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Maternal influences on binge eating behaviors in children

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ABSTRACT

Binge eating in childhood has been linked to adverse future health outcomes. Parental factors, such as parents' emotion regulation and executive functioning, are likely to influence children's self-regulatory behaviors, including eating. Executive functioning describes a range of higher-order cognitive functions such as planning, abstraction, inhibitory control and working memory, which involves the ability to learn, update and manipulate new information while managing distractions. No studies have examined associations between maternal emotion regulation and executive functioning and the child's maladaptive eating patterns, which was the goal of the present study. Forty-eight mother and child pairs completed self-report clinical measures of emotion dysregulation and attentional control, and mothers completed a brief neuropsychological battery, which included executive functioning measures. Child's disordered eating was measured with the Child Binge Eating Disorder Scale. Linear regression results indicated that mother's performance on a working memory task and child's emotion dysregulation was significantly associated with child's binge eating symptoms ($R^2 = 0.34$). These data, which reveal that maternal executive functioning is associated with self-regulatory behaviors in children, indicate a possible mechanism through which maladaptive eating behaviors may emerge early in development. This relationship merits further exploration in larger-scale prospective intergenerational studies.

1. Introduction

Maladaptive eating behaviors, such as impulsive eating and binge eating (Ortega-Luyando et al., 2015), adversely impact diverse populations of individuals in different communities (Austin et al., 2011; Sonneville and Lipson, 2018). Maladaptive eating is associated with numerous physiological (Pereira and Alvarenga, 2007) and psychological disorders (Pollert et al., 2016; Rosenbaum and White, 2013), and can lead to substantial economic burdens (Agh et al., 2016). Binge Eating Disorder (BED), a common form of maladaptive eating, is characterized by the consumption of large amounts of food in discrete time frames and a loss of control over eating, as well as intense emotional distress following binging episodes (American Psychiatric Association, 2013). BED is considered to be one of the most prevalent types of maladaptive eating, with a U.S. prevalence of 1.9% (Kessler et al., 2013)−2.8% in adults (Hudson et al., 2007). While the typical age of onset for BED symptoms is between the late teens and early twenties (Hudson et al., 2007; Kessler et al., 2013), BED symptoms can manifest as early as six years of age (Lamerz et al., 2005). Importantly, maladaptive eating can serve as a precursor to the development of severe lifelong chronic disorders; it has been linked to numerous adverse health outcomes, including metabolic disorders, such as obesity and diabetes (Dietz, 1998; Tanofsky-Kraff et al., 2012), as well as substance abuse disorders, mood and anxiety disorders (American Psychiatric Association, 2013; Grilo et al., 2009).

Despite the severity of these adverse outcomes, there is limited understanding of what contributes to the development of BED symptoms. In addition to genetic vulnerabilities (C. Davis et al., 2012; C. A. Davis

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et al., 2009; Tanofsky-Kraff et al., 2009), social factors such as parenting (K. L. Allen et al., 2014; Degortes et al., 2014) appear to influence the development of BED symptoms. Studies investigating maternal contributions to maladaptive eating have primarily focused on parent-child interactions, such as parental criticism (Fairburn et al., 1998), attachment styles (Goossens et al., 2012) and the child's perceptions of the mother's expressed emotions (Schmidt et al., 2015). While direct parent-child interactions may impact the development of maladaptive eating behaviors, observational learning and modeling are likely to play a critical role as well. Previous studies have shown that children often mirror parental emotion regulation (Burstein and Ginsburg, 2010; M. Gottman, Katz, and Hooven, 1996; Morris et al., 2007; Rutherford et al., 2015). A parent's emotion regulation is thus a potential influence on the development of BED symptoms in children.

