties in children's ability to self-regulate eating (e.g., Fisher & Birch, 2002). However, these studies have been conducted with a cohort of Caucasian girls, and replication of experimental studies of disturbances in children's eating with diverse samples is needed.

Next, the current study focused on a potential relationship between binge eating mothers and aberrant eating in the context of overweight, and examination of mother and child eating

behaviors in normal weight children at differing stages of childhood is warranted. Evidence supports relationships among binge eating, depression, and overweight in adults, and the findings of the current study provide support for similar relationships in children. Considering the heritability of depression, weight, and eating, future examination of the contribution of maternal mood as a risk factor for aberrant eating is needed.

Finally, there may be specific implications for treatment for overweight children who report loss of control. In adults, treatment of BED has been examined using cognitive-behavior therapy (e.g., Marcus, Wing, & Fairburn, 1995; Telch, Agras, Rossiter, Wilfley, & Kennardy, 1990; Wilfley et al., 2002), interpersonal therapy (e.g., Wilfley et al., 1993; 2002), and dialectical behavior therapy (e.g., Telch, Agras, & Linehan, 2001), as well as dietary approaches, which have focused on weight loss with secondary emphasis on binge eating reduction (e.g., de Zwann et al., 2003). Generally, results indicate that both targeted psychotherapy and dietary approaches yield binge eating abstinence rates of approximately 50% at 12-month follow-ups, and the dietary approaches to the treatment of BED appear to be slightly more effective in terms of short-term weight loss than psychotherapeutic approaches. Some clinicians and researchers fear that dieting may increase the risk of eating disorders in children and adolescents (Garner & Wooley, 1991; Polivy & Herman, 1985). By contrast, obesity experts believe that early intervention is desirable, and there is agreement that treatment of pediatric obesity does not contribute to changes in eating disorder symptoms (Butryn & Wadden, 2005; Epstein, Paluch, Saelens, Ernst, & Wilfley, 2001). Indeed, a recent study demonstrated that moderately overweight adolescents who reported successful dietary restriction showed significantly greater decreases in bulimic symptoms compared to weight-matched participants who did not demonstrate successful dietary restriction (Stice, Martinez, Presnell, & Groesz, 2006). It is

unknown what effect weight loss interventions have on loss of control in children, or what effect such eating behaviors have on treatment outcome.

Levine and colleagues (2006) examined the effect of binge eating on the outcome of a behavioral weight management program for 27 overweight children. The authors provide preliminary evidence that loss of control was not associated with weight loss treatment, consistent with findings in adults. However, 50% of children reporting loss of control prior to the start of treatment did not finish treatment. The small sample size limits the interpretation of the findings, but children with loss of control may require targeted intervention or increased motivational enhancement strategies to engage and complete treatment regimens.

Weight loss programs for pediatric overweight should include assessment of aberrant eating attitudes and behaviors including loss of control, eating in the absence of hunger, and cognitive correlates such as weight concerns. In addition, studies are needed to determine if targeting these behaviors specifically in treatment improves reductions in weight and aberrant eating. It may be that children who reduce loss of control over eating experience better treatment outcome. Finally, evaluation and intervention of maternal disordered eating in treatment may be warranted. Parental participation in weight loss treatment for children is critical (e.g., Epstien et al., 1994). If future research supports the relationship between mother and child disordered eating, there may be reason for interventions targeting eating behaviors and weight in binge eating mothers as these may indirectly impact children's eating behaviors.