Emotion dysregulation, which often manifests as an inability to monitor emotions properly and respond appropriately in the presence of emotions (Zeman et al., 2006), has been associated with maladaptive eating behaviors in adults (Buckholdt et al., 2015). Emotion dysregulation appears to play a role in the development and maintenance of maladaptive eating (Harrison et al., 2010), and some studies suggest that maladaptive eating may serve as an emotion regulation strategy (Aldao et al., 2010)—for example, some adults report a decrease of negative affect while binging and/or increased positive affect after binging (Leehr et al., 2015). This relationship between emotion regulation and maladaptive eating has also been found in child populations. In a study of 8–13-year-old children, participants who demonstrated problems with controlling the amount of food they consumed in a given time period also showed patterns of emotion dysregulation (Czaja et al., 2009). Emotion dysregulation in children is predictive of eating disorder development in adulthood (Goossens et al., 2016) and has been associated with binge eating episodes (Hughes et al., 2015; Kelly et al., 2016). Considering that emotion dysregulation is a risk factor for developing maladaptive eating behaviors in children, emotional dysregulation in parents could directly influence the development of symptoms of BED in their children.

In a recent review by Kerr and colleagues (2019), the authors highlight different pathways through which parental factors affect children's self-regulation, including modeling of emotion regulation, parenting practices, and modeling of executive functioning (Kerr et al., 2019). Parents serve as models for emotion regulation; children observe parents self-regulatory behaviors and develop similar strategies for managing their emotions. Social referencing theories indicate that children learn and imitate their parents' dysregulated behaviors (Dix, 1991; Feldman, 2015; Morris et al., 2007). Longitudinal research by Tan & Smith (2019) highlighted the influence of maternal emotion regulation in children, finding that mothers may transmit their emotion regulation processes intergenerationally, exerting influence on their children through their own emotional expression. Another way in which mothers may be influencing child emotion regulation is through their parenting practices. Mothers who report difficulties in their emotion regulation are more likely to provide unsupportive emotional parenting practices, such as reprimanding their child for their emotion expression, which in turn influences their child's comfort with expressing emotion (Morelen et al., 2016). This type of unsupportive emotional parenting may teach children to suppress their emotions and also provides children a dysregulated model to imitate when developing their own emotion regulation practices (Bariola et al., 2011).

Parental executive functioning similarly plays a role in the development of self-regulatory behaviors in children (Kerr et al., 2019); this is likely to extend to eating behaviors. Executive functioning refers to a set of higher-order cognitive processes such as planning, organization, inhibitory control, and flexible adaption to contextual demands. Executive functioning includes attentional control, which involves the ability to sustain attention to a desired target and inhibit interference, as well as working memory, which describes the ability to learn, update and manipulate new information while managing distracting information. Maternal executive functioning may directly influence the same abilities in children; for example, parents may teach their children to persist in the face of challenging tasks, inhibit impulsive responses or shift attention away from distracting information to stay focused on an objective. Cuevas et al. (2014) found an association between maternal and child performance on executive functioning tasks. A study by Jester et al. (2009) found a similar association between parental and child executive functioning when dyads completed the same cognitive tasks. A recent study also indicated a positive association between maternal and child executive function in a sample of young children (Chen et al., 2020). One component of executive functioning is the ability to inhibit impulses; mothers with a history of high impulsivity are more likely to have children with lower levels of inhibitory control (Fuchs et al., 2016), which has been shown to play an essential role in maladaptive eating (Bartholdy et al., 2017). Similarly, maternal executive functioning has been found to play a crucial role in different aspects of parenting. Mazursky-Horowitz et al. (2018) found that maternal executive functioning was predictive of levels of scaffolding, a learning process that has been shown to influence a child's self-regulatory ability development. Poor executive functioning in mothers has been associated with harsher parenting styles (Deater-Deckard et al., 2012), child attentional disorders (Efron et al., 2018), and child mental health disorders (Farrell et al., 2012). This evidence suggests that maternal executive functioning may affect parenting, which, in turn, may affect children's self-regulation abilities. An observational study of mothers and their children conducted by Bridgett et al. (2017) found that poor levels of maternal executive functioning were related to negative parenting (Bridgett et al., 2017). Lower levels of maternal executive functioning affect the amount of attention mothers are able to supply to their children (Chico et al., 2014). Furthermore, poorer working memory is associated with reactive parenting (Deater-Deckard et al., 2010). Overall, the current literature suggests that maternal executive functioning influences children's self-regulatory abilities, and similarly, is likely to influence children's eating behaviors; notably, this relationship has not yet been explored.

Meaningful connections have been consistently reported between maternal emotion regulation, executive functioning, and child self-regulatory behaviors, suggesting that maternal emotion regulation and executive functioning may influence the development of maladaptive eating in children. However, to our knowledge, these factors have not been examined in mother-child pairs. Therefore, the current exploratory study was designed to investigate possible relationships between maternal emotion dysregulation and executive functioning and child BED symptoms. We hypothesize that greater maternal emotion dysregulation and poorer executive functioning, measured by clinical assessment and performance on neuropsychological measures, would be associated with more severe child BED symptoms. Subsequently, we expect to find a negative relationship between child emotion regulation and child binge eating symptoms.

2. Methods

2.1. Participants

Participants were 48 African-American mother-child dyads drawn from a larger intergenerational study examining trauma and stress in a primarily African-American urban population (MH100122). Mothers were recruited from waiting rooms of primary care clinics of a publicly-funded urban hospital in Atlanta, GA. Eligible participants were mothers between the ages of 18–65 ($M = 33.9$; SD=8.06), with children between the ages of 8 and 13 ($M = 9.15$; SD=1.41), identified as African-American, were fluent in English and able to give informed consent. Mothers and children were interviewed separately by trained researchers; each completed a battery of self-report measures independently from the another. Children with diagnosed autism spectrum disorder, bipolar disorder, psychosis, or cognitive disability were excluded from the study. All study procedures were reviewed and

approved by the Emory Institutional Internal Review Board and the Grady Hospital Research Oversight. Demographic characteristics of the sample are shown in Table 1.

2.2. Child assessments

The Children's Emotion Management Scale (CEMS; (Zeman et al., 2006)) is a 33 item self-report measure that assesses children's emotions, specifically anger (i.e. "*I hold my anger in*"), sadness (i.e. "*I'm afraid to show my sadness*") and worry (i.e. "*I show my worried feelings*"). The measure uses a 3-point scale with responses including: hardly-ever, sometimes, and often. This measure comprises three factors measuring emotion expression inhibition (α=0.70), emotion regulation coping (α=0.60) and emotion dysregulation (α=0.61). The CEMS has established internal consistency for the three factors with children as young as 6 years old.

The Children's Binge Eating Disorder Scale (C-BEDS; (Shapiro et al., 2007)) is a brief self-report measure that is used to measure binge eating symptoms in children as young as five years old. It consists of seven questions that are related to critical behaviors associated with binge eating in children. Six of the questions are dichotomous, and children must indicate whether the statement describes ("YES" = 1) or does not describe ("NO" = 0) their eating behaviors. Total binge eating severity was calculated by summing responses from the six questions (α=0.59). The remaining question provides information about the onset of the behaviors. Due to the low number of children that endorsed symptoms consistent with a binge eating disorder diagnosis, we examined total binge eating symptoms endorsed.

2.3. Maternal assessments

The Attentional Control Scale (ACS; (Olafsson et al., 2011)) was administered to assess self-reported attentional control in mothers. The ACS is a 20-item self-report questionnaire that is scored on a 4-point Likert type scale, ranging from 1 ("almost never") to 4 (always). A summed total score was used in analyses (α=0.88). Higher scores indicate better attentional control in participants.