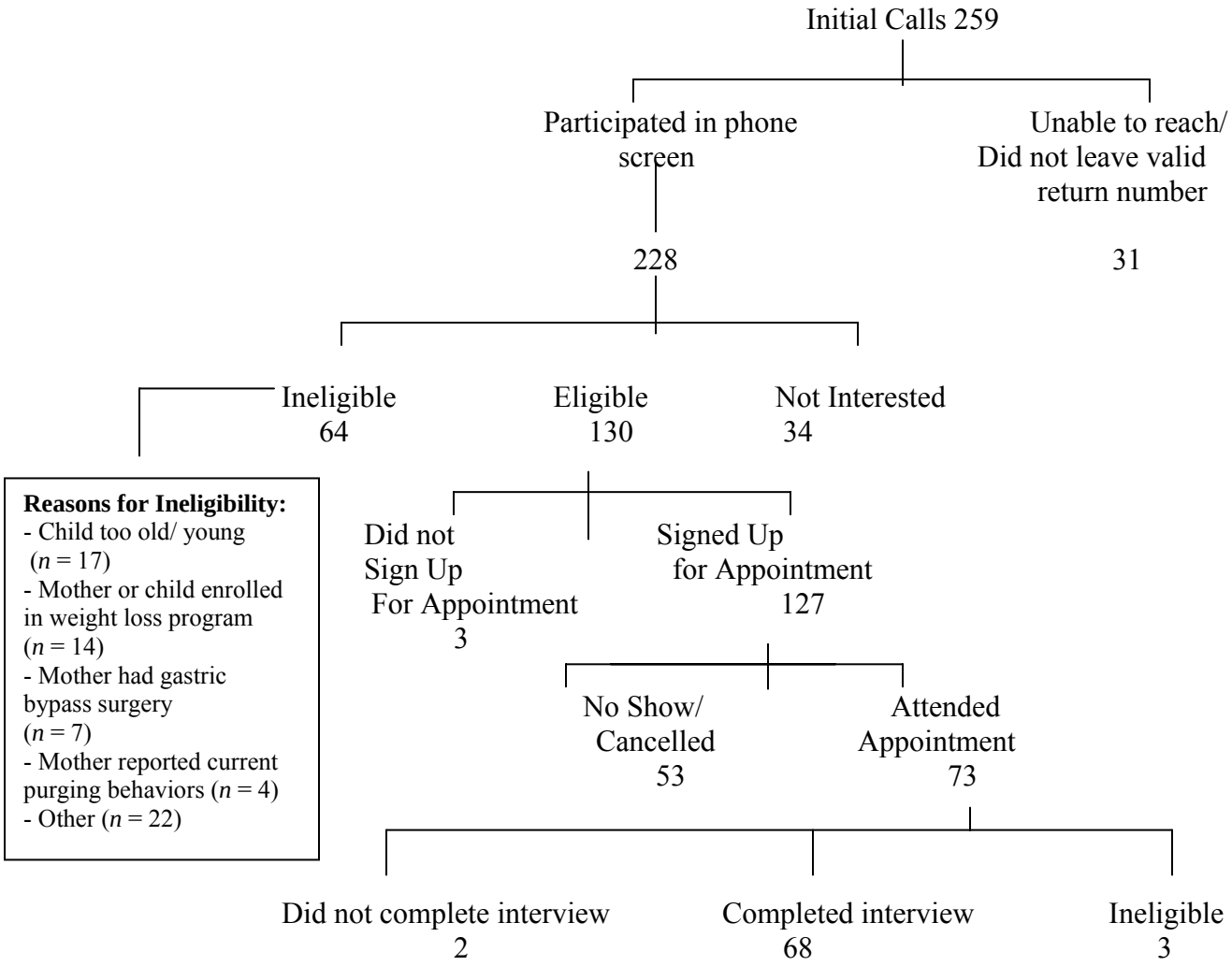
4.9 CONCLUSIONS

Studies have shown that subclinical problems are often the most common predictor of the development of full-blown disorder and early identification and intervention are important. A

number of risk factors for eating disorders and overweight have been identified, but the timing of their manifestation and the interactions among these risk factors in the development of eating and weight problems have remained unexplored in school aged children. The current study highlights that in school aged children, weight, mood, and aberrant eating are significantly interrelated. Maternal eating pathology may or may not be a risk factor for child aberrant eating, and future work is needed to elucidate this relationship and to further understand the role of maternal binge eating in overweight and normal weight children. Findings from this study represent an important first step in understanding risk for aberrant eating behaviors in childhood and contribute to future work examining factors related to the treatment and prevention of childhood overweight.

APPENDIX A

PARTICIPANT FLOW CHART



APPENDIX B

RESULTS OF COMPARISONS OF CHILDREN'S DEMOGRAPHIC CHARACTERISTICS AND CHEDE SUBSCALE SCORES BASED ON EATING BEHAVIOR

Measure *M (SD)*	NE (n = 34) **A**	OBE (n = 11) **B**	SBE (n = 15) **C**	OO (n = 8) **D**	p-value	
Age (years)	9.53 (1.35)	9.00 (1.18)	9.67 (1.50)	10.25 (1.75)	.299	
BMI (kg/m^2)	26.30 (3.51)	29.03 (3.95)	25.77 (4.05)	26.64 (1.84)	.115	
Gender (% Female)	52.9% (n = 18)	81.8% (n = 9)	66.7% (n = 10)	62.5% (n = 5)	.369	
Ethnicity (% Caucasian)	61.8% (n = 21)	63.6% (n = 7)	73.3% (n = 11)	62.5% (n = 5)	.887	
Mother's Education (% completed some college)	64.7% (n = 22)	72.7% (n = 8)	73.3% (n = 11)	62.5% (n = 5)	.900	
ChEDE-Restraint	0.46 (0.63)	1.16 (0.99)	0.81 (0.68)	0.30 (0.45)	.015	B,C>A,D
ChEDE-Eating Concern	0.07 (0.21)	0.47 (0.31)	0.48 (0.57)	0.08 (0.10)	.000	B,C>A; B>D
ChEDE-Shape Concern	0.62 (0.75)	1.34 (1.22)	1.98 (1.21)	0.56 (0.61)	.000	B,C>A; C>D
ChEDE-Weight Concern	1.16 (1.00)	2.31 (0.93)	2.28 (1.30)	1.43 (1.19)	.002	B,C>A
ChEDE-Global	0.56 (0.54)	1.32 (0.49)	1.39 (0.78)	0.59 (0.40)	.000	B,C>A,D

Note. BE = Binge Eating; BMI = Body Mass Index (k/m^2); ChEDE = Eating Disorder Examination.