The Difficulties in Emotion Regulation Scale (DERS; (van Strien et al., 1986)) is a 36-item self-report measure of emotion dysregulation. The various subscales include: non-acceptance of emotional responses (non-acceptance subscale), difficulties engaging in goal-oriented behavior (goals subscale), impulse control (impulse subscale), lack of emotional awareness (awareness subscale), limited access to emotion regulations strategies (strategies subscale), and lack of emotional clarity (clarity subscale). Higher scores indicate more emotion dysregulation.

The Penn Computerized Neuropsychological Battery (CNP; (Kurtz et al., 2004)) is a computerized cognitive assessment equipped to measure accuracy and speed of performance on various tests. The CNP has been shown to have excellent psychometric validity and good reliability in both healthy and patient populations (Gur et al., 2010). The following CNP measures were administered to mothers, which assess different dimensions of executive functioning:

The Penn Conditional Exclusion Test (PCET; (Kurtz et al., 2004)) assesses abstraction, concept formation and cognitive flexibility. In this task, participants are presented with four objects and are instructed to select the object that does not belong with the other three. The sorting criteria for the task includes three different categories, including the thickness of a line, object shape, and object size. Participants receive feedback on whether or not their selection is correct for each trial. This task is similar to the Wisconsin Card Sorting Test (WCST; (Heaton, 1981)) in that participants must use feedback to learn sorting rules; PCET errors have been found to correlate highly with WCST errors (Kurtz et al., 2004).

The Penn Continuous Performance Test (PCPT; (Kurtz et al., 2004)), obtained from the CNP, measures sustained and selective attention, including errors of commission (impulsivity) and omission (inattention) in participants. In the task, participants are presented with two conditions, the first being numbers and non-number distractors and the second being letters and non-letter distractors. This task includes a short practice trial before beginning the actual task. Participants are asked to respond by pressing the space bar on a keyboard only when they see real numbers or real letters on the screen. The two conditions (numbers and letters) alternate throughout the duration of the task with a notice to participants before each condition changes.

The Letter N-Back Task (LNB; (Jaeggi et al., 2010)) within the CNP measures attention span and working memory. The LNB has three different conditions which require attentional vigilance, learning new information, maintaining and updating this information over time. In the 0-Back condition, participants are presented with a series of letters and asked to button press whenever an X is presented. In the 1-Back condition, participants are presented with a series of letters and are asked to button press whenever the letter on the screen is the same as the previous letter. The 2-Back condition is the most challenging condition, which requires working memory updating and maintenance; participants are presented with a series of letters and are asked to button press whenever the letter on the screen is the same as the one that was presented 2 positions prior to the current letter. Before beginning the task, participants must successfully complete a practice round for each condition. The task conditions change throughout the measure with notice given to participants beforehand.

Table 1
Demographics and neuropsychological test performance.

Maternal Demographics Characteristics		
	Mean (SD) *N* = 48	
Maternal Age	33.9 (8.06)	
Maternal Education	%	
<12th	21.3	
High school diploma	19.1	
College or above	57.4	
Household Monthly Income	%	
$0 – 249	21.3	
$250 – 999	38.3	
$1000 ≥	48.9	
Maternal Neuropsychological Task Performance		
	Mean (SD) *N* = 48	**Range**
LNB True Positive Responses	41.23 (2.32)	2–45
LNB True Positive Responses, 1 Back	14.15 (1.05)	0–15
LNB True Positive Responses, 2 Back	12.13 (2.12)	0–15
Continuous Performance Task	111.35 (8.23)	3–120
Conditional Exclusion Task	2734.38 (937.25)	1249–8083
Child Clinical and Demographic Characteristics		
	Mean (SD) *N* = 48	**Range**
Age	9.15 (1.41)	
Sex		
Female	55.3% *n* = 26	
Binge Eating Symptoms, C-BEDS Total	1.68 (1.42)	0–6
Emotion Regulation, CEMS Total	56.59 (7.24)	41–76
CEMS Subscale scores:		
Positive Coping	24.34 (4.26)	11–33
Inhibition	21.51 (5.19)	12–34
Dysregulation	15.43 (4.54)	10–30
Anger Management	17.95 (3.30)	12–29

LNB = Letter N-Back task.
C-BEDS = Child Binge Eating Disorder Scale.
CEMS = Children's Emotion Management Scale.

3. Statistical analysis

Statistical analyses were conducted using SPSS (v.24). Multivariate correlations were first conducted with maternal and child measures. Maternal measures included self-reported levels of attentional control (ACS total score), emotion regulation (DERS) and neuropsychological variables including correct responses on the PCET, PCPT and on LNB (all

conditions). Child variables included child binge eating disorder (C-BEDS) symptoms and emotion management skills (CEMS). In order to limit the numbers of predictors in the model with our limited sample size and to avoid model overfitting, only variables that were significantly correlated with C-BEDS score were entered into a linear regression model as predictors of C-BEDS total score. Child sex was included to examine potential associations with binge eating, given that sex previously demonstrated relationships with binge eating behaviors (Assari, 2018). Results were considered significant at an alpha level of $p < .05$.

4. Results

Emotion dysregulation. Maternal emotion dysregulation total score and subscale scores were not associated with binge eating symptoms in children (C-BEDS total) or child emotion regulation management (CEMS) (Table 2). Bivariate correlations showed that CEMS total score was associated with child binge eating symptoms ($r = 0.36$, $p<.001$), and the emotion dysregulation CEMS subscale score was even more strongly associated with C-BEDS total ($r = 0.52$, $p<.001$; Table 2).

Executive Function. There was no significant relationship between C-BEDS total and correct responses on the CPT, PCET, 0-Back and 1-Back conditions of the Letter N-back tasks (Table 2). However, there was a significant negative association between performance on the 2-Back condition of the LNB task and C-BEDS total score ($r=-0.4$, $p=.006$; see Table 2). Maternal self-reported attentional control (ACS total score) was not significantly correlated with C-BEDS total score.

Prediction of child binge eating symptoms. Child sex, emotion dysregulation (CEMS - dysregulation subscale score), and maternal scores for the LNB 2-Back trial condition were entered into a linear regression model to predict child binge eating symptoms. Results indicated that both child emotion dysregulation ($\beta= 0.44$; $p=.001$) and maternal performance on the LNB task ($\beta= -0.33$; $p=.02$) predicted C-BEDS total score (Table 3). The overall model was significant F (3, 43) = 7.5, $p<.001$, and explained 34% of the variance in child binge eating symptoms ($R = 0.59$). Fig. 1 shows the relationship between maternal performance on the LNB (2-Back condition) and C-BEDS total score.

5. Discussion

In the current study, we investigated the influences of maternal emotion dysregulation and executive functioning on child binge eating symptoms. We used clinical measures and neuropsychological assessments to examine relationships between cognition and child binge eating disorder symptoms. Results indicated that maternal emotion regulation was not related to child binge eating disorder symptoms. However, we did find that the child's emotion dysregulation, as well as maternal performance on the N-back task, a measure of working memory, was significantly associated with binge eating disorder symptoms in children.

Our findings extend earlier studies indicating associations between executive functioning and dysregulated eating behaviors in adults (Manasse et al., 2015). Specifically, individuals with low working memory capacity show higher rates of maladaptive eating (Calvo et al., 2014). Duchesne et al. (2010) found a correlation between individuals with binge eating disorder and poor performance on measures of working memory. Recent studies have also shown that individuals with binge eating behaviors also exhibit some cognitive disturbancessine cig some (Lee Y, 2018). Current research in children has also found that poorer executive functioning abilities are associated with disordered eating behaviors (Anderson et al., 2015; Groppe and Elsner, 2015). Maternal executive functioning appears to influence child executive functioning, with relationships observed as early as 24 months of age (Cuevas et al., 2014). Maternal executive functioning appears to have an intergenerational relationship, affecting children's eating behaviors in different ways. Poor executive functioning in mothers can have an impact on available attentional resources for children, which can adversely affect interactions with their children (Bridgett et al., 2017). Executive functioning affects how a mother attends to and parents her child. Mothers with poorer executive functioning provide less positive affect and scaffolding to their children (Mazursky-Horowitz et al., 2018), both of which possibly influence the development of healthy emotion regulation in children, which can, in turn, affect their eating patterns. More specifically, research by Deater-Deckard et al. (2010) has found that mothers with low working memory are more likely to react negatively towards their children. Working memory may be affecting maladaptive eating in children simply by way of the cognitive resources