APPENDIX C

RESULTS OF MANN-WHITNEY U ANALYSES COMPARING LOC+ VS LOC- CHILDREN ON CHEDE AND EAS SUBSCALES

	z	Mann-Whitney *U*	*p*- value
ChEDE-Restraint	-3.01	314.00	.003
ChEDE- Eating Concern	-4.67	219.50	.000
ChEDE-Shape Concern	-4.09	223.50	.000
ChEDE-Weight Concern	-3.61	261.00	.000
EAS Shyness	-1.49	418.00	.137
EAS Emotionality	-1.09	460.00	.276

Note. LoC = Loss of Control; ChEDE = Eating Disorder Examination, Child version; EAS = EAS Temperament Survey for Children, Parent rating.

APPENDIX D

RESULTS MANN-WHITNEY U TESTS COMPARING OVERWEIGHT CHILDREN OF BE+ AND BE- MOTHERS ON CHEDE AND EAS SUBSCALES (N = 53)

	Z	Mann-Whitney *U*	*p*- value
ChEDE-Restraint	-.186	234.00	.852
ChEDE- Eating Concern	.982	272.00	.982
ChEDE-Shape Concern	.252	216.00	.252
ChEDE-Weight Concern	.551	243.50	.551
EAS Shyness	.569	238.50	.569
EAS Emotionality	.284	220.00	.284

Note. BE = Binge Eating; ChEDE = Eating Disorder Examination, Child version; EAS = EAS Temperament Survey for Children, Parent rating.

APPENDIX E

COMPARISONS OF DEMOGRAPHIC CHARACTERISTICS AND CHEDE, CDI, AND EAS SUBSCALES AMONG OVERWEIGHT CHILDREN OF BE+, INFREQUENT LOSS OF CONTROL, AND BE- MOTHERS (N = 68)

M (SD)	Children of BE+ mothers (*n* = 14)	Children of infrequent loss of control mothers (*n* = 15)	Children of BE- mothers (*n* = 39)	*p*- value
Age (years)	9.50 (1.61)	9.93 (1.22)	9.44 (1.43)	.513
BMI (kg/m^2)	26.95 (4.47)	26.33 (2.59)	26.69 (3.76)	.901
Gender (% Female)	78.6% (*n* = 11)[a]	26.7% (*n* = 4)	69.2% (*n* = 27)[a]	.005
Ethnicity (% Caucasian)	71.4% (*n* = 10)	60.0% (*n* = 9)	64.1% (*n* = 25)	.807
Maternal Education (% completed some post high school training)	35.7% (*n* =5)	20.0% (*n* = 3)	35.9% (*n* = 14)	.511
Loss of Control (%)	50.0% (*n* = 7)	33.3% (*n* = 5)	35.9% (*n* = 14)	.451
ChEDE-Restraint	0.74 (0.88)	0.61 (0.78)	0.60 (0.68)	.824
ChEDE- Eating Concern	0.29 (0.49)	0.12 (0.29)	0.25 (0.38)	.451
ChEDE-Shape Concern	1.53 (1.40)	0.68 (0.87)	0.98 (0.99)	.099
ChEDE-Weight Concern	1.82 (1.31)	1.47 (1.37)	1.61 (1.09)	.727
ChEDE-Global	1.10 (0.82)	0.72 (0.70)	0.86 (0.62)	.333
CDI- Total	6.79 (3.83)	7.00 (5.59)	6.31 (4.76)	.876
CDI- Negative Mood	1.57 (1.02)	1.53 (1.13)	1.51 (1.67)	.992
CDI- Interpersonal Problems	0.71 (0.91)	0.67 (0.72)	0.64 (1.22)	.976
CDI- Ineffectiveness	0.79 (0.80)	1.27 (1.53)	0.85 (1.09)	.431
CDI- Anhedonia	2.57 (1.83)	2.80 (2.48)	2.31 (2.24)	.753
CDI- Self-esteem	1.14 (1.29)	0.73 (0.96)	1.00 (1.15)	.611

M (SD)	Children of BE+ mothers (*n* = 14)	Children of infrequent loss of control mothers (*n* = 15)	Children of BE- mothers (*n* = 39)	*p*- value
EAS Shyness	2.55 (0.80)	2.33 (0.80)	2.36 (0.69)	.657
EAS Emotionality	2.31 (1.13)	2.68 (0.86)	2.64 (1.04)	.539
EAS Activity	2.85 (0.81)	3.16 (0.79)	3.38 (0.83)	.513

Note. BE = Binge Eating; BMI = Body Mass Index (k/m^2); ChEDE = Eating Disorder Examination, Child version; CDI = Children's Depression Inventory; EAS = EAS Temperament Survey for Children, Parent rating.

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