Table 3
Predictors of child binge eating disorder symptoms.

	B	SE	β	*p*
Child Sex	−0.19	0.37	−0.06	0.61
CEMS - Dysregulation	0.14	0.04	0.44	0.001
LNB 2 Back Trial Correct Responses (mother)	−0.22	0.09	−0.33	0.02

CEMS = Children's Emotion Management Scale
LNB = Letter N-Back task.

Table 2
Associations between child and maternal emotion regulation and cognitive variables
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	1	2	3	4	5	6	7	8	9	10	11	12	13
1= Children's Binge Eating Disorder Scale	1												
2= Attentional Control Scale	−0.18	1											
3= Difficulties in Emotion Regulation Scale	0.06	−0.60**	1										
4= Children's Emotion Management Scale, Total Score	.36**	−0.04	0.10	1									
5= Children's Emotion Management Scale, Dysregulation subscale	.52**	−0.16	0.10	.73**	1								
6= Behavioral Assessment for Children, Hyperactivity subscale	.30**	−0.53**	.56**	.35**	.35**	1							
7= Behavioral Assessment for Children, Attention Problems subscale	0.16	−0.45**	.38**	.23*	.23*	.61**	1						
8= Behavioral Assessment for Children, Executive Function subscale	.21*	−0.51**	.56**	.34**	.34**	.86**	.69**	1					
9= Letter N-Back, 0 Back	−0.20	0.08	0.00	0.16	0.04	0.25	0.27	0.28	1				
10= Letter N-Back, 1 Back	0.08	−0.08	−0.18	−0.09	−0.06	−0.33*	−0.08	−0.21	−0.17	1			
11= Letter N-Back, 2 Back	−0.39**	0.21	0.00	−0.03	−0.07	−0.05	0.02	−0.02	−0.04	−0.04	1		
12= Continuous Performance Task	0.08	0.00	−0.08	−0.23	−0.13	0.09	−0.06	−0.09	−0.15	−0.13	0.06	1	
13= Penn Conditional Exclusion Task	−0.04	−0.19	0.08	−0.10	−0.20	−0.01	0.13	0.00	−0.17	0.23	−0.04	−0.18	1

** *Correlation is significant at the 0.01 level (2-tailed).*
* *Correlation is significant at the 0.05 level (2-tailed).*

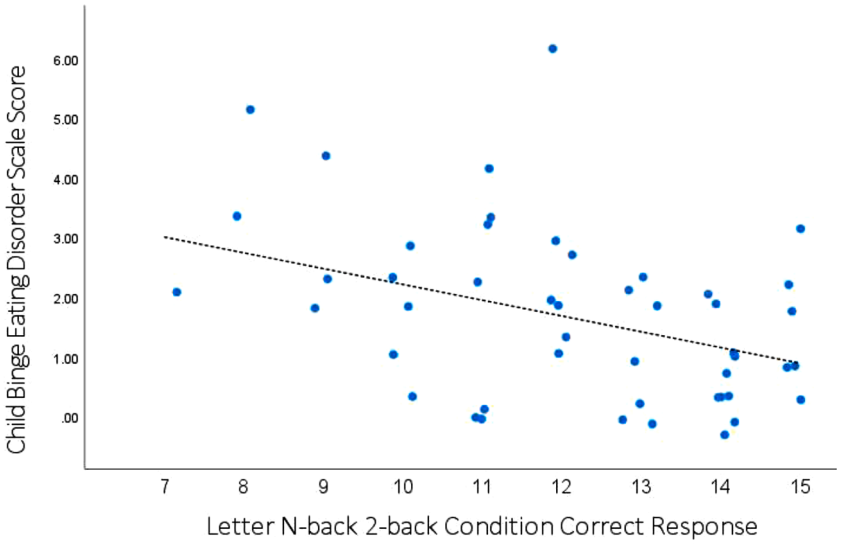

Fig. 1. Maternal performance on a working memory (2-back) task corresponds with child binge eating disorder symptoms.

the mother has available to interact with her child. This corpus of data suggests that executive functioning, including working memory, plays a role in the development and persistence of maladaptive eating patterns in individuals, regardless of age. Our findings expand on these separate studies of adults and children, indicating that executive functioning in parents may influence maladaptive eating in their children.

We also found a positive correlation between child emotion dysregulation and child binge eating symptoms in the current study. This finding extends previous evidence of a relationship between binge eating symptoms and emotion regulation in adolescent and adult populations (Gianini et al., 2013) to a younger preadolescent sample of children that had previously not been examined. Previous studies have also shown that emotion dysregulation is a predictor of maladaptive eating patterns in children (Goossens et al., 2016). Though the correlation between child emotion dysregulation and child binge eating symptoms was not surprising, it is another essential factor in understanding the development of maladaptive eating in children. A review by Dingemans et al. (2017) concluded that a relationship exists between maladaptive eating and binge eating in adult populations. Previous work by Greeno et al. (2000) demonstrated that episodes of binge eating were often preceded by poor moods in adult women. There is a clear relationship between maladaptive eating and emotion dysregulation since individuals with BED often lack healthy adaptive emotion strategies (Dingemans et al., 2017). Binge eating and maladaptive eating patterns may serve as maladaptive emotion regulation strategies for both children and adults (Aldao et al., 2010; Evers et al., 2010).

Other measures of executive functioning explored in this study were not associated with child binge eating symptoms, including maternal performance on measures of sustained attention and impulsivity (CPT) abstraction and cognitive flexibility (PCET), and maternal self-reported attentional control (ACS). It is possible that these indices of executive functioning were less relevant to binge eating than working memory. A review article by Voon (2015) concluded that working memory impairments are common in individuals with BED. Earlier studies investigating executive functioning in individuals with BED have consistently found interferences in working memory but not in other aspects of executive functioning (Duchesne et al., 2010; Svaldi et al., 2014). In addition, the lack of food-relevant stimuli in our measures may have influenced our finding; some studies that included food-related stimuli observed that attentional performance was associated with binge eating disorder symptoms (Higgs, 2015).

Surprisingly, we did not find a relationship between maternal emotional regulation and binge eating symptoms in children. It is possible that parental emotion dysregulation has an indirect impact on child binge eating symptoms. The literature supports that emotion regulation may indirectly impact a child's development, as demonstrated in a study by Edwards et al. (2017), which found that the use of suppression as a type of emotion regulation by mothers was correlated with negative affect in infants. Other parental factors that may influence the development of maladaptive eating behaviors in children include a child's attachment (Goossens et al., 2012) and a child's perception of their mother's expressed emotion (Schmidt et al., 2015). Future studies should be designed to clarify further whether maternal emotion regulation directly impacts child eating behaviors or if it is merely child perception of emotion regulation and parental interactions that contributes to the development of child BED.

Our study has several limitations that must be acknowledged. We did not collect data on child executive function, which is likely to correspond to binge eating behaviors, . There is some empirical evidence of lower executive functioning performance in adolescents with binge eating disorder and weight issues (Kittel et al., 2017). This evidence merits further investigation on how executive functioning may relate to maladaptive eating behaviors in younger children, and if there is a possible relationship between maternal and child EF. A second limitation for this project is the sample size, which limits power to detect more subtle associations between maternal factors and child binge behaviors. Nonetheless, our sample size is comparable to other studies of mother-child dyads (Azhari et al., 2019; Levy et al., 2017; Zwönitzer et al., 2016). For this project, we only studied mothers as the primary parental influence on child eating, but it is possible that fathers' cognition and emotion regulation style also affect a child's eating behaviors, although previous findings are equivocal. It has been postulated that the impact that fathers have on children's development is due to the father's interaction with the mother (Ganzach, 2000). One study conducted by Goldschmidt et al. (2014) revealed that father's eating behavior plays a more important role in the development of eating behavior of adolescent girls; however, other studies have shown a different relationship, indicating that only mothers' eating behaviors are correlated with daughters' eating behaviors (de Lauzon-Guillain et al., 2009). This study is also limited in the type of maternal data collected. The current literature suggests that maternal eating behaviors may be related to child eating behaviors, including different types of eating disorders (Karina L. Allen et al., 2014). Unfortunately, maternal eating patterns were not assessed in this study, thus precluding our ability to examine possible relationships with child eating behaviors—this is worthy of investigation in future studies. Thus, future studies investigating potential relationships

between maternal and child executive functioning abilities are warranted. Further, the C-BEDS is a short scale explicitly designed to measure symptoms of BED; we did not examine binge eating disorder as a diagnosis, and also did not examine symptoms of other eating disorders such as anorexia nervosa and bulimia nervosa. Due to the brevity of the C-BEDS and the fact that recruitment was not based on child eating disorder diagnosis, there was also high variability in responses on the measure; this, in turn, affected the reliability coefficient for this measure. Finally, the cross-sectional nature of this study precluded any assumptions that maternal factors were, in fact, causally related to child binge eating behaviors; this relationship merits investigation in large-scale longitudinal studies.

Results from the current study indicate that maternal executive functioning, specifically, working memory, was linked to binge eating behaviors in children. To our current knowledge, this is the first study that has utilized both objective and subjective measures of cognitive ability as well as a measure of emotion regulation in mothers to assess potential relationships with child binge eating symptoms. Our findings highlight the importance of using multimodal data in mothers when examining associations with maladaptive behavioral and emotional responses in children. Further, the inclusion of African-American parent-child dyads is a major strength of this study, given the general lack of intergenerational research on African-American families.

Identification of the dyadic relationship between maternal executive functioning and child binge eating presents a unique target for early interventions for children at risk for developing BED. Parent-focused interventions could assist in childhood binge eating symptoms, including interventions for stress reduction, which impact executive functioning (Crandall et al., 2015). Altogether, understanding the importance of maternal executive functioning in children's binge eating is an important step in identifying useful targets for BED prevention early in development.

CRediT authorship contribution statement

Dominique La Barrie: Conceptualization, Formal analysis, Writing - review & editing, Supervision. **Raven A. Hardy:** Data curation, Writing - original draft, Writing - review & editing. **Cherita Clendinen:** Data curation, Writing - review & editing. **Jahnvi Jain:** Data curation, Writing - review & editing. **Bekh Bradley:** Resources, Writing - review & editing. **Andrew P. Teer:** Data curation, Writing - review & editing. **Vasiliki Michopoulos:** Data curation, Writing - review & editing. **L. Alexander Vance:** Data curation, Writing - review & editing. **Rebecca Hinrichs:** Data curation, Writing - review & editing. **Tanja Jovanovic:** Conceptualization, Resources, Writing - review & editing. **Negar Fani:** Conceptualization, Formal analysis, Writing - review & editing.

Declaration of Competing Interest

The authors have no financial conflicts of interest to disclose.

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Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.psychres.2020.113600.

